

DSC (3) Syllabus for B.Sc. Biochemistry (Basics and Honors)

Semester-III

Course Code :	222369	
Course Title:	DSC(3)- Bio-organic Chemistry	
	Theory	Practical
Total Course credits (L:T:P) (4:0:2)	04	02
Total contact hours	56	56
Hours of teaching/week	04	04
Formative assessment marks	40	25
Semester End Assessment marks	60	25
Exam duration	2 ½ Hrs	3Hrs

COURSE OUTCOMES (COs):

CO1: Classify the organic reactions and illustrate the concept of reactive intermediates of organic compounds and the fundamental aspects of reaction mechanism.

CO2: Elucidate the mechanism, stereochemistry and energy profile diagrams of substitution and elimination reactions and addition reactions of with examples.

CO3: Develop competence in relating the chemistry and role of co-enzymes and interpret the mechanism of electrophilic aromatic substitution reaction.

CO4: Acquire the knowledge the Isolation, classification, structure, properties and biological importance of various bio-organic compounds.

Course Content : DSC (3) - Bio-organic Chemistry	56Hr
Unit-1: Reaction mechanisms and aliphatic hydrocarbons	14hr
<ul style="list-style-type: none">Introduction: Meaning of the terms - kinetic and non-kinetic. Fundamental aspects: Homo and heterolytic cleavage. Classification of organic reactions - substitution, addition, elimination and re-arrangement with two examples for each. Concepts of reactive intermediates – Carbocations, carbanions, free radicals, carbenes, nucleophiles and electrophiles (Formation and Stability). Concept of inductive effect and mesomeric effect. Resonance and hyperconjugationAliphatic Hydrocarbons - Mechanism of addition of HCl to propene, Markovnikov's rule, Alkenes – Ozonolysis, oxidation. Alkynes – formation of acetylides and their importance. Dienes– types with examples. Conjugate dienes-1, 3-butadiene - stability, mechanism of addition of HBr. Conformational analysis of ethane and n-butane.	
Unit 2 : Mechanism of substitution, elimination, and addition reactions	14hr
<ul style="list-style-type: none">Substitution reaction- SN₁ and SN₂ reactions on tetrahedral carbon, energy profile diagrams, Stereochemistry of SN₂ and SN₁ reactions. Factors affecting SN₂ and SN₁ reactions. Substitution reactions in synthesis of ether (Williamson ether synthesis) and amines.Elimination reactions - E₂ reaction, Zaitsev rule, E₁ reaction. Stereochemistry of E₁ & E₂ reactions, E₂ & E₁ elimination from cyclic compounds. Elimination reactions in synthesis of alkynes.Addition reactions – Nucleophilic addition reactions of Aldehydes and Ketones with HCN, Formation of acetals& ketals. Addition reactions of Ammonia, primary amines and other ammonia derivatives. Nucleophilic addition in alpha and beta unsaturated aldehydes and ketones: 1, 2 and 1, 4 additions.	

<p>Unit 3: Mechanism of electrophilic aromatic substitution reactions</p> <ul style="list-style-type: none"> • Aromatic compounds – Aromaticity, Huckel’s rule, criteria for aromaticity, anti-aromatic, and non-aromatic compounds with examples. Mechanism of electrophilic substitution reactions - Halogenation, nitration and Sulfonation. Mechanism of Friedel crafts alkylation and Friedel crafts acylation. Effect of substituents on reactivity and orientation of mono substituted benzenes and polycyclic benzenoid hydrocarbons (E.g.: Naphthalene) • Structure and Role of coenzymes Thiamine pyrophosphate- structure and its role in decarboxylation of alpha- keto acids. Biotin- structure and its role in carboxylation of some important biochemical reactions of carbohydrate and lipid metabolism. Vit B₁₂ its role in rearrangement reactions. Vit B₂ coenzymes and its role in redox reactions with suitable examples. 	<p>14 hr</p>
<p>Unit 4: Bio-organic compounds</p> <ul style="list-style-type: none"> • Alcohols: Classification, Monohydric alcohols: examples, general and distinguishing reactions. Dihydric alcohols: glycols, Tri hydric alcohols: glycerol – synthesis from propene, properties and uses. • Phenols: Classification, electronic interpretation of acidity of phenols, mechanism of Kolbe, Reimer– Tiemann and bromination reactions • Hydroxy acids: Structure and properties: Lactic acid, Citric acid and Isocitric acid. Dicarboxylic acids: Maleic and Fumaric acid. Ketoacids: Pyruvic, α-Ketoglutaric, Oxaloacetic acid. • Carbonyl compounds: General properties, Keto-enol tautomerism. Mechanisms: addition of HCN to acetaldehyde, Claisen and aldol condensations. Quinones: o and p-benzoquinones-structure and properties. • Amines: Classification, properties, functional group – Basicity of amines, acylation. Reaction with HNO₂ & Schiff’s base formation. Distinguishing reactions of primary, secondary and tertiary amines. • Heterocyclic compounds: Definition, classification with examples, structure and biological importance of furan, pyrrole, thiophene, pyridine, pyran, thiazole, pyrimidine, purine, indole, imidazole, quinoline and isoquinoline. Basicity of pyrrole and pyridine. • Terpenes: Definition, Isoprene rule, classification, isolation, structure and biological importance of menthol, camphor, farnesol, phytol, lanosterol, lycopene, and dolichols. • Steroids: Basic ring structure in steroids. Structure and biological importance of cholesterol, phytosterols, ergosterol, cortisol, β-estradiol, testosterone, and aldosterone. Bile acids (Mono, Di & Tri cholic acids). • Alkaloids: Definition, classification based on their structure and biological functions, Isolation of alkaloids, structure and physiological action of morphine, nicotine and atropine. 	<p>14 hr</p>
<p>References:</p> <ol style="list-style-type: none"> 1. Textbook of Organic Chemistry 22nd Edition S. Chand Publishers 2019. 2. Organic Chemistry. Vol. I Fundamental Principles. I. L. Finar. 6th Edn. ELBS, 2002 3. Organic Mechanisms, Peter Sykes, Longman, 1977 4. Organic Chemistry. R.T. Morrison and R.N. Boyd. 6th Edn. Prentice Hall, India, 2018 5. Lehninger- Principles of Biochemistry; DL Nelson and MM Cox [Eds], 6th Edn. Macmillan Publications 2012 6. Chemistry- An Introduction to General, Organic and Biological Chemistry, 7th Edn. Karen C. Timberlake, Benjamin Cummings, 1999 7. Reaction Mechanisms at a Glance, ed. M. Moloney, Blackwell Science 2000. https://www.sciencedirect.com/science/article/pii/B9780444533456504600 https://egyankosh.ac.in/bitstream/123456789/7586/1/Unit-15.pdf https://www.britannica.com/science/hydrocarbon/Chemical-reactions https://www.britannica.com/science/elimination-reaction https://www.chemistrylearner.com/addition-reaction.html 	

COURSE ARTICULATION MATRIX: DSC (3)- 222369

PO CO	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	1	1	2	1	1	1	1	1	1	-	1
CO2	3	1	1	2	1	-	1	1	1	1	-	1
CO3	3	1	1	2	1	-	1	1	1	1	-	2
CO4	3	1	1	2	1	1	2	1	1	1	1	2
Weighted average	3	1	1	2	1	1	1.25	1	1	1	1	1.5

OE (3) Biochemistry Syllabus for All Programs (Except Science)

Semester-III

Course Code :	22OEBIC301
Course Title:	Biochemical Techniques
Total Course credits (L:T:P) (3:0:0)	03
Total contact hours	42
Hours of teaching/week	03
Formative assessment marks	40
Semester End Assessment marks	60
Exam duration	2 ½ Hrs

COURSE OUTCOMES (COs):

- **CO1:** Explicate the different types of microscope and their characteristics. Implement the knowledge of basic principles of centrifugation, their types and applications.
- **CO2:** Develop competence in handling various chromatographic, electrophoretic techniques and apply them in isolating and characterizing different biological molecules
- **CO3:** Acquire the knowledge of basic principle, methodology and applications of radio isotopic methods and spectroscopic methods in bio-analysis.

Course Content : OE(3)-Biochemical Techniques	42hr
Unit 1: Microscopy and Centrifugation techniques	14hr
<ul style="list-style-type: none"> • Microscopy: Different types of microscopes – electron microscopes – TEM, SEM. Fluorescence and confocal microscopes used in fine structure studies. • Centrifugation Techniques: Introduction, basic principle – sedimentation, Sedimentation coefficient. Centrifuge - Basic instrumentation. Types of Centrifuge - Small bench centrifuges, high speed refrigerated centrifuges, analytical ultracentrifuge Preparative ultra- centrifuge (density gradient and differential centrifugation). Applications of centrifuge. 	
Unit 2: Chromatography and Electrophoresis techniques	14 hr
<ul style="list-style-type: none"> • Chromatography: Introduction, Classification, Principle, theory and applications - paper chromatography, thin layer chromatography, column chromatography- adsorption chromatography and gel permeation. Principle and applications of ion exchange chromatography, affinity chromatography. Applications of High performance liquid chromatography (HPLC). • Electrophoresis techniques: Introduction, types, Principle of paper electrophoresis, starch gel electrophoresis. Principle, procedure and applications of agarose gel electrophoresis and PAGE. Principles and applications - Isoelectric focusing, Pulse field electrophoresis, two-dimensional electrophoresis and Capillary electrophoresis. 	
Unit 3: Radio isotopic techniques and Spectroscopy	14 hr

- **Radio isotopic techniques:** Introduction to isotopes, stable and unstable radioisotopes, Nature of radioactive decay, decay constant, units of radioactivity. Measurement of radioactivity using proportional counter and GM counter. Principle and applications of autoradiography. Applications of radioisotopes in biological sciences. Harmful effects of radioisotopes on environment and human. Safety measures in handling radio isotopes.
- **Spectroscopy:** Introduction, Definition, Nature of electromagnetic radiations. Principles and applications- of UV- Visible spectroscopy, Fluorescence spectroscopy and Infrared spectroscopy. Brief principle of Atomic Absorption spectroscopy. Principle and Applications of NMR, electron spin resonance (ESR) and Mass spectroscopy.

References:

1. Modern Experimental Biochemistry: Rodney Boyer, 3rd Edn. Benjamin Cummings,2000
2. Practical Skills in Biomolecular Sciences: R Reed, D. Holmes, J. Weyers, and A. Jones 1998
3. Physical Biochemistry: David Frifielder 2nd Edition,1983
4. Biophysical Chemistry Upadya and Upadya,2016
5. Introductory Practical Biochemistry: SK Sawhney and Randhir Singh,2001

<http://www.nature.com/subjects/analytical-biochemistry>
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206469/>
<https://www.britannica.com/science/chromatography>
<http://www.nature.com/subjects/analytical-biochemistry>
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206469/>
<https://www.britannica.com/science/chromatography>

COURSE ARTICULATION MATRIX: OE (3): 22OEBIC301

PO CO	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	1	1	1	1	1	1	-	2
CO2	2	1	2	2	2	2	1	1	1	1	2	2
CO3	2	1	2	2	1	3	1	2	1	1	1	2
Weighted average	2	1	2	2	1.33	2	1	1.33	1	1	1.5	2

OE (3) Biochemistry Syllabus for All Programs (Except Science)

Semester-III

Course Code :		22OEBIC302
Course Title:	Hormones- Biochemistry and function	
Total Course credits (L:T:P) (3:0:0)	03	
Total contact hours	42	
Hours of teaching/week	03	
Formative assessment marks	40	
Semester End Assessment marks	60	
Exam duration	2 ½ Hrs	

COURSE OUTCOMES (COs):

- **CO1:** Classify hormones and demystify functions of various hormones.
- **CO2:** Interpret the hormonal systems act in an integrated manner to regulate overall body functions.
- **CO3:** Analyze the failure of the normal physiologic functions and integrations associated with some endocrine disorders.

Course Content : OE(3)-Hormones biochemistry and functions	42hr
Unit 1: Introduction	14hr
<ul style="list-style-type: none">• Introduction to the system and concepts of signaling. Classification, intercellular communication, regulation of synthesis and secretion of hormones. Chemical signaling- endocrine, paracrine, autocrine, juxtacrine, and neuroendocrine mechanisms.• Mechanisms of hormone action: synergism, antagonism, and permissive effects. Classification of hormones by the origin, chemical structure, location, and mechanism of action. Physiological role and disorders of Pituitary, Pineal, Thyroid and Parathyroid hormones. Introduction to the hypothalamus as the true master gland with Releasing hormones and inhibitory substances. Neurohypophysis and its secretions – Vasopressin (ADH) and Oxytocin	
Unit 2: Mechanism of Hormones and Signal transduction pathways	14 hr
<ul style="list-style-type: none">• Physiological role and disorders of hormones of pancreas, adrenal, and placenta. Introduction to gastrointestinal hormones and neurotransmitters (Acetyl choline, GABA, Serotonin). Mechanism of action, target tissues, and the physiological effects of gastrointestinal hormones. Functions of sex hormones. Hormones during ovarian and uterine phases of menstrual cycle; Placental hormones: role of hormones during parturition and lactation. Hormone receptors: receptors in the cell membrane and in the cell.• Secondary and tertiary messengers (cAMP and Ca⁺²). Overview on signal transduction pathways for steroidal and non-steroidal hormones (One example each).	
Unit 3: Clinical Endocrinology	14 hr

Clinical endocrinology- Blood volume, composition and functions of plasma and serum. Separation and storage of body fluids. Methods of hormone estimation, principles of assay systems, normal range of hormones in tissues and clinical conditions leading to abnormal levels with interpretations. Thyroid function test- Determination of T3, T4, and TSH. Infertility profile: Determination of LH, FSH, TSH, Estrogen, Progesterone, Total Testosterone, Free testosterone. Major manifestations of disease of the endocrine pancreas, thyroid, hypothalamus, and pituitary disease

References:

1. Norman AW, Litwack G (1997), Hormones, 2nd Edition, Elsevier Publications.
 2. Bolander F (2004), Molecular Endocrinology, 3rd Edition, Elsevier Publications.
 3. Rifai N (2007), Teitz Fundamentals of Clinical Chemistry, 6th Edition, Elsevier Publications.
 4. Henry's Clinical Diagnosis and Management by Laboratory Methods (2011), 22nd Edition, Elsevier.
 5. Vasudevan DM (2011), Text book of Medical Biochemistry, 6th Edition, Jaypee Publishers.
 6. Chatterjea MN & Shinde R (2012), Text book of Medical Biochemistry, 8th Edition, Jaypee Publications.
 7. Bishop ML, Fody EP, Schoeff LE (2013), Clinical Chemistry: Principles, Techniques, and Correlations, 7th Edition, Wiley Publications.
- <https://my.clevelandclinic.org/health/articles/22464-hormones>
 - <https://www.healthline.com/health/the-endocrine-system>
 - <https://www.britannica.com/science/hormone>

COURSE ARTICULATION MATRIX: OE (3)- 22OE BIC302

PO \ CO	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	2	2	1	1	2	1	1	1	-	1
CO2	2	1	2	2	1	2	2	1	1	1	-	1
CO3	2	1	2	2	1	3	2	1	1	1	-	1
Weighted average	2	1	2	2	1	2	2	1	1	1	-	1

DSC (4) Syllabus for B.Sc. Biochemistry (Basics and Honors)

Semester- IV

Course Code :	222469	
Course Title:	DSC(4)- Analytical Biochemistry	
	Theory	Practical
Total Course credits (L:T:P) (4:0:2)	04	02
Total contact hours	56	56
Hours of teaching/week	04	04
Formative assessment marks	40	25
Semester End Assessment marks	60	25
Exam duration	2 ½ Hrs	3Hrs

COURSE OUTCOMES (COs):

- **CO1:** Illustrate different methods of extraction and biological sample preparation. Get acquainted with care and maintenance of equipment and chemicals. Acquire the knowledge of basic principles of centrifugation, their types and applications.
- **CO2:** Develop competence in handling various chromatographic techniques and apply the principle of chromatography in isolating and characterizing different biological molecules i.e., proteins, electrolytes, hormones etc.
- **CO3:** Implement the knowledge of basic principle, methodology, applications of various electrophoretic techniques and radio isotopic methods in various fields
- **CO4:** Elucidate the principle, methodology and applications of different types of spectroscopic methods of bio-analysis.

Course Content : DSC (4) - Analytical Biochemistry	56hr
Unit 1: Biological sample preparation and fractionation and centrifugation	14hr
<ul style="list-style-type: none">• Introduction to bio-analysis, objectives of bio-analysis, Extraction of molecules from tissue and cells, types of biological sample - living and post-mortem, sample preparation and preservation of biological sample. Extraction of macromolecules from cells and tissues: liquid-liquid, liquid-solid and precipitation methods.• Centrifugation: Introduction, principle of centrifugation, sedimentation, sedimentation coefficient, angular velocity, centrifugal field and relative centrifugal field. Basic instrumentation, types of rotors and their design. Types of centrifuge: desk top, high speed and ultra-centrifuge. Construction and applications of Ultra-centrifuge. <p>Types of Ultra centrifuge – Preparative: Differential and density gradient ultra-centrifuge (Principle and applications) and Analytical ultra-centrifuge. Operational instruction and applications of Laboratory centrifuge in sub-cellular fractionation. Care and maintenance of instrument</p>	

Unit 2: Chromatography	14hr
<ul style="list-style-type: none"> • General principles of chromatography, history of chromatography, Classification based on - nature of stationary and mobile phase: Gas chromatography and liquid chromatography, principle or mode of operation: adsorption and partition, based on geometry: Planar and column chromatography. • Principle, methodology and applications of Paper chromatography - ascending, descending and circular, 2D chromatography, Rf values, Thin layer Chromatography (TLC), Adsorption chromatography, gel-filtration, Ion-exchange and affinity- chromatography. • Advanced chromatography- HPLC and FPLC, UPLC and GLC 	
Unit 3: Electrophoretic and radio isotopic methods	14hr
<ul style="list-style-type: none"> • Electrophoresis: General principle of electrophoresis, velocity of a charged molecule in the applied electric field in relevance of ohm's law on electrophoretic separation. Factors affecting electrophoresis, supporting media for electrophoresis- work of Tiselius, paper, agarose and polyacrylamide. • Principle, methodology and applications of - Agarose gel, Pulse field electrophoresis, native PAGE and SDS- PAGE, 2-D electrophoresis, diagonal electrophoresis. Identification of proteins; post electrophoresis- dyes and biological activities. Brief principle and applications of applications of capillary electrophoresis, isoelectric focusing, cellulose acetate electrophoresis and immuno- electrophoresis. • Radioisotopic methods: Radioactivity, radioactive decay, types of radioactive decay, Properties of α, β, γ radiations. Group displacement law, decay law, decay constant, Half-life period and average life of a radioactive element. Detection of radioactivity – GM counter and scintillation counters (Construction, principle and working) Applications of radioisotopes – ^3H, ^{14}C, ^{131}I, ^{60}Co and ^{32}P. Biological effects of radiations, radio labeling, Safety measure in handling radioisotopes. 	
Unit 4: Spectroscopic methods of bio-analysis	14hr
<ul style="list-style-type: none"> • Introduction, Wave particle duality of light, electromagnetic spectrum, transition in spectroscopy. Beer-Lambert's and its limitations. Determination of molar absorption coefficient of molecules. • Spectroscopic methods: Working principle and applications of a colorimeter, flame photometer and fluorimeter. Principle, design and applications of UV-Visible spectrophotometer. Principle and applications of IR, and Raman spectroscopy, ESR and NMR spectroscopy. 	
References: <ol style="list-style-type: none"> 1. Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer 2011 2. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology 8th Edn. Andreas Hoffman and Samuel Clockie, Ed., Cambridge University Press, 2018. 3. Biochemistry and Molecular Biology; 5th Edn. D. Papachristodoulou, A. Snape, W.H. Elliott, and D. C. Elliott, Oxford University Press 2014. <p> https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206469/ https://www.britannica.com/science/chromatography https://www.youtube.com/watch?v=SnbXQTTHGs4 https://www.youtube.com/watch?v=WQBjrqK24U http://www.nature.com/subjects/analytical-biochemistry https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206469/ https://www.britannica.com/science/chromatography https://www.youtube.com/watch?v=SnbXQTTHGs4 https://www.youtube.com/watch?v=WQBjrqK24U </p>	

DSC (4) - Practical Syllabus

Course Content–DSC(4): Analytical Chemistry Practical-4	56hr
List of experiments to be conducted	
<ol style="list-style-type: none"> 1. Preparation of human lymphocytes using clinical centrifuge 2. Determination of packed cell volume/ hematocrit 3. Resolution of basic, acidic & aromatic amino acids by ascending /descending Paper chromatography. 4. Identification and resolution of amino acids using circular paper chromatography. 5. Identification and resolution of plant pigments by thin layer chromatography 6. Separation of plant pigments by Gel permeation chromatography 7. Determination of Void volume of Gel filtration chromatography 8. Recording the absorption spectrum of Riboflavin. 9. Colorimetric estimation of glucose by DNS method/ protein by biuret method 10. Estimation of DNA by diphenylamine method. 11. Electrophoretic Separation of plasma proteins by SDS PAGE. 	
References :	
<ol style="list-style-type: none"> 1. Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer,2011 2. Wilson and Walker’s Principles and Techniques of Biochemistry and Molecular Biology 8thEdn. Andreas Hoffman and Samuel Clockie, Ed., Cambridge University Press, 2018. 3. Biochemistry and Molecular Biology; 5th Edn. D. Papachristodoulou, A. Snape, W.H. Elliott,and D. C. Elliott, Oxford University Press, 2014 <ul style="list-style-type: none"> • https://www.academia.edu/37972088/Lab_Manual_STK1211_Practical_For_Analytical_Chemistry_Semester_1_Session_2018_2019_pdf • https://www.researchgate.net/publication/338224715_Practical_analytical_chemistry_lab_manual_lab 	

COURSE ARTICULATION MATRIX: DSC (4) - 222469

PO CO	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1	3	2	2	2	1	1	1	1	1	1	2	1
CO2	3	2	2	2	1	-	2	1	2	1	2	1
CO3	3	2	2	2	1	-	2	2	1	1	2	1
CO4	3	2	2	2	1	1	2	1	1	1	2	1
Weighted average	3	2	2	2	1	1	1.75	1.25	1.25	1	2	1

OE (4) Biochemistry Syllabus for All Programs (Except Science)

Semester-IV

Course Code :	22OEBIC401
Course Title:	Biochemical Toxicology
Total Course credits (L:T:P) (3:0:0)	03
Total contact hours	42
Hours of teaching/week	03
Formative assessment marks	40
Semester End Assessment marks	60
Exam duration	2 ½ Hrs

COURSE OUTCOMES (COs):

- **CO1:** Gain basic idea about biochemical basis various toxins, route of administration, their site of action, dose response, effects and its risk assessments.
- **CO2:** Categorize the classes of toxicants with specific examples and explain the factors effecting toxic responses, absorption, metabolism and elimination of toxins.
- **CO3:** Illustrate the methods of identifying the damages to the targets or organs and biochemical mechanism of toxicity.

Course Content : OE(4)-Biochemical toxicology	42 hr
Unit 1: Fundamentals of toxicology and dose response	14 hr
Introduction, aim and Scope of toxicology; Toxins/xenobiotics (drugs) and Grading toxicity, use of animal models for toxicity studies, <i>in vitro</i> toxicity, organ toxicity (liver and kidney toxicity). Indicators of toxicity/drug effects; biomarkers. Concentration and site of action, dose response, effect of route of administration, ED ₅₀ , LD ₅₀ /TD ₅₀ . Hazard and risk assessment, acceptable daily intake (ADI) and tolerable daily intake (TDI).	
Unit 2: Factors affecting toxic response	14 hr
Disposition- Outline of toxin/drug uptake, entry to cells and systemic circulation. Effect of size, shape, solubility, and charge on their uptake. Major sites of absorption - liver, intestine, and skin. Role of transporters, role of plasma proteins in toxins distribution, levels of toxins/drugs in plasma and its half-life, excretion- disposition by kidney, biliary excretion. Metabolism: Types of metabolic changes of foreign compounds, biotransformation/detoxification reaction, phase-1 and phase -2 reactions, nature of phase-1 and phase 2 enzymes.	
Unit 3: Targets of toxic substances and biochemical mechanism of toxicity	14 hr
Toxins/drugs causing liver, kidney, gall bladder, and lung damage. Methods of identifying the damages.Examples of biochemical toxicity mechanisms; <ul style="list-style-type: none">• Chemical carcinogens- Benzo[a]pyrene, Tamoxifen.• Liver necrosis- carbon tetrachloride, Valproic acid, and Iproniazid, Kidney damage- Chloroform, Antibiotics- gentamycin,• Lung damage- 4-Ipomeanol• Neurotoxicity – Isoniazid, parquet, primaquine and cyclo phosphamide.	

References:

1. Biopharmaceuticals Biochemistry and Biotechnology 2nd Edn. Gary Walsh, John Wiley & Sons, Ltd, England, 2003
2. Fundamentals of Experimental Pharmacology, Ghosh, M.N. 2nd Edition, Scientific Book Agency, Kolkatta, 1984.
3. Introduction to Biochemical Toxicology, 3rd Edn., Ernest Hodgson , Robert C. Smart; Wiley-Interscience; , 2001
4. Principles of Biochemical Toxicology, John A. Timbrell, 4th Edn. 2009, Taylor & Francis
5. Remington Pharmaceutical Sciences, Lippincott, Williams and Wilkins, 2000

<https://pharmacy.utah.edu/pharmtox/research/drug-metabolism-biochemical>

<https://onlinelibrary.wiley.com/journal/10990461>

COURSE ARTICULATION MATRIX: OE (4)- 22OEBIC401

PO CO	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	1	1	1	2	2	1	1	1	1	1
CO2	2	1	1	1	1	2	2	1	1	1	1	1
CO3	2	1	1	1	1	2	2	1	1	1	1	1
Weighted average	2	1	1	1	1	2	2	1	1	1	1	1

OE (4) Biochemistry Syllabus for All Programs (Except Science)

Course Code :	22OEBIC402
Course Title:	Plant Biochemistry
Total Course credits (L:T:P) (3:0:0)	03
Total contact hours	42
Hours of teaching/week	03
Formative assessment marks	40
Semester End Assessment marks	60
Exam duration	2 ½ Hrs

COURSE OUTCOMES (COs):

- **CO1:** Gain the knowledge of plant cell, Photosynthesis, transporters and important primary metabolites of plants.
- **CO2:** Illustrate plant growth regulators, plant's responses to various biotic and abiotic stresses.
- **CO3:** Ability to explain secondary metabolites of plants and their functional importance.

Course Content : OE(4)-Plant Biochemistry	42 hr
Unit 1: Introduction	14 hr
<ul style="list-style-type: none"> • Plant cell- structure and molecular components: Cytoskeleton- an overview. Plant cell division and cell cycle. Outlines of energy production in plant cells, Carbon assimilation and nitrogen assimilation. • An overview of photosynthesis: Introduction, Photosynthesis and it's importance, Photosynthesis in C₃, C₄ plants and Crassulacean acid metabolism (CAM) plants, photorespiration- definition and significance, Differences between photorespiration and photosynthesis, Phytochromes, cryptochromes and phototropins (definition, examples and function). Sulfur cycle. • Plant cell membranes and membrane transport: Introduction to plant cell membranes and membrane constituents. Organization of transport systems across plant membranes; Different types of pumps operate at plant cell and organelle membranes, importance of H⁺-ATPases. Ion channels-properties and significance; Aquaporins and water transport. • Important Primary metabolites of plants: Definition of primary metabolites, Cellulose, starch, sucrose, oligosaccharides; fructans, gums, mucilages, poly unsaturated fatty acids, lignin, suberin, surface waxes, sulfides and sweet proteins. 	
Unit 2: Plant growth regulators and responses.	14 hr
<ul style="list-style-type: none"> • Plant growth regulators: Auxins, cytokinins, gibberellins, abscisic acid, ethylene, brassinosteroids, polyamines, jasmonic acid, salicylic acid. • Plant responses to biotic and abiotic stresses: Introduction; Plant pathogens and diseases; plant defense systems - hypersensitive response; systemic acquired resistance; induced systemic resistance; Plant biotic stress response to pathogens and insects. • Plant abiotic stress responses: Salt stress, drought, and heavy metal stress responses; osmotic adjustment and significance of osmolytes such as proline, sugar alcohols and quaternary ammonium compounds; an overview of oxidative stress and oxidative damage. Antioxidant enzymes and stress tolerance 	
Unit 3: Plant secondary metabolites	14 hr

- **Plant secondary metabolites (Natural products):** Introduction, secondary metabolites (natural productions), classification of plant secondary metabolites. An overview of primary metabolism contribution to secondary metabolites biosynthesis.
- **Alkaloids:** Definition, Classification of alkaloids; Contribution of amino acids for alkaloid biosynthesis; Isolation, purification and characterization of alkaloids. (S)-Seticuline-the chemical chameleon.
- **Phenolics:** Definition, Classification of phenolic compounds, flavonoids and anthocyanins; Isolation, purification and characterization of phenolics.
- **Terpenoids:** Definition, Classification of terpenoids, isoprene rule; volatile compounds – menthol, camphor, limonene; plant growth regulators – gibberellin, abscisic acid; brassinosteroids and saponins. Isolation, purification, and characterization of terpenoids
- **Biological properties of secondary metabolites:** Role of secondary metabolites - in plants defense; in insects signaling, morphogenesis, and defense. Physiologically active secondary metabolites in modern medicine and therapeutic compounds for human ailments

References:

1. Lehninger's Principles of Biochemistry - Nelson & Cox. CBS Publishers & Distributors, 2013
2. Principles of Biochemistry - Moran, Horton, Scrimgeour, Perry. Pearson, 5th Edition, 2011
3. Plant Biochemistry - P.M. Dey & J.B. Harborne. Hart Court Asia Pvt Ltd. 1997
4. Plant Biochemistry and Molecular Biology - P. Lea & Richard C Leegood., John Wiley & Sons. 1999
5. Introduction to Plant Biochemistry - Goodwin and Mercer. CBS Publisher and Distributors. 2005
6. Biochemistry and Molecular Biology of Plants - Buchanan, Greussem and Jones. American Society of Plant Physiologists. 2000
7. Natural Products from plants. Peter B. Kaufman, Leland J. Cseke, Sara Warber, James A. Duke, Harry L. Brielmann, CRC Press, Boca Raton 1999.
8. Natural Products Targeting Clinically Relevant Enzymes. Paula B. Andrade, Patricia Valentao David M. Pereira. Wiley-VCH Verlag GmbH & Co 2017
9. Plant Cell Tissue and Organ Culture: Fundamental Methods - O.L. Gamborg & G.C. Phillips Narosa Publishers, New Delhi, 1995.
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DSC (3) Syllabus for B.Sc. Biotechnology (Basic and Honors)

Semester III

Course Code: 222359	Course Title: Biomolecules (Theory) Biomolecules (Practical)
Course Credits: 06 (4:0:2)	Hours of Teaching/Week: 8 hrs 04 (Theory) + 04 (Practical)
Total Contact Hours: 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2.5 Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes:

1. Acquire knowledge about types of biomolecules, structure, and their functions
2. Demonstrate the skills to perform bioanalytical techniques
3. Apply comprehensive innovations and skills of biomolecules to biotechnology field

Contents	Hours
Unit I	
<p>a) Carbohydrates: Introduction, classification of carbohydrates. Structure, function and properties of carbohydrates. Monosaccharides- Isomerism and ring structure, sugar derivatives – amino sugars and ascorbic acid. Disaccharides – Maltose, Lactose and Sucrose Polysaccharides – Classification as homo and heteropolysaccharides. Homopolysaccharides - storage polysaccharides (starch and glycogen- structure, reaction and properties), structural polysaccharides (cellulose and chitin-structure, properties). Heteropolysaccharides - glycoproteins and proteoglycans (structure and functions).</p> <p>b) Amino Acids, Peptides and Proteins: Introduction, classification and structure of amino acids. Concept of – Zwitterion, isoelectric point, pKa values. Essential and nonessential amino acids. Peptide bond and peptide. Structural organization of proteins [primary, secondary (α, beta, tertiary and quaternary)]. Fibrous and globular proteins, Denaturation and renaturation of proteins.</p>	14
Unit II	
<p>a) Lipids Classification and function of lipids, Saturated and unsaturated fatty acids, properties (saponification value, acid value, iodine number, rancidity), Hydrogenation of fats and oils. General structure and biological functions of - phospholipids, sphingolipids, glycolipids, lipoproteins, prostaglandins, cholesterol, ergosterol.</p> <p>b) Enzymes Introduction, nomenclature and classification. Enzyme kinetics: Enzyme activity, specific activity, factors influencing enzyme activity (temperature, pH, substrate concentration), metalloenzymes, activation energy and transition state. Cofactors, Coenzymes and their functions (one reaction involving TPP, FAD, NAD). Enzyme inhibition- Irreversible and reversible (competitive, non-competitive and uncompetitive inhibition with an example each) Zymogens (trypsinogen,</p>	14

chymotrypsinogen and pepsinogen), Isozymes (LDH, Creatine kinase and their clinical significance).	
Unit III	
<p>a) Vitamins: Water and fat soluble vitamins, dietary source and biological role of vitamins. Deficiency manifestation of vitamin A, B, C, D, E and K</p> <p>b) Nucleic acids: Structure of nucleosides, nucleotides in DNA and RNA. Structure and functions of DNA and RNA, Watson and Crick model of DNA and other forms of DNA (A and Z). Types of RNA (rRNA, tRNA, mRNA, snRNA, hnRNA, miRNA), ribozymes.</p> <p>c) Hormones: Classification of hormones based on chemical nature and mechanism of action. Chemical structure and functions of Glucagon, insulin, Epinephrine, Testosterone and Estradiol.</p>	14
Unit IV	
Bioanalytical Tools	
<p>a) Electrophoresis: Principle, procedure and applications of electrophoresis (paper electrophoresis, gel electrophoresis -PAGE, SDS- PAGE & agarose electrophoresis) and isoelectric focusing.</p> <p>b) Spectroscopy: Colorimetry, UV-Vis spectrophotometry, Spectrofluorimetry, IR and NMR spectroscopy, atomic absorption spectroscopy, mass spectroscopy.</p> <p>c) Radioisotope techniques: Radioactivity, half life, radioisotopes, GM counter, scintillating counting, autoradiography, applications, biosafety.</p>	14

III SEMESTER PRACTICAL PAPER

BIOMOLECULES

1. Introduction to basic instruments: Principle, standard operating procedure with demonstration of colorimeter, Spectrophotometer, pH meter, Centrifuge, Electrophoresis unit.
2. Definitions and calculations: Molarity, Molality, Normality, Mass percent % (w/w), Percent by volume (% v/v), parts per million (ppm), parts per billion (ppb), Dilution of concentrated solutions. Standard solutions, stock solution, solution of acids. Reagent bottle label reading and precautions.
3. Preparation of standard buffers by Hendersen-Hasselbach equation – Acetate, phosphate, Tris and determination of pH of solution using pH meter.
4. Estimation of maltose by DNS method
5. Determination of α -amylase activity by DNS method
6. Estimation of proteins by Biuret method
7. Estimation of amino acid by Ninhydrin method
8. Extraction of protein from soaked/sprouted green gram by salting out method
9. Separation of amino acids by circular paper chromatography
10. PAGE
11. Determination of iodine number of lipids

Text Books / References

1. An Introduction to Practical Biochemistry, 3rd Edition, (2001), David Plummer; Tata McGraw Hill Edu.Pvt.Ltd. New Delhi, India.
2. Biochemical Methods, 1st Edition, (1995), S.Sadashivam, A.Manickam; New Age International Publishers, India.
3. Experimental Biochemistry: A Student Companion, BeeduSasidharRao & Vijay Despande(ed).I.K International Pvt. LTD, NewDelhi. ISBN 81-88237-41-8
4. Introductory Practical biochemistry, S. K. Sawhney & Randhir Singh (eds) Narosa Publishing. House, New Delhi, ISBN 81-7319-302-9.
5. Standard Methods of Biochemical Analysis, S. K. Thimmaiah (ed), Kalyani Publishers, Ludhiana ISBN 81-7663-067.
6. J.L Jain, Fundamentals of Biochemistry, S.Chand & company ltd. New Delhi ,India
7. John A Timbell, Principles of Biochemical Toxicology.
8. Lehninger A.L., Principles of Biochemistry (1982), Worth Publishers, Inc. New York.
9. Voet, D and Voet, J.G. (2004). Biochemistry, 3rd Edition, JohnWiley & Sons, Inc.USA.
10. U. Satyanarayana., Biochemistry, Books and Allied (P) Ltd. Kolkata, India
11. A.C.Deb- TextBook of Biochemistry, New Central Book Agency (P) Ltd, Kochi, India
12. David T. Plummer, An Introduction to practical biochemistry, McGraw-Hill Book Company (U.K.) Ltd., London
13. Sadasivam S., Manickam A, Biochemical Methods 2nd ed, New Age International, Bengaluru, India
14. Biochemistry 2nd ed Keshav Trehan, New Age International, Bengaluru, India

15. Murray, K. Robert; Granner, K. Daryl; Mayes, A. Peter; Rodwell, W. Victor. Harper's Illustrated Biochemistry 26th ed, McGraw-Hill Companies, USA
16. Jayaraman, J., Laboratory Manual in Biochemistry. New Age International, Bengaluru, India
17. G.R. Agarwal, Text Book OF Biochemistry Krishna Prakashan Media (P) Ltd, Meerut, India
18. Jasra O.P, Text book of biochemistry vol 1 Sarup Books Publishers Pvt Ltd, New Delhi, India
19. Denise R. Ferrier, Lippincott's illustrated reviews: Biochemistry, Lippincott Williams & Wilkin, Philadelphia, USA

Web links:

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<https://www.britannica.com/science/biomolecule>

<https://testbook.com/learn/biology-biomolecules-organic-and-inorganic/>

<https://www.geeksforgeeks.org/biomolecules-definition-structure-classification-examples/>

https://www.researchgate.net/publication/323551103_UNIT-I_Biomolecules

Course Articulation Matrix: 222359

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	-	-	2	2	1	-	-	-	2	-	-
CO2	2	-	2	2	2	1	-	1	3	1	-	-
CO3	2	2	2	1	2	2	-	2	3	1	1	2
Weighted Average	2.3	2	2	1.6	2	1.3	-	1.5	3	1.3	1	2

OE (3) Biotechnology Syllabus for All Programs (Except Science)

Semester III

Course code: 22OEBIT301	Course Title: Nutrition and Health (Theory)
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40 (Theory)
Exam Duration: 2.5 Hours (Theory)	Semester End Examination Marks: 60 (Theory)

Course Outcomes:

At the end of the course the student should be able to:

1. Study the concepts of food, nutrition, diet and health
2. To apply the best practices of food intake and dietary requirements
3. Acquire knowledge about various sources of nutrients and good cooking practices

Contents	Hours
Unit 1	
Introduction Concepts of nutrition and health. Definition of Food, Diet and nutrition, Food groups. Food pyramids. Functions of food. Balanced diet. Meal planning. Eat right concept. Functional foods, Prebiotics, Probiotics, and antioxidants	14
Unit II	
Nutrients Macro and Micronutrients - Sources, functions and deficiency. Carbohydrates, Proteins, Fats – Sources and calories. Minerals –Calcium, Iron, Iodine. Vitamins – Fat soluble vitamins –A, D, E & K. Water soluble vitamins – vitamin C Thiamine, Riboflavin, Niacin. Water–Functions and water balance. Fibre –Functions and sources. Recommended Dietary Allowance, Body Mass Index and Basal Metabolic Rate.	14
Unit III	
Nutrition and Health Methods of cooking affecting nutritional value. Advantages and disadvantages. Boiling, steaming, pressure cooking. Oil/Fat – Shallow frying, deep frying. Baking. Nutrition through life cycle. Nutritional requirement. Dietary guidelines: Adulthood, pregnancy, lactation, infancy complementary feeding, pre-school, adolescence, geriatric. Nutrition related metabolic disorders- diabetes and cardiovascular disease.	14

References

- 1 Sri Lakshmi B, (2007), Dietetics. New Age International publishers. New Delhi
- 2 Sri Lakshmi B, (2002), Nutrition Science. New Age International publishers. New Delhi
- 3 Swaminathan M. (2002), Advanced text book on food and Nutrition. Volume I. Bappco
- 4 Gopalan.C., RamaSastry B.V., and S.C.Balasubramanian (2009), Nutritive value of Indian Foods.NIN.ICMR.Hyderabad.
- 5 Mudambi S R and Rajagopal M V, (2008), Fundamentals of Foods, Nutrition & diet therapy by New Age International Publishers, New Delhi

Web links:

<https://vikaspedia.in/health/nutrition/nutrition-and-health-1>

<https://www.healthline.com/health/food-nutrition/micros-vs-macros#how-it-works>

<https://mynutrition.wsu.edu/nutrition-basics>

<https://www.publichealthnotes.com/15-differences-between-macro-nutrients-and-micro-nutrients/>

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Course Articulation Matrix Course Code: 22OEBIT301

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	-	-	2	2	-	-	-	-	-	1
CO2	-	2	2	-	-	2	-	-	-	-	2	2
CO3	3	-	-	-	2	2	-	-	-	2	2	2
Weighted Average	3	2	2	-	2	2	-	-	-	2	2	1.6

DSC (4) Syllabus for B.Sc. Biotechnology (Basic and Honors)

Semester IV

Course Code: 222459	Course Title: Molecular Biology (Theory) Molecular Biology (Practical)
Course Credits: 06 (4:0:2)	Hours of Teaching/Week: 8 hrs 04 (Theory) + 04 (Practical)
Total Contact Hours: 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2.5 Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes:

At the end of the course the student should be able to:

1. Appreciate the advancements in molecular biology with latest trends.
2. Comprehend the structure, functional relationship of proteins and nucleic acids.
3. Describe the basic cellular processes such as transcription, translation, DNA replication and repair mechanisms.

Contents	Hours
Unit I	
DNA as genetic material, Replication and Repair: Experimental proof of DNA as genetic material (Griffith's, Avery-McLeod-McCarty, Martha-Chase). Central dogma, Replication of DNA in prokaryotes and eukaryotes—semiconservative mode (Messelson and Stahl experiment), Theta, linear and rolling circle models. Enzymes and proteins involved in replication-DNA polymerases, helicases, gyrases, ligase, SSB proteins, RNase H. The replication complex: Pre-priming proteins, primosome, replisome, unique aspects of eukaryotic chromosome replication, Fidelity of replication.	14
Unit II	
Transcription and RNA processing: Transcription in prokaryotes- RNA polymerase, sigma factor, promoter, initiation, elongation and termination. Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance, elongation and termination. RNA processing of pre-mRNA: 5' cap formation, polyadenylation, splicing.	14
Unit III	
Translation: Genetic code and its characteristics, Wobble hypothesis. Translation- in prokaryotes and eukaryotes- ribosomes, enzymes and factors involved in translation. Activation of amino acids, aminoacyl tRNA synthetases. Mechanism of translation- initiation, elongation and termination of polypeptide chain. Fidelity of translation, Inhibitors of translation (Chloramphenicol and Tetracycline) Post translational modifications of proteins (Phosphorylation and Methylation).	14

Unit IV	
Regulation of gene expression: Prokaryotic gene regulation- operon concept- regulation of <i>lac</i> operon and <i>trp</i> operon, attenuation control. Eukaryotic gene regulation- Activators, repressors binding to enhancers, coordinated control (tissue specific gene expression), DNA methylation, chromatin remodeling, Translational control of gene expression-ferritin mRNA regulation, RNAi- miRNA and siRNA.	14

IV SEMESTER PRACTICAL PAPER MOLECULAR BIOLOGY

1. Estimation of DNA by DPA method
2. Estimation of RNA by Orcinol method
3. DNA isolation from plant/ animal/ microbial sources
4. Concentration and purity of isolated DNA samples
5. Agarose gel electrophoresis of DNA
6. Charts on- DNA replication, transcription, translation, Types of DNA, RNA

References

1. Glick, B.R and Pasternak J.J (1998) Molecular biotechnology, Principles and application of recombinant DNA, Washington D.C. ASM press.
2. Howe. C. (1995) Gene cloning and manipulation, Cambridge University Press, USA
3. Lewin, B., Gene VI New York, Oxford University Press
4. Rigby, P.W.J. (1987) Genetic Engineering Academic Press Inc. Florida, USA
5. Sambrook et al (2000) Molecular cloning Volumes I, II & III, Cold spring Harbor Laboratory Press New York, USA.
6. Walker J. M. and Ging old, E.B. (1983) Molecular Biology & Biotechnology (Indian Edition) Royal Society of Chemistry U.K
7. Karp. G (2002) Cell & Molecular Biology, 3rd Edition, John Wiley & Sons;
8. Molecular Biology - by Freifelder.
9. Genetics, A Conceptual Approach - by Benjamin A Pierce
10. Molecular Biology of The Cell, 6th Edition - By Bruce Alberts
11. Principles of Genetics, 8th ed – by Gardner, M. J. Simmons, D. P. Snustad
12. Genes VIII – By Benjamin Lewis Genetic Engineering by N. Arumugam, A. Thangamani, L.M : Saras Publication.
13. Molecular Biology and Genetic Engineering – By P K Gupta.

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2. [https://hbmahesh.weebly.com/uploads/3/4/2/2/3422804/dna estimation by dpa method.pdf](https://hbmahesh.weebly.com/uploads/3/4/2/2/3422804/dna%20estimation%20by%20dpa%20method.pdf)
3. [https://hbmahesh.weebly.com/uploads/3/4/2/2/3422804/estimation of rna by orcinol reaction.pdf](https://hbmahesh.weebly.com/uploads/3/4/2/2/3422804/estimation%20of%20rna%20by%20orcinol%20reaction.pdf)
4. <https://info.gbiosciences.com/blog/ammonium-sulfate-protein-precipitation-the-key-to-salting-out>
5. <https://ruo.mbl.co.jp/bio/e/support/method/sds-page.html>

Course Articulation Matrix: 222459

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
C01	3	-	-	-	3	1	-	-	-	2	-	3
C02	3	1	-	-	3	2	-	-	-	2	-	1
C03	3	1	1	2	3	2	-	1	-	2	-	1
Weighted Average	3	2	1	2	3	1.6	-	1	-	2	-	1.6

OE (4) Biotechnology syllabus for All Programs (Except Science)

Semester IV

Course Code: 22OEBIT401	Course Title: Intellectual Property Rights
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40 (Theory)
Exam Duration: 2.5 Hours (Theory)	Semester End Examination Marks: 60 (Theory)

Course Outcomes:

At the end of the course the student should be able to:

1. Appreciate the need and scope of Intellectual property rights.
2. Acquire knowledge about filing patents, process, and infringement.
3. Describe about trademarks, industrial designs, and copyright.

Contents	Hours
Unit 1	
Introduction to Intellectual property rights (IPR): Genesis and scope. Types of Intellectual property rights - Patent, Trademarks, Copyright, Design, Trade secret, Geographical indicators, Plant variety protection. National and International agencies – WIPO, World Trade Organization (WTO), Trade-Related Aspects of Intellectual Property Rights (TRIPS), General Agreement on Tariffs and Trade (GATT).	14
Unit II	
Patenting, process, and infringement Basics of patents - Types of patents; Patentable and Non-Patentable inventions, Process and Product patent. Indian Patent Act 1970; Recent amendments; Patent Cooperation Treaty (PCT) and implications. Process of patenting. Types of patent applications: Provisional and complete specifications; Concept of “prior art”, patent databases (USPTO, EPO, India). Financial assistance, schemes, and grants for patenting. Patent infringement- Case studies on patents (Basmati rice).	14
Unit III	
Trademarks, Copy right, Industrial Designs Trademarks- types, Purpose and function of trademarks, trademark registration, Protection of trademark. Copy right- Fundamentals of copyright law, Originality of material, rights of reproduction, industrial Designs: Protection, Kind of protection provided by industrial design.	14

References

1. Manish Arora. 2007. Universal's Guide to Patents Law (English) 4th Edition) -Publisher: Universal Law Publishing House
2. Kalyan C. Kankanala. 2012. Fundamentals of Intellectual Property. Asia Law House
3. Ganguli, P. 2001. Intellectual Property Rights: Unleashing the knowledge economy. New Delhi: Tata McGraw-Hill Pub
4. World trade organization.
5. World Intellectual Property organization – www.wipo.int Office of the controller general of Patents, Design & Trademarks.

Web links

1. <http://www.wto.org>
2. www.ipindia.nic.in
3. <https://www.uspto.gov/patents/basics>
4. <https://sagaciousresearch.com/blog/what-is-patent-cooperation-treaty-pct/>
5. https://www.wipo.int/edocs/mdocs/sme/en/wipo_ip_bak_03/wipo_ip_bak_03_www_34147.pdf

Course Articulation Matrix Course Code: 22OEBIT401

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	-	-	2	2	3	1	3	-	2	1	1
CO2	3	1	1	2	2	3	2	3	-	2	1	1
CO3	3	1	-	2	2	3	-	3	-	2	2	1
Weighted Average	3	1	1	2	2	3	1.5	3	-	2	1.3	1

**DSC (7) Syllabus for BBA
Semester - III**

Course Code: 224329	Course Title: Cost Accounting
Course Credit (L:T:P): 4(4:0:0)	Teaching Hours/Week:4
Total Contact Hours:56	Formative Assessment Marks: 40
Duration of Exam: 2 ½ Hours	Semester End Examination Marks: 60
Pedagogy: Classrooms lecture, tutorials, and Problem Solving.	
Course Outcomes: On successful completion of the course, the Students will;	
CO1: Gather knowledge on the elements of cost and preparation of cost sheet.	
CO2: Acquire knowledge on materials and analyze the material cost by various methods of pricing material issues.	
CO3: Compare and contrast labour cost techniques.	
CO4: Differentiate the kinds of overhead costing.	
CO5: Analyze the reconciliation of cost and financial accounts	
Syllabus:	Hours
Module No. 1: INTRODUCTION TO COST ACCOUNTING	12
Introduction: Meaning, Objectives, Importance and Uses of Cost Accounting, Functions of Cost Accounting Department in an Organization, Difference between Cost Accounting and Financial Accounting; Various elements of Cost and Classification of Cost; Cost Object, Cost Unit; Cost Reduction and Cost Control; Limitations of Cost Accounting; Cost Sheet: Meaning and Cost Heads in a Cost Sheet, Presentation of Cost information in Cost Sheet/Statement- Problems on Cost Sheet, Tenders and Quotations, Methods of Costing.	
Module No. 2: MATERIALS COST	12
Materials: Meaning, Importance and Types of Materials - Direct and Indirect Material.	
Materials Procurement: Procedure for procurement of materials and documentation involved in procurement of materials- (Bill of materials, Material requisition note, Purchase requisition note,, Purchase order, Goods received note); Material Storage and Records: Duties of Store keeper, Store records- (Bin cards, Stores Ledger, Stock Control Cards); Material Issues and Valuation: Procedure for material issues, Documents used in material issues- (Material Requisition Note, Material Transfer Note, Materials Return	

<p>Note); Valuation of material issues- preparation of Stores Ledger/ Account - FIFO, LIFO,- problems.</p> <p>Inventory Control: Inventory control techniques and determination of various stock levels- Problems on Level Setting and Computation of EOQ; ABC Analysis, FSN Inventory, VED Inventory, HML Inventory, (Concepts only).</p>	
Module No. 3: EMPLOYEE COST	10
<p>Employee Cost: Meaning, Components, Classification and Importance of Employee (Labour) Cost in Organizations; Attendance Procedure- Time keeping and Time Booking, Idle Time- Causes and treatment of Normal and Abnormal Idle Time, Overtime- Causes and treatment (Theory only);</p> <p>Methods of Remuneration (Payment of Wages and Incentives) Problems on calculation of earnings under Time Rate (Straight time rate, Halsey and Rowan Methods) and Piece rate systems, Employee Turnover- Meaning, Reasons and Effects of LTO/ETO.</p>	
Module No. 4: OVERHEADS	12
<p>Overheads: Meaning and Classification of Overheads; Accounting and Control of Manufacturing Overheads: Estimation and Collection, Cost allocation, Apportionment, Re-apportionment and Absorption of Manufacturing Overheads; Problems on Primary distribution only; Absorption of overheads: Meaning and Methods of Absorption of overheads; Problems on Machine hour rate</p>	
Module No. 5: RECONCILIATION OF COST AND FINANCIAL ACCOUNTS	10
<p>Reasons for differences in Profits under Financial and Cost Accounts; Procedure for Reconciliation –Ascertainment of Profits as per Financial Accounts and Cost Accounts and Reconciliation of Profits of both sets of Accounts – Preparation of Reconciliation Statement – Problems.</p>	

Skill Developments Activities:

- Prepare a Cost Sheet with imaginary figures.
- List the documents required in Inventory Management.
- Demonstrate the valuation of inventory using any one method of pricing material issues.
- Calculate the amount of Wages under Halsey / Rowan Plans, using imaginary data.

Text Books:

1. Jain and Narang, Cost Accounting, Kalyani Publication House.
2. N.K. Prasad, Cost Accounting, Books Syndicate Pvt. Ltd.
3. P C Tulsian, Cost Accounting, MHE India
4. Nigam & Sharma, Cost Accounting, HPH
5. Dr. B. Mariyappa, Cost Accounting, HPH
6. Khanna, Ahuja & Pandey, Practical Costing, S Chand & Co. Ltd.
7. B.S. Raman, Cost Accounting, United Publisher

Course Articulation Matrix - 224329

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	1	2	1	1	1
CO2	3	2	2	1	1	1	1	1	1	1	1	1
CO3	2	2	2	-	-	1	1	1	1	1	1	1
CO4	2	2	2	-	-	-	1	1	1	1	1	1
CO5	1	1	1	-	-	-	1	1	1	1	1	1
WA	2.2	1.8	1.6	1	1	1	1	1	1.2	1	1	1

**DSC (8) Syllabus for BBA
Semester - III**

Course Code: 224330	Course Title: Organisational Behaviour
Course Credit (L:T:P): 4 (4:0:0)	Teaching Hours/Week:4
Total Contact Hours:56	Formative Assessment Marks: 40
Duration of Exam: 2 ½ Hours	Semester End Examination Marks: 60
Pedagogy: Classrooms lecture, tutorials, and Problem Solving.	
Course Outcomes: On successful completion of the course, the Students will:	
CO1: Acquire knowledge on role of OB in business organization.	
CO2: Analyze group dynamics in an organization.	
CO3: Evaluate the change management.	
CO4: Structure the process of organizational development.	
CO5: Implement the kinds of Interventions in OB.	
Syllabus:	Hours
Module No. 1: ORGANIZATIONAL BEHAVIOUR AND FOUNDATIONS OF INDIVIDUAL BEHAVIOUR	10
<p>Organization Behavior– Meaning, Definition of OB, Importance of OB, Foundations of OB. Individual Behavior - Personal Factors, Environmental Factors, organization systems and resources Personality-Meaning, Nature, Determinants and Traits of Personality</p> <p>Perception- Meaning, Factors influencing perception, Perceptual Process, Perceptual Errors, Managing Perceptions.</p>	
Module No. 2: GROUP AND TEAM DYNAMICS	8
<p>Group Dynamics-meaning, Types of Group, Development of Groups- Stages of Group Development, Determinants of Group Behavior, Team Dynamics- meaning, Types of Teams: Conflict-sources of conflict and ways of resolving conflict, managing interpersonal relationships</p>	
Module No. 3: CHANGE MANAGEMENT	10
<p>Introduction to Change Management: Importance and Nature of Planned Change; Theories of Planned Change - Action Research Model, Kurt Lewin’s Change Model</p> <p>Introducing Change Effectively: Basic steps, Factors Influencing Change - Resistance to Change, Overcoming Resistance to Change; Empowering People to Manage Change.</p>	

Module No. 4: ORGANIZATIONAL DEVELOPMENT	12
OD: Meaning and Nature of Organizational Development (OD), Competencies of an OD Practitioner, Ethical Guidelines for OD Practitioners Process of Organizational Development: Meaning of Diagnosing, Comprehensive Model for Diagnosing Organizational Systems (Organizational Level, Group Level and Individual Level)	
Module No. 5: OD INTERVENTIONS	16
Designing Effective OD Interventions: How to Design Effective Interventions, Overview of OD interventions - Human Process Interventions, Techno Structural Interventions, HRM Interventions and Strategic Change Interventions, Conditions for optimal success of OD	
<p>(a) Human Process Interventions T-Groups, Process Consultation, Third-party Intervention; Team building; Organization Confrontation Meeting, Inter-group relation Intervention: Microcosm Group; Large Group Intervention: Open –Systems Method, and Open-Space Method(in brief)</p> <p>(b) Techno Structural Interventions Restructuring Organization: Structural Design: Functional structures, Divisional structure - Product structure, Geographic and Market structure, Metrics structure, Network structure, Boundary less organization; (in brief)</p>	
<p>Skill Developments Activities:</p> <ul style="list-style-type: none"> • Two cases on the above syllabus should be analyzed and record in the skill development • Draw Blake and Mouton managerial grid • List the determinants of personality 	
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Fred Luthans, Organizational Behaviour. McGraw Hill 2. Robbins, Organizational Behaviour, International Book House. 3. K. Aswathappa, Organizational Behaviour, HPH. 4. Appanniah and, Management and Behavioural Process, HPH 5. Sharma R.K and Gupta S.K, Management and Behaviour Process, KalyaniPublishers. 	

Course Articulation Matrix - 224330

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	2	-	2	2	2	2	2
CO2	2	1	1	1	1	1	-	2	2	2	2	2
CO3	2	2	1	1	1	2	1	2	2	2	2	2
CO4	2	2	2	2	2	2	1	2	2	2	1	2
CO5	2	2	2	2	2	2	-	1	2	2	2	2
WA	2.2	1.6	1.4	1.4	1.4	1.8	1	1.8	2	2	1.8	2

Semester - III

Course Code: 224331	Course Title: Statistics for Business Decisions
Course Credit (L:T:P): 4(4:0:0)	Teaching Hours/Week:4
Total Contact Hours:56	Formative Assessment Marks: 40
Duration of Exam: 2 ½ Hours	Semester End Examination Marks: 60
Pedagogy: Classrooms lecture, tutorials, and Problem Solving.	
<p>Course Outcomes: On successful completion of the course, the Students will;</p> <p>CO1: Understand the requirements of statistical framework</p> <p>CO2: Construct and visualize the data.</p> <p>CO3: Determine the data adequacy for analysis.</p> <p>CO4: Review the data by using various tools.</p> <p>CO5: Illustrate and analyze the impact of probability.</p>	
Syllabus:	Hours
Module No. 1: INTRODUCTION TO STATISTICS	12
Introduction – Meaning, Functions and Uses of Statistics; Collection of Data - Techniques of Data Collection – Census Technique and Sampling Technique (Concepts). Classification: Meaning, and Methods of Classification of Data, Tabulation: Meaning, Parts of a Table – Simple problems on Tabulation; Diagrammatic Presentation: Bar Diagrams – Simple Bars, Multiple Bars, Percentage Sub-divided Bar Diagram; Two Dimensional Diagrams – Pie Diagram.	
Module No. 2: MEASURES OF CENTRAL TENDENCY AND DISPERSION	14
<p>Measures of Central Tendency: Calculation of Arithmetic Mean, Median and Mode for Individual, Discrete and Continuous Series – Problems; Empirical relation between Mean, Median and Mode.</p> <p>Measures of Dispersion: Absolute and Relative measures of Range, Quartile deviation, Standard Deviation in Individual, Discrete and Continuous Series – Problems</p> <p>Measures of Skewness: Calculation of Karl Pearson’s (Uni-modal) and Bowley’s Co- efficient of Skewness</p>	

Module No. 3: CORRELATION AND REGRESSION ANALYSIS	10
<p>Correlation Analysis - Meaning, Types of Correlation, Calculation of Karl Pearson's Coefficient of Correlation, Computation of Probable Error, Spearman's Rank Coefficient of correlation- problems. Regression Analysis – Concept of Regression, Regression equations- Problems.</p> <p>TIME SERIES ANALYSIS: Meaning, Components, fitting a straight-line trend using Least Square Method (Problems where $\Sigma X=0$ only), calculation and estimation of trend values.</p>	
Module No. 4: TIME SERIES ANALYSIS	10
<p>Meaning, Components, fitting a straight-line trend using Least Square Method (Problems where $\Sigma X=0$ only), calculation and estimation of trend values.</p>	
Module No. 5: INDEX NUMBERS	10
<p>Index number, Construction of Index number, Methods of Index number - simple aggregate method, Weighted method (Laspeyres, Paashes, Marshal - Edgeworth and Fishers Ideal Index number). Tests of Adequacy (Unit test, TRT, FRT, Circular test). Consumer Price Index number</p>	
<p>Skill Developments Activities:</p> <p>a) Data Visualization practical session Using Tableau/Power BI.</p> <p>b) Execute Average, Variance, Standard Deviation, CV, Covariance using Excel.</p> <p>c) Execute and Analyse Regression Model using Excel,</p> <p>d) Practical session on Time series models using GRETl</p> <p>e) Collect past years' Indian consumer price index data (as of the current base year)and analyse its impact on any macroeconomic indicator.</p>	
<p>Text Books:</p> <ol style="list-style-type: none"> 1. S P Gupta: Statistical Methods- Sultan Chand 2. Dr. B N Gupta: Statistics, Sahithya Bhavan 3. S.C Gupta: Business Statistics, HPH 4. Elhance: Statistical Methods, Kitab Mahal 5. Chikoddi & Satya Prasad: Quantitative Analysis for Business Decision, HPH 6. Sanchethi and Kapoor: Business Mathematics, Sultan Chand 	

Course Articulation Matrix - 224331

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	-	-	-	-	1	2	1	1
CO2	2	2	2	2	2	-	-	-	1	-	-	1
CO3	2	2	2	2	1	1	-	-	-	-	1	1
CO4	2	2	2	1	1	-	-	-	1	-	1	1
CO5	-	-	-	-	-	-	-	-	-	-	-	-
WA	2	1.75	2	1.5	1.33	1	-	-	1	2	1	1

OE (3) Syllabus for BBA

Semester - III

Course Code: 22OEBBA301	Course Title: Social Media Marketing
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week:3
Total Contact Hours:45	Formative Assessment Marks: 40
Duration of Exam: 2 ½ Hours	Semester End Examination Marks: 60
Pedagogy: Classrooms lecture, tutorials, and Problem Solving.	
Course Outcomes: On successful completion of the course, the Students will:	
CO1: Acquire knowledge of social media marketing goal setting for successful online campaigns.	
CO2: Analyze the effective social media marketing strategies for various types of industries and businesses.	
CO3: Design social media content and create strategies to optimize the content's reach to the target audience.	
CO4: Appraise the reach and track progress in achieving social media objectives with a variety of measurement tools and metrics.	
CO5: Design a suitable social media campaign for the business goals.	
Syllabus:	Hours
Module No. 1: Social Media Introduction	10
Introduction to social media, how to build a successful Social Media Strategy, Goal setting, Overview of Global E-Marketing Issues, Country and Market Opportunity Analysis, User engagement on social networks; Social advertising; Social, media analytics; Impact of online reputation; Social Technology and its marketing influence in India.	
Module No. 2: Facebook -Instagram marketing	10
Exploring the use of a Facebook page, Facebook Ad campaign, Facebook groups, Hashtags, Instagram, Creating automation for Instagram, Audience Insights, page Insights, exploring the various IG content types, Setting a theme and flow on Instagram, and generating Leads.	
Module No. 3: Twitter Marketing	08
Creating a Twitter account, optimizing a page, content types, posting contents, Integrating a personal brand on Twitter, Twitter Analytics & Ads, post assistants and automation for Twitter.	
Module No. 4: YouTube marketing	08
Youtube marketing, creating a youtube channel, posting content, youtube analytics, Google Pages for YouTube Channels, Video Flow, Verify Channel, Webmaster Tool –Adding Asset.	

Module No. 5: Search Engine Optimization-Recent trends and challenges	09
Search Engine Optimisation (SEO) Introduction, Understanding SEO, User Insights, Benefits and Challenges, Content Marketing, Traditional Media vs Social Media, recent trends and challenges in Social Media marketing.	
Skill Developments Activities: <ol style="list-style-type: none"> Prepare Facebook Page in your name. Open a YouTube channel. Create a blog and write an article on Climate change. Create a search engine optimization (SEO) dashboard. 	
Text Books: <ol style="list-style-type: none"> Annamarie Hanlon (2022), Digital Marketing Strategic Planning & Integration, 2nd Edition, SAGE Publications Ltd. Matt Golden (2022), Social Media Marketing, 1st Edition, Bravex Publications. Simon Kingsnorth (2022), The Digital Marketing Handbook: Deliver Powerful Digital Campaigns, 1st Edition, Kogan Page. Melissa Barker, Donald I. Barker, Nicholas F. Bormann and Debra Zahay (2016), Social Media Marketing: A Strategic Approach, 2nd Edition, Cengage Learning. Tracy L. Tuten and Michael R. Solomon, (2016), Social Media Marketing, 2nd Edition, Sage Publications India Private Limited. 	

Course Articulation Matrix - 22OEBBA301

	PO1	PO2	P03	P04	PO4	P05	P06	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	1	1	3	--	--	1	1	2	3	2
CO2	2	2	2	1	2	3	1	1	1	1	2	2	2
CO3	1	1	1	1	1	3	1	1	2	1	2	2	2
CO4	2	1	2	2	2	3	1	1	2	1	2	2	2
CO5	2	2	2	2	2	3	1	1	2	1	2	2	2
WA	1.8	1.4	2	1.4	1.6	3	1	1	1.6	1	2	2.2	2

OE (3) Syllabus for BBA Semester - III	
Course Code: 22OEBBA302	Course Title: Rural Marketing
Course Credit (L:T:P): 3(3:0:0)	Teaching Hours/Week:3
Total Contact Hours:45	Formative Assessment Marks: 40
Duration of Exam: 2 ½ Hours	Semester End Examination Marks: 60
Pedagogy: Classrooms lecture, tutorials, and Problem Solving.	
Course Outcomes: On successful completion of the course, the Students will	
CO1: Explore the importance and application of various concepts of rural marketing.	
CO2: Examine the appropriate selection of the segmentation, targeting and positioning strategies along with the environmental factors that influence rural consumers' buying behavior.	
CO3: Design a Pricing Strategy that suits the characteristics of rural products and the stage in the product life cycle.	
CO4: Identify the appropriate marketing communication and rural distribution channel plans to promote and deliver the products.	
CO5: Analyze the recent trends in Rural marketing and the application of digital technology in rural marketing.	
Syllabus:	Hours
Module No. 1: Introduction to Rural Marketing	10
Nature and scope of rural marketing, rural vs urban markets, concepts and classification of rural markets, rural marketing environment: rural population, occupation pattern, income generation, location of the rural population, expenditure pattern, literacy level, land distribution, land use pattern, irrigation, development programs, infrastructure facilities.	
Module No. 2: Rural Consumer Behavior	08
Consumer buying behavior in rural markets, factors affecting consumer behaviour, rural consumer buying process, the rise of rural consumerism. Market segmentation – Bases for segmenting rural consumer markets.	
Module No. 3: Rural Product and Pricing Strategy	08
Rural product, Rural product classification, product life cycle, Product Life Cycle strategies in rural markets, New Product Development in rural markets, Branding for rural markets. Pricing for rural markets – Factors and strategies.	
Module No. 4: Rural Distribution and Communication Strategy	09
Wholesaling and retailing in the rural market, rural mobile traders, rural distribution models- FMCG companies, durable companies, Service organizations, emerging distribution models. Rural communication strategy, challenges in rural Communication, creating promotion mix	

for rural audiences: advertisement, sales promotion, publicity.	
Module No. 5: Regulations and Recent Trends in Rural Marketing	10
Regulated market, Regulated Market in India, Future of Regulated Markets in India, Role of Govt in Developing rural marketing, Public Distribution Systems (PDS), Food Corporation of India, Self Help Groups (SHG's). Agricultural Credit Policy, Digitalizing rural India, online marketing reach in the rural market, recent trends in packing, labelling, grading, transporting, order processing, payment methods, storage and warehousing and Corporate farming.	
Skill Developments Activities: <ol style="list-style-type: none"> Prepare a Product life cycle for a Rural product Select a Rural Product and conduct a Consumer Satisfaction Survey Prepare an advertisement copy for a rural product Visit an APMC Yard/Mandi's and prepare a report on any one Agri product pricing. 	
Text Books: <ol style="list-style-type: none"> Debarun Chakraborty and Soumya Kanti Dhara, et al. (2021), Rural Marketing in India: Texts and Cases, 1st Edition Atlantic Publishers and Distributors Pvt Ltd Acharya SS and Agarwal NL (2019), Agricultural Marketing in India, 6th Edition, Oxford & IBH Publishing Co Pvt Ltd. Dinesh Kumar and Punam Gupta (2019), Rural Marketing, 1st Edition, SAGE Publications India Pvt Ltd. C. G. Krishnamacharyulu (2010), Rural Marketing: Text and Cases, 2nd Edition, Pearson India Education Services Pvt Ltd. T.P.Gopalaswamy (2009) Rural Marketing-Environment, Problems and Strategies, 3rd Edition, Vikas Publishing House. 	

Course Articulation Matrix – 22OEBBA302

	PO1	PO2	P-3	P-4	PO4	P-5	P-6	PO7	PO8	PO9	PO1-	PO11	PO12
CO1	-	1	1	-	-	-	1	1	-	-	-	-	1
CO2	1	-	-	1	-	-	1	1	-	-	-	-	-
CO3	1	-	1	-	-	-	-	1	-	-	-	1	-
CO4	-	-	-	-	-	-	1	1		1	1	-	-
CO5	1	1	-	-	1	1	-	-	-	-	-	-	-
WA	1	1	1	1	1	1	1	1	-	1	1	1	1

DSC (10) Syllabus for BBA Semester - IV	
Course Code: 224429	Course Title: Management Accounting
Course Credit (L:T:P): 4(4:0:0)	Teaching Hours/Week:4
Total Contact Hours:56	Formative Assessment Marks: 40
Duration of Exam: 2 ½ Hours	Semester End Examination Marks: 60

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.	
Course Outcomes: On successful completion of the course, the Students will: CO1: Acquire the knowledge with respect to the concept of Management Accounting. CO2: Analyze the ratios and apply the same on given case. CO3: Construct Cash flow statement. CO4: Apply Marginal costing techniques to make business decisions. CO5: Utilize the standard costing technique for implementing control over cost.	
Syllabus:	Hours
Module No. 1: INTRODUCTION TO MANAGEMENT ACCOUNTING	8
Introduction- Meaning and Definition – Objectives – Nature and Scope–Functions- Role of Management Accountant, Relationship between Financial Accounting and Management Accounting, Relationship between Cost Accounting and Management Accounting, advantages and limitations of Management Accounting.	
Module No. 2: RATIO ANALYSIS	14
Introduction-Meaning and Definition of ratio, Meaning of Accounting ratio, and Ratio Analysis – Uses and Limitations –Classification of ratios- Liquidity ratios, Profitability ratios and Solvency ratios. Problems on conversion of financial statements into ratios and ratios into financial statements.	
Module No. 3: CASH FLOW ANALYSIS	12
Meaning and Definition of Cash Flow Statement – Concept of Cash and Cash Equivalents - Uses of Cash Flow Statement – Limitations of Cash Flow Statement– Differences between Cash Flow Statement and Fund Flow Statement – Provisions of Ind. AS-7. Procedure for preparation of CashFlow Statement – Cash Flow from Operating Activities – Cash Flow from Investing Activities andCash Flow from Financing Activities – Preparation of Cash Flow Statement according to Ind. AS- 7	

Module No. 4: MARGINAL COSTING	12
Introduction-Meaning and definition of marginal cost, marginal costing, features of marginal costing- terms used in marginal costing – P/V ratio, BEP, Margin of Safety, Angle of Incidence and Break-Even Chart. Break Even Analysis- assumption and uses-problems. Decision Making-Make or Buy, -problems on decision making.	
Module No. 5: STANDARD COSTING	10
Historical costing - Introduction – Meaning & Definition of Standard Cost and Standard Costing - Advantages & Disadvantages of Standard Costing –preliminaries in establishing system of standard costing – Variance Analysis – Material Variance, Labour Variance and Overheads Variance – Problems on Material Variances and Labor Variances only.	
Skill Developments Activities:	
<ul style="list-style-type: none"> • Collect the financial statement of a company and calculate important ratios. • Collect the annual report of a company and prepare a cash flow statement. • Prepare a Break-even-chart with imaginary figures. • Prepare a flexible budget using imaginary figures of at least three levels. • Draft the chart of various total cost variances. 	
Text Books:	
<ol style="list-style-type: none"> 1. Dr. S.N. Maheswari, Management Accounting, Mahavir Publications 2. T.S.Sexana, Advanced Cost and Management Accounting, Sultan Chand 3. Sudhindra Bhat, Management Accounting, Excel Books. 4. Dr. S.N. Goyal and Manmohan, Management Accounting, S.N. Publications. 5. B.S. Raman, Management Accounting, United Publishers. 6. Sharma and Gupta, Management Accounting, Kalyani Publishers. 7. M Muniraju & K Ramachandra, Management Accounting, HPH 8. PN Reddy & Appanaiah, Essentials of Management Accounting, HPH. 	

Course Articulation Matrix - 224429

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	-	-	1	-	-	-	1	1	1
CO2	3	2	2	-	-	1	-	-	-	1	1	1
CO3	3	2	2	-	-	1	-	-	-	1	1	1
CO4	3	2	2	-	-	1	-	-	-	1	1	1
CO5	3	2	2	-	-	1	-	-	-	1	1	1
WA	3	1.8	1.8	-	-	1				1	1	1

DSC (11) Syllabus for BBA Semester - IV	
Course Code: 224430	Course Title: Business Analytics
Course Credit (L:T:P): 4(4:0:0)	Teaching Hours/Week:4
Total Contact Hours:56	Formative Assessment Marks: 40
Duration of Exam: 2 ½ Hours	Semester End Examination Marks: 60
Pedagogy: Classrooms lecture, tutorials, and Problem Solving.	
Course Outcomes: On successful completion of the course, the Students will;	
CO1: Illustrate the Data Types and storage of Data.	
CO2: Classify and compare the various types of analytics and data models.	
CO3: Demonstrate visualization of data.	
CO4: Make use of the data mining and processing of data.	
CO5: Interpret the concepts of different analytics model.	
Syllabus:	Hours
Module No. 1: INTRODUCTION TO BUSINESS ANALYTICS	12
Business Analytics, Terminologies used in Analytics: Business Analytics, Business Intelligence, Meaning, Importance, Scope, Uses of Business Analytics, Architecture of Business Analytics, Types of Analytics: Descriptive, Diagnostics, Predictive, Prescriptive, Application of Business analytics, Introduction to Data Science and Big Data.	
Module No. 2: ROLE OF DATA IN THE ORGANIZATION	10
Sources of data, Use of Data in Decision making, Importance of data quality, dealing with missing or incomplete data, Types of Digital Data- Structured, Semi Structured, Unstructured Data. Data warehouse, Data mining, Data Integration – What, need, advantages, approaches of Data integration, Data profiling.	
Module No. 3: TOOLS USED FOR DATA ANALYTICS	12
Introduction to data analytics software – Types of data analytics software – open source and proprietary software. Lab sessions: R, JAMOVI, GRETL, Python: Installation of software –Installation of packages / library -Importing of data – Saving of data – Run descriptive Statistics – Interpret result – plotting of charts – inferences of chart. (Using all the four specified softwares).	
Module No. 4: DATABASE ORIENTATION	12
Database definition, types of structures, DBMs, RDBMS, Relational Database Language , Introduction to SQL, Features of SQL, SQL Languages, DDL commands - Create, Add, Drop, Constraints in SQL, DML Commands – Insert, Delete, Update, Data Query Language – Where clause, Order by, Group by, DCL commands – Grant, Revoke, TCL Commands – Commit, Roll Back, Save point. Aggregate Functions, Relational Algebra.	
Module No. 5: DATA VISUALIZATION USING TABLEAU (PUBLIC VERSION)	10

Introduction to Dimensions and measures, Types of Charts, (Pie Chart, Column Chart, Line Chart, Bar Chart, Area Chart, Scatter Chart, Bubble Chart, Stock Chart), Basic understanding in dashboard and storyboard. (Explain using practical examples and students executes the examples using tableau.)

Skill Developments Activities:

1. Prepare tree map chart using Tableau.
2. Run a descriptive statistic using R and Python software.
3. Execute a summary chart in JAMOVI.
4. Execute DCL and TCL Command in SQL.

Text Books:

1. Business Analytics: Text and Cases, Tanushri Banerjee, Arvindram Banerjee, Publisher: Sage Publication
2. Business Analytics, U Dinesh Kumar, Publication: Wiley
3. Business Analytics, R. Evans James, Publisher: Pearson
4. Fundamental of Business Analytics, Seema Acharya R N Prasad, Publisher: Wiley
5. Business Analytics: Data Analysis and Decision Making, Albright and Winston published by Cengage Learning.
6. Swain Scheps, Business Intelligence for Dummies.
7. Rick Sherman, Business Intelligence Guidebook: From Data Integration to Analytics
8. Cindi Howson. Successful Business Intelligence, Second Edition: Unlock the Value of BI & Big Data
9. Seema Acharya R N Prasad, Fundamentals of Business Analytics, 2ed, Wile

Course Articulation Matrix - 224430

	PO1	PO2	P-3	P-4	PO4	P-5	P-6	PO7	PO8	PO9	PO1-	PO11	PO12
CO1	2	-	2	-	2	-	-	-	-	-	-	-	1
CO2	2	1	2	2	-	1	-	-	-	-	-	2	1
CO3	2	2	2	2	2	2	-	-	-	-	1	1	-
CO4	2	2	2	2	2	2	-	-	-	-	-	-	-
CO5	2	2	2	2	1	1	-	-	-	-	-	-	-
WA	2	1.75	2	2	1.75	1.5	-	-	-	-	1	1.5	1

DSC (11) Syllabus for BBA Semester - IV	
Course Code: 224431	Course Title: Financial Markets & Services
Course Credit (L:T:P): 4(4:0:0)	Teaching Hours/Week:4
Total Contact Hours:56	Formative Assessment Marks: 40
Duration of Exam: 2 ½ Hours	Semester End Examination Marks: 60
Pedagogy: Classrooms lecture, tutorials, and Problem Solving.	
Course Outcomes: On successful completion of the course, the Students will;	
CO1: Acquire knowledge on the concepts of financial system.	
CO2: Examine the current structure and functioning of financial institutions	
CO3: Acquire knowledge on the concepts of financial services.	
CO4: Analyze and interpret the trading process of Instruments.	
CO5: Critically evaluate the concept of stock market.	
Syllabus:	Hours
Module No. 1: OVERVIEW OF FINANCIAL SYSTEM	10
Financial System – Features, Constituents of Financial System; Financial Institutions; Financial Services; Financial Markets and Financial Instruments.	
Module No. 2: FINANCIAL INSTITUTIONS	14
Characteristics of Financial Institutions, Broad Categories – Money Market Institutions and Capital Market Institutions. Objectives and Functions of Industrial Finance Corporation of India, Industrial Development Bank of India, State Financial Corporations, Industrial Credit and Investment Corporation of India, EXIM Bank of India, National Small Industrial Development Corporation, National Industrial Development Corporation, RBI Measures for NBFCs.	
Module No. 3: FINANCIAL SERVICES	12
Financial Services – Meaning, Objectives, Functions, Characteristics; Types of Financial Services - Merchant Banking – Functions and Operations, Leasing, Mutual Funds, Venture Capital & Credit Rating.	
Module No. 4: FINANCIAL MARKETS AND INSTRUMENTS	10
Meaning and Definition, Role and Functions of Financial Markets, Constituents of Financial Markets; Money Market Instruments, Capital Market and Instruments; SEBI guidelines for Listing of Shares and Issue of Commercial Papers.	

Module No. 5: STOCK MARKETS	10
Introduction - Functions of Stock Exchange; Stock Market Operations - Trading, Settlement and Custody (Brief discussion on NSDL & CSDL); Brief discussion of BSE, NSE and OTCEI.	
<p>Skill Developments Activities:</p> <ul style="list-style-type: none"> • Visit any financial institution and prepare a report regarding its structure, functions and performance. • Analyze the ratings given by any credit rating agency, for at least 5 companies. • Conduct a mock stock-trading session and record the outcome. • Identify a company of your choice and record its share prices for one month. 	
<p>Text Books:</p> <ol style="list-style-type: none"> 1. L.M. Bhole, Financial Institutions & Markets, McGraw Hill 2. Khan, M.Y, Indian Financial System, McGraw Hill 3. Sharma, Meera, Management of Financial Institutions, Eastern Economy Edition 4. Bhole and Mahakud, Financial Institutions and Markets – Structure, Growth and Innovations, McGraw Hill 5. Guruswamy, S., Financial Services and System, McGraw Hill 6. Edminister. R.O, Financial Institutions, Markets & Management, McGraw Hill 7. Khan. M.Y, Indian Financial System, Vikas Pub. House 8. H.R Machiraju, Indian Financial System, Vikas Pub. House 9. E.Gorden & K. Nataraj, Financial Markets and Services, HPH 	

Course Articulation Matrix - 224431

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	-	-	1	2	2	2	2
CO2	2	2	2	2	2	2	-	1	1	1	1	1
CO3	3	2	2	1	1	1	-	-	1	1	1	1
CO4	3	3	2	2	3	2	-	1	2	2	2	2
CO5	3	3	2	3	3	2	-	1	2	2	2	2
WA	2.6	2.2	1.8	1.8	2	1.75	-	1	1.6	1.6	1.6	1.6

DSC (12) Syllabus for BBA Semester - IV	
Course Code: 224432	Course Title: Financial Management
Course Credit (L:T:P): 4(4:0:0)	Teaching Hours/Week:4
Total Contact Hours:56	Formative Assessment Marks: 40
Duration of Exam: 2 ½ Hours	Semester End Examination Marks: 60
Course Outcomes: On successful completion of the course, the Students will;	
CO1: Evaluate the goals of financial management.	
CO2: Appraise the concepts of time value of money.	
CO3: Evaluate the different models of dividend policy.	
CO4: Analyze the business problem related to investments.	
CO5: Appraise the working capital requirements in an organization.	
Syllabus:	
Module No. 1: INTRODUCTION TO FINANCIAL MANAGEMENT	Hours
Introduction – Meaning of Finance, Business Finance, Finance Functions, Organization structure of Finance Department; Financial Management – Goals of Financial Management, Financial Decisions, Role of a Financial Manager; Financial Planning – Steps in Financial Planning, Principles of Sound Financial Planning, Factors influencing a Sound Financial Plan	12
Module No. 2: TIME VALUE OF MONEY	
Meaning, Need, Future Value (Single Flow, Uneven Flow & Annuity); Present Value (Single Flow – Uneven Flow & Annuity); Doubling Period; Concept of Valuation -- Valuation of Bonds, Debentures and Shares (Simple Problems)	12
Module No. 3: FINANCING & DIVIDEND DECISIONS	
Financing Decision: Sources of Long-Term Finance -- Meaning of Capital Structure, Factors influencing Capital Structure, capital structure theories, Optimum Capital Structure – EBIT, EPS Analysis, Leverages – Problems Dividend Decision: Meaning & Determinants of Dividend Policy, Types of Dividends, Bonus Shares (Meaning only)	12

Module No. 4: INVESTMENT DECISION	
Meaning and Scope of Capital Budgeting, Features & Significance, Techniques --Payback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return and Profitability Index (Problems)	10
Module No. 5: WORKING CAPITAL MANAGEMENT	
Working Capital -- Concept of Working Capital, Significance of Adequate Working Capital, Types of Working Capital, Problems of Excess or Inadequate Working Capital, Determinants of Working Capital, Sources of Working Capital, Estimation of Working Capital (Simple Problems)	10
<p>Skill Developments Activities:</p> <ul style="list-style-type: none"> • Calculate Equated Installment and prepare Loan Repayment schedule for the loan borrowed by your family / friend. • Identify the capital budgeting and capital structure practices followed in any firm/company of your choice (using primary/secondary data) • Visit a business entity and estimate working capital requirement for the entity. • Develop spreadsheet models for different components of time value of money and capital budgeting. 	
<p>Text Books:</p> <ol style="list-style-type: none"> 1. I M Pandey, Financial Management. Vikas Publication. 2. Prasanna Chandra, Financial Management, TMH 3. S N Maheshwari, Financial Management, Sultan Chand 4. Khan and Jain, Financial Management, TMH 5. Dr. V Rajeshkumar and Nagaraju V, Financial management, MH India 6. Dr. Aswathanarayana.T ,Financial Management, VBH 7. K. Venkataramana, Financial Management, SHBP 8. G. Sudarshan Reddy, Financial Management, 9. Sharma and Shashi Gupta, Financial Management, Kalyani Publication 	

Course Articulation Matrix – 224432

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	1	1	1	2	2	2	1	2
CO2	3	2	2	2	2	1	1	1	1	1	3	2
CO3	3	3	3	2	3	1	-	2	2	2	3	2
CO4	3	3	3	2	2	1	-	2	2	2	3	2
CO5	3	2	2	2	2	1	-	2	2	2	2	2
WA	2.8	2.2	2.2	2	2	1	1	1.8	1.8	1.8	2.4	2

OE (4) Syllabus for BBA Semester - IV	
Course Code: 22OEBBA401	Course Title: Business Leadership Skills
Course Credit (L:T:P): 3(3:0:0)	Teaching Hours/Week:3
Total Contact Hours:45	Formative Assessment Marks: 40
Duration of Exam: 2 ½ Hours	Semester End Examination Marks: 60
Pedagogy: Classrooms lecture, tutorials, and Problem Solving.	
Course Outcomes: On successful completion of the course, the Students will	
CO1: Acquire knowledge about the significance of leadership skills for effective people management	
CO2: Evaluate comprehension of leadership through various leadership theories	
CO3: Analyze and interpret different leadership styles, types, patterns and functions	
CO4: Implement various leadership approaches for effective management of people	
CO5: Examine the recent trends in the area of business leadership	
Syllabus:	Hours
Module No. 1: Introduction to business leadership	10
Introduction to business leadership, meaning/definition of leadership, evolution and growth of leadership; functions and characteristics of leadership; latest trends/current scenario of business leadership.	
Module No. 2: Leadership from managerial perspective	12
Nature of leadership, Significance or importance of leadership, Qualities of an effective leader, leader v/s manager; authority v/s leadership; formal v/s informal leadership; different roles of leadership; different levels of leadership;	
Module No. 3: Leadership from theoretical perspective	8
Great man theory, Trait theory, Situational leadership theory, transactional leadership, transformational leadership theory, Likert's Management System; Fielder's contingency model, Blake and Mouton's Managerial Grid.	
Module No. 4: Leadership from an operational perspective	8
Leadership styles: a) Autocratic leadership, b) Bureaucratic leadership, c) Democratic leadership, and d) Laissez faire leadership;	
Module No. 5: Leadership strategies	7

Leadership Strategies a) leading from the front, b) supporting leadership, c) interactive leadership. Group conflict, leader's role in managing group conflict; challenges in leadership; change management.

Skill Developments Activities:

1. Collect information about the real time corporate leaders with different leadership styles & discuss their leadership styles and traits in the class room.
2. Present the students with a workplace problem, and have each student participant write down what they would do to solve it. Then, have each participant read their response aloud. This can help the teacher to identify the types of leadership styles that are present among the student participants and thereby highlight and discuss them in the class.
3. Student can make a presentation on any famous corporate/political personality covering their leadership style, their approach to people management, their effectiveness in managing conflicts and how did they manage the crisis situations and so on.

Text Books:

1. Northouse, P. (2007). Leadership: Theory and Practice. Sage Publications.
2. Stephen, R. P. (1988). Organizational Behaviour - Concepts, controversies and Applications. New Delhi: Printice Hall of India Ltd.
3. Subba Rao. (2018). Organizational Behaviour (18th ed.). Himalaya Publishing House.
4. Subba Rao. (2022). Personnel and Human Resource Management (5th ed.). Bangalore: Himalay Publishing House.

Course Articulation Matrix – 22OEBBA401

	PO1	PO2	P-3	P-4	PO4	P-5	P-6	PO7	PO8	PO9	PO1-	PO11	PO12
CO1	1	-	-	-	1	-	-	-	1	-	1	-	1
CO2	-	-	-	-	-	-	-	-	1	1	1	-	1
CO3	1	-	-	-	-	-	-	-	1	1	1	-	1
CO4	1	-	-	-	-	-	1	-	1	1	1	-	1
CO5	1	-	-	-	-	1	1	-	1	1	1	-	1
WA	1	-	-	-	1	1	1	-	1	1	1	-	1

OE (4) Syllabus for BBA Semester - IV	
Course Code: 22OEBBA402	Course Title: Personal Wealth Management
Course Credit (L:T:P): 3(3:0:0)	Teaching Hours/Week:3
Total Contact Hours:45	Formative Assessment Marks: 40
Duration of Exam: 2 ½ Hours	Semester End Examination Marks: 60
Pedagogy: Classrooms lecture, tutorials, and Problem Solving.	
Course Outcomes: On successful completion of the course, the Students will; CO1: Incorporate the importance of Wealth Management and Financial Planning in personal life CO2: Identify the Real Estate Investment Routes and understand the tax planning that minimizes tax burden CO3: Select and Apply the Asset Allocation strategies to balance between Risk and Return CO4: Analyze the Retirement Planning Benefits and retirement strategies to provide regular income for life. CO5: Evaluate the basic principles and importance of various insurance policies	
Syllabus:	Hours
Module No. 1: Wealth Management and Financial Planning	09
Meaning of Wealth Management, Need, Scope and Components of Wealth Management, Process of Wealth Management, Expectations of Clients, Code of Ethics for Wealth Manager. Challenges to WM in India – Financial Planning - Systematic Approach to Investing (SIP, STP & SWP)- Life Cycle and Wealth Cycle - Financial Planning in India, Legal aspects of Financial Planning.	
Module No. 2: Estate Planning and Tax Planning	09
Real Estate, Role of Real Estate, Real Estate Investment Routes, Real Estate Indices -Assets & Liabilities, Nomination, Inheritance Law, Will, Understanding Trust and Trust Documents – Tax Planning Concepts, Assessment Year, Financial Year, Income Tax Slabs, TDS, Advance Tax, LTCG, STCG, Carry Forward and Set-off.	
Module No. 3: Asset Allocation Strategies	09
Asset allocation Strategies -Asset allocation Decision, Equity portfolio strategies - Active Vs Passive, Management strategies, Value Vs growth investing, -Tactical, Fixed & Flexible. Portfolio Management Strategies - Indexing - Active - interest rate anticipation, Valuation analysis, Credit analysis, Yield spread analysis and Bond swaps - Allocation to Speculation, Diversification in Perspective.	

Module No. 4: Retirement Planning and Employee Benefits	10
Introduction to Retirement Planning - Types of Retirement Plans - Defined Benefit and Defined Contribution plan, Superannuation Fund and other retirement plans, Pre and Post Retirement Planning Strategies – ESOP and ESPP.	
Module No. 5: Insurance Products in Wealth Management	08
Meaning, Basic Principles of Insurance, Functions and Characteristics of Insurance - Group Life and Health Insurance; Types of Life Insurance Policies, Types of General Insurance Policies, Health Insurance and Group Insurance Policy – Risk Management through Insurance.	
Skill Developments Activities: <ul style="list-style-type: none"> • List out different Insurance schemes • Create your own personal portfolio using imaginary numbers and justify. • Conduct a survey of 20 salaried employees on their investment avenues through questionnaire. • Prepare technical charts report of any 5 listed stocks in BSE S&P SENSEX. 	
Text Books: <ul style="list-style-type: none"> • Pawan V. Jhabak – Wealth Management, Himalaya Publishing Hou Himalaya Publishing House Pvt. Ltd., Mumbai - 400 004. • S.K Bagchi – Wealth Management Jaico Publishing House, Firs Edition. • NSE Academy – Financial Planning and Wealth Management. • NCFM Work Book – Financial Markets (Advanced). 	

Course Articulation Matrix – 22OEBBA402

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	-	-	-	1	-	1
CO2	2	1	1	-	-	-	-	-	-	-	-	1
CO3	2	1	1	-	-	-	-	-	-	-	-	1
CO4	2	1	1	-	-	-	-	-	-	-	-	1
CO5	2	1	1	-	-	-	-	-	-	-	-	1
WA	2	1	1	-	-	-	-	-	-	1	-	1

III SEMESTER

DISCIPLINESPECIFICCOURSE(DSC) 7

Course Code: 223329	Course Title: CorporateAccounting
Course Credits:4 .(L:T:P): 4:0:0	Teaching Hours/Week: 04 Hours
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 1/2 Hours	Semester End Examination Marks: 60

Course Objectives:

To provide students an understanding of various accounting techniques applied in various vital financial events in corporate business.

CourseOutcomes:

CO1-Knowingthetreatmentofunderwritingofshares.

CO2-Comprehendthecomputationofprofitpriortoincorporation.

CO3-Knowthevaluationofintangibleassets and valuationofshares

CO4-Preparethefinancialstatementsofcompaniesaspercompanies' act.

ModuleNo.1: Underwriting of Shares:

10 Hours

Introduction- Meaning of Underwriting - SEBI regulations regarding underwriting; Underwriting commission. Underwriter-functions –Advantages of Underwriting, Types of underwriting- Marked and Unmarked Applications-Determination of Liability inrespect of underwriting contract-whenfully underwritten and partially underwritten-with and without firm underwriting problem.

Module No.2: Profit Prior to Incorporation:

10 Hours

Introduction-Meaning-calculation of sales ratio- time ratio – weighted ratio-treatment of capital and revenue expenditure – Ascertainment of pre-incorporation and post- incorporation profits by preparing statement of Profit and Loss and Balance Sheet as per scheduleIII of companies Act, 2013.

Module No.3 Valuation of Intangible Assets:

10 Hours

Introduction – Valuation of Goodwill –factors influencing good will, circumstances of valuation of goodwill-Methods of Valuation of Goodwill: Average Profit Method, Capitalization of average Profit Method, Supper Profit Method, Capitalization of Super Profit Method, and Annuity Method-Problems. Brand valuation and Intellectual Property Rights(IPR).

Module No.4: Valuation of Shares:**10 Hours**

Introduction- Meaning- Need for Valuation- Factors Affecting Valuation- Methods of Valuation: Intrinsic Value Method, Fair Value of shares – Discounted Cash Flow Method. Rights Issue and Valuation of Rights Issue, Valuation of Warrants.

Module 5 : Financial Statements of Companies:**16 Hours**

Statutory Provisions regarding preparation of financial statements of companies as per schedule III of companies act, 2013 and INDAS – 1 – Treatment of Special Items – Tax deducted at source-Advance payment of Tax-Provision for Tax – Depreciation – Interest on debentures-Dividends-Rules regarding payment of dividends – Transfer to Reserves-Preparation of Statement of profit and loss and Balance Sheet.

Skill Development Activities:

1. Compile the list of Indian companies which have issued shares through IPO/FPO in the current financial year.
2. Determine Underwriters 'Liability in case of an IPO, with imaginary figures. • Present the format of 'Statement of Profit and Loss', 'Balance Sheet' and 'Statement of Changes in Equity', with imaginary figures
3. Collect financial statement of a company and calculate intrinsic value of an equity share.
4. Collect annual report of a Company and List out its assets and Liabilities.
5. Collection of latest financial statements of a company and find out the intrinsic value of shares
6. Collect the annual reports of company and calculate the value of goodwill under different methods
7. Any other activities, which are relevant other course.

Reference Books:

1. J.R. Monga, Fundamentals of Corporate Accounting. Mayur Paper Backs, New Delhi.
2. M.C. Shukla, T.S. Grewal, and S.C. Gupta. Advanced Accounts. Vol.-II. S. Chand & Co., New Delhi.
3. S.N. Maheshwari, and S.K. Maheshwari. Corporate Accounting Vikas Publishing House, New Delhi.

4.Ashok Sehgal, Fundamentals of Corporate Accounting. Taxman Publication, NewDelhi.

5.V.K.Goyal and Ruchi Goyal, Corporate Accounting. PHILearning.

6.Jain,S.P.andK.L.Narang.CorporateAccounting.KalyaniPublishers ,NewDelhi

7. Bhushan Kumar Goyal, Fundamentals of Corporate Accounting, International Book House

8.P.C.Tulsian and Bharat Tulsian,Corporate Accounting, S.Chand

9.Amitabha Mukherjee, Mohammed Hanif, Corporate Accounting, McGraw Hill Education

10.Arulanandam&Raman;CorporateAccounting-II

11.Madegowda J-Advanced corporate accounting, HPH

12.Soundarajan.A&K.Venkataramana,Corporate

13.Accounting,VBH.13.S.P.JainandK.L.Narang-CorporateAccounting

14. S.Bhat-CorporateAccounting.

Note: Latest edition of textbooks may be used.

Web links:

<https://www.svtuition.org/2010/10/underwriting-of-shares-and-debentures.html>

<https://cleartax.in/s/profit-prior-company-incorporation>

Course Articulation Matrix – 223329

Course/Program Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	-	1	-	1	1	1	1	1
CO2	2	1	1	1	-	-	-	1	1	1	1	1
CO3	2	1	1	1	1	-	1	1	-	1	1	1
CO4	2	2	1	1	1	1	-	1	1	1	2	2
WAVG	2	1.25	1	1	1	1	1	1	1	1	1.25	1.25

**III SEMESTER
DISCIPLINE SPECIFIC COURSE(DSC) 8**

Course Code: 223330	Course Title: Business Statistics
Course Credits:4 .(L:T:P): 4:0:0	Teaching Hours/Week: 04 Hours
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 1/2 Hours	Semester End Examination Marks: 60
Course Code: 223330	Course Title: Business Statistics

Pedagogy: Classroom lectures, Case studies, Tutorial Classes, Group discussion, Seminar & field work etc.,

Course Objectives: To equip students with statistical tools which have wider applications in business situation analysis and with research skills to analyse and find solutions to various problems facing various business undertakings.

Course Outcomes:

CO1-Familiarizes statistical data and descriptive statistics for business decision-making.

CO2-Comprehend the measures of variation and measures of skewness.

CO3-Know the use of probability and its distributions in business.

CO4-Application of correlation and regression in business decisions along with index numbers

ModuleNo.1:Statistical Data and Descriptive statistics: 10 Hours

Nature and Classification of data: Univariate, bivariate and multivariate data; Measures of Central Tendency :Mathematical averages including arithmetic mean, Properties and applications. Positional Averages- Mode and Median (including graphic determination).

Module No.2: Measures of Variation: andSkewness: 12 Hours

Measures of Variation: absolute and relative. Range, quartile deviation, mean deviation, standard deviation, and their co efficient, Properties of standard deviation/variance.

Skewness: Meaning, Measurement using Karl Pearson and Bowley's measures; concept of Kurtosis.

ModuleNo. 3: Probability Distributions:**14 Hours**

Theory of Probability. Approaches to the calculation of probability; Calculation of event Probabilities. Addition and multiplication laws of probability (Proof not required); Conditional probability and Bayes' Theorem (Proof not required)-Expectation and variance of a random variable- Probability distributions- Binomial distribution :Probability distribution function, Constants, Shape, Fitting of binomial distribution-Poisson distribution: Probability function, (including Poisson approximation to binomial distribution), Constants, Fitting of Poisson distribution-Normal distribution: Probability distribution function, Properties of normal curve, Simple problems.

Module No.4: Correlation and Regression Analysis:**12 Hours**

Correlation Analysis: Meaning of Correlation:-types of correlation-Positive and negative correlation-simple, partial, and multiple correlation. linear and Non-linear correlation and Scatter diagram, Pearson's co-efficient of Correlation; Correlation and Probable error; Spearman's Rank Correlation co-efficient.- problems.

Regression Analysis: meaning and definition- regression lines, Regression equations and estimation; Properties of regression coefficients; Relationship between Correlation and Regression coefficients- problems.

Module 5: Index Numbers:**8 Hours**

Meaning and uses of index numbers; Construction of index numbers: Fisher's ideal index number with Time Reversal and Factor Reversal Tests. Construction of consumer price indices Using Aggregative Expenditure method and Family Budget method.

Skill Development Activities:

1. Application of MS Excel Functions in statistical decision making and students should submit output of the same.
2. Collect the age statistics of 10 new married couples calculate Correlation coefficient.
3. Recall the use of probability theory in business.
4. Identify the applicability of correlation and regression in business decision-making.
5. Construct consumer price indices with imaginary figures.
Any other activities, which are relevant to the course.

Text Books:

1. Gupta,S.P., and Archana Agarwal. Business Statistics, Sultan Chand and Sons, New Delhi.
2. VohraN.D., Business Statistics, McGraw Hill Education.
3. Gupta,S.C. Fundamentals of Statistics. Himalaya Publishing House.
4. Anderson, Sweeney, and Williams, Statistics for Students of Economics and Business, Cengage Learning.
5. CB Gupta
6. DNEI hance Fundamentals of statistics
7. Sen Chetty and Kapoor mathematical statistics

Course Articulation Matrix – 223330

Course/Program Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	1	1	1	2	1	1	1
CO2	1	1	1	1	-	1	-	1	1	1	1	-
CO3	2	2	2	1	1	-	1	1	2	1	1	1
CO4	2	2	2	1	-	1	-	1	1	2	2	2
W/AVG	2	1.5	1.5	1	1	1	1	1	1.5	1.25	1.25	1.3

Note:Latest edition of text books may be used.

Web Links<https://www.simplilearn.com>
<https://www.itl.nist.gov>

III SEMESTER

DISCIPLINE SPECIFIC COURSE(DSC) 9

Course Code: 223331	Course Title: Cost Accounting
Course Credits:4 (L:T:P): 4:0:0	Teaching Hours/Week: 04 Hours
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 1/2 Hours	Semester End Examination Marks: 60

Pedagogy: Classrooms lecture, Case studies, Tutorial classes, Group discussion, Seminar & field work etc.,

Course Objectives: To make students understand the various costing techniques applied in different industries to ascertain the cost of products and services.

Course Outcomes:

CO1- Know the concepts of cost accounting & Methods of Costing.

CO2- knowing the Procedure and documentations involved in procurement of Materials & compute the valuation of Inventory.

CO3- Make use of payroll procedures & compute idle and overtime.

CO4- Preparation of cost sheet and knowing the methods of allocation, apportionment, absorption of overheads.

Module No.1: Introduction to Cost Accounting:

12 Hours

Introduction-Meaning and definition- Objectives, Importance and Uses of Cost Accounting, Difference between Cost Accounting and Financial Accounting; Various Elements of Cost and Classification of Cost; Cost object, Cost unit, Cost driver, cost centre; Cost reduction and Cost control; Methods and Techniques of Costing (Meanings Only); Use of IT in Cost Accounting; Limitations of Cost Accounting; Cost Sheet: Meaning and Cost heads in a Cost Sheet, Presentation of Cost Information in Cost Sheet. Problems on Cost Sheet, Tenders and Quotations.

Module No.2:Material Cost:**12 Hours**

Materials: Meaning, Importance and Types of Materials-Direct and Indirect Material Materials material control.-Inventory Control Technique of inventory control, problems on level setting and EOQ. Procurement-Procedure for procurement of materials and documentation involved in materials accounting- Material Storage: Duties of Storekeeper, pricing of material issues, preparation of Stores Ledger Account-FIFO, LIFO, Simple Average Price and Weighted Average Price Methods- Problems.

Module No.3:Employee Cost:**10 Hours**

Introduction- Employee Cost- types of labor cost- Labor Cost Control-time keeping and time booking and Payroll Procedure-Preparation of Payroll: Idle Time Causes and Treatment of Normal and Abnormal Idle time, Over Time Causes and Treatment –Labor Turnover-Meaning, Reasons and Effects of Labor turn over. Methods of Wage Payment: Time rate system and piece rate system, and the Incentive schemes-Halsey plan, Rowan plan and Taylor differential piece rate system-problems.

Module No.4:Overheads Cost:**12 Hours**

Introduction-Meaning and Classification of Overheads; Accounting and Control of Manufacturing Overheads: Estimation and Collection, Cost Allocation, Apportionment, Re-apportionment and Absorption of Manufacturing Overheads; Problems on Primary and Secondary overheads distribution using Reciprocal Service Methods (Repeated Distribution Method and Simultaneous Equation Method); Absorption of Overheads: Meaning and Methods of Absorption of Overheads; Problems on Machine Hour Rate.

ModuleNo.5:Reconciliation of Cost and Financial Accounts: 10Hours

Introduction-meaning of reconciliation, Reasons for differences in Profits under Financial and Cost Accounts; Procedure for Reconciliation-Ascertainment of Profits as per Financial Accounts and Cost Accounts and Reconciliation of Profits of both sets of Accounts-Preparation of Reconciliation Statement- Problems.

Skill Developments Activities:

1. Visit any Manufacturing entity collect the method of inventory valuation adopted & procedure involved in procuring inventory.
2. Draw the format of five documents used for material accounting
3. Prepare dummy Payroll with imaginary figures.
4. Visit any large-scale organization, identify the techniques used for controlling administrative, Selling & distribution overheads.
5. Visit any manufacturing entity and collect the cost data and prepare the cost sheet. Any other activities, which are relevant to the course.

Text Books:

1. Charles T. Horngren, SrikantM. Datar, MadhavV. Rajan, Cost Accounting: A Managerial Emphasis, Pearson Education.
2. Jawahar Lal, Cost Accounting., Mc Graw Hill Education
3. Made gowda J, Cost Accounting, HPH.
4. Rajiv Goel, Cost Accounting, International Book House
5. Jain,S.P. andK.L.Narang.CostAccounting: Principles and Methods. Kalyani Publishers
6. Arora,M.N.Cost Accounting-Principles and Practice,Vikas Publishing House, NewDelhi.
7. Maheshwari, S . N . and S.N. Mittal. Cost Accounting: Theory and Problems. Shri Mahavir Book Depot, New Delhi.
8. Iyengar, S.P Cost Accounting, Sultan Chand & Sons
9. Mariyappa B Cost Accounting,

Course/Program Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	1	-	2	2	2	1	1	1	1
CO2	2	1	1	1	2	2	1	1	1	1	1	1
CO3	1	-	-	-	1	1	1	1	-	1	1	1
CO4	2	1	1	1	2	1	2	1	1	2	2	2
W/AVG	1.75	1	1	1	1.25	1.5	1.5	1.25	1	1.25	1.25	1.25

**Course Articulation Matrix – 223331
III SEMESTER OPEN ELECTIVE 3**

Course Code: 22OECOM301	Course Title: Advertising Skills
Course Credits: 3 (L:T:P): 3:0:0	Teaching Hours/Week: 03 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Exam Duration: 2 1/2 Hours	Semester End Examination Marks: 60

Pedagogy: Classrooms lecture, Case studies, Group discussion & Seminar etc.,

Course Objectives: This course seeks to provide knowledge about the concepts, tools, techniques, and relevance of digital marketing in the present changing scenario.

Course Outcomes:

CO1- Familiarize with advertising concepts.

CO2- Identify effective media choice for advertising.

CO3- Developing ads for different media.

CO4- Measure the advertising effectiveness and analyze the role of Advertising agency.

ModuleNo.1:Introduction: 10 Hours

Communication Process; Advertising as a tool of communication; Meaning, nature and importance of advertising; Types of advertising; Advertising objectives.

Audience analysis; Setting of advertising budget: Determinants and major methods.

ModuleNo.2:Media Decisions: 7 Hours

Major media types-their characteristics, internet as an advertising media, merits and demerits; Factors influencing media choice; media selection, media scheduling, Advertising through the Internet-media devices.

Module No.3: Message Development: 8 Hours

Advertising appeals, Advertising copy and elements, Preparing ads for different media

Module No.4: Measuring Advertising Effectiveness: **10 Hours**
Evaluating communication and sales effects; Pre-and Post-testing techniques

Module No.5: Advertising Agency: **7 Hours**
a) Advertising Agency: Role, types and selection of advertising agency.
b) Social, ethical and legal aspects of advertising in India.

Skill Development Activities: 1.

1. Analyze the audience feedback on advertisement of FMCG.
2. List out any ten products/services advertised through internet.
3. Design any two ads for print media.
4. Examine the legal aspects of advertising in India and submit the report.
5. Any other activities, which are relevant to the course.

Web Links:

<https://www.managementstudyguide.com/objectives-importance-of-advertising.html>
<https://bbamantra.com/media-types-characteristics/>

IV SEMESTER

DISCIPLINE SPECIFIC COURSE (DSC) 10

Course Code: 223429	Course Title: Advanced Corporate Accounting
Course Credits:4 .(L:T:P): 4:0:0	Teaching Hours/Week: 04 Hours
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 1/2 Hours	Semester End Examination Marks: 60

Pedagogy: Classroom lectures, Case studies, Group discussion & Seminar etc

Course Objectives: To understand the various higher accounting methods and accounting techniques applied in valuing the effect of inflation on financial affairs

Course Outcomes:

CO1- Know the procedure of redemption of preference shares.

CO2- Comprehend the different methods of Mergers and Acquisition Of Companies

CO3- Know the process of internal reconstruction.

CO4- Prepare the liquidators final statement of accounts and understand The recent developments in accounting.

ModuleNo.1: Redemption of Preference Shares:

10 Hours

Meaning- legal provisions-treatment regarding premium on redemption- creation of Capital Redemption Reserve Account-Fresh issue of shares – Arranging for cash balance for the purpose of redemption- minimum number of shares to be issued for redemption-issue of bonus shares – preparation of Balance sheet (Schedule III to Companies Act 2013) after redemption.

ModuleNo.2:Mergers and Acquisition of Companies: 16 Hours

Meaning of Amalgamation and Acquisition–Types of Amalgamation–Amalgamation in the nature of Merger–Amalgamation in the nature of Purchase –Methods of Calculation of Purchase Consideration (IndAS103), Net asset Method -Net Payment Method, Accounting for Amalgamation (Problems on pooling of interest method and purchase method)–Journal Entries and Ledger Accounts in the Books of Transfer or Company and Journal Entries in the books of Transferee Company–Preparation of Balance Sheet after Merger. (Schedule III to Companies Act 2013).

Module No.3: Internal Reconstruction of Companies: 10 Hours

Meaning of Capital Reduction; Objectives of Capital Reduction; Provisions for Reduction of Share Capital under Companies Act, 2013. Forms of Reduction. Accounting for Capital Reduction. Problems on passing Journal Entries, preparation of Capital Reduction Account and Balance sheet after reduction (Schedule III to Companies Act 2013).

Module No.4: Liquidation of Companies: 12 Hours

Meaning of Liquidation, Process, Modes of Winding up –Compulsory Winding up, Voluntary Winding up and winding up subject to Supervision by Court. Order of payments in the event of Liquidation. Liquidator's Statement of Account. Liquidator's remuneration. Problems on preparation of Liquidator's Statement of Account.

ModuleNo.5:Recent Developments in Accounting and Accounting standards: 8 Hours

Human Resource Accounting–Environmental Accounting Discloser as per Global Reporting Initiative (GRI) Reporting of variables –Social Responsibility Accounting, Indian Accounting Standards – Meaning – Objectives – Significance of Accounting standards in India –Process of setting Accounting Standards in India - List of Indian accounting standards.(INDAS). ICA vs NFRA

Skill Development Activities:

1. List out legal provisions in respect of Redemption of Preference shares.
2. Calculation of Purchase consideration with imaginary figures.
3. List any five cases of amalgamation in the nature of merger or acquisition of Joint Stock Companies.
4. List out legal provisions in respect of internal reconstruction.
5. List out any five Indian Accounting Standards.

Any other activities, which are relevant to the course.

Text Books:

1. Arulanandam & Raman; Corporate Accounting-II,HPH
2. Anil Kumar.S Rajesh Kumar.V and Mariyappa. B Advanced Corporate Accounting, HPH
3. Dr. Venkataraman. R- Advanced Corporate Accounting
 4. S.N.Maheswari,Financial Accounting, Vikas publishing
 5. SoundarajanA & K.Venkataramana, Advanced Corporate Accounting, SHBP.
6. R L Gupta, Advanced Accountancy, Sultan Chand
7. K.K Verma – Corporate Accounting.
8. Jain and Narang, Corporate Accounting.
9. Tulsian, Advanced Accounting,
- 10.Shukla and Grewal – Advanced Accountancy, Sultan Chand
- 11.Srinivas Putty, Advanced Corporate Accounting ,HPH.

Note:Latesteditionoftextbooksmaybeused.

Web Links:

<https://taxguru.in> > company-law
<https://www.resurgentindia.com>

Course Articulation Matrix – 223429

Course/Program Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	-	-	1	1	1	1	-	-
CO2	2	1	1	1	-	1	1	2	1	1	1	1
CO3	2	2	1	2	1	1	-	1	1	1	1	-
CO4	2	1	1	1	-	1	-	1	1	1	1	1
W/AVG	2	1.25	1	1.25	1	1	1	1.25	1	1	1	1

**IV SEMESTER
DISCIPLINE SPECIFIC COURSE (DSC) 11**

Course Code: 223430	Course Title: Costing Methods and Techniques
Course Credits:4 (L:T:P): 4:0:0	Teaching Hours/Week: 04 Hours
Total Contact Hours: 56Hours	Formative Assessment Marks: 40
Exam Duration: 2 1/2 Hours	Semester End Examination Marks: 60

Pedagogy: Classroom lectures, Case studies, Group discussion & Seminar etc

Course objective: It aims to report, analyze, and lead to the improvement of internal cost controls and efficiency.

Course Outcomes:

CO1-The method of costing applicable in different industries and Determination of cost by applying different methods of costing.

CO2-Prepare flexible and cash budget with imaginary figures

CO3-Analyze the processes involved in standard costing

CO4- Knowledge of Activity Based Costing and its applications.

Module No.1: Job and Contract Costing:

12 Hours

Contract Costing: Meaning, features of contract costing, applications of contract costing, similarities and dissimilarities between job costing and contract costing, recording of contract costs, meaning of terms used in contract costing; treatment of profit on incomplete contracts - Problems.

Job Costing: Meaning, prerequisites, job costing procedure, Features, objectives, applications, advantages and disadvantages of Job costing, Job cost sheet – simple problems.

Module No. 2: Process and Service Costing:

12 Hours

Process costing: Meaning, features and applications of Process Costing; comparison between Job Costing and Process Costing, advantages and disadvantages of process costing; treatment of process losses and gains in cost accounts; preparation of process accounts.

Service costing: Introduction to service costing; Application of Service costing; Service costing v/s product costing; Cost units for different service sectors; Service cost statement; Determination of costs for different service sectors-Transport services, hospitals and educational institutions – problems on preparation of service cost statements for these service sectors.

Module No. 3: Activity Based Costing:

10 Hours

Introduction – Weakness Of Conventional Costing System –Concept Of ABC – Characteristics Of ABC – Kaplan And Cooper's Approach – Cost Drivers And Cost Pools –Allocation Of Overheads Under ABC— Steps In The Implementation Of ABC-Benefits From Adaptation Of ABC System-Difficulties Faced By The Industries In The Successful Implementation Of ABC - Problems.

Module 4: Marginal Costing:

12 Hours

Meaning and Definition of marginal cost, marginal costing, features of marginal costing – terms used in marginal costing -P/V ratio, BEP, Margin of Safety, Angle of Incidence. Break Even Analysis assumptions and uses. Break Even Chart. (Theory). Problems on CVP analysis.

Module 5: Budgetary Control and Standard Costing:

10 Hours

Budgetary Control Introduction –Meaning & Definition of Budget and Budgetary Control – Objectives of Budgetary Control –essential requirements of budgetary control – advantages and disadvantages of budgetary control – Types of budgets - Functional Budgets – Cash budget, sales budget, purchase budget and production budget. Fixed and Flexible budgets- Problems on Flexible budget and Cash budget only.

Standard Costing Introduction – Uses and limitations, variance analysis – Material variances, Labour variances –problems on Material and Labour variances only.

Skill Development Activities:

1. Naming the appropriate method of costing with justification for each of the following Industries –Paper Mill, Printing, Sugar Mill, Rice Mill, Hospital, Oil Refinery, Pickle Manufacturing, KSRTC and Hotel.
 2. List out the modern costing tools in accounting field.
 3. Prepare flexible Budget and cash budget with imaginary figures
 4. Narrate the steps involved in standard costing System.
 5. Prepare a report, which explains the conditions that are necessary for the successful implementation of a JIT manufacturing system.
 6. Explain ABC. Illustrate how ABC can be applied.
- Any other activities in addition to the above, which are relevant to the course.

Text Books:

1. John K Shank and Vijaya Govinda rajan; Strategic Cost Management; Free Press Publication; NewYork
2. SP Jain and KL Narang, Advanced Cost Accounting, Kalyani Publications,
3. Robert S Kaplan and Anthony A Atkinson, Advanced Management Accounting, PHI, New Delhi.
4. Shank and Govind rajan, Strategic Cost Management, Simon and Schuster, 36 NewYork.
5. Lin Thomas, Cases and Readings in Strategic Cost Management, McGraw Hill Publications, New York.
6. Mariyappa B Methods and Techniques of Costing.HPH.

Course Articulation Matrix – 223430

Course/Program Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	-	1	1	1	1	1	1	1
CO2	2	1	1	1	-	1	1	1	1	1	2	1
CO3	2	1	2	2	1	1	1	1	1	1	1	1
CO4	2	1	1	1	1	1	-	1	1	1	1	1
W/AVG	2	1	1.25	1.25	1	1	1	1	1	1	1.25	1

Web links:

<https://www.accountingtools.com>

<https://www.patriotsoftware.com>

IV SEMESTER

DISCIPLINE SPECIFIC COURSE (DSC) 12

Course Code: 223431	Course Title: BusinessRegulatoryFramework
Course Credits:4 .(L:T:P): 4:0:0	Teaching Hours/Week: 04 Hours
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 1/2 Hours	Semester End Examination Marks: 60

Pedagogy: Class room lectures, Case studies, Group discussion, Seminar & field work etc

Course Objectives: To equip students with the provisions of Law of Contract and enable them to discuss and restate the same.

Course Outcomes:

CO1- Recognize the laws relating to Contracts and its application In business activities.

CO2- Acquire knowledge on bailment and indemnification of Goods in a contractual relationship and role of agents.

CO3- Comprehend the rules for Sale of Goods and rights and duties of A buyer and seller

CO4- Distinguish the partnership laws, its applicability and relevance. Re phrase the cyber law in the present context

Module No.1: Indian Contract Act, 1872: 12 Hours

Introduction- Definition of Contract, Essentials of Valid Contract, Offer and acceptance, consideration, contractual capacity, free consent. Classification of Contract, Discharge of a contract, Breach of Contract and Remedies to Breach of Contract

Module No . 2: The Sale of Goods Act, 1930:

10 Hours

Introduction – Definition of Contract of Sale, Essentials of Contract of Sale, Conditions and Warranties, Transfer of ownership in goods including sale by a non-owner and exceptions – Performance of contract of sale – Unpaid seller, rights of an unpaid seller against the goods and against the buyer

Module No.3: Competition and Consumer Laws:

12 Hours

The Competition Act 2002 – Objectives of Competition Act, Features of Competition Act, CAT, Offences and Penalties under the Act, Competition Commission of India.

Consumer Protection Act 2019 – Definitions of the terms - Consumer, Consumer Dispute, Defect, Deficiency, Unfair Trade Practices, and Services, Rights of Consumer under the Act, Consumer Redressal Agencies – District Forum, State Commission and National Commission.

Module No.4:Economic Laws:

12 Hours

WTO patent rules – Indian Patent Act, 1970 – Meaning and Scope of Intellectual Property Rights (IPR), Procedure to get Patent for Inventions and Non - Inventions.

FEMA1999-Objectives of FEMA, Salient Features of FEMA, Definition of Important Terms- Authorized Dealer, Currency – Foreign Currency, Foreign Exchange, Foreign Security

Module 5: Environment and Cyber Laws:

10 Hours

Environment Protection Act 1986 –Objectives of the Act, Definitions of Important Terms

-Environment, Environment Pollutant, Environment Pollution, Hazardous Substance and Occupier, Types of Pollution, Powers of Central Government to protect Environment in India. Cyber Law: Definition, Introduction to Indian Cyber Law, Cyber space and Cyber security.

Skill Development Activities:

1. Discuss the case of "Carlill vs Carbolic Smoke Ball Company" case
2. Discuss the case of "Mohori Bibee v/s Dharmod as Chose".
3. Discuss any one case law relating to minor.
4. State the procedure for getting patent for 'inventions' and / or 'non - inventions'.
5. List at least 5 items which can be categorized as 'hazardous substance' according to Environment Protection Act.
6. List out any top upcoming jobs in cyber security and examine the skill

Any other activities, which are relevant to the course.

Text Books:

1. M.C. Kuchhal, and Vivek Kuchhal, Business Law, Vikas Publishing House, New Delhi.
2. Avtar Singh, Business Law, Eastern Book Company, Lucknow.
3. Ravinder Kumar, Legal Aspects of Business, Cengage Learning
4. SN Maheshwari and SK Maheshwari, Business Law, National Publishing House, New Delhi.
5. Aggarwal SK, Business Law, Galgotia Publishers Company, New Delhi
6. Bhushan Kumar Goyal and Jain Kinneri, Business Laws, International Book House
7. Sushma Arora, Business Laws, Taxmann Publications.
8. Akhileshwar Pathak, Legal Aspects of Business, McGraw Hill Education, 6th Ed.
9. PC Tulsian and Bharat Tulsian, Business Law, Mc Graw Hill Education

Web links:

<https://www.legalserviceindia.com/legal/article-1019-importance-of-cyber-law-in-india.html>

https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=0CAMQw7AJahcKEwjA0YrgkPb7AhUAAAAAHQAAAAAQAg&url=https%3A%2F%2Fwww.indiacode.nic.in%2Fhandle%2F123456789%2F2390%3Fsam_handle%3D123456789%2F1362&psig=AOvVaw3KjxWHypwERPhT271Dmm7-&ust=1671002864020408

Course Articulation Matrix –223431

Course/Program Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	1	1	-	2	1	2	1	1
CO2	2	2	1	2	1	1	1	2	1	2	1	1
CO3	2	1	1	1	-	1	1	1	-	1	1	1
CO4	2	2	1	2	1	1	-	2	1	2	1	1

IV SEMESTER
Skill Enhancement Course 1

Course Code: 22FEIS94	Course Title: Financial education and investment awareness
Course Credits:2 (L:T:P): 1:0:1	Teaching Hours/Week: 15 Hours of Theory 30 Hours of Practical
Total Contact Hours: 45 Hours	Formative Assessment Marks: 20
Exam Duration: 1 1/2 Hours	Semester End Examination Marks: 30

Course Objective: Benchmark knowledge according to the requirements of the age and situation, Assimilation, application and retention through case scenarios

Course Outcomes:

CO1-Acquiring the knowledge of Basic Concepts and life goals with financial goals

CO2-knowledge according to the requirements of the age and situation

CO3-Create follow up assignments that sustain changed behaviours

Module 1- Foundations for Finance:

4 Hrs

Introduction to Basic Concepts: Understand the need for financial planning – basic concepts – life goals and financial goals – format of a sample financial plan for a young adult

Economics: Meaning – scope – key concepts influencing decision making both micro & macro

Banking in India: Types of Bank Deposits, Deposit Insurance (PMJDY). Traditional and New Banking Models. Debit and Credit Cards. Digital Payment System – Internet Banking (NEFT, RTGS and IMPS), Mobile Banking, Mobile Wallet, AEPS, UPI. **Orientation to Financial Statements:** financial terms and concepts, model for reading financial statements, basic ratios for evaluating companies while investing – Time Value of Money – Concept of Compounding and Discounting

Module 2- Investment Management:

8Hrs

Investment Goals: Basic investment objectives – Investment goals – time frame – assessing risk profile – concept of diversification – risk measurement tools

Investment and Saving Alternatives for a Common Investor: Insurance – Health, Life and Other General Insurance (Vehicle Insurance, Property Insurance, etc), Retirement and Pension Plans – National Pension System, Atal Pension Yojana, PM-SYM Yojana, PMLV MY PMKMDY etc., Stocks, Bonds, Mutual Funds. Investor Protection and Grievance Redressal

Stock Markets: Primary Market and Secondary Market, Stock Exchanges, Stock Exchange Operations – Trading and Settlement, Demat Account, Depository and Depository Participants.

Stock Selection: Fundamental Analysis – Economy Analysis, Industry Analysis and Company Analysis. Technical Analysis – Graphical Patterns, Candle-stick Patterns, Indicators and Oscillators.

Stock Return and Risk: Analysing risk and returns trade off relationship- investment risk.

Module 3- Mutual Funds and Financial Planning Essentials:

3Hrs

Mutual Funds: Features of Mutual Funds, Mutual Fund History in India, Major Fund Houses in India and Mutual Fund Schemes. Types of Mutual Fund Plans. Net Asset Value.

Criteria for selection of Mutual Funds: Returns, Performance Measures – Sharpe, Treynor, Alpha, Beta and r^2

Financial Planning: Sample formats – Integrating all the concepts learnt with a personal financial plan.

Giving and supporting: Family support – charitable giving – crowd sourcing for needs.

Practical's:

Foundations for Finance:

7Hrs

- Spreadsheet Modelling:
- IF Function
- SUM Function
- AVERAGE Function
- INDEX, MATCH and VLOOKUP Function
- RANK Function
- SUMPRODUCT Function
- MAX & MIN Function
- ERRORS in Modeling (#VALUE!, #NAME?, #DIV/0!, #REF!, #NUM!, #NA)
- PRESENT VALUE Functions
- FUTURE VALUE Functions
- ANNUITY Functions
- PERPETUITY Functions
- Statistical Functions in Excel
- Financial Statements in Excel

Investment Management:

17Hrs

- Administering Risk Tolerance Tool 17 hours NSE Academy Ltd. Confidential Page 4 of 6
- Group Presentations on Investment Alternatives (Advantages, Suitability and Limitations)
- Demonstration of Stock Trading

- Economy Analysis (www.tradingeconomics.com)
- Industry Analysis (www.ibef.org)
- Company Analysis (www.valueresearchonline.com)
- Spreadsheet Modelling for Stock Valuation (Dividend Discount Model, Free Cash Flow and Relative Valuation)
- Demonstration of Technical Analysis and Exercises (NSE – TAME)
- Spreadsheet Modelling for calculating Stock Return, Risk and Beta

Mutual Funds and Financial Planning Essentials:

6Hrs

- Identification of Fund Houses in India, Schemes and Plans of each Mutual Fund House (www.amfiindia.in , www.valueresearchonline.com)
- Exercises on Calculation of Net Asset Value
- Demonstration of Mutual Fund Fact Sheet
- Exercises on reading performance measures and selection of Mutual Funds
- Preparation of Financial Plan

References

1. RBI Financial Education Handbook
2. NSE Knowledge Hub, AI-powered Learning Experience Platform for BFSI
3. NSE Academy Certification in Financial Markets (NCFM) Modules:
 - a. Macroeconomics for Financial Markets
 - b. Financial Markets (Beginners Module)
 - c. Mutual Funds (Beginners Module)
 - d. Technical Analysis

Websites:

1. www.sebi.gov.in
2. www.nseindia.com
3. www.amfiindia.com

Course Articulation Matrix – 22FEIS94

Course/Program Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	2	1	1	1	1	2	1	2
CO2	2	1	1	1	1	-	-	1	2	-	1	1
CO3	2	1	1	-	-	1	-	1	1	1	-	2
WAVG	2	1.3	1	1	1.5	1	1	1	1.3	1.5	1	1.6

Syllabus for BCA III and IV Semester

Semester: III

Course Code: 225329	Course Title: Database Management Systems
	Database Management Systems Lab
Course Credits: 05 (3:0:2)	Hours of Teaching/Week: 03 Theory + 4 Lab
Total Contact Hours: 42 Theory	Formative Assessment Marks: 40 Theory
56 Lab	25 Practical
Exam Duration: 2 1/2 Hours	Semester End Exam Marks: 60 (Theory)
3 Hours	25 (Lab)

Course Outcomes (COs):

- CO1: Summarize the concepts of database objects enforce integrity constraints on a database make use of ER diagram and types of relationships and roles of structural constraints degree and cardinality ratio.
- CO2: Structured Query Language (SQL) for database manipulation Design simple database systems for some application to interact with databases and solve queries on relation algebra.
- CO3: Implement normalization algorithms using database design theory for different applications analyze and implement transaction processing, concurrency control and database recovery protocols in databases.

Course Content

Unit	Description	Hours
1	Database Architecture: Introduction to Database system applications. Characteristics and Purpose of database approach. People associated with Database system. Data models. Database schema. Database architecture. Data independence. Database languages, interfaces, and classification of DBMS. E-R Model: Entity-Relationship modeling: E – R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram.	14

2	<p>Relational Data Model: Relational model concepts. Characteristics of relations. Relational model constraints: Domain constraints, key constraints, primary & foreign key constraints, integrity constraints and null values.</p> <p>Relational Algebra: Basic Relational Algebra operations. Set theoretical operations on relations. JOIN operations Aggregate Functions and Grouping, Nested Sub Queries-Views.</p>	14
3	<p>Data Normalization: Anomalies in relational database design. Decomposition. Functional dependencies – Axioms, minima and maxima cover. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.</p> <p>Query Processing Transaction Management: Introduction Transaction Processing. Single user & multiuser systems. Need of concurrency control: The lost update problem, Dirty read problem. Transaction states. Desirable properties (ACID properties) of Transactions.</p>	14

Lab Activities

Activity 1:

Database: Student (DDL, DML Statements)

Table: Student

Name	RegNo	Class	Major
Smith	17	1	CS
Brown	8	2	CS

Table: Course

Course Name	Course Number	Credit Hours	Department
Introduction to Computer Science	CS1310	4	CS
Data Structure	CS3320	4	CS
Discrete Mathematics	MATH2410	3	MATH
Database Management Systems	CS3380	3	CS

Table: Section

Section_Identifier	CourseNumber	Year	Instructor
85	MATH2410	98	King
92	CS1310	98	Andreson
102	CS3320	99	Knuth
112	MATH2410	99	Chang
119	CS1310	99	Andreson
135	CS3380	99	Stone

Table: Grade_Report

RegNo	Section_Identifier	Grade
17	112	B
17	119	C
8	85	A
8	92	A
8	102	B
8	135	A

- Create Tables using create statement
- Insert rows to individual tables using insert statement
- Alter table section add new field section and update the records
- Delete brown's grade report
- Drop the table section

Activity 2: (Select clause, Arithmetic Operators) Database: Employee Create
 Following tables and insert tuples with suitable constraints

Table: Employee

Emp_Id	First_Name	Last_Name	Hire_Date	Address	City
1001	George	Smith	11-May-06	83 first street	Paris
1002	Mary	Jones	25-Feb-08	842 Vine Ave	Losantiville
1012	Sam	Tones	12-Sep-05	33 Elm St.	Paris
1015	Peter	Thompson	19-Dec-06	11 Red Road	Paris
1016	Sarath	Sharma	22-Aug-07	440 MG Road	New Delhi
1020	Monika	Gupta	07-Jun-08	9 Bandra	Mumbai

Table : Empsalary

Emp_Id	Salary	Benefits	Designation
1001	10000	3000	Manager
1002	8000	1200	Salesman
1012	20000	5000	Director
1015	6500	1300	Clerk
1016	6000	1000	Clerk
1020	8000	1200	Salesman

Write queries for the following

1. To display FIRSTNAME, LASTNAME, ADDRESS AND CITY of all employees living in PARIS.
2. To display the content of employee table in descending order of FIRSTNAME
3. Select FIRSTNAME and SALARY of salesman
4. To display the FIRSTNAME, LASTNAME, AND TOTAL SALARY of all employees from the table EMPLOYEE and EMPSALARY. Where TOTAL SALARY is calculated as SALARY+BENEFITS
5. List the Names of employees, who are more than 1 year old in the organization
6. Count number of distinct DESIGNATION from EMPSALARY
7. List the employees whose names have exactly 6 characters
8. Add new column PHONE_NO to EMPLOYEE and update the records
9. List employee names, who have joined before 15-Jun-08 and after 16-Jun-07
10. Generate Salary slip with Name, Salary, Benefits, HRA-50%, DA-30%, PF-12%, Calculate gross. Order the result in descending order of the gross.

Activity 3: (Logical, Relational Operators)

Database: Library

Create Following **tables** and insert **tuples** with suitable constraints

Table: Books

Book_Id	Book_Name	Author_Name	Publishers	Price	Type	Quantity
C0001	The Klone and I	Lata Kappor	EPP	355	Novel	5
F0001	The Tears	William Hopkins	First Publ	650	Fiction	20
T0001	My First C++	Brain & Brooke	ERP	350	Text	10
T0002	C++ Brainwork"s	A.W.Rossaine	TDH	350	Text	15
F0002	Thunderbolts	Ana Roberts	First Publ.	750	Fiction	50

Table: Issued

Book_Id	Quantity Issued
T0001	4
C0001	5
F0001	2
T0002	5
F0002	8

Write queries for the following

1. To show Book name, Author name and price of books of **First Publ.** publisher
2. Display Book id, Book name and publisher of books having quantity more than 8 and price less than 500
3. Select Book id, book name, author name of books which is published by other than ERP publishers and price between 300 to 700
4. Generate a Bill with Book_id, Book_name, Publisher, Price, Quantity, 4% of VAT "Total"
5. Display book details with book id"s C0001, F0001, T0002, F0002 (Hint: use IN operator)
6. Display Book list other than, type Novel and Fiction
7. Display book details with author name starts with letter "A"
8. Display book details with author name starts with letter "T" and ends with "S"
9. Select Book_Id, Book_Name, Author Name , Quantity Issued where Books.Books_Id = Issued.Book_Id.
10. List the book_name, Author_name and Price. In ascending order of Book_name and then ondescending order of price.

Activity 4: (Date Functions)

Database: Lab

Create Following table and insert tuples with suitable constraints

Table: Equipment_Details

No.	ItemName	Costperitem	Quantity	Dateofpurchase	Warranty	Operational
1	Computer	30000	9	21/5/07	2	7
2	Printer	5000	3	21/5/06	4	2
3	Scanner	8000	1	29/8/08	3	1
4	Camera	7000	2	13/6/05	1	2
5	UPS	15000	5	21/5/08	1	4
6	Hub	8000	1	31/10/08	2	1
7	Plotter	25000	2	11/1/09	2	2

(Use date functions and aggregate functions)

1. To select the ItemName purchase after 31/10/07
2. Extend the warranty of each item by 6 months
3. Display ItemName , Dateofpurchase and number of months between purchase date and present date
4. To list the ItemName in ascending order of the date of purchase where quantity is more than 3.
5. To count the number, average of costperitem of items purchased before 1/1/08
6. To display the minimum warranty, maximum warranty period
7. To Display the day of the date , month , year of purchase in characters
8. To round of the warranty period to month and year format.
9. To display the next Sunday from the date "07-JUN-96"
10. To list the ItemName, which are within the warranty period till present date.

Activity 5: (Numeric, character functions) Use Functions for the following

1. Find the mod of 165,16
2. Find Square Root of 5000
3. Truncate the value 128.3285 to 2 and -1 decimal places
4. Round the value 92.7683 to 2 and -1 decimal places
5. Convert the string "Department" to uppercase and lowercase
6. Display your address, convert the first character of each word to uppercase and rest are in lowercase
7. Combine your first name and last name under the title Full name
8. A) Take a string length maximum of 15 display your name to the left. The remaining space should be filled with " * "
9. Take a string length maximum of 20 display your name to the right. The remaining space should be filled with "#"
10. Find the length of the string " Mahajana College, Mysore"
11. Display substring "BASE" from "DATABASE"
12. Display the position of the first occurrence of character "o" in Position and Length
13. Replace string Database with Data type
14. Display the ASCII value of " " (Space)
15. Display the Character equivalent of 42

Activity 6:

Database: Subject

Create Following **table** and insert **tuples** with suitable constraints

Table - Physics

Regno	Name	Year	Combination
AJ00325	Ashwin	First	PCM
AJ00225	Swaroop	Second	PMCs
AJ00385	Sarika	Third	PME
AJ00388	Hamsa	First	PMCs

Table – Computer Science

Regno	Name	Year	Combination
AJ00225	Swaroop	Second	PMCs
AJ00296	Tajas	Second	BCA
AJ00112	Geetha	First	BCA
AJ00388	Hamsa	First	PMCs

1. Select all students from physics and Computer Science
2. Select student common in physics and Computer Science
3. Display all student details those are studying in second year
4. Display student those who are studying both physics and computer science in secondyear
5. Display the students studying only physics
6. Display the students studying only Computer Science
7. select all student having PMCs combination
8. select all student having BCA combination
9. select all student studying in Third year
10. Rename table Computer Science to CS

References:

1. Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015
2. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
3. Introduction to Database System, C J Date, Pearson, 1999.
4. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6th Edition, McGraw Hill, 2010.
5. Database Management Systems, Raghu Rama Krishnan and JohannesGehrke, 3rd Edition, McGraw Hill, 2002

Web Links:

1. <https://www.classcentral.com/course/swayam-data-base-management-system-9914>
2. <https://www.mysql.com>
3. https://onlinecourses.nptel.ac.in/noc21_cs04/preview

COURSE ARTICULATION MATRIX-225329

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	3	1	2	1	1	1	3	2	2	3
C02	3	2	3	1	2	1	1	1	2	1	2	3
C03	3	2	3	1	3	2	1	1	3	1	3	3
W.A	3	2	3	1	2.33	1.33	1	1	2.66	1.33	2.33	3

Course Code: 225330

Course Title: C# and .Net Technologies

C# and .Net Technologies

Lab

Course Credits: 05 (3:0:2)

Hours of Teaching/Week: 03 Theory + 4

Lab

Total Contact Hours: 42 Theory

Formative Assessment Marks: 40 Theory

56 Lab

25 Practical

Exam Duration: 2 ½ Hours

**Semester End Exam Marks: 60
(Theory)**

3 Hours

25 (Lab)

Course Outcomes (CO's):

CO1: Acquire Knowledge on web Technologies, client Server Script and implementing programs on c#.

CO2: Applying the concept on VB.Net & IDE and implementing docking & undocking Tools.Designing and developing VB.net Statements.

CO3: Designing on windows Application and implementing on window forms, DataBase Application& Acquiring knowledge on BDO.Net and Implementing on web APP with web forms.

Unit	Descriptio n	Hours
1	Introduction to .Net Technologies: Introduction to Web Technologies. HTML Basics, Scripts. Sample Programs. Advantages and Disadvantages of Client-side and Server-side Scripts. Overview of Client-side Technologies and Server-side Technologies. Introduction to C#: Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Control Structures-Methods, Arrays, Strings, Structures, Enumerations.	14

2	<p>Introduction to VB.NET: Introduction VB.NET -IDE – Creating a shortcut to start VB.NET. Maneuverings the Toolbar Auto-hide, Dockingand Undocking, Placing and Resizing the Windows, Forms, Properties Window and Solution Explorer. Writing and Event Procedure. Execution Basic Keywords. Data Types. VB.NET statements. Conditional statements:If Else, Select Case, Switch and Choose Loops: Do, For Next, For Each Next, While loop. Arrays.</p>	14
3	<p>Application Development on .NET:C#.NET: Building Windows Applications, VB.NET: Windows Forms. Working with Controls, Timer, Picture-box, Group-box, Combo-box, Horizontal and Vertical Scrollbar, Numeric-up-down, Track-bar, and Progress-bar. Subroutines and FunctionsinVB.NET. Database applications</p> <p>ADO .NET Connectivity: Introduction to ADO.NET, ADO vs ADO.NET. Architecture: Data reader, Data adopter, Accessing Data with ADO.NET.</p> <p>Programming Web Applications with Web Forms. ASP .NET applicationswith ADO.NET</p>	14

Practicals:

1. Develop a C# .NET console application to demonstrate the conditional statements.
2. Develop a C# .NET console application to demonstrate the control statements.
3. Develop an application in C#.NET that demonstrates the windows controls
4. Demonstrate Multithreaded Programming in C#.NET
5. Demonstrate subroutines and functions in C#.NET
6. Develop an application for deploying various built-in functions in VB.NET
7. Develop an MDI application for Employee Pay-roll transactions in VB.NET
8. Construct a console application to demonstrate the OOP Concepts
9. Develop a web application in VB.NET for dynamic Login Processing
10. Develop a Windows application with database connectivityfor core-bankingtransactions.

References:

1. "Programming in C#", E. Balagurusamy, 4th Edition, Tata McGraw-Hill, 2017.
2. "Visual Basic.NET", Shirish Chavan, 3rd Edition, Pearson Education, 2009.
3. "ASP.NET and VB.NET Web Programming", Matt J. Crouch, Edition 2012.
4. "Computing with C# and the .NET Framework", Arthur Gittleman, 2nd Edition, Jones & Bartlett Publishers, 2011

Web Links:

2. <https://dotnet.microsoft.com/en-us/apps/aspnet>
3. https://www.w3schools.com/asp/webpages_intro.asp

COURSE ARTICULATION MATRIX-225330

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	2	3	1	1	2	1	1	2	1	2	2
C02	2	2	3	1	2	1	1	1	3	2	3	2
C03	2	2	3	1	3	1	1	1	3	2	3	2
W.A	2	2	3	1	2	1.33	1	1	2.6	1.66	2.6	2

Course Code: 225331**Course Title: Computer Networks****Course Credits: 03 (3:0:0)****Hours of Teaching/Week: 03 Theory****Total Contact Hours: 42 Theory****Formative Assessment Marks: 40 Theory****Exam Duration: 2 1/2 Hours****Semester End Exam Marks: 60 (Theory)**

Course Outcomes (COs):

CO1: Acquire knowledge of how computer network and physical layer organization with the concept of layered approach.

CO2: Apply the concept of data link and network layer of network model in solving real-time problems.

CO3: Identify and employ the top 3 layer of network model along with the skills in analyzing usability of web.

Unit	Description	Hours
1	Introduction: Computer Networks and its applications, Network structure, network architecture, Topologies, LAN, WAN, MAN, The OSI referencemodel, The TCP/IP reference model. The Physical Layer: Transmission Media – Twisted pair, coaxial cable, optical fiber, radio transmission, microwaves and infrared transmission, Switching – message switching, Multiplexing.	14
2	The Data Link Layer: Data Link Layer design issues, Error detection – Single parity checking, Checksum, polynomial codes – CRC, Error correction- Hamming code, Elementary data link protocols, sliding windowprotocols. The Network Layer: Network layer design issues, Routing algorithms – Flooding, Distance vector routing, Hierarchical routing, Link state routing, Congestion, control algorithms – Leaky bucket, token bucket algorithm, admission control, Hop by Hop choke packets.	14

3	The Transport Layer, Presentation Layer and Application Layer: Elements of Transport service, Elements of Transport, protocols, Internet transport protocols (TCP & UDP), Presentation Layer – Introduction, protocol, Application Layer DNS, Electronic Mailing, and World Wide Web, Introduction to mobile internet.	14
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References:

1. Computer Networks, Andrew S. Tanenbaum, 5th Edition, Pearson Education, 2010.
2. Data and Computer Communications, William Stallings, 10th Edition, Pearson Education, 2017.
3. Data Communication and Computer Networks, Brijendra Singh, 3rd Edition, PHI, 2012
4. Data Communication & Network, Dr. Prasad, Wiley Dreamtech.

Web links:

1. <https://www.javatpoint.com/computer-network-tutorial>
2. <https://www.cs.vu.nl/~ast/CN5/>

COURSE ARTICULATION MATRIX-225331

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
CO1	2	1	2	1	3	2	-	-	2	2	2	3
CO2	-	3	3	2	2	-	-	-	2	3	1	2
CO3	3	2	1	3	3	1	1	1	2	3	-	3
W. A	2.5	2	2	2	2.6	1.5	1	1	2	2.6	1.5	2.6

OE(3) Computer Science Syllabus for All Programs(Except Science)

Semester III

Course Code: 22OECMS301	Course Title: OE(3)- Python Programming Concept
Course Credits (L:T:P): 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO 1:Acquire basic knowledge on computers and python programming.

CO 2:Develop python programs with input output statements, various datatypes and control structure.

CO 3:Implement simple python programs with function and strings.

Course Content

UNIT – 1	FUNDAMENTALS OF COMPUTERS	14 HOURS
<p>Introduction to Computers - Definition, Characteristics, Generations, Types, Basic Organization of a Digital Computer; Number Systems – Different Types, Conversion From One Number System To Another; Computer Code – ASCII; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software; Computer Languages - Machine Level, Assembly Level & High Level Languages; Translators – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart with Examples.</p> <p>Python Basics: - Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line Mode and Python IDEs; Simple Python Program. Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association.</p>		
UNIT – 2	DATA TYPES AND CONTROL STRUCTURE	14 HOURS
<p>Data Types; Indentation; Comments; Built-in Functions - Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples; Illustrative Programs.</p> <p>Python Control Flow: Types of Control Flow; Control Flow Statements - if, else, elif, while loop, break statement, for loop statement; range() and exit() functions; Illustrative Programs.</p>		
UNIT – 3	FUNCTIONS AND STRINGS	14 HOURS
<p>Python Functions: Types of Functions; Function Definition - Syntax, Function Calling, Passing Parameters/Arguments, return statement; Default Parameters; Command Line Arguments; Key Word Arguments; Illustrative Programs.</p> <p>Strings: Creating and Storing Strings; Accessing String Characters; str() function; Operations on Strings - Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods; Illustrative Programs.</p>		

Textbooks:

1. Programming with Python: Neeraj Kushwaha, Evincepub Publishing.
2. Python Programming for Beginners: Thomas J. Stephenson, Amplitudo Ltd Publication.

References:

1. Computer Fundamentals: Pradeep K Sinha and Priti Sinha, 6th Edition, BPB Publication.
2. Think Python - How to Think Like a Computer Scientist: Allen Downey et al., 2nd Edition, Green Tea Press, 2015.
3. Introduction to Python Programming: Gowrishankar Setal., CRC Press, 2019.
4. <https://www.greenteapress.com/thinkpython/thinkCSpy.pdf>
5. http://scipy-lectures.org/intro/language/python_language.html
6. <https://docs.python.org/3/tutorial/index.html>

Course Articulation Matrix – 22OECMS301

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	-	2	1	1	1	1	1	1	2
CO 2	2	1	2	-	1	-	-	-	1	-	-	2
CO 3	1	1	2	-	1	-	-	-	1	-	-	2
Weighted Average	1.66	1.33	1.66	-	1.33	1	1	1	1	1	1	2

Semester: IV

Course Code: 225433	Course Title: Python Programming
Python Programming Lab	
Course Credits: 05 (3:0:0)	Hours of Teaching/Week: 03 Theory + 4 Lab
Total Contact Hours: 42 Theory 56 Lab	Formative Assessment Marks: 40 Theory 25 Practical
Exam Duration: 2 ½ Hours 3 Hours	Semester End Exam Marks: 60 (Theory) 25 (Lab)

Course Outcomes (COs):

CO1: Acquiring knowledge on features and application of python and types of control flow statements of python, defining on exception handling and python functions.

CO2: Identifying, designing and developing strings, lists, tuples and sets.

CO3: Designing and developing GU Interface, Data Analysis and Data Visualization.

Unit	Description	Hours
1	<p>Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program.</p> <p>Python Basics: Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions - Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples.</p> <p>Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions.</p> <p>Exception Handling: Types of Errors; Exceptions; Exception Handling using try, except and finally.</p> <p>Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions.</p> <p>Strings: Creating and Storing Strings; Accessing Sting Characters; the str()</p>	14

2	<p>function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods.</p> <p>Lists: Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists.</p> <p>Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries.</p> <p>Tuples and Sets: Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods</p>	14
3	<p>File Handling: File Types; Operations on Files – Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator; Inheritance- Single an</p> <p>GU Interface: The tkinter Module; Window and Widgets; Layout Management- pack, grid and place.</p> <p>Python SQLite: The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables- Insert, Select, Update. Delete and Drop Records.</p> <p>Data Analysis: NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames.</p> <p>Data Visualisation: Introduction to Data Visualisation; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart.</p>	14

Programs for Practical Component:

Part-A

1. Check if a number belongs to the Fibonacci Sequence
2. Solve Quadratic Equations
3. Find the sum of n natural numbers
4. Display Multiplication Tables
5. Check if a given number is a Prime Number or not
6. Implement a sequential search
7. Create a calculator program
8. Explore string functions
9. Implement Selection Sort
10. Implement Stack and Queue
11. Read and write into a file

Part-B

1. Demonstrate usage of basic regular expression
2. Demonstrate use of advanced regular expressions for data validation.
3. Demonstrate use of List
4. Demonstrate use of Dictionaries
5. Create SQLite Database and Perform Operations on Tables
6. Create a GUI using Tkinter module
7. Demonstrate Exceptions in Python
8. Drawing Line chart and Bar chart using Matplotlib
9. Drawing Histogram and Pie chart using Matplotlib
10. Create Array using NumPy and Perform Operations on Array
11. Create DataFrame from Excel sheet using Pandas and Perform Operations on DataFrames

References:

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online @ <https://www.greenteapress.com/thinkpython/thinkCSpy.pdf>, 2015.
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, Apress®, 2015
4. Advance Core Python Programming, MeenuKohli, BPB Publications, 2021.
5. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall, 2012.
6. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015.
7. Data Structures and Program Design Using Python, D Malhotra et al., Mercury Learning and Information LLC, 2021.

Web References:

<http://www.ibiblio.org/g2swap/byteofpython/read/>
<https://docs.python.org/3/tutorial/index.html>

Course Articulation Matrix-225433

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	1	-	-	1	-	1	-	-	1	1	1
C02	2	3	1	1	1	-	1	-	1	1	2	1
C03	2	2	3	1	3	2	2	2	2	1	3	2
W.A	2	2	2	1	1.66	2	2	2	1.5	1	2	2

Course Code: : 225434

Course Title: Multimedia Animation

Multimedia Animation Lab

Course Credits: 05 (3:0:2)

Hours of Teaching/Week: 03 Theory + 4 Lab

Total Contact Hours: 42 Theory

Formative Assessment Marks: 40 Theory

56 Lab

25 Practical

Exam Duration: 2 Hours

Semester End Exam Marks: 60 (Theory)

3
Hours

25 (Lab)

Course Outcomes (COs):

CO1: Participate in the planning and implementation of animation projects, develop and execute believable animation sequences.

CO2: Create animation sequences that employ basic cinematography principles and skills to create, develop and execute animation sequences.

CO3: Apply performance theory to the creation of animation also Produce layouts and backgrounds with Attention to composition, perspective and color .

Unit	Description	Hours
1	Web Design: Origins and evolution of HTML, Basic syntax, Basic text markup, Images, Lists, Tables, Forms, Frame, Overview and features of HTML5. CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The and <div> tags; Overview and features of CSS3. JavaScript: Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input. Introduction to Animation: Definition, The Start and End States, Interpolation, Animations in HTML.	14
2	CSS Animations, Creating a Simple Animation, CSS Animation Property, Keyframes, Declaring Multiple Animations, Wrap-up. CSS Transitions, Adding a Transition, Transitions in Detail, The Longhand Properties, Longhand Properties vs. Shorthand Properties, Working with Multiple Transitions. HTML5 – SVG: Viewing SVG Files, Embedding SVG in HTML5, HTML5 – SVG Circle, HTML5 – SVG Rectangle, HTML5 – SVG Line, HTML5 – SVG Ellipse, HTML5 – SVG Polygon, HTML5 – SVG Polyline, HTML5 – SVG Gradients, HTML5 – SVG Star.	14

3	HTML5 – CANVAS: The Rendering Context, Browser Support, HTML5 Canvas Examples, Canvas - Drawing Rectangles, Canvas - Drawing Paths, Canvas - Drawing Lines, Canvas - Drawing Bezier Curves, Canvas - Drawing Quadratic Curves, Canvas - Using Images, Canvas - Create Gradients, HTML5 - Styles and Colors, Canvas - Text and Fonts, Canvas - Pattern and Shadow, Canvas - Save and Restore States, Canvas - Translation, Canvas - Rotation, Canvas - Scaling, Canvas - Transforms, HTML5	14
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List of Lab programs

Part-A

1. Write an HTML program to create and display navigations menus using list tags and anchor tag.
2. Write an HTML program to display Multi-media data (text, images, audios, videos, gifs, etc) on a webpage.
3. Write an HTML program to create student Registrations form on submitting the form checkwhether fields are empty or not using JavaScript. If any fields are empty display an error message
4. Write an HTML program to create bio-data (CV or Resume) and to change the following CSS properties
 - Font
 - Text
 - Background
5. Write an HTML program to create div and apply the following CSS properties on created div
 - Margin
 - Padding
 - Border
 - Box shadow
6. Write an HTML program to create a box and using CSS transform and transition properties move the box to the center of the web page on loading web-page
7. Write an HTML program to create a circle and create an animation of bouncing of the circle for 10 sec
8. Write an HTML program to create page loading animations

Part-B

1. Write an HTML program to draw line, polyline and rectangle and fill rectangle with red color using svg tag.
2. Write an HTML program to draw star and multiple circle and with different color using svg tag
Write an HTML program to create logo with linear gradient properties using svg tag.
3. Write an HTML program to draw Square and Rectangle using canvas tag and JavaScript
4. Write an HTML program to draw bezier curve using canvas tag and JavaScript
5. Write an HTML Program to import an external image into a canvas and then to draw on that image
6. Write an HTML program to draw a rectangle box using canvas and to change background color to red, scale of the rectangle to 2 on move-over (hover)properties.
7. Write an html program to draw a circle using canvas and to apply the rotations animations onloading the page

References:

2. The Complete Reference HTML and CSS, 5th Edition, Thomas A Powell, 2017
3. Animation in HTML, CSS, and JavaScript, Kirupa Chinnathambi, Createspace Independent Pub, 2013.

Web Links:

1. <https://www.w3.org/Style/CSS/current-work#CSS3>
2. <http://bedford-computing.co.uk/learning/cascading-style-sheets-css/>

Course Articulation Matrix-225434

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	3	1	2	1	1	1	2	2	1	2
C02	2	2	1	1	3	-	1	1	2	1	2	2
C03	2	2	2	2	2	2	1	1	2	-	2	2
W.A	2.33	2	2	1.33	2.33	1.5	1	1	2	1.5	1.6	2

Course Code: 225435	Course Title: Operating System Concepts
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Theory
Total Contact Hours: 42 Theory	Formative Assessment Marks: 40 Theory
Exam Duration: 2 ½ Hours	Semester End Exam Marks: 60 (Theory)

Course Outcomes (COs):

CO1: Acquiring knowledge on basics of operating system their types and functioning. Optimize system performance using CPU scheduling and process management concepts.

CO2: Apply the concept of deadlock and storage management technologies.

CO3: Analyze and design the solution for the problems based on virtual memory.

Unit	Description	Hours
1	<p>Introduction to Operating System: Definition, History and Examples of Operating System; Computer System organization; Types of Operating Systems; Functions of Operating System; Systems Calls; Operating System Structure.</p> <p>Process Management: Process Concept- Process Definition, Process State, Process Control Block, Threads; Process scheduling- Multiprogramming, Scheduling Queues, CPU Scheduling, Context Switch; Operations on Processes- Creation and Termination of Processes; Inter process communication (IPC)- Definition and Need for Inter process Communication; IPC Implementation Methods- Shared Memory and Message Passing;</p> <p>CPU Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling; Multiprocessor Scheduling; Real-Time CPU Scheduling.</p>	14

2	<p>Multithreaded Programming: Introduction to Threads; Types of Threads; Multithreading- Definition, Advantages; Multithreading Models; Thread Libraries; Threading Issues.</p> <p>Process Synchronization: Introduction; Race Condition; Critical Section Problem and Peterson's Solution; Synchronization Hardware, Semaphores; Classic Problems of Synchronization- Readers and Writers Problem, Dining Philosophers Problem; Monitors.</p> <p>Deadlocks: System Model; Deadlocks Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection; and Recovery from Deadlock.</p>	14
3	<p>Memory Management: Logical and Physical Address Space; Swapping; Contiguous Allocation; Paging; Segmentation; Segmentation with Paging. Virtual Memory: Introduction to Virtual Memory; Demand Paging; Page Replacement; Page Replacement Algorithms; Allocation of frames, Thrashing.</p> <p>File System: File Concepts- Attributes, Operations and Types of Files; File System; File Access methods; Directory Structure; Protection; File System Implementation- File System Structure, Allocation Methods, Free Space Management, Mobile Operating Systems.</p>	14

References:

1. Operating System Concepts, Silberschatz et al., 10th Edition, Wiley, 2018.
2. Operating System Concepts - Engineering Handbook, Ghosh PK, 2019.
3. Understanding Operating Systems, McHoes A et al., 7th Edition, Cengage Learning, 2014.
4. Operating Systems - Internals and Design Principles, William Stallings, 9th Edition, Pearson.
5. Operating Systems – A Concept Based Approach, Dhamdhere, 3rd Edition, McGrawHill Education India.
6. Modern Operating Systems, Andrew S Tanenbaum, 4th Edition, Pearson.

Web Links:

1. <https://www.operating-system.org/betriebssystem/english/os-links.htm>
2. <https://nptel.ac.in/courses/106106144>

COURSE ARTICULATION MATRIX-225435

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	2	1	1	1	1	1	1	2
CO2	2	2	2	2	1	1	1	1	1	2	2	2
CO3	2	2	2	1	2	1	1	1	2	1	2	2
W. A	2	1.66	2	1.66	1.66	1	1	1	1.33	1.33	1.66	2

Evaluation Pattern

Theory Evaluation Scheme for C1, C2 and C3

	Assessment Criteria	Marks	Total
Continuous assessment-1(c1)	Session test	20	40
Continuous assessment-2(c2)	Seminar/Presentation/Assignment/Activity/Case Study/Field Work/Project Work/Quiz etc.	20	
Continuous assessment-3(c3)	Semester End Exam (SEE)	60	60
Total			100

Evaluation Scheme for Lab Examination

	Assessment Criteria	Marks	Total
Continuous assessment-1(c1)	Test	10	25
Continuous assessment-2(c2)	Test and record assessment	15 (10 + 05 marks for record)	
Continuous assessment-3(c3)	Semester End Exam (SEE)	25	25
Total			50

Assessment Criteria-c3		Marks
Program - 1 from Part A	Writing the Program and Execution.	10
Program -2 from Part B	Writing the Program and Execution.	
Viva Voce based		05
Total		25

Question Paper Pattern for DSC

Instructions: Answer both part-A and part-B
Marks)

(Max: 60

Part-A

Answer any ten Questions:

(10 X 2=20)

2

3

.

.

.

1

2

(4 questions to be given from each unit)

Part-B

(Four questions to be given from each unit with internal split if required)

Answer all the Questions:
marks

Max: 40

13. a)

(2*8=16)

b)

OR

c)

d)

14. a)

(2*6=12)

b)

OR

c)

d)

15. a)

(2*6=12)

b)

OR

c)

d)

OE(4) Computer Science Syllabus for All Programs(Except Science)

Semester IV

Course Code:22OECMS401

Course Title:OE(4)- Fundamentals of Multimedia

Course Credits (L:T:P): 03 (3:0:0)

Hours of Teaching/Week: 03 Hours (Theory)

Total Contact Hours: 42 Hours (Theory)

Formative Assessment Marks:40

Exam Duration: 2 $\frac{1}{2}$ Hours

Semester End Examination Marks:60

Course Outcomes (COs):

CO 1: Acquire knowledge on multimedia and related terminologies.

CO 2: Acquaint with various input output technologies used and technological issues faced in multimedia.

CO 3: Interpret and apply the concept of security systems in multimedia.

Course Content

UNIT - 1 HOURS	INTRODUCTION TOMULTIMEDIA	14
Concepts of Multimedia, Multimedia applications, Advantage of Digital Multimedia, MultimediasystemArchitecture, ObjectsofMultimedia.IntroductiontoCompressionandDecompressionT echniquesanditstypes.Fileformatstandards-RTF,TIFF,RIFF,MIDI,JPEG,AVI,TWAINArchitecture.		
UNIT - 2 HOURS	MULTIMEDIA I/O TECHNOLOGIES	14
Key Technology Issues, Pen Input, Video and Image Display Systems, Print Output Technologies,ImageScanners,DigitalVoiceandAudio,VideoImagesandAnimation,FullMotionVideo.		
UNIT - 3 HOURS	SECURED MULTIMEDIA AND AUTHENTICATION	14
SecuredMultimedia,DigitalRightsManagementSystems,andTechnicalTrends-Multimediaencryption - Digital Watermarking – Security Attacks. Multimedia Authentication - Pattern, SpeakerandBehavior Recognition– SpeakerRecognition -FaceRecognition.		

Text Books:

A Textbook of Multimedia: Vishnu Priya Singh, 2nd Revised Edition, Asian Computech Book.

1. Introduction to Multimedia: Prof. Satish Jain, Shashi Singh and M Geetha, BPB Publications.

References:

1. MultimediaSecurity-SteganographyandDigitalWatermarkingtechniquesforProtectionof IntellectualProperty: Chun-ShienLu, Springer Inc, 2007.
2. MultimediaSystems: AndleighP K andThakrarK,AddisonWesleyLongman,1999.
3. MultimediaCommunications: FredHalsall,AddisonWesley,2000.
4. <https://www.tutorialspoint.com/multimedia/index.htm>
5. https://www.youtube.com/watch?v=Syeu_13sAJE
6. <https://www.techtarget.com/searchsecurity/definition/authentication>

Course Articulation Matrix –22OECMS401

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	1	-	1	1	1	1	1	1	-	2
CO 2	1	1	1	-	1	-	-	-	1	1	-	2
CO 3	1	2	1	-	1	1	1	3	1	1	1	2
Weighted Average	1.33	1.33	1	-	1	1	1	2	1	1	1	2

DSC (3) Syllabus for B.A Criminology and Forensic Science (Basic and Honors)

Course Code : 221372	Course Title : DSC (3) Police Science and Criminal Investigation (Theory) DSC (3) Lab -Police Science and Criminal Investigation
Course Credits : 06 (4:0:2)	Hours of Teaching/ Week : 04 (Theory) 04 (Practical)
Total Contact Hours : 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Mark : 40 (Theory) 25(Practical)
Exam Duration : 2 ½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks : 60 (Theory) 25 (Practical)

Course Outcomes (COs):

- CO1:** Recognize the idea behind police science, its role in preventing crime, conducting investigations, and preserving a stable social order.
- CO2:** Gain expertise of maintaining law and order, enforcing national laws, and managing the police administration.
- CO3:** Being aware of the many difficulties that police officers encounter on a daily basis.
- CO4:** Learn about the many sorts of crime scenes, investigations, and the legal processes that surround them.

Content of Theory course	Hours
Unit – 1 Introduction to Police Science	14
Chapter-1 Police administration in India <ul style="list-style-type: none"> • Role of Police in Independent India, Constitutional provisions regarding policing in India • Police Organization of state Chapter-2 Policing in present scenario. <ul style="list-style-type: none"> • Introduction to various styles of Policing • Ethics in Policing • Technology and policing • Short comings of policing • Police recruitment, training and Police Reforms • Policing in present scenario 	
Unit – 2 Powers, Duties and challenges of Police	14

<p>Chapter-3 Powers and duties</p> <ul style="list-style-type: none"> • Executive powers and duties of police officers in the investigation • Police accountability in India: Courts, Executive Magistrates ,State Government, Citizens/ Community, Programmes for redressing Public grievances, Police Complaints Authorities <p>Chapter-4 Challenges in policing</p> <ul style="list-style-type: none"> • Internal and external challenges in policing • Police Image, Police Corruption, Police and Human Rights • Technological short comings and policing 	
Unit – 3 Criminal Investigation	14
<p>Chapter-5 Basics of Investigation</p> <ul style="list-style-type: none"> • Objectives of Criminal Investigation • Characteristics and role of Investigating officer <p>Chapter-6 Legal procedures in Investigation</p> <ul style="list-style-type: none"> • Investigation procedures in traditional, contemporary and special crimes • Registration of FIR, charge sheet, recording of statements, arrest, confession, summons and warrants Execution. 	
Unit -4 Crime scene Investigation	14
<p>Chapter -7 Crime scene Management</p> <ul style="list-style-type: none"> • Responsibilities of First responding officer. • Crime scene – Types, search methods, and Documentation. <p>Chapter-8 Physical Clues</p> <ul style="list-style-type: none"> • Types of physical clues and various crime scenes • Procedures in locating, handling, collecting, packing and forwarding of physical clues; Chain of Custody 	

Text Books:

1. Encyclopedia of Police in India. Gosh & Rustumji
2. Police & Political Order in India, P.D.Sharma
3. Indian Police Today, Shankar Sen
4. Inside India Police, Joginder Singh
5. Sharma B.R, 2007, Forensic Science in Criminal Investigation and Trials Universal Law Pub. Co. Pvt. Ltd.
6. Douglas Cruise (2002) The Business of Private Investigations, Texas: Thomas Investigative Publications.
7. Ramanujam T, 1992, Prevention and Detection of Crime, Madras Book Agency
8. Nehad Ashraf, (1992), Police and Policing in India, Common Wealth Publishers, New Delhi

JOURNAL REFERENCES:

1. International journal of police science and management, SAGE
2. The Indian Police Journal
3. The Journal criminal Law, Criminology and Police Science, JSTOR ISSN-15476154

DIGITAL REFERENCES:

1. <https://www.ojp.gov/pdffiles1/nij/228922.pdf>
https://www.researchgate.net/publication/340874515_Police_science_as_an_emerging_scientific_discipline.

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Content of Lab Practical Course DSC-3:

Credits: 02 Marks: 25+25=50

List of Experiments to be conducted

1. Procedure and process of filing complaint to the Police Station
2. Scene of Crime Documentation: rough sketch, final sketch, photography and videography
3. Crime Scene Investigation Methods (Murder, Burglary, Traffic Accident etc)
4. Methods of Searching the Scene of Crime.
5. Reconstruction of Scene of Crime and report writing
6. Handling, packing and forwarding of physical clues to experts (Fingerprints on articles, Blood stains on articles, hair and fibre samples, Bullets & Cartridge Cases)

Course Articulation Matrix - 221472

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	3	3	2	1	3	3	2	3	3
CO2	2	2	3	3	3	2	1	3	3	2	3	3
CO3	3	3	3	3	3	3	1	3	3	3	3	3
CO4	3	3	3	3	3	3	1	3	3	3	3	3
Weighted Average	2.5	2.5	2.75	3	3	2.5	1	3	3	2.5	3	3

DSC (3) Syllabus for B.A Criminology and Forensic Science (Basic and Honors)

Course Code : 221373	Course Title : DSC (3) Law of Prints and Impression (Theory) DSC (3) Lab-Law of Prints and Impression
Course Credits : 06 (4:0:2)	Hours of Teaching/ Week : 04 (Theory) 04 (Practical)
Total Contact Hours : 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Mark : 40 (Theory) 25 (Practical)
Exam Duration : 2 ½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks : 60 (Theory) 25 (Practical)

Course Outcomes (CO's):

- CO1:** Recognize the numerous print and impression kinds, which are crucial for inspection, suspect identification, and their forensic significance in court.
- CO2:** Specify the fingerprint type, identification, pattern categorization, and ridge features.
- CO3:** Using physical and chemical techniques to comprehend the various sorts of chance prints and how they arise.
- CO4:** Learn about additional impressions and prints, such as footprints, tyre marks, and lip prints, and their significance.

Content of Theory course	Hours
Unit – 1 Introduction to Fingerprints	14
Chapter-1 Fingerprints: Meaning and importance <ul style="list-style-type: none"> • Historical development. • Principles of Dactyloscopy. • Organization of State and Central Fingerprint Bureaus. Chapter-2 Identification and Classification of Patterns <ul style="list-style-type: none"> • Recording of fingerprints. • Identification of patterns and ridge characteristics. • Henry's Primary and Secondary Classification. 	
Unit – 2 Introduction to Chance prints	14

<p>Chapter-3 Chance prints: Meaning & Types.</p> <ul style="list-style-type: none"> • Visible prints • Plastic Prints • Latent Prints <p>Chapter-4 Development of Chance Prints</p> <ul style="list-style-type: none"> • Powder, Liquid & Gaseous Method • Recent Developments – Lifting & Preservation. 	
Unit – 3 Introduction to Footprints	14
<p>Chapter-5 Footprints: Meaning and importance.</p> <ul style="list-style-type: none"> • Types of footprints. • Methods of recording and lifting. • Gait pattern. <p>Chapter-6 Collection of Footprints</p> <ul style="list-style-type: none"> • Photography • Tracing • Lifting • Casting 	

Unit -4 Other Impressions	14
<p>Chapter -7 Tyre Impressions: Meaning and importance in crime investigation.</p> <ul style="list-style-type: none"> • Methods of recording and lifting. • Skid marks and its importance • Length of the skid marks and measurement of vehicle speed <p>Chapter-8 Lip prints</p> <ul style="list-style-type: none"> • Nature, • location, • collection and examination of lip prints. 	

Text Books:

1. J.E. Cowger, Friction Ridge Skin, CRC Press, Boca Raton (1983).
2. D.A. Ashbaugh, Quantitative-Qualitative Friction Ridge Analysis, CRC Press, Boca Raton (2000).
3. C. Champod, C. Lennard, P. Margot an M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton (2004).
4. Lee and Gaensleen's, Advances in Fingerprint Technology, 3rd Edition, R.S.Ramotowski (Ed.), CRC Press, Boca Raton (2013).
5. Nabar, B.S. 2007, Forensic Science in Crime Investigation, 3rd Edition, Asia Law House, Hyderabad.
6. Sharma B.R, 2007, Forensic Science in Criminal Investigation and Trials Universal Law Pub. Co. Pvt. Ltd.
7. Ramanujam T, 1992, Prevention and Detection of Crime, Madras Book Agency

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Content of Lab Practical Course DSC-3:

Credits: 02 Marks: 25+25=50

List of Experiments to be conducted

1. To record plain and rolled fingerprints.
2. To identify different fingerprint patterns and identify core and delta.
3. To carry out ridge tracing and ridge counting.
4. To investigate physical and chemical methods of fingerprint detection.
5. To use different light sources for enhancing developed fingerprints.
6. To prepare cast and lifting of foot prints.
7. To tracing of surface footprints.

Course Articulation Matrix: 221373

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	1	3	3	1	1	2	3	1	1	2
CO2	3	3	3	3	3	2	1	2	3	2	2	2
CO3	3	3	3	3	3	2	2	2	3	2	2	2
CO4	3	3	3	3	3	2	2	2	3	2	2	3
Weighted Average	3	2.5	2.5	3	3	1.75	1.5	2	3	1.75	1.75	2.25

OE (3) Syllabus for All Programs (Except B A)

Course Code: 22OECRI301	Course Title : OE 3:Gender and Crime (Theory)
Course Credits : 03 (3:0:0)	Hours of Teaching/ Week : 03 (Theory)
Total Contact Hours : 42 Hours (Theory)	Formative Assessment Mark : 40 (Theory)
Exam Duration : 2 ½ Hours (Theory)	Semester End Examination Marks : 60 (Theory)

Course Outcomes (CO's):

- CO1:** Recognize the significance, character, and extent of crime and gender equality.
- CO2:** Elucidate the difficulties in explaining how gender affects crime from a criminological Perspective
- CO3:** Being aware of the numerous trends in gender-related crime and how to prevent it & outline the different gender-related crimes committed against minors.

Content of Theory course	Hours
Unit – 1 Gender Equality	14
Chapter-1 Gender awareness in Criminology <ul style="list-style-type: none"> • Gender and crime: Meaning, nature and scope • Gender awareness in Criminology Chapter-2 Gender gap in crime <ul style="list-style-type: none"> • Gender equality: Meaning, definition • Gender equality and Crime • Cognitive capacities and crime • Situational pressures and gender 	
Unit – 2 Gender specific crimes and Criminological studies	14

<p>Chapter-3 Criminological theories of gender and crime</p> <p>Chapter-4 Gender in Criminal Justice System</p> <ul style="list-style-type: none"> • Crimes and Cultural Views • Legal system • Police practice • Court trials <p>Chapter-5 Patterns of Crime</p> <ul style="list-style-type: none"> • Meaning, definition and nature • Gendered pathways to offending <p>Chapter-6 Women and Crime, Men and Crimes</p> <ul style="list-style-type: none"> • Female patterns of offending • Rising female criminality • Male patterns of offending <p>Reasons for male criminality</p>	
Unit -3 Crimes against gender specific children	14
<p>Chapter-7 Crimes against children</p> <ul style="list-style-type: none"> • Meaning, Definition, Nature and Scope • Harmful cycle of gender-based violence on children • Causes and impacts of gender-based violence against children <p>Chapter-8 Types of Crimes against Children</p> <ul style="list-style-type: none"> • Infanticides and feticides • Child trafficking • Child pornography • Labour and street offences, etc • Various procedural rules for protection of children 	

Text Books:

1. Fitz-Gibbon, K. & Walklate, S. (2018). Gender, Crime and Criminal Justice, Routledge, ISBN: 9781138656376
2. Mukharjee, S. K. & Scutt, J. A. (1981). Women and Crime, Routledge, ISBN: 9781138186569
3. Silvestri, M. & Crowther-Dowey, C. (2008). Gender and Crime (A Key Approach to Criminology), SAGE Publications
4. Britton, D. M. (2011). The Gender of Crime, Rowman & Littlefield
5. Evans, K & Jamieson, J. (2008). Gender and Crime: A Reader, Open University Press

JOURNAL REFERENCES:

1. Child mal treatment-SAGE
2. International journal on child mal treatment-Springer
3. Women and Criminal Justice – Taylor and Francis
4. Feminist Criminology-SAGE
5. Violence and Gender

DIGITAL REFERENCES:

1. [Gender-Based Violence: A Global Threat | Save the Children](#)
2. <https://www.open.edu/openlearncreate/mod/oucontent/view.php?id=53771&printable=1>
3. [\(PDF\) Gender and Crime: Toward a Gendered Theory of Female Offending \(researchgate.net\)](#)
4. <https://ijcst.journals.yorku.ca/index.php/ijcst/article/download/39737/35977>
5. [Gender and Theories of Delinquency - Oxford Handbooks](#)

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Course Articulation Matrix-22OECRI301

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	-	-	2	1	1	1	1	2	2
CO2	2	2	3	2	2	3	1	2	2	2	2	2
CO3	3	3	3	2	3	3	2	2	2	2	3	2
Weighted Average	2.3	2.3	2.6	2	2.5	2.6	1.3	1.6	1.6	1.6	2.3	2

OE (3) Syllabus for All Programs (Except B A)

Course Code: 22OECRI302	Course Title : OE 3 :Crime Scene Investigation (Theory)
Course Credits : 03 (3:0:0)	Hours of Teaching/ Week : 03 (Theory)
Total Contact Hours : 42 Hours (Theory)	Formative Assessment Mark : 40 (Theory)
Exam Duration : 2 ½ Hours (Theory)	Semester End Examination Marks : 60 (Theory)

Course Outcome (CO's):

CO1: Be familiar with the techniques for securing, searching, and recording crime scenes.

CO2: Able to perform the skill of gathering, protecting, and packing various kinds of physical and trace evidence at crime scenes.

CO3: Explain the significance of chain of custody in legal terms , recognize the methods and equipment used in the analysis of various types of evidence found at crime scenes.

Content of Theory course	Hours
Unit – 1 Crime Scene Preliminaries	14
Chapter-1 Crime Scene and its importance. <ul style="list-style-type: none"> • Meaning and Types of crime scenes • indoor and outdoor Mobile • primary secondary and tertiary. Chapter-2 Securing and isolating the crime scene. <ul style="list-style-type: none"> • Crime scene search methods. • Safety measures at crime scenes. • Legal considerations at crime scenes. 	
Unit – 2 Crime Scene Documentation	14
Chapter-3 Crime Scene Documentation and its importance <ul style="list-style-type: none"> • Types of documentation of crime scenes • Photography. • Videography, • Sketching and • Recording notes. Chapter-4 Duties of first responders at crime scenes. <ul style="list-style-type: none"> • Coordination between police personnel and forensic scientists at crime scenes. • The evaluation of 5Ws (who?, what?, when?, where?, why?) and 1H (how?). 	
Unit -3 Crime Scene Evidence Management.	14

Chapter-5 Classification of crime scene evidence <ul style="list-style-type: none"> • Locard principle and Importance. • Physical evidence and • Trace evidence. Chapter- 6 Collection, labelling, sealing of evidence. <ul style="list-style-type: none"> • Hazardous evidence. • Preservation of evidence. 	
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Text Books:

- 1.M. Byrd, Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence, CRC Press, Boca Raton (2001).
- 2.T.J. Gardener and T.M. Anderson, Criminal Evidence, 4th Ed., Wadsworth, Belmont (2001).
- 3.S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
- 4.W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher’s, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Course Articulation Matrix-22OECRI302

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	2	3	3	2	1	2	3	1	3	2
CO2	3	3	3	3	3	2	2	2	3	2	3	3
CO3	3	3	3	3	3	2	2	2	3	2	3	3
Weighted Average	2.6	3	2.6	3	3	2	1.6	2	3	1.6	3	2.6

DSC (4) Syllabus for B.A Criminology and Forensic Science (Basic and Honors)

Course Code : 221472	Course Title : DSC(4):Correctional Administration (Theory) DSC (4): Lab -Correctional Administration
Course Credits : 06 (4:0:2)	Hours of Teaching/ Week : 04 (Theory) 04 (Practical)
Total Contact Hours : 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Mark : 40 (Theory) 25(Practical)
Exam Duration : 2 ½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks : 60 (Theory) 25 (Practical)

Outcomes (CO's):

CO1: The importance, nature, and application of criminology and the criminal justice system.

CO2: Outline the ideas and different forms of punishments used in India and other countries in the past and now.

CO3: Explaining the jail as a correctional facility, its varieties the laws that govern it.

CO4: Being aware of the principles underlying alternatives to institutional care for prisoners.

Content of Theory course	Hours
Unit – 1 Introduction to Correctional Administration	14
Chapter-1 Penology and correctional administration <ul style="list-style-type: none"> • Penology – Definition, nature and scope • Correction – Definition, nature and scope • Types of punishment. • Similarities and Differences between punishment and correction Chapter-2 Theories of Punishment <ul style="list-style-type: none"> • Deterrence theory • Retributive theory • Preventive theory • Reformation theory 	
Unit – 2 Prison system	14
Chapter-3 Prison and prison organization <ul style="list-style-type: none"> • Historical development of prison system. • Objectives of Imprisonment • Types of prisons and correctional institutions in India. • Modernization of Prisons in India; Reformation & Rehabilitation approach in Prisons. Chapter-4 Prison reforms in India <ul style="list-style-type: none"> • History and evolution of prison legislations in India. • Recommendation of different committees on reformation system. • Prison act and prison manual 	

Unit – 3 Institutionalized treatment	14
Chapter-5 Corrections through Institutionalized treatment <ul style="list-style-type: none"> • Meaning and purpose • Types of institutions: Adult, women and children • Facilities provided in institutions. • Remission, temporary release and premature release Chapter-6 Legal provisions of prisoners <ul style="list-style-type: none"> • Legal Rights of prisoners • Constitutional provisions of prisoners • Nelson Mandela rules for the treatment of prisoners 	
Unit -4 Non Institutionalized treatment for prisoners	14
Chapter -7 Community based corrections <ul style="list-style-type: none"> • Probation: Concept, history and scope • Parole: Concept, history and scope • After care services • Restitution and fine Chapter-8 Miscellaneous <ul style="list-style-type: none"> • Standard minimum rules for non custodial measures(Tokyo rules) • Role of NGOs in reformation and rehabilitation 	

Text Books:

1. Edelston, C.D. & Wicks, R.I. (1977), An Introduction to Criminal Justice, McGraw Hill.
2. Krishna Mohan Mathur, (1994), Indian Police, Role and Challenges, Gyan Publishing House, New Delhi.
3. Bhattacharya S.K., (1986). Probation system in India, Manas Publications, New Delhi.
4. Brodie, S.R., (1976). Effectiveness of sentencing, Home office, London.
5. Paranjpe, N.V., (2002). Criminology and Penology, Central Law Publications, Allahabad.

JOURNAL REFERENCES

1. The Prison Journal-SAGE
2. International Journal of Prisoner Health
3. Journal Of Correctional Health Care

DIGITAL REFERENCES

1. <http://kamarajcollege.ac.in/Department/Criminology/II%20Year/003%20Core%205%20-%20Penology%20&%20Correctional%20Administration%20-%20III%20Sem.pdf>.
2. <https://www.scribd.com/document/408782187/Notes-on-Correctional-Administration-2017>.
3. https://www.academia.edu/34249101/Notes_on_Correctional_Administration.
4. <https://bprd.nic.in/WriteReadData/userfiles/file/5261991522-Part%20I.pdf>.

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Content of Lab Practical Course DSC-4:

Credits: 02 Marks: 25+25=50

List of Field Based Practical's to be conducted

1. To visit and study the overview of Prison as a correctional institution
2. To visit and study the reformatory measures, training and rehabilitation process.
3. To visit and study various facilities provided in Prison
4. To visit and study the non-institutional treatment programmes
5. To visit and study the functions and powers of JJB and CWC
6. To visit and study the functions and powers of Probation
7. To visit and study the aftercare services and other NGOs working toward reformation, rehabilitation and resocialization of inmates.

Course Articulation Matrix - 221472

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	2	2	3	1	2	2	1	1	2
CO2	3	2	3	3	3	3	2	2	3	2	2	2
CO3	3	3	3	3	3	3	2	2	3	3	2	3
CO4	3	3	3	3	3	3	2	3	3	3	2	3
Weighted Average	3	2.5	2.75	2.75	2.75	3	1.75	2.25	2.75	2.25	1.75	2.5

DSC (4) Syllabus for B.A Criminology and Forensic Science (Basic and Honors)

Course Code : 221473	Course Title : DSC (4) Forensic Psychology and Criminal Profiling (Theory) DSC (4) Lab -Forensic Psychology and Criminal Profiling
Course Credits : 06 (4:0:2)	Hours of Teaching/ Week : 04 (Theory) 04 (Practical)
Total Contact Hours : 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Mark : 40 (Theory) 25(Practical)
Exam Duration : 2 ½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks : 60 (Theory) 25 (Practical)

Course Outcomes (CO's):

- CO1:** Have a basic understanding of forensic psychology, including its applications and legal ramifications.
- CO2:** Exemplify the role of psychological testing and criminal profiling in predicting criminal behaviour.
- CO3:** Providing an explanation of the methods and tools needed to spot falsehood.
- CO4:** Comprehending the evaluation of complex forensic methods including Polygraphy, narco-analysis, and brain electrical oscillation patterns.

Content of Theory course	Hours
Unit – 1 Introduction to Forensic Psychology	14
Chapter-1 Definition and fundamental concepts of forensic psychology and forensic psychiatry. <ul style="list-style-type: none"> • Psychology and law. • Ethical issues in forensic psychology • Assessment of mental competency. • Mental disorders and forensic psychology. Chapter-2 Psychology of evidence <ul style="list-style-type: none"> • Eyewitness testimony, • Confession evidence. • Criminal profiling. • Psychology in the courtroom, with special reference to Section 84 IPC. 	
Unit – 2 Psychology and Criminal Behavior	14
Chapter-3 Psychopathology and personality disorder. <ul style="list-style-type: none"> • Psychological assessment and its importance. • Serial murderers. • Psychology of terrorism. Chapter-4 Biological factors and crime <ul style="list-style-type: none"> • Social learning theories, • Psycho-social factors, • Abuse. Chapter-5 Juvenile delinquency and Child Abuse <ul style="list-style-type: none"> • Theories of offending (social cognition, moral reasoning) • Child abuse (physical, sexual, emotional), • Juvenile sex offenders, • Legal controversies. 	
Unit – 3 Introduction to Personality Disorder	14
Chapter-6 Personality: Meaning and its importance in life. <ul style="list-style-type: none"> • Personality Development • Personality disorders 	
<ul style="list-style-type: none"> • Types and its impact on life. Chapter-7 Therapy interfering behaviors <ul style="list-style-type: none"> • Various types of therapies to correct the behaviour • Cognitive Behaviour Therapy (CBT) to Family-focused therapy 	
Unit -4 Detection of Deception	14

Chapter -8 Tools for detection of deception –

- Interviews,
- Non-verbal detection,
- Statement analysis,
- Voice stress analyzer,
- Hypnosis.

Chapter-9 Polygraphy Test

- Operational and question formulation techniques, ethical and legal aspects, the guilty knowledge test.
- Narco analysis and brain electrical oscillation signatures – principle and theory, ethical and legal issues.
- Role of psychologist in metal related cases and legal framework.

Text Books:

- 1.A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, The Foundation Press, Inc., New York (1995).
- 2.R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
- 3.J.C. DeLadurantey and D.R. Sullivan, *Criminal Investigation Standards*, Harper & Row, New York (1980).
- 4.J. Niehaus, *Investigative Forensic Hypnosis*, CRC Press, Boca Raton (1999).
- 5.E. Elaad in *Encyclopedia of Forensic Science*, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
- 6.David V. Canter *Forensic Psychology For Dummies* (2012)
- 7.Ilaria Cabula, Frank Paul E *Criminology and Criminal Profiling for beginners: (crime scene forensics, serial killers and sects): 1 (Criminology, Criminal Profiling, Serial Killers)* (2020)

DIGITAL REFERENCES:

<https://www.infobooks.org/free-pdf-books/psychology/criminal-psychology/>

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Semester-IV
Content of Lab Practical Course DSC-4:

Credits: 02 Marks: 25+25=50

List of Experiments to be conducted

1. To cite a crime case where legal procedures pertaining to psychic behavior had to be invoked.
2. To prepare a report on relationship between mental disorders and forensic psychology.
3. To review a crime case involving serial murders.
4. Comment on the psychological traits of the accused.
5. To cite a criminal case in which narco-analysis was used as a means to detect deception.
6. To cite a criminal case in which polygraph test was used as a means to detect deception.
7. To cite a crime case involving a juvenile and argue for and against lowering the age for categorizing an individual as juvenile.

Course Articulation Matrix - 221473

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	3	2	2	2	1	1	1	1	2
CO2	2	3	3	3	2	2	2	1	2	1	2	2
CO3	3	3	3	3	2	2	2	2	2	2	2	3
CO4	3	3	3	3	3	3	2	2	2	2	2	3
Weighted Average	2.5	2.75	2.75	3	2.25	2.25	2	1.5	1.75	1.5	1.75	2.5

OE (4) Syllabus for All Programs (Except B A)

Course Code: 22OECRI401	Course Title : OE(4):Child Protection Laws (Theory)
Course Credits : 03 (3:0:0)	Hours of Teaching/ Week : 03 (Theory)
Total Contact Hours : 42 Hours (Theory)	Formative Assessment Mark : 40 (Theory)
Exam Duration : 2 ½ Hours (Theory)	Semester End Examination Marks : 60 (Theory)

Course Outcomes (CO's):

- CO1:** Acknowledging the legal and constitutional concept of a kid, as well as the issues and difficulties related to their developmental stage.
- CO2:** Explicate the importance of child protection and the role that various social institutions play in it.
- CO3:** Being aware of the authority and duties of the Child Welfare Committees and Juvenile Justice Board, which are listed under the former .
- CO4:** Define the rules and regulations that apply to crimes against children.

Content of Theory course	Hours
Unit – 1 Introduction to Child, their Protection and Laws	14
Chapter-1 Child: Meaning and Definition <ul style="list-style-type: none"> • Legal and constitutional definitions of child • Developmental stages of childhood • Theories in child development Chapter-2 Factors determining Well Being and Development Of Children <ul style="list-style-type: none"> • Adult-child relationships • Protection, care and support • Factors affecting development and well-being of children Chapter-3 Child Protection <ul style="list-style-type: none"> • Meaning, definition, nature and scope • Role of family, school, society, NGOS and government in child protection. Chapter-4 Legislations, Policies and Programmes <ul style="list-style-type: none"> • Constitutional provisions for children • UNCRC, other relevant conventions and • National policies in child protection 	
Unit – 2 Juvenile Justice System	14
Chapter-5 Juvenile Justice act <ul style="list-style-type: none"> • Salient features of JJ act • Procedures while dealing with children in conflict with law • Procedures while dealing with children in need care and protection Chapter-6 Commissions for Protection Of Child Rights Act 2005 <ul style="list-style-type: none"> • Role, functions and powers of national commission and state commissions in protection of child rights • Salient features of integrated child protection scheme 	
Unit -3 Crimes against children	14
Chapter -7 Crimes against children <ul style="list-style-type: none"> • Crimes against children in family, schools and public places • Child labour ad street offences • Child trafficking, prostitution and pornography etc Chapter-8 Special Laws for Crimes Against Children <ul style="list-style-type: none"> • Prohibition of child marriage act • Protection of children from sexual offences • Child labour (prohibition and prevention) act • United Nations Standard Minimum Rules for Juvenile Justice (Beijing rules) • UN Riyadh Guidelines etc. 	

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Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Course Articulation Matrix - 22OECRI401

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	1	2	1	1	2	2	1	1	2
CO2	3	2	2	2	2	2	1	2	2	2	1	2
CO3	3	3	3	2	3	2	1	2	2	2	1	3
Weighted Average	2.6	2.3	2.3	1.6	2.3	1.6	1	2	2	1.6	1	2.3

OE (4) Syllabus for All Programs (Except B A)

Course Code: 22OECRI402	Course Title : OE(4) :Cybercrimes and Cyber law (Theory)
Course Credits : 03 (3:0:0)	Hours of Teaching/ Week : 04 (Theory)
Total Contact Hours : 42 Hours (Theory)	Formative Assessment Mark : 40 (Theory)
Exam Duration : 2 ½ Hours (Theory)	Semester End Examination Marks : 60 (Theory)

Course Outcomes (CO's):

- CO1:** Have a basic understanding of what computers, networking, and operating systems mean and how they work.
- CO2:** Identify the many types of cybercrimes and the role that cyber security plays in their detection.
- CO3:** Know how to detect and examine digital evidence using the many sorts of cyber forensic tools & describe the laws that govern cybercrimes and provide information on how to prevent and detect them.

Content of Theory course	Hours
Unit – 1 Introduction to Computer and networking	14
Chapter-1 Fundamentals of Computers and operating system <ul style="list-style-type: none"> • Computers & Networking – Basics of computers, its Definitions and classification • Operating systems- Operating system and Function, Batch, Interactive, Time-sharing and Real-Time systems, CPU Scheduling – Scheduling concept, algorithms and Performance criteria, memory management. File sharing, File System Implementation. Overview of Linux Operating System. Chapter-2 Basics of Networking <ul style="list-style-type: none"> • Network Components - Server, client, routers, Shared Printers and other peripherals, Network Interface Card. • Network Devices – hubs, Switches, routers, repeaters. OSI model and TCP/IP model. Basic HTTP, World Wide Web, Web Browsers, Web Servers, Domain Names, URL and DNS. • IP addressing – types and classes. Types of Networks – LAN, MAN and WAN. Working of Wi-Fi and Bluetooth. Overview of cloud computing. 	
Unit – 2 Cyber-crime, cyber security& Cyber Forensics	14

<p>Chapter-3 Cyber Crime</p> <ul style="list-style-type: none"> • Cyber crime- meaning, definition and its classification • Cybercrimes against Individuals – E-mail spoofing and online frauds, Phishing and its forms, Spamming, Cyber-defamation, Cyber stalking, Cyber Bullying and harassment, Computer Sabotage, Pornography, Password Sniffing. etc • Cyber Crimes against Women and Children. • Cybercrime against organization – Unauthorized access of computer, Password Sniffing, Denial-of-service (DOS) attack, Backdoors and Malwares and its types, E-mail Bombing, Salami Attack, Software Piracy, Industrial Espionage, Intruder attacks. 	
<p>Chapter-4 Cyber Security</p> <ul style="list-style-type: none"> • Risk evaluation – Identification of Threats, Vulnerabilities and Risk. • Risk Management, Risk Assessment and Analysis. • Information Classification, Policies, Standards, Procedure and Guidelines. • Security Frameworks, Layers of Security. • Authorization and Access Controls- Models, Methods and Types of Access Control. 	
<p>Chapter-5 Digital Forensics: Meaning, Importance and Tools</p> <ul style="list-style-type: none"> • Types of Computer Forensics Tools and its needs • Computer Forensics Software Tools. • UNIX/Linux Forensics Tools, Other GUI Forensics Tools, Computer Forensics Hardware Tools, Forensic Workstations 	
<p>Unit -3 IT Act and other Laws for Cyber-crime</p>	14
<p>Chapter-6 IT Act 2000</p> <ul style="list-style-type: none"> • Objectives, Applicability, Non-applicability, Definitions, Amendments and Limitations. • Various cyber-crimes under Sections 43 (a) to (j), 43A, 65, 66, 66A to 66F, 67, 67A, 67B, 70, 70A, 70B, 80 etc. along with respective penalties, punishment and fines, Penal Provisions. <p>Chapter-7 Indian Evidence Act</p> <ul style="list-style-type: none"> • Classification – civil, criminal cases. Essential elements of criminal law • Cross examination and re-examination of witnesses. □ Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141. Section 293 in the code of criminal procedure. Secondary Evidence Section 65-B. 	

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2. V. Rajaraman and Niharika Adabala; "Fundamentals of Computers", 6th Edition, PHI Learning Pvt. Ltd., 2015.
3. Anita Goel; "Computer Fundamentals", Pearson Publications, 2010.
4. Beherouz. A Forouzan; "Data Communication and Networking", 4th Edition, TMH, 2000.
5. Andrew S.Tanenbaum; "Modern Operating Systems", 2nd edition, Addison Wesley, 2001.
6. Gary Nutt; "Operating Systems: A Modern Perspective", 2nd edition, Pearson Education, 2001.
7. William Stallings; "Operating Systems: Internals and Design Principles", 5th Edition, Prentice Hall, 2005.
8. Karnika Seth; "Computers, Internet and New Technology Laws", Lexis Nexis Buttersworth Wadhwa, 2012.
9. Vikas Vashishth.; "Law and practice of intellectual property in India"
10. Jonathan Rosenoer; "Cyber Law: The Law of Internet", Springer- Verlag, New York, 1997.
11. Sreenivasulu N.S; "Law Relating to Intellectual Property", Patridge Publishing, 2013
12. Pavan Duggal; "Cyber Law – The Indian Perspective", Saakshar Law Publications.
13. Harish Chander; "Cyber Laws and IT Protection", PHI Learning Pvt. Ltd, 2012.

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Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Course Articulation Matrix -22OECRI402

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	1	3	2	1	2	2	2	2	2
CO2	3	3	2	2	3	2	1	3	3	2	2	2
CO3	3	3	3	3	3	2	1	3	3	2	3	3
Weighted Average	3	2.6	2.3	2	3	2	1	2.6	2.6	2	2.3	2.3

III Semester BA

Course Code: 221337	Course Title: DSC 5: Micro Economics
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week: 3 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Duration of Exam: 2 $\frac{1}{2}$ Hours	Summative Assessment Marks: 60

Course Outcomes (COs):	
CO1. Recognize &illustrate the Micro economic concepts,basic supplyand demandanalysis with Determinants of Demand and Supply	
CO2. Examinethestructureand the roleof costs in theeconomy and describe,usinggraphs,variousmarketmodels to examine structure of both perfectand Imperfect competitions	
CO3. Evaluate as to howequilibriumis achievedinthevarious marketmodels, Identifyproblemareasintheeconomy,andpossiblesolutions,usingtheanalytical toolsdevelopedinthe course.	
Contents	42 Hrs
Unit-1:BasicsofMicroeconomics	6
Chapter:1 Exploring Microeconomics: Nature and scope of economics – Opportunity cost,Scarcity,Productionpossibilityfrontier-Marketsystemasawaytoorganiseeconomicactivities	3
Chapter:2SupplyandDemand: Law of demand, Demand schedule and Exceptions to Law of Demand, Law of supply;supplieschedulesandshiftsinthedemandandsupplycurves.	3
Practicum:	
<ul style="list-style-type: none"> ➤ Readingand workingwith graphs ➤ Estimationofelasticityanddiscussingitsapplications;solvingproblemstoestimatetheequilibriumpriceand quantity 	
Unit-2:Consumption Decisions	5
Chapter3 The Households: Diminishing marginal utility; Indifference curves–Meaning and properties; Budget constraint; Maximization of satisfaction; Price, Income and Substitution effects;	
Practicum: Conductingaconsumersurveyto understandtheirtastes andpreferences	

Unit-3: Production and Costs	8
Chapter 4: The Firms: Concept of firm and industry; Production function; Law of variable proportions; iso-quant and iso-cost lines, cost minimizing equilibrium condition; Meaning of Cobb-Douglas production function	5
Chapter 5: Cost of Production: Short run and long run costs; Returns to Scale. (diminishing, constant and increasing)	3
Practicum: <ul style="list-style-type: none"> ➤ Analysing reasons for diminishing marginal returns ➤ Examining the relationship between cost and output / Deriving cost functions from output functions 	
Unit -4: Pricing	13
Chapter 6: The Markets: Meaning of market structure and types; Pricing under perfect competition; Monopoly pricing and price discrimination; Monopolistic competition – Oligopoly, Interdependence, Collusive and non-collusive oligopoly;	7
Chapter 7: The Inputs (Factors): Functional and Personal income; Demand for and supply of factors; Marginal productivity theory of distribution; Meaning and determinants of rent, wages, interest and profits.	6
Practicum: <ul style="list-style-type: none"> ➤ Conducting Market Survey to identify the nature and features of markets for different goods/services ➤ Understanding distribution of national income as factor incomes 	
Unit-5: Welfare Economics 6	
Chapter 8: Welfare Economics: Meaning of welfare; Pigou's welfare economics; Compensation principle; Impediments to attain maximum social welfare;	
Practicum: Examining day to day externalities and proposing solutions to them	
Unit-6: Economics in Action	4
Chapter 9: Economic Theory and Policy: Basics of monetary and fiscal policies; controls and regulations; incentives and penalties;	
Practicum: Analysis of latest budget of the Central Government; Review of terminology used in the latest Monetary Policy of the RBI	

Note:Strictly followthePracticum

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1	Ahuja,H.L.(2008): <i>PrinciplesofMicroeconomics</i> , S.Chand andCo.,NewDelhi
2	Mankiw,N. Gregory(2020). <i>Principlesof Economics</i> (Ninthed.).Boston,MA.
3	Jhingan,M.L.(2016): <i>Microeconomics</i> ,VrindaPublications,NewDelhi
4	Koutsoyianis,A(1979): <i>ModernMicroeconomics</i> ,London,Macmillan
5	Omkarnath,G.(2012: <i>Economics:APrimerforIndia</i> ,OrientBlackswan,Hyderabad
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Course Articulation Matrix- 221337

PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO's												
CO1	3	2	1	1	1	2	2	-	-	1	2	1
CO2	2	2	2	2	1	2	2	1	1	1	2	1
CO3	2	2	2	2	2	2	2	1	1	1	1	1
Weighted Average	2.3	2	1.6	1.6	1.3	2	2	1	1	1	1.6	1

Semester –III

Course Code: 221338	Course Title: DSC 6: Mathematics for Economics
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week: 3 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Duration of Exam: $2\frac{1}{2}$ Hours	Summative Assessment Marks: 60

Course Outcomes (COs):	
<p>CO1. Acquire the knowledge of mathematical tools and their application to Economic Concepts; Perform the basic operations in Sets and Matrices.</p> <p>CO2. Calculate limits, derivatives of Economic functions and identify the nature of relationship among Costs and Revenue curves.</p> <p>CO3. Computation of maxima and minima of functions through integral and differential calculus.</p>	
Contents	42 Hrs
Unit-1:Preliminaries	12
Chapter:1- Introduction to Mathematical Economics: Nature and scope of mathematical economics-Role of mathematics in economic theory	4
Chapter:2- Number system and Set theory: Types of Numbers: Natural Number, Real number, integers, Irrational number, Complex number. Concepts of sets-meaning–types-union of sets –interaction of sets.	4
Chapter:3-Functions: Meaning of function-Types of functions: Linear Function: Derivation of Supply and Demand Functions through Two Point Formula. Non-Linear Functions: Quadratic Functions	4
Unit-2:Economic Functions, their Application and Matrices	14
Chapter 4 Economic Functions: Demand function, Supply function, Production function, Cost, Revenue and Profit function, Consumption function	4
Chapter- 5: Application of Functions: Graph of economic functions, Market equilibrium; Equilibrium price and quantity, Impact of specific tax and subsidy on market equilibrium	5
Chapter-6:Matrices: Definition and Types of matrices- Matrix operations: Addition, Subtraction and Multiplication, Transpose of a matrix, Determinant of a matrix-Cramer's rule	5

Unit-3:DifferentialCalculusandIts Applications	16
Chapter7-Limits: Limitsoffunctions,differentiationandrules ofdifferentiation.	4
Chapter8DerivativesofEconomicfunctions: Derivationofmarginalfunctionsfromtotalfunction-Marginalproduction,Marginal cost,MarginalrevenueandMarginalprofit.	6
Chapter9-ApplicationsofDerivativesand Higherorderderivatives: Elasticityofdemand-Secondorder derivatives- Maximaand Minimaof economicfunction.	6

References	
1	Chiang, A.C.andWainwright,K,(2005) <i>“Fundamental MethodsofMathematicalEconomics”</i> , McGraw-Hill/Irwin,4th Edition.
2	AllenR.G.D.,(2015) <i>MathematicalAnalysisforEconomists</i> ,Macmillan.
3	BoseD.,(2003) <i>AnIntroductionofMathematicalEconomics</i> ,HimalayaPublishingHouse,Mumbai.
4	Dowling,E.T., <i>“IntroductiontoMathematicalEconomics”</i> ,McGraw-Hill,2001.
5	Hoy,M.,Livernois,J.McKenna,C,Rees,R.andStengos,T., <i>“MathematicsforEconomics”</i> ,MITPress, 3rdEdition, 2011
6	VeerachamyR(2005) <i>QuantitativeMethodsforEconomics</i> ,NewAgeInternationalPublishersPrivateLtd. New Delhi.
7	S.N.Yogish,(2005) <i>MathematicalmethodsforEconomists</i> -Mangaldeeppublications,Jaipur.

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Course Articulation Matrix-221338

PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO's												
CO1	2	1	2	1	2	1	1	1	1	1	1	1
CO2	2	3	2	1	2	1	1	-	2	1	2	1
CO3	2	3	2	1	2	1	1	-	1	1	1	1
Weighted Average	2	2.3	2	1	2	1	1	1	1.3	1	1.3	1

III SEMESTER

Course Code: 22OEEO301	Course Title: OE 3: Rural Economics
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week: 3 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Duration of Exam: 2 $\frac{1}{2}$ Hours	Summative Assessment Marks: 60

Course Outcomes (COs):

CO1 Identifying the basics of rural development, study the characteristics, problems, and programs of rural redevelopment

CO2 Evaluate the trends and patterns of economic activities in rural areas

CO3 Examine the role of infrastructural facilities and governance in rural development and enable the student to know about significance of rural enterprises and agriculture.

Contents	42 Hrs
Unit-1:	14
Chapter:1 - Introduction to Rural Economy : Meaning and objectives of rural economy- Characteristics of Rural Economy-Indicators of rural development- Concepts of inclusive and sustainable development	5
Chapter:2-Approaches to Rural Development Gandhian model:Community development approach,Minimum needs approach,Integrated rural development and Inclusive growth approach.	4
Chapter:3-Poverty and Unemployment in Rural India Meaning and measurement of poverty-Causes of poverty-Far and non-farm employment Measurement and types of employment- Review of poverty alleviation and employment generation programs in India.	5

Practicum:	
<ul style="list-style-type: none"> • Field visit to nearby village and study the poverty situation • Field visit to village and study the employment pattern • Undertake evaluation study on employment generation programmes and prepare an assignment. 	
Unit -2:	14
Chapter4-RuralEnterprises	5
Meaning and importance, Classification of MSME - Progress and problems of MSME Khadi and Village industries	
Chapter-5:RuralBanking andFinance	4
Credit co-operatives societies-Regional rural banks-Role of NABARD-Microfinance institutions	
Chapter-6: Rural Infrastructure Educational and health Infrastructure-Housing and sanitation, Drinking water supply-Rural transport and communication rural electrification	5
Practicum:	
<ul style="list-style-type: none"> • Write an assignment on Rural infrastructure • Write a small report on Rural Industry 	
Unit -3:	14
Chapter7-RuralDevelopment Programmes	4
Wage employment programmes-Self-employment and entrepreneurship development programs-Rural housing programs-Rural sanitation programs	
Chapter8 - Rural Markets	5
Meaning and types of rural markets-Defects and government measures for removal of defects in rural markets-Co-operative marketing societies-Meaning and importance of regulated markets-digital marketing (e-MAN).	
Chapter9 -RuralGovernance	5
Legislative powers, functions and sources of revenue of panchayat raj institutions- Role of NGOs in rural development - People's participation in rural development	
Practicum:	
<ul style="list-style-type: none"> • Group Discussion on Rural Governance • Interview Gram Panchayat members and prepare brief note on their participation in rural development. <p>Undertake evaluation study on rural development programs and prepare an assignment.</p>	

References	
1	Chambers,R.(1983): <i>RuralDevelopment:PuttingtheLastFirst</i> ,Longman,Harlow.
2	Dandekar,V.M.andN.Rath(1971): <i>PovertyinIndia</i> ,GIPE,Pune.
3	Dantwala,M.L. (1973): <i>PovertyinIndia:ThenandNow,1870-1970</i> ,Macmillan,Bombay.
4	Gupta.K.R.(Ed)(2003): <i>RuralDevelopmentinIndia</i> ,AtlanticPublishersandDistributors,NewDelhi.
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11	Tyagi,B.P.(1998): <i>AgriculturalEconomicsandRuralDevelopment</i> ,JaiPrakashMathandCo.,Meerut
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Course Articulation Matrix- 220EECO301

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
COs												
CO1	3	2	2	2	2	3	3	2	2	1	1	1
CO2	3	2	2	2	1	2	2	2	2	1	-	1
CO3	2	2	2	1	2	3	2	2	2	1	2	1
Weighted Average	2.6	2	2	1.6	1.6	2.6	2.3	2	2	1	1.5	1

III SEMESTER

Course Code: 22OEECO302	Course Title: OE 3: Economics of Insurance
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week: 3 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Duration of Exam: 2 $\frac{1}{2}$ Hours	Summative Assessment Marks: 60

Course Outcomes (COs):

CO1. Gain knowledge relating to fundamentals and types of the insurance in the field of insurance

CO2. Examine the role of Insurance planning and tax advantages and Dis advantages

CO3. Acquiring Knowledge in Health insurance, Insurance plans and legislations involved.

Contents	42 Hrs
Unit-1: Introduction to Economic of Insurance	17
Chapter:1- Fundamentals of Economic of insurance Definition of insurance- Scope of economic of insurance- Importance of insurance	6
Chapter:2- The conceptual framework Brief history of insurance- Perils and risks in insurance, Classification of risk hazards- How insurance works - Classes of insurance and assumptions	6
Chapter:3- Type of Insurance Risk pooling and risk transfer in insurance- Social vs private insurance- Life vs non-life insurance	5
Unit -2: Insurance Planning	12
Chapter 4- Types of Insurance Planning Wealth accumulation plan and life cycle planning- Tax advantage and tax non-advantage	4
Chapter-5: Retirement Planning Essential of individual retirement planning- Investing pension plan, basic principles of pension plans- Pension plans in India.	4
Chapter-6: General Insurance Structure concept of General Insurance - Types of General Insurance, Marine Insurance, Motor Insurance, Agricultural Insurance - Fire Insurance, Personal Accident Insurance.	4
Unit-3: personal insurance/Health Insurance	13
Chapter 7- Essential of Life and Health Insurance Fundamentals of Life and Health Insurance, functions of Life and Health Insurance Health Insurance and Economic Development, Insurance and Farmer Security	4

Chapter8 -InsuranceDocumentation HealthInsuranceproducts,HealthInsuranceunderwriting-HealthInsuranceclaims.	4
Chapter9-InsuranceLegislation The insurance act, 1938- Registration- Accounts and Returns-Investments Limitation on expenseof Management RegulationofInsurance,InsuranceregulationinIndia,roleandneedofregulation, history of insurance regulation in India - Insurance Reforms Development Authority(IRDA),performanceofIRDA- IndianInsuranceinglobalplatform,futurepotentialinIndian InsuranceBusiness.	5

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Course Articulation Matrix-22OEEC0302

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
COs												
CO1	1	1	-	-	1	1	1	1	-	1	-	-
CO2	1	-	-	-	1	1	-	2	1	1	1	1
CO3	1	1	1	-	1	1	1	2	-	1	1	1
Weighted Average	1	1	1	-	1	1	1	1.6	1	1	1	1

III SEMESTER

Course Code: 22OEEO303	Course Title: OE 3: Economics of Human Development
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week: 3 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Duration of Exam: 2 $\frac{1}{2}$ Hours	Summative Assessment Marks: 60

Course Outcomes (COs):
CO1. Differentiate between Human Resource Development (HRD), Human Development (HD) and HRM
CO2. Comprehend the concepts of Human security, describe dimensions of human development, and various practices and policies of human development
CO3. Measurement of human development and analysis of the impact of globalization on Human Development

Contents	42 Hrs
Unit-1: Introduction to Human Development	12
Chapter 1: Human growth and human development- Basic needs approach- Quality of life approach- Capability approach	04
Chapter 2: Human resource development (HRD), Human resource management (HRM).	04
Chapter 3: Human Development: meaning and definition, importance, and objectives.	04
Unit-2: Human Security, SDGs and Approaches to Human Development.	12
Chapter 4: Human Security: Economic security- Food security- Health security- Environmental security- Personal security- Community security- Political security.	04
Chapter 5: Sustainable Development Goals (SDGs): Understanding the SDGs- Linkages between human development and the SDGs.	04
Chapter 6: Indian Perspectives and Experience with Human Development: Approach to human development in national plans	04
Unit-3: Dimensions and Measurement of Human Development	18

Chapter7: DimensionsofHumanDevelopment:Empowerment-meaningandusage,Cooperation - definition and brief introduction, Equity - concept and usage, Sustainability –meaningandimportance,Participation-concept,differentformsofparticipation,Humandevelopment &Productivity-factors determining productivity.	06
Chapter 8: Measuring Human Development: Need for indices- limitations of per capitaGDPas an indicator. Earlier indices (meaning): - Physical Quality of Life Index (PQLI), - DisabilityAdjusted Life Years (DALYs), - Social Capability Index. Human Development Index - HDI ascompared to per capita GDP - Method of computing HDI - Critique of HDI. Other indices(meaning):HumanPovertyIndex(HPI)-Gender-relatedDevelopmentIndex(GDI)-Gender EmpowermentMeasure(GEM).	08
Chapter9: SelectedIssuesinHumanDevelopment:ImpactofGlobalisationonHumanDevelopm ent-Tradeand HumanDevelopment.- TechnologyandHumanDevelopment	04

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3	https://www.un.org/millenniumgoals/
4	https://www.undp.org/india/publications/national-human-development-report-india
5	https://www.sdgfund.org/mdgs-sdgs

Course Articulation Matrix -220EEEC0303

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
COs												
CO1	2	1	1	1	1	1	1	1	1	1	-	1
CO2	1	1	1	1	1	1	1	1	1	1	1	1
CO3	2	1	1	1	1	1	1	2	1	1	-	1
Weighted Average	1.6	1	1	1	1	1	1	1.3	1	1	1	1

IV SEMESTER

Course Code: 221437	Course Title: DSC 7:MacroEconomics
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week: 3 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Duration of Exam: 2 $\frac{1}{2}$ Hours	Summative Assessment Marks: 60

Course Outcomes (COs):	
<p>CO1.Gain the Knowledge about classical and Keynesian Employment Theories and National Income Accounting</p> <p>CO2.Examine the process of Consumption and Investment Functions</p> <p>CO3. Evaluate the Concept of Multiplier, Accelerator along with money supply, Demand and Inflation</p>	
Content	42 Hrs
Unit-1: Theory of National Income Determination	14
<p>Chapter: 1 Classical Framework: Typical Features of classical theory of employment; Assumptions- Basis of Classical theory: Say's Law, Pigou's wage price flexibility, Fisher's quantity theory of money, Knut Wicksell's loanable funds theory, Criticism of classical theory</p>	7
<p>Chapter-2: The Keynesian Framework Introductory: connecting growth of national income to development; why incomes of all fall or rise? Are income, output, and employment related? Some basic concepts: The idea of equilibrium and identity; ex- ante and ex-post concepts. Aggregate demand and its components. Consumption function: Marginal and Average propensity to consume. Investment function; savings and investment relationship. Aggregate Supply: Meaning and graphical explanation; Effective demand. Determination of national income in Keynes' two sector economy with Aggregate Demand and Aggregate Supply Determination of national income in Keynes' two sector economy with investment and savings.</p>	7

Unit-2:AggregateConsumptionandInvestment	15
Chapter-3:TheoriesofDeterminantsofConsumption: Keynesianpsychological lawofconsumption;determinantsandpermanent incomehypothesisofMiltonFriedman	5
Chapter-4:Investment and Savings Typesofinvestment- Determinantsofinvestment:rateofinterestandmarginalefficiencyofcapital:meaningand determinants-Savings and itsdeterminants	5
Chapter-5:ConceptsofMultiplierandAccelerator InvestmentMultiplier:Meaningandassumptions.multiplier;leakages;	5
Unit -3:MonetaryEconomics	13
Chapter-6:MoneySupply: ConceptofMoneySupply;recentmeasuresofmoneysupplyassuggestedbyRBI- Determinants of money supply:high powered money and money multiplier. The reserve ratioand depositmultiplier	5
Chapter-7: Moneydemand: Cashtransactionsapproach(onlymeaning)andCambridgeapproach(OnlyMarshall'sequ ation)-Theliquiditypreferenceapproach of Keynes	4
Chapter-8:Inflation andUnemployment: PhillipsCurve andWagecuttheoryandemployment	4

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Course Articulation Matrix- 221437

PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO's												
CO1	3	2	1	1	2	2	1	1	1	1	2	1
CO2	3	1	-	-	2	2	1	1	-	1	1	1
CO3	3	2	2	2	2	2	1	-	1	1	1	1
Weighted Average	3	1.6	1.5	1.5	2	2	1	1	1	1	1.3	1

IV SEMESTER

Course Code: 221438	Course Title: DSC 8:StatisticsforEconomics
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week: 3 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Duration of Exam: $2\frac{1}{2}$ Hours	Summative Assessment Marks: 60
Course Outcomes (COs):	
<p>CO1Identifythe natureand Sources ofData and their presentation</p> <p>CO2CalculateDescriptivestatisticslikemeasures ofcentraltendencyanddispersion</p> <p>CO3Applystatistical techniques likecorrelation andregression in the study of Economic analysis</p>	
Contentof Theory	42 Hrs
Unit-1:Preliminaries	12
Chapter:1IntroductiontoStatistics: Meaningandimportanceofstatistics,functionsof statistics, types of statistics: descriptive statistics and inferential statistics-variables; qualitativevariableandquantitativevariable	4
Chapter-2: Data types, sources and collection of data: qualitative and quantitative data - crossection data, time series data and panel data - primary and secondary sources of data - methodsof collectingprimarydata	4
Chapter-3: Tabulationandpresentationofdata:classificationandtabulationofdata-frequency distributions - continuous and discrete frequency distribution. graphical presentation-histogram- frequencypolygon -Ogive curves-bar diagram,pie chart	4
Unit-2:Measures ofCentralTendencyandDispersion	14
Chapter-4:ArithmeticAverage: Definitionofcentraltendency,typesofcentraltendency: Arithmetic mean:meaningand properties ofarithmetic mean- computation of arithmetic mean	5
Chapter-5:PositionalAverages- MedianandMode: Definitionandimportanceofmedian-calculation of median-definition and importanceof mode -calculation of mode.	4

Chapter-6:Dispersion: Meaningof dispersion-measuresof dispersion-range-quartiledeviation-meandeviation-standarddeviation-coefficientofvariation andtheircomputation.	5
Unit-3:Correlation,Regression andTimeSeriesAnalysis	16
Chapter-7:Correlation: Meaningofcorrelation-typesofcorrelation-methodsofmeasuringcorrelation-Karl Pearson’s correlation coefficients.	5
Chapter-8:Regression: Meaningandimportanceofregression-regressionequation-estimationof regressionequation-applicationsofregressionequationineconomics.	6
Chapter-9:TimeSeriesAnalysis: Definitionoftimeseries–componentsoftimeseries–estimationand forecastingof trend.	5

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Course Articulation Matrix-221438

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
COs												
CO1	2	3	3	3	2	1	1	1	1	1	1	1
CO2	2	2	2	2	2	1	-	-	2	1	1	1
CO3	2	2	2	2	1	-	-	-	1	1	1	1
Weighted Average	2	2.3	2.3	2.3	1.6	1	1	1	1.3	1	1	1

IV SEMESTER

Course Code: 22OEEC0401	Course Title: OE 4:KarnatakaEconomy
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week: 3 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Duration of Exam: 2 ¹ / ₂ Hours	Summative Assessment Marks: 60

Course Outcomes (COs):

- CO1. Understandthe natureofeconomic growth and problemsof Karnatakastate.
- CO2. Explaintheprocess of structuralgrowth in KarnatakaEconomy
- CO3.EvaluatethepoliciesandprogramsundertakenbytheGovt.ofKarnatakaforbringingaboutso cio-economicdevelopment

Contents	42 Hrs
Unit-1:KarnatakaEconomy –Anoverview	15
Chapter:1CharacteristicsofKarnatakaEconomy FeaturesofKarnatakaeconomy- TrendsandsectoraldistributionofstatedomesticproductandpercapitaincomeMeasur estoredressregionalimbances–Dr.Nanjundappacommitteereport,-Article371J	6
Chapter-2:HumanResources Humanresources:importance,sizeandhealthindicators-HumanDevelopmentIndex– Povertyandunemployment–Eradicationprograms	4
Chapter-3:NaturalResourcesManagement NaturalResources: Importanceandvolumeofdifferentnaturalresources- Karnatakaenvironmental policy	5
Practicum: ConductfieldvisittoForest/Reservoir/Miningandpreparethereport	
Unit-2:Agriculture,Ruraldevelopment,andIndustriesin Karnataka	11
Chapter-5:RuralDevelopment Publicdistributionsystem-Ruraldevelopmentprograms(brief)- Governmentschemesforruralwomen	4
Chapter-6:IndustriesinKarnataka MajorindustriesinKarnataka:problemsandprospects- MSMEs:problemsandmeasures-ITindustriesin Karnataka- IndustrialfinanceinKarnataka-IndustrialpolicyofKarnataka	7
Practicum: visittoindustrialunitsinlocalareaandpreparethereport/Trace- outtheimpactof Prof.D. M.NanjundappaCommitteereport	
Unit-3:Infrastructure andFinanceinKarnataka	16

Chapter-7:EconomicInfrastructure Transportation:Road,Rail,WaterandAirtransport.Informationandcommunicationtechnologyfacilities	6
Chapter-8:SocialInfrastructure Drinkingwater - Housingand Sanitation -Health andEducation -RuralElectrification	4
Chapter-9:StateFinance SourcesofRevenue:DirectandIndirectTaxes-ImpactofGSTonKarnatakaeconomy-StateExpenditure- StateFinanceCommission -Current StateBudget (Brief)	6
Practicum: DiscussiononStatebudget	

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Course Articulation Matrix - 22OECCO401

PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO's												
CO1	2	3	2	2	2	2	2	2	1	1	1	1
CO2	2	2	2	2	2	1	1	1	1	1	-	1
CO3	1	1	2	2	1	-	2	1	1	1	-	1
Weighted Average	1.6	2	2	2	1.6	1.5	1.6	1.3	1	1	1	1

IV Semester

Course Code -22OEEO402	Course Title: OE 4:EntrepreneurialEconomics
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week: 3 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Duration of Exam: 2 $\frac{1}{2}$ Hours	Summative Assessment Marks: 60

Course Outcomes (COs):	
CO1. Gain the capacity to Startown business as an Entrepreneur	
CO2. Enablingthe students tofind career opportunitiesin the field of business.	
CO3.Enablethestudentstogainknowledgeandskillsneededtorunabusinesssuccessfully.	
Contents	42 Hrs
Unit-1:EntrepreneurandEntrepreneurship	12
Chapter1:EntrepreneurandEntrepreneurship: Meaning, Definitions, Evolution, types, Characteristics, qualities and functions of entrepreneur- Distinctionbetweenentrepreneurandmanger,Distinctionbetweenentrepreneurandintra-preneur,	05
Chapter2: RoleandimportanceofEntrepreneurship: RoleandimportanceofEntrepreneurshipineconomicdevelopment,Factorsinfluencingentpreneurship'-Psychological, social, economicand environmental.	04
Chapter3:Newgenerationsofentpreneurship: Newgenerationsofentpreneurship:social,health,tourismandwomenentpreneurship; barrierstoentpreneurship.	03
Unit-2:LaunchingEntrepreneurialVentures	12
Chapter4:Generationof ideas: Generationofideas:Methodsandprocess-sourcesofideas-screeningprocess-Assessingopportunities-Challenges,pitfallsand criticalfactorsofnewventure;	04
Chapter5:Businessplan Businessplan-Newventures:Stepsinvolvedinsettingupabusiness-identifying,selecting good business opportunity, Market survey and research, techno-economic feasibility assessment.	04
Chapter6:RoleofInnovation&Creativity:Innovation- Meaningandimportanceofinnovation;Typesofinnovation;Sourcesofinnovation;Conditio nsforeffectiveinnovationat Organizationlevel.	04

Unit-3:BusinessandEntrepreneurialdevelopment	18
Chapter7: Creativity: Creativity:Conceptandprocessofcreativity;roleandimportanceofcreativityandmental blockstocreativity;branding,trademarks,patents,copyrights,andregistereddesignprotection- Methodsofprotectinginnovationandcreativity.	05
Chapter8:Entrepreneur Assistance: Entrepreneur Assistance: Assistance to an entrepreneur-Industrial Park (Meaning, features, &examples)-SpecialEconomicZone (Meaning,features&examples)- Financialassistance bydifferentagencies-License,EnvironmentalClearance,e-tenderprocess,Exciseexemptionsand concession,Exemptionfromincometax-QualityStandards withspecialreferencetoISO.	06
Chapter9:Business andEntrepreneurialdevelopment BusinessandEntrepreneurialdevelopment:Determiningandacquiringrequiredresources(Financial, Physical and Human): Search for entrepreneurial capital- Debt vs. Equity; VentureCapitalMarket;Angelfinancingandalternativesourcesoffinanceforentrepreneurs.Entrepreneurship development programme (EDP) in India- Objectives, phases, and inputs ofEDP;-Governmentinitiativesforentrepreneurship-MakeinIndia,Start-upIndia,MUDRAetc.	07

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Course Articulation Matrix - 22OEECO402

PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO's												
CO1	2	2	1	-	2	1	1	1	3	1	3	2
CO2	2	1	-	1	2	1	-	1	2	1	1	1
CO3	2	2	1	-	2	1	1	1	3	1	3	3
Weighted Average	2	1.6	1	1	2	1	1	1	2.6	1	2.3	2

IV Semester

Course Code: 22OEEC0403	Course Title: OE 4: Economics and Law
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week: 3 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Duration of Exam: 2 $\frac{1}{2}$ Hours	Summative Assessment Marks: 60

Course Outcomes (COs):	
CO1.	Comprehend the basic economic issues affecting the economy along with the related legal provisions
CO2.	Acquire knowledge on the basic provisions of law relating to consumer activities, business organizations, environment also to recognize the law framework in order to frame the economic model close to reality.
CO3.	Enable the student to realize the consequences of legal rules, primarily as an exercise in applied microeconomics, macroeconomics, industrial and international economics.
Contents	
Unit-1: Economic analysis of law	42 Hrs
Chapter 1: Introduction to legal reasoning Efficiency- Markets and efficiency- Market failure - Coase theorem and related ideas.	5
Chapter 2: welfare economics Compensation principles- Social welfare function- Maximization problem	4
Chapter 3: Economic Reasoning Nature of economic reasoning- Economic approach to law – History- Criticism	5
Practicum:	
1. Group Discussion on Economic reasoning. 2. Assignment on Coase theorem and related issues	
Unit-2: An Introduction to Law and Legal Institutions	12
Chapter 4: Law Definition- Territorial Nature of Law- Kinds of Law- General Law and Special Law- Kinds of Special Law	6
Chapter 5: Civil law and the and the Common Law Traditions The institutions of the federal and State Court systems- The nature of legal dispute - How legal rules evolve	6
Practicum:	
1. Group Discussion on Civil law and the and the Common Law Traditions 2. Assignment on the different kinds of Law	
Unit-3: Economic Laws	16
Chapter 6: Law Relating to Consumer Activities Bargaining theory- Economic theory of contract - Defining tort law- Economics of tort liability-	5

Definition of Consumer-Consumer protection; The Consumer Protection Act, 2019- Consumer courts.	
Chapter 7: Law of Business Organizations Structure of firm— Kinds, Corporations -Capital, Shares, Debentures, Insiders' and trading- RBI, IRDA, MRTP, Role of SEBI,	5
Chapter 8: Macroeconomics and Law Inequality; Contract theory of Distributive justice- Economic and social costs of poverty - Wealth distribution by Liability Rules- Taxation and efficiency- National and global environmental problems and international environmental agreements - their legal and economic implications	6
Practicum 1. Hold the moot court in the classroom and let there be discussion consisting of at least two or more different views on National and Global environment problems and acts. 2. Discuss the case studies on Economic and social costs of poverty and consumer court judgements protecting the consumers.	

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Course Articulation Matrix- 22OEECO403

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
COs												
CO1	2	1	-	-	1	2	2	2	1	1	1	1
CO2	2	1	1	1	1	2	2	2	1	1	-	1
CO3	2	1	1	1	1	2	2	2	-	1	1	1
Weighted Average	2	1	1	1	1	2	2	2	1	1	1	1

IV Semester

Course Code: 22OEEC0404	Course Title: OE 4:Economicsof GST
Course Credit (L:T:P): 3 (3:0:0)	Teaching Hours/Week: 3 Hours
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Duration of Exam: 2 ¹ / ₂ Hours	Summative Assessment Marks: 60

Course Outcomes (COs):	
<p>CO1. Acquireknowledge on indirecttaxeswithspecial reference to GST</p> <p>CO2. Application of theoretical and Practical knowledge of GST and its Evolution in India</p> <p>CO3. Enablethestudentstobe aware of theGSTLaw, ITC,Valuationofsupplyand returns, SimplecalculationofGSTandInputTaxCredit,ValuationofSupply</p>	
Contents	42 Hrs
Unit-1:IntroductiontoEconomicsof GST	14
Chapter1:Indirect taxesbeforeGST IndirectTaxes-Meaning,Typeswithexamples- ConstitutionalframeworkofIndirectTaxesbeforeGST(TaxationPowersofUnion&StateGov ernment)-ConceptofVAT:Meaning,VariantsandMethods;	5
Chapter2:Reformsin IndirectTaxes MajorDefectsinthestructureofIndirectTaxesprioroGST;NeedforTaxreforms- Kelkarcommitteeon Tax Reforms	4
Chapter3:Introduction to GST RationaleforGST-Constitution[101stAmendment]Act,2016-GST- Meaning,OverviewofGST-TaxessubsumedunderGST-TerritorialJurisdictionofGST- MultipleratesofGST-Recentreforms inGST.	5
Practicum: 1. GroupDiscussionsonIndirectTaxesdefectsprior toGST. 2. AssignmentonTypes ofIndirectTaxesprioroGSTand Afterintroduction ofGST.	
Unit-2Fundamentalsof GST	12
Chapter4: GST Structure in India GST:AdvantagesandDisadvantages-OneNation-OneTax-StructureofGST- FeaturesofSingleandDualGSTModel	6

<p>Chapter5: Dual GST Mode and GST Council Dual GST Mode in India: (SGST, CGST, UTGST & IGST) - Goods and Services Tax Network [GSTN] - GST Council; Creation, Members, Decisions, Compensation to states - GST Network - Registration.</p>	6
<p>Practicum:</p> <ol style="list-style-type: none"> 1. Group Discussion on advantages and disadvantages of GST 2. Hold the moot of GST Council in the classroom and decide the different slabs of GST 	
<p>Unit-3: Taxes and Duties</p>	16
<p>Chapter6: Transactions and taxes covered and not covered Transactions and taxes covered under GST - Taxes and duties outside the purview of GST - Tax structure Computation - Administration of Tax on items containing alcohol, petroleum products, tobacco products - Taxation on services.</p>	4
<p>Chapter7: Levy and Collection of Tax Taxable event - "Supply" of Goods and Services - Place of Supply: Within state, Interstate Levy and Collection - Import and Export; Time of supply - Valuation for GST - Valuation rules - Taxability of reimbursement of expenses - Exemption from GST: Small supplies and Composition Scheme Classification of Goods and Services: Composite and Mixed Supplies.</p>	6
<p>Chapter8: Input Tax Credit Eligible and Ineligible Input Tax Credit - Apportionments of Credit and Blocked Credits - Tax Credit in respect of Capital Goods - Recovery of Excess Tax Credit - Availability of Tax Credit in special circumstances - Transfer of Input Credit (Input Service Distribution) - Payment of Taxes; Refund; Doctrine of unjust enrichment.</p>	6
<p>Practicum</p> <ol style="list-style-type: none"> 1. Simple illustrations on calculation of GST and Input Tax Credit, 2. Valuation of Supply (Numerical on valuation and calculation of tax) 3. Simple calculation Adjustment of Input tax credit against output CGST, SGST, IGST. 	

References	
1	The Central Goods and Services Tax, 2017
2	The Integrated Goods and Services Tax, 2017
3	The Union Territory Goods and Services Tax, 2017
4	The Goods and Services Tax (Compensation to States), 2017
5	The Constitution (One Hundred and First Amendment) Act, 2016
6	Gupta, S.S., <i>GST-How to meet your obligations (April 2017)</i> , Taxmann Publications
7	Datey, V.S. (2019). <i>Indirect Taxation</i> . New Delhi: Vastu and Sevakar Vidhan by Government of India
8	Mehrotra, H.C. & Goyal, S.P. (2019), <i>Indirect Taxes</i> , Agra: Bhawan Publications.

Web links:

- <https://gstcouncil.gov.in/brief-history-gst>
- <https://khatobook.com/blog/structure-of-gst/>
- <https://taxguru.in/goods-and-service-tax/dual-gst-model-gst-structure-india.html>
- [https://www.icsi.edu/media/webmodules/customs%20laws/Levy & Collection CGST\(11-2\).pdf](https://www.icsi.edu/media/webmodules/customs%20laws/Levy%20&%20Collection%20CGST(11-2).pdf)
- <https://www.bajajfinserv.in/insights/types-of-gst-in-india#:~:text=Currently%2C%20the%20types%20of%20GST,three%20different%20types%20of%20GST.>

Course Articulation Matrix -22OEECO404

PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO's												
CO1	2	2	1	1	2	1	1	1	-	1	1	1
CO2	2	1	1	1	1	1	1	1	1	1	-	1
CO3	3	2	1	1	1	1	1	1	-	1	1	1
Weighted Average	2.3	1.6	1	1	1.3	1	1	1	1	1	1	1

Anexure: English Language Syllabus

Syllabus For Ability Enhancement Compulsory Course (AECC) ENGLISH LANGUAGE (L2)

For Undergraduate Programs
offered in

Faculty of Arts and Science (BA, BSc, BCA)

Title of the Paper – Generic English, L2 - Drama and Language Component

Semester III Course Code: BA / BSc / BCA - 22ENG319	Course Title: AECC, Generic English L2 Drama and Language Component
Course Credits: 03 (2:1:0)	Hours of Teaching/Week: 04
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2½ Hours	Semester End Examination Marks: 60

Course Outcomes

- CO1:** Ability to critically analyse, interpret and appreciate literary texts and gain an awareness of social, cultural, religious and ethnic diversities for an inclusive outlook to function effectively in a multi-cultural society.
- CO2:** Augmented presentation and analytical skills.
- CO3:** Prepare students for the technologically advanced world, its challenges and opportunities.
- CO4:** Acquire and apply language skills for competitive exams and employability skills for emerging sectors such as content writers, interpreters, translators and transcribers.
- CO5:** Enhanced competency for LSRW (Listening, Speaking, Reading, Writing skills)

Course Content

Unit-1			
Receptive Skills	Reading and Listening Skills		
Reading Skills	Play		
	<i>Othello</i> by Shakespeare	26 Hours	30 Marks
Listening Skills	Persuasive Speeches	5 Hours	10 Marks
1-Swami Vivekananda's speech at the World Parliament of Religions in Chicago, in which he introduced Hinduism to North America, which became historical.			

2- "Crisis of Civilization" speech by Rabindranath Tagore at Shanti Niketan in April 1941 was his last speech. Tagore had been unwell for some time, yet his words were very moving. https://www.youtube.com/wat
3-"Quit India" speech delivered by Mahatma Gandhi on August 8, 1942, addressed the A.I.C.C. at Mumbai. https://youtu.be/QXajHuEKY
4-Dr. B R Ambedkar's Constituent Assembly Speech on Dec 17,1946 https://www.youtube.com/wat
5-Martin Luther King's 'I Have a Dream' Speech, 1963 https://www.youtube.com/wat

Productive Skills: Speaking and Writing Skills			
Speaking Skills	Presentation Skills		
	Types - <ul style="list-style-type: none"> • Informative/Instructional Presentation • Persuasive Presentation • Decision Making Presentation • Demonstrative Presentation 	5 Hours	5 Marks
Writing Skills	Introduction to Writing and Types of Writing		
	Introduction to Writing Types of Writing <ul style="list-style-type: none"> • Descriptive Writing • Narrative Writing • Reflective Writing • Persuasive/Argumentative Writing • Comparative Writing • Cause and Effect Writing 	5 Hours	5 Marks
	Business Correspondence		
	Letters of Enquiry, Order Letters, Letters of Complaint, Reply to Letter of Complaint, Promotion Letters, Sales Letters	6 Hours	5 Marks
	Commercial Writing		
	<ul style="list-style-type: none"> • Advertisement Writing • Product Manual • Poster/Brochure Writing 	5 Hours	5 Marks
Formative Assessment Activities	Formative Assessment First Internal Test Second Internal Test First Class Test/Oral Test/ Assignments/ Surveys/ Interviews Second Class Test/Oral Test/ Assignments/ Surveys/ Interviews	4 Hours	4 Hours

- **Text: Othello by William Shakespeare**

(Unit – 1)References for Unit - 2:

- Chaturvedi PD and Mukesh Chaturvedi, Business Communication, Concepts, Cases and Applications. Pearson, 2011
- Garg Manoj Kumar. English Communication – Theory and Practice – Ability Enhancement Compulsory Course. Cengage, 2019.
- Peck, John and Martin Coyle. Write It Right – Secrets of Effective Writing (Palgrave Study Skills), Palgrave Macmillan, 2005, 2012
- Seely, John, Oxford Guide to Effective Writing and Speaking. OUP, 2998, 2013
- Yadugiri, M A. Making Sense of English – A Textbook of Sounds, Words and Grammar, Viva Books, 2005, 2020

Course Articulation Matrix - BA / BSc / BCA - 22ENG319

COs / POs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	2	1	2	3	1	3	2	3	1	3
C02	3	2	1	1	1	1	1	3	2	3	1	3
C03	1	1	2	-	3	3	1	2	2	3	1	3
C04	3	3	2	1	2	3	-	1	3	3	1	3
C05	3	3	1	1	1	2	1	1	1	3	-	3
WA	2.6	2.4	1.6	1	1.8	2.4	1	2	2	3	1	3

Annexure: English Language Syllabus
Syllabus For Ability Enhancement Compulsory Course
(AECC) ENGLISH LANGUAGE (L2)

For Undergraduate Programs
 offered in

Faculty of Commerce and Management

B.Com, BBA, BBA (H &H), BBA (Aviation & International Tourism) Title of
the Paper – Generic English – 2 Drama and Language Component

Semester III Course Code: BCom / BBA (All) – 22ENG320	Course Title: AECC, Generic English - 2 Drama and Language Component
Course Credits: 03 (2:1:0)	Hours of Teaching/Week: 04
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2½ Hours	Semester End Examination Marks: 60

Course Outcomes

CO1: Ability to critically analyse, interpret and appreciate literary texts and gain an awareness of social, cultural, religious and ethnic diversities for an inclusive outlook to function effectively in a multi-cultural society.

CO2: Augmented presentation and analytical skills.

CO3: Prepare students for the technologically advanced world, its challenges and opportunities.

CO4: Acquire and apply language skills for competitive exams and employability skills for emerging sectors such as content writers, interpreters, translators and transcribers.

CO5: Enhanced competency for LSRW (Listening, Speaking, Reading, Writing skills)

Course Content

Unit-1			
Receptive Skills	Reading and Listening Skills		
Reading Skills	Play		
	<i>Macbeth</i> by Shakespeare	26 Hours	30 Marks
Listening Skills	Persuasive Speeches	5 Hours	10 Marks
1-Swami Vivekananda’s speech at the World Parliament of Religions in Chicago, in which he introduced Hinduism to North America, which became historical.			
2- “Crisis of Civilization” speech by Rabindranath Tagore at Shanti Niketan in April 1941 was his last speech. Tagore had been unwell for some time, yet his words were very moving. https://www.youtube.com/wat			
3-“Quit India” speech delivered by Mahatma Gandhi on August 8, 1942, addressed the A.I.C.C. at Mumbai. https://youtu.be/QXaiHuEKY			
4-Dr. B R Ambedkar's Constituent Assembly Speech on Dec 17,1946 https://www.youtube.com/wat			
5-Martin Luther King’s ‘I Have a Dream’ Speech, 1963 https://www.youtube.com/wat			

Productive Skills: Speaking and Writing Skills			
Speaking Skills	Presentation Skills		
	Types - <ul style="list-style-type: none"> • Informative/Instructional Presentation • Persuasive Presentation • Decision Making Presentation • Demonstrative Presentation 	5 Hours	5 Marks
Writing Skills	Introduction to Writing and Types of Writing		
	Introduction to Writing Types of Writing <ul style="list-style-type: none"> • Descriptive Writing • Narrative Writing • Reflective Writing • Persuasive/Argumentative Writing • Comparative Writing • Cause and Effect Writing 	5 Hours	5 Marks
	Business Correspondence		
	Letters of Enquiry, Order Letters, Letters of Complaint, Reply to Letter of Complaint, Promotion Letters, Sales Letters	6 Hours	5 Marks
	Commercial Writing		
	<ul style="list-style-type: none"> • Advertisement Writing • Product Manual • Poster/Brochure Writing 	5 Hours	5 Marks
Formative Assessment Activities	Formative Assessment First Internal Test Second Internal Test First Class Test/Oral Test/ Assignments/ Surveys/ Interviews Second Class Test/Oral Test/ Assignments/ Surveys/ Interviews	4 Hours	4 Hours

Course Articulation Matrix
BCom / BBA (All) – 22ENG320

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	3	1	3	2	3	1	3
CO2	3	2	1	1	1	1	1	3	2	3	1	3
CO3	1	1	2	-	3	3	1	2	2	3	1	3
CO4	3	3	2	1	2	3	-	1	3	3	1	3
CO5	3	3	1	1	1	2	1	1	1	3	-	3
WA	2.6	2.4	1.6	1	1.8	2.4	1	2	2	3	1	3

Assessment Pattern for III Semester Common to all Programs		
A	Formative Assessment	40 Marks
B	Summative Assessment	60 marks
	Total	100 Marks

Formative Assessment	40 Marks
Assessment Occasion/ type	Weightage in Marks
First Internal Test	20
First Class Test/Oral Test/ Assignments/ Surveys/ Interviews	10
Second Class Test/Oral Test/ Assignments/ Surveys/ Interviews	10
Total	40

Question Paper Pattern for Semester End Examination Common to all Programs

**Language English – II
(AECC)**

Title of the Paper: Generic English – 2 Drama and Language Component

Time: 2½ hours

Max. Marks: 60

UNIT - 1

I Answer FOUR of the following:

4x5=20

(Characters / Scenes from the Drama – 4 questions out of 6 to be answered)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

II Answer ONE of the following:

1x10=10

(Characters / Scenes from Drama – 1 question out of 3 to be answered)

- 1.
- 2.
- 3.

III Answer TWO of the following:

2X5=10

(Persuasive Speeches – 2 questions out of 4 to be answered)

- 1.
- 2.
- 3.
- 4.

Unit – 2

IV Answer ONE of the following:

(1X5=5)

(Presentation Skills – 1 question out of 3 to be answered)

- 1.
- 2.
- 3.

a) Answer ONE of the following:

(1X5=5)

(Writing Skills – 1 question out of 3 to be answered – Introduction to Writing and Types of Writing)

- 1.
- 2.
- 3.

b) Answer ONE of the following:
(Business Correspondence - 1 question out of 3 to be answered)

(1X5=5)

- 1.
- 2.
- 3.

c) Answer ONE of the following:
(Commercial Writing- 1 question out of 3 to be answered)

(1X5=5)

- 1.
- 2.
- 3.

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Annexure: English Language Syllabus

**Syllabus For Ability Enhancement Compulsory Course
(AECC) ENGLISH LANGUAGE (L2)**

For Undergraduate Programs
offered in

Faculty of Arts and Science (BA BSC BCA)

Title of the Paper – Generic English – 2 Fiction & Language Component

Semester IV Course Code: BA / BSc./ BCA – 22ENG419	Course Title: AECC, Generic English - 2 Fiction & Language Component
Course Credits: 03 (2:1:0)	Hours of Teaching/Week: 04
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2½ Hours	Semester End Examination Marks: 60

Course Outcomes

CO1: Ability to critically analyse, interpret and appreciate literary texts and gain an awareness of social, cultural, religious and ethnic diversities for an inclusive outlook to function effectively in a multi-cultural society.

CO2: Augmented presentation and analytical skills.

CO3: Prepare students for the technologically advanced world, its challenges and opportunities.

CO4: Acquire and apply language skills for competitive exams and employability skills for emerging sectors such as content writers, interpreters, translators and transcribers.

CO5: Enhanced competency for LSRW (Listening, Speaking, Reading, Writing skills)

Course Content

Unit-1			
Receptive Skills: Reading and Listening Skills			
Reading Skills	Novel		
	<i>Talkative Man</i> by R K Narayan	26 Hours	30 Marks
Listening Skills	Listening and Decoding		

Listen to and understand the following Poems: 1. Darkling Thrush- Thomas Hardy 2. Good-Bye Party for Pushpa T S -Nissim Ezekiel 3. Snake- D. H. Lawrence 4. The Learned Astronomer – Walt Whitman	5 Hours	10 Marks
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Productive Skills: Speaking and Writing Skills			
Speaking Skills			
Speaking Skills	<ul style="list-style-type: none"> • Group Discussion • Public Speaking 	6 Hours	5 Marks
Writing Skills	Technical Skills		
	Copy writing Business Writing Travel Writing Article Writing	8 Hours	5 Marks
E-correspondence and Content Writing Skills			
E-mail-Casual and Professional	Apology Letters, Appreciation Letters Congratulation Letters	5 Hours	5 Marks
Social Media Content Writing skills	<ul style="list-style-type: none"> • Blog writing • Podcast writing • Writing on Instagram 	6 Hours	5 Marks

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	3	1	3	2	3	1	3
CO2	3	2	1	1	1	1	1	3	2	3	1	3
CO3	1	1	2	-	3	3	1	2	2	3	1	3
CO4	3	3	2	1	2	3	-	1	3	3	1	3
CO5	3	3	1	1	1	2	1	1	1	3	-	3
WA	2.6	2.4	1.6	1	1.8	2.4	1	2	2	3	1	3

Annexure: English Language Syllabus

Syllabus For Ability Enhancement Compulsory Course (AECC) ENGLISH LANGUAGE (L2)

For Undergraduate Programs
offered in

Faculty of Commerce and Management

B.Com, BBA, BBA (H &H), BBA (Aviation & International Tourism Title of
the Paper – Generic English – 2 Fiction and Language Component

Semester IV Course Code: B.Com / BBA (All) – 22ENG420	Course Title: AECC, Generic English - 2 Fiction & Language Component
Course Credits: 03 (2:1:0)	Hours of Teaching/Week: 04
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2½ Hours	Semester End Examination Marks: 60

Course Outcomes

- CO1:** Ability to critically analyse, interpret and appreciate literary texts and gain an awareness of social, cultural, religious and ethnic diversities for an inclusive outlook to function effectively in a multi-cultural society.
- CO2:** Augmented presentation and analytical skills.
- CO3:** Prepare students for the technologically advanced world, its challenges and opportunities.
- CO4:** Acquire and apply language skills for competitive exams and employability skills for emerging sectors such as content writers, interpreters, translators and transcribers.
- CO5:** Enhanced competency for LSRW (Listening, Speaking, Reading, Writing skills)

Course Content

Unit-1			
Receptive Skills: Reading and Listening Skills			
Reading Skills	Novel		
	<i>The Man-Eater of Malgudi</i> - R K Narayan	26 Hours	30 Marks
Listening Skills	Listening and Decoding		
Listen to and understand the following Poems: 5. Darkling Thrush- Thomas Hardy 6. Good-Bye Party for Pushpa T S -Nissim Ezekiel 7. Snake- D. H. Lawrence 8. The Learned Astronomer – Walt Whitman		5 Hours	10 Marks

Productive Skills: Speaking and Writing Skills			
Speaking Skills			
Speaking Skills	<ul style="list-style-type: none"> • Group Discussion • Public Speaking 	6 Hours	5 Marks
Writing Skills	Technical Skills		
	Copy writing Business Writing Travel Writing Article Writing	8 Hours	5 Marks
E-correspondence and Content Writing Skills			
E-mail-Casual and Professional	Apology Letters, Appreciation Letters Congratulation Letters	5 Hours	5 Marks
Social Media Content Writing skills	<ul style="list-style-type: none"> • Blog writing • Podcast writing • Writing on Instagram 	6 Hours	5 Marks

- **Text: The Man-Eater of Malgudi - R K Narayan (Unit – 1)**

References for Unit - 2:

- Chaturvedi PD and Mukesh Chaturvedi, Business Communication, Concepts, Cases and Applications. Pearson, 2011
- Garg Manoj Kumar. English Communication – Theory and Practice – Ability Enhancement Compulsory Course. Cengage, 2019.
- Peck, John and Martin Coyle. Write It Right – Secrets of Effective Writing (Palgrave Study Skills), Palgrave Macmillan, 2005, 2012
- Seely, John, Oxford Guide to Effective Writing and Speaking. OUP, 2013
- Yadugiri, M A. Making Sense of English – A Textbook of Sounds, Words and Grammar, Viva Books, 2005, 2020

Course Articulation Matrix – B.Com / BBA (All) – 22ENG420

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	3	1	3	2	3	1	3
CO2	3	2	1	1	1	1	1	3	2	3	1	3
CO3	1	1	2	-	3	3	1	2	2	3	1	3
CO4	3	3	2	1	2	3	-	1	3	3	1	3
CO5	3	3	1	1	1	2	1	1	1	3	-	3
WA	2.6	2.4	1.6	1	1.8	2.4	1	2	2	3	1	3

Assessment Pattern for IV Semester Common to all Programs		
A	Formative Assessment	40 Marks
B	Summative Assessment	60 marks
	Total	100 Marks

Formative Assessment	40 Marks
Assessment Occasion/ type	Weightage in Marks
First Internal Test	20
First Class Test/Oral Test/ Assignments/ Surveys/ Interviews	10
Second Class Test/Oral Test/ Assignments/ Surveys/ Interviews	10
Total	40

Question Paper Pattern for Semester End Examination, Common to all Programs

Language English – II

Title of the Paper: Generic English Fiction and Language Component

Time: 2½ hours

Max. Marks: 60

UNIT - 1

I Answer FOUR of the following:

4x5=20

(Characters / Key Incidents from the Novel – 4 questions out of 6 to be answered)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

II Answer ONE of the following:

1x10=10

(Characters / Incidents from the Novel - 1 question out 3 of to be answered)

- 1.
- 2.
- 3.

III Answer TWO of the following:

2X5=10

(Poetry – 2 questions out of 4 to be answered - Poetry)

- 1.
- 2.
- 3.
- 4.

Unit – 2

IV a) Answer ONE of the following:

(1X5=5)

(Speaking Skills – 1 question out of 2 to be answered)

- 1.
- 2.

b) Answer ONE of the following:

(1X5=5)

(Technical Skills – 1 question out of 4 to be answered)

- 1.
- 2.

3.

4.

Va) Answer ONE of the following:

(1X5=5)

(E-mail – Casual and
Professional

– 1 question out of 3 to be answered)

1.

2.

3.

b) Answer ONE of the following:

(1X5=5)

(Social Media Content Writing Skills – 1 question out of 3 to be answered)

1.

2.

3.

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Syllabus DSC(3) Syllabus for B.A. Geography (Basic and Honors)

Semester III

Course Code: 221344	Course Title: Fundamentals of Human Geography (Theory) Fundamental Techniques in Human Geography (Practical)
Course Credits: 06 (4:0:2)	Hours of Teaching/Week: 04 (Theory) + 04 (Practical)
Total Contact Hours: 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2 $\frac{1}{2}$ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs)

1. Associate and describe the basic concepts related to the History and evolution of Human Geography.
2. Interpret the concept of culture and cultural diffusion in the realm of Geography.
3. Analyze and describe the dynamics of geographical population and migration.
4. Analyze and demonstrate the nature of economic activities and human settlements.

Course Content

Content	Hours
UNIT - 1 Introduction to Human Geography	
1.1 Nature and scope, Development and Branches of Human Geography, 1.2 Themes in Geography: Location, Place, Human-Environment Interaction, Movement and Region. 1.3 Man- Environment Relation: Environmental Determinism and Possibilism, Neo- Determinism (stop and go determinism) 1.4 Approaches to Human geography: Exploration and Descriptive Approach, Regional Approach, Areal Differentiation Approach, Spatial organization Approach. Modern Approaches: Welfare or Humanistic Approach, Radical Approach, Behavioral Approach, Post Modernism in geography.	14

UNIT – 2 Cultural patterns and Processes	
<p>2.1 Concept of culture, Material and Non-Material Culture, Cultural traits and Cultural regions.</p> <p>2.2 Meaning and Definition of races, Classification of races, Main characteristics (traits) and Broad racial groups of the world and their distribution.</p> <p>2.3 Languages: Classification and Distribution of languages.</p> <p>2.4 Religion: Types, Classification and Distribution of religions: Hinduism, Christianity, Islam and Buddhism.</p> <p>Assignment: Each student is expected to prepare a brief report on the cultural composition of their own locality/ place/ village/ ward/town or neighborhoods through field Investigation and also can use published data.</p>	14
UNIT – 3 Population and Settlements	
<p>3.1 Distribution and Growth of Population; Factors affecting population Distribution.</p> <p>3.2 Density of Population: Meaning and Types; Arithmetic Density, Physiological Density and Agricultural density, Regional Distribution of Density of Population; Carrying capacity and Sustainability</p> <p>3.3 Concept of Settlements, Origin and evolution of Human settlements, Factors of settlements, origin and distribution, types and pattern of settlements,</p> <p>3.4 Rural and Urban settlements, Trends and Patterns of World Urbanization.</p> <p>Field Activity: Students should study and identify the factors influencing on the origin and growth of the settlement and each student is expected to identify patterns of settlements by visiting nearest settlement.</p> <p>The students are advised to carry topographical map of the place during field visit.</p>	14
UNIT - 4 Economic Activities	

<p>4.1 Concept and Classification of Economic activities; Factors affecting Economic Activities.</p> <p>4.2 Primary Economic Activities – Agriculture, Types: Primitive Subsistence, Intensive Subsistence, Plantation Agriculture, Extensive Commercial grain Cultivation, Mixed Farming, Dairy Farming.</p> <p>4.3 Secondary Activities: Manufacturing, Classification –</p> <p>a. Based on size – Small Scale and Large scale.</p> <p>b. Based on Raw Material – Agro-based, Mineral based, Chemical Based and Forest based.</p> <p>4.3.1. Industrial Regions of the world.</p> <p>4.4 Tertiary Activities: Types: Trade and Commerce, Retail Trading Services, Wholesale Trading. Transport and communications: Factors. Communication Services – Telecommunication Services: Informal and Non formal sector. Information technology and service.</p> <p>Case Study: Students have to visit a village/a town nearby and observe the economic activities and understand different classes and identify the most dominant economic activities.</p>	<p>14</p>
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References:

- 1) De Blij H. J. Alexander B Murphy, Erin H Fouberg, (2006) Human Geography: people, Place and culture, Abe books Published by Wiley ISBN 10: 0471679518 / ISBN 13: 9780471679516
- 2) Sarah Bendarz, Mark Bockenbauer, Fredrik Hiebert, 2020, Human Geography: A Spatial Perspective; National Geographic School Pub Inc.
- 3) Majid Hussein 2018 Human Geography, Rawat Publication (Fifth Edition)
- 4) David Dorrell, Joseph Henderson, Todd Lindley and Georgeta Connor (2019) Introduction to Human Geography, University System of Georgia
- 5) Hartshorne, T.A., & Alexander, J.W. (2010). Economic Geography. New Delhi: PHI Learning.
- 6) Nellson, Gabler Vining (1995) Human Geography, People, Cultures and Landscapes
- 7) Ranganath (2002) Principles of Human Geography (Kannada Version) Vidyanidhi, Gadag
- 8) Rubenstein J.M (2016). An Introduction to Human Geography, Macmillan Publishing Company, New York
- 9) Siddhartha, K. (2000). Economic Geography: Theories, Process and Patterns, New Delhi: Kosalaya Publications.
- 10) Smith, D.M. (1971). Industrial Location: An Economic Geographical Analysis, New York: John Wiley and Sons.

Webiste links:

- 1) A P Human Geography
- 2) <https://ung.edu/university-press/books/introduction-to-human-geography.php>
- 3) <https://www.thoughtco.com>
- 4) <https://ncert.nic.in>
- 5) <https://vedantu.com>

DSC (3)-Lab

Fundamental Techniques in Human Geography Practical

Content of the Practical Course		Hours
Exercise 1	Maps: Definition, Elements of map: scale, direction, map projection, conventional signs and symbols, legend, Types of map: 1. Based on scale: A. large scale: cadastral maps, Topographic maps, B. Small scale: wall maps, atlas maps, maps 2. Based on purpose and content: Physical Maps, Political Maps, Thematic Maps. Uses of Maps.	08
Exercise 2	Map Scales: Definition of Scale, Methods of representing Scales: Statement Method, Graphical Method, Ratio Method (R F).	08
Exercise 3	Conversion of Scale: Verbal to RF, RF to Verbal, Verbal to Graphical. Exercises on Measuring Distances on Map and converting map distance to ground distance.	08
Exercise 4 and 5	Map Projections: Meaning and Purpose, Latitudes and Longitudes, Classification of Map Projections and their general properties: Conical Projections, Cylindrical Projections, Zenithal Projections. UTM Projections. Choice of Map Projection.	08
Exercise 6	Drawing of conical projection with One Std. Parallel and Two Std. Parallels,	08
Exercise 7	Drawing of Cylindrical Equal Area Projection.	06
Exercise 8	Drawing of Zenithal Polar Gnomonic Projection.	06
Exercise 9	Introduction to UTM Projection, uses and importance.	04

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1. Dr.L.R.Singh (2010), Fundamentals Of Practical Geography, Sharda Pustak Bhavan, Allahabad, India.
2. Pijushkanti Saha, Partha Basu (2013) Advanced Practical Geography
3. Ashis Sarkar (2015) Practical Geography: A Systematic Approach, Orient Black swan Pvt Ltd.
4. Rana Pb Singh RI Singh (2018), Elements of Practical Geography. Kalyani Publishers
5. Dent B.D., 1999. Cartography: Thematic Map Design, (Vol. 1), McGraw Hill
6. Gupta K.K and Tyagi V.C., 1992. Working with Maps, Survey of India, DST, New Delhi.
7. Mishra R.P. and Ramesh A., 1989. Fundamentals of Cartography, Concept Publishing.
8. Monk house, F.J. and Wilkinson, H.R., 1971. Maps and Diagrams. Methuen and Co. Ltd., London. K.
9. Singh, R.L., 2005. Elements of Practical Geography. Kalyani Publishers, New Delhi. India.

Course Articulation Matrix-221344

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	-	2	2	1	-	-	-	2
CO2	2	2	1	1	-	2	2	1	1	-	-	2
CO3	2	2	1	1	-	2	2	1	1	-	-	2
CO4	2	2	1	1	-	1	2	1	1	-	-	2
Weighted Average	2	2	1.25	1	-	1.75	2	1	1	-	-	2

OE(3) Geography Syllabus for All Programs(Except Arts)

Semester III

Course Code: 22OEGEO301	Course Title: Geography of India
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 3 Hours (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours (Theory)	Semester End Examination Marks: 60

Course Outcomes (COs):

1. Acquire the knowledge of location, relief features, climate and vegetation of India.
2. Examine and interrelate the Irrigation and Agricultural systems in India.
3. Analyze the nature and challenges associated with natural resources and Industries in Indian context.
4. Describe the modes of transport and communication and analyze the dynamics of Human Population.

Course Content

UNIT - 1 Physical Basis	12 HOURS
1.1 Location, Size and Extent, Political Divisions	
1.2 Relief Features-Northern Mountains, Northern Great Plain, The Peninsular Plateau and Coastal Plain and Islands	
1.3 Climate: Seasons – Summer Season, South-West Monsoon, Retreating Monsoon Season, Winter Season,	
1.4 Drainage system- Rivers of North India, Rivers of South India,	
1.5 Vegetation - Types and Distribution- Afforestation programs	
UNIT - 2 Irrigation and Agriculture	10 HOURS
2.1 Irrigation: Need for Irrigation and Types	
2.2 Soils- Types and Distribution, Issues and conservation	
2.3 Irrigation: Need for Irrigation and Types	
2.4 Agriculture: Significance and Types- Intensive and Extensive Farming, Subsistence and Mixed Farming	
2.5 Major Crops- Production and Distribution: Rice, Wheat, Cotton, Sugar cane and Tea, Development of Agriculture- Green Revolution	

UNIT - 3 Minerals, Power and Industries	10 HOURS
<p>3.1 Mineral and Power Resources-Types and Significance</p> <p>3.2 Production and Distribution: Iron Ore, Manganese</p> <p>3.3 Production and Distribution: Coal, Petroleum, Hydro Electricity</p> <p>3.4 Major industries- Iron and Steel, Cotton textile, Sugar.</p> <p>3.5 Major industrial regions of India</p> <p>3.6 Special Economic Zones</p>	
UNIT - 4 Transport, Communication and Human Population	10 HOURS
<p>4.1 Roadways, Railways, Airways and Waterways.</p> <p>4.2 Important Ports: Calcutta, Chennai, Mumbai and New Mangalore.</p> <p>4.3 Indian Space Programme (Indian Communication Satellites)</p> <p>4.4 Growth of Population</p> <p>4.5 Distribution and Density of Population</p> <p>4.6 Population Composition – Sex Ratio, Literacy</p> <p>4.7 Population Issues</p>	

References:

1. Gopal Singh : Geography of India, Atmarama and Sons, New Delhi.
2. Hussain M, 2014, Geography of India, Tata McGraw-Hill Education- New Delhi
3. ICAR: Cropping pattern in India, 1974.
4. Mathur, S.M.: Physical Geology of India, NBT 1991.
5. Ranganath : Regional and economic Geography of India (Kan. Ver) Vidyanidhi Prakashana, Gadag, 2020.
6. Mallappa P : Economic Geography of India (Kan. Ver.) K V Lalitha Publishers
7. Ranjit Thirtha, 1996, Geography of India, Raniat, Jaipur.
8. Khullar D.R. 2000, India a Comprehensive Geography , Kalyani Publishers, Ludhiana.
9. Sharma T C, 2012, Economic Geography of India, Rawath Publications, Delhi
10. Tiwari R.C 2006, Geography of India, Prayag Pustak Bhawan, Allahabad,

11. Pritivish Nag & Smita Sengupta, 1992, Geography of India, Concept Publishing Company, New Delhi.
12. Ranganatha, 2007, Geography of India, Vidhyanidhi Prakashan, Station Road, Gadag-01.
13. Phani Deka & Abani Bhagabati, 1992, Geography: Economic and Regional, Wiley Eastern Limited, Ansari Road, Daryaganj, N. Delhi-01.

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2. <https://agricoop.nic.in/en>
3. <https://www.resourcedata.org/dataset/rgi-ministry-of-minerals-energy-and-water-resources>
4. <https://dpiit.gov.in/>
5. <http://rfrfoundation.org/nadi-ko-jano/>
6. <https://jalshakti-ddws.gov.in/>
7. ISRO WEBSITE.....

Course Articulation Matrix _ 220EGE0301

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	3	1	1	1	1	3
CO2	3	2	1	1	2	2	3	1	-	-	1	3
CO3	2	2	1	1	1	2	3	1	-	-	1	3
CO4	2	2	1	1	1	2	3	1	1	-	1	3
Weighted Average	2.5	2	1.25	1.25	1.5	2	3	1	1	1	1	3

OE(3) Geography Syllabus for All Programs(Except Arts)

Semester III

Course Code: 22OEGE0302	Course Title: Application of GIS and Remote sensing
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 3 Hours (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours (Theory)	Semester End Examination Marks: 60

Course Outcomes (COs):

1. Describe the basic concepts associated with the evolution of remote sensing.
2. Analyze the factors of remote sensing and their application in different areas.
3. Interpret the concepts, components and data structures in GIS.
4. Examine and describe the nature of Data analysis and its application in the context of GIS.

Course Content

UNIT - 1	12 HOURS
Remote Sensing; Concept, Definition, Evolution of Remote Sensing, Process of Remote sensing, EMR; Wave length, Frequency, Electromagnetic Spectrum; Bands, Atmospheric window, Interaction of EMR with atmosphere and surface. Spectral signature.	
UNIT - 2	10 HOURS
Remote Sensing Platforms, Orbit, Active and Passive Remote Sensing, Indian remote sensing satellites and launch vehicle's, Application of Remote Sensing in Agriculture, Disaster management, Urban studies, Coastal management and EIA.	
UNIT - 3	10 HOURS
Geographic information System; Definition, Development of GIS, Components of GIS, Data types; Spatial and Non-spatial data, Raster and Vector data models, Data Sources, errors, Data input methods; Manual and Automated.	
UNIT - 4	10 HOURS
Data Analysis; Buffer Analysis and its applications, Overlay functions, Query, Network Analysis, GIS Applications in urban monitoring & planning, Disaster Mitigation, Forestry, Wetland monitoring.	

References:

1. Lilles and Thomas M. & Kiefer Ralph: Remote Sensing and Image Interpretation Third Edition John Wiley
2. Campbell John B.: Introduction to Remote Sensing Taylor & Francis
3. Floyd F. Sabins : Remote Sensing and Principles and Image Interpretation
4. Manual of Remote Sensing: American Society of Photogrammetry and Remote Sensing.
5. George Joseph: Fundamentals of Remote Sensing; Universities Press India Pvt Ltd, Hyderabad, India
6. Editors: John D. Bossler; John R. Jensen; Robert B. McMaster; Chris Rizos, 2001. Manual of Geospatial Science and Technology, November 2001, Vol 1 Part 1 and II.
7. Paul M. Mather, 1999. Computer Processing of Remotely sensed Images: An Introduction. John Wiley
8. Aronoff, S. (1991). Geographic Information Systems: A Management Perspective, WDL Publications, Ottawa, Canada.
9. Chang, Kang-Tsung (2006). Introduction to geographic information systems. Boston: McGraw-

Hill Higher Education.

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11. Bernhardsen, T. (2002). Geographic information systems: an introduction. John Wiley & Sons.
12. Ian Heywood, Sarah Cornelius and Steve Carver (2010). An introduction to geographical information systems. Prentice Hall - Pearson Education limited.
13. Chang, Kang-tsung (2002). Introduction to Geographic Information Systems, McGraw-Hill Companies, Inc
14. Chrisman, N. (1997): Exploring Geographic Information systems, John Wiley & Sons., New York
15. The ESRI Guide to GIS Analysis, by Andy Mitchell, ESRI Press, 1999, 188 pp.

Websites:

1. <https://neo.sci.gsfc.nasa.gov/>
2. <https://earthexplorer.usgs.gov/> Satellite
3. <https://scihub.copernicus.eu/>
4. <https://search.earthdata.nasa.gov/> Science data
5. <https://www.class.ngdc.noaa.gov/>

Course Articulation Matrix-22OEGEO302

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	1	2	-	-	-	-	2
CO2	2	2	2	2	2	2	2	1	1	-	1	2
CO3	2	-	2	-	2	1	2	-	-	-	1	2
CO4	2	2	3	2	2	2	2	1	1	-	-	2
Weighted Average	2	2	2.25	1.66	2	1.5	2	1	1	-	1	2

Scheme of Valuation for Practical Examinations- III Semester

C1 and C2 are internal tests to be conducted during 8th and 16th weeks respectively of the semester. C3 is the semester-end examination conducted for 3 hours. The student will be evaluated on the basis of procedure development and its execution. The student has to compulsorily submit the practical record for evaluation during C2. For C3, the record has to be certified by the Head of the Department.

- The student is evaluated for 25 marks in C1 and C2 as per the following scheme:
Part-A Practical Exercises (C1): 10 marks
Part-B Practical Exercises (C2): 10 marks + Record: 05 marks = 15 marks
- The student is evaluated for 25 marks in C3 as per the following scheme:

Assessment Criteria	Marks
Maps	04
Maps Scales	04
Conversion of Scales	04
Maps Projections	04
Drawing of Projection	09
Total	25

Syllabus DSC (4) Syllabus for B.A. Geography (Basic and Honors)

Semester IV

Course Code: 221444	Course Title: India- Resources and Sustainability(Theory) Representation of Indian Geographical features and Resources (Practical)
Course Credits: 06 (4:0:2)	Hours of Teaching/Week: 04 (Theory) + 04 (Practical)
Total Contact Hours: 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2 $\frac{1}{2}$ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs):

1. Associate and explain the different types and factors associated with Physical features in the Indian context.
2. Describe nature and interplay between water and agricultural resources
3. Analyze the origin, significance and challenges associated with Industries, transportation and communication in Indian context.
4. Analyze and interpret the nature and dynamics of Human resources.

Course Content:

Content	Hours
UNIT – 1 Physical Setting:	
1.1.Location, Size and Extent. Major Physiographic Regions-Northern Mountains, Northern Great Plains, Peninsular Plateau and Coastal Plains and Islands and their Characteristics;	14
1.2.Climate: Seasonal Weather Characteristics, Climatic Zones. Mechanism and Characteristics of Indian Monsoons.	
1.3.Tropical Cyclones and Western Disturbances.	
1.4.Floods and Droughts	
1.5.Drainage System.	
1.6.Soil: Types, Erosion and Conservation.	

1.7. Vegetation: Types, Distribution, Afforestation programs, National Parks, Wildlife Sanctuaries, and Biosphere reserves.	
UNIT – 2 Water and Agricultural Resources:	
2.1. Water resources of India, Surface and Groundwater, Water Demand and Utilization.	14
2.2. Irrigation: Sources, Types and Intensity. Issues and Challenges: Water Resources Scarcity, Water Conservation and Management.	
2.3. Watershed Management, Rainwater Harvesting, Recycle and Reuse of water. Interlinking of Rivers,	
2.4. National Water Policies, National Water Mission, Jalashakti Abhiyaan.	
UNIT – 3 Industries, Transportation and Communication:	
3.1. Locational factors of industries, Major Industrial Regions and their characteristics	
3.2. Classification of Industries: Agro-based, Mineral-based, Forest-based and Animal-based industries.	
3.3. Special Economic Zones: Industrial / Economic Corridor.	
3.4. Transport & Communication: Significance, Growth and Development– Road ways, Railways, Waterways, Airways and Pipeline Networks and their Complementary and Competition.	
3.5. Communication: Means of Communication and their Significance	
Assignment: Selecting a region students have to study the locational factors nearby industry and prepare a report.	
Unit – 4 Human Resources:	
4.1. Growth, Distribution and Density of Population.	
4.2. Composition of Population: Age, Sex, Rural-Urban Population Composition.	
4.3. Migration: Meaning, Factors, Types, Causes and Consequences.	
4.4. Human Development in India: Measures, Levels of Development based on HDI	
4.5. Field Study: Selecting a region / district students have to examine the levels of Human Development using HDI and prepare a report.	
Command Area Development and Water Management. Central Water	

Commission and Water Tribunal and their role.

2.5.Agriculture: Land Use and Cropping Pattern – Meaning and Concepts, Land Use and Cropping Pattern in India, Agro-climatic Regions, Green Revolution – Causes and Effects, Hunger Index and Malnutrition; Food security and right to food to achieve Zero hunger and Good Health and Wellbeing.

References:

1. Majid Husain (2020) Geography of India, McGraw Hill Publishers
2. R.C. Tiwari (2016) Geography of India, Provolika Publications, Allahabad
3. D.R.Khullar (2019) India: A Comprehensive Geography, Kalyani Publishers
4. R.L.Singh (1993) India: A Regional Geography, National Geographical Society of India, New Delhi.
5. Dr Deep Shikha (2016) Geography of India - A Text Book;
6. AlkaGautam (2009) Geography of India, Sharada pustak bhawan, University Road, Allahabad – UP.
7. Sharma TC & Coutinho O (2005) : Economic and Commercial geography of India, Vikas Publishing House Ltd., New Delhi-14
8. Pritivish Nag & Smita Sengupta (1992) Geography of India, Concept Publishing Company, New Delhi.
9. Ranganath (2007) Geography of India, Vidhyanidhi Prakashan, Station Road, Gadag-01

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3. <https://tourism.gov.in/>
4. <https://www.resourcedata.org/dataset/rgi-ministry-of-minerals-energy-and-water-resources>
5. <https://dpiit.gov.in/>
6. <https://agricoop.nic.in/en>
7. <https://www.fao.org/soils-portal/en/>

DSC(4)-Lab

Representation of Indian Geographical features and Resources

	Content of the Practical Course	Hours
Ex.No.1	<p>Mapping exercises on Indian outline Map: International Boundaries, Mountain peaks, Passes, Glaciers and important Physical Divisions of India, Rivers, National Biospheres and National Parks, Dams and Reservoirs, Lakes and Water Bodies, Islands, National Waterways, Ports and Harbours, National High ways, Important Airports, Industrial Corridors, Important Coastal Zones and Beaches, Ecologically Sensitive areas, Important industrial zones, Special Economic Zones, Resource centres and Mining, Cultural Regions, Tribal Areas.</p> <p>Note: Each student is expected to complete at least 3 mapping exercises from the above topics which should cover brief description on: Location (Latitude and longitude, state, district, place,) geographic/environmental/ ecological/ political/ economic significance of the place/ location. Minimum 10 locations shall be involved in each exercise.</p>	10
Ex.no.2 and 3,	Mapping Temperature and Rainfall Distribution of India / Karnataka using Isoleth method.	10
Ex.no.4 and 5	Mapping of Agro-climatic zones of India, Flood Prone and Drought Prone Areas	8
Ex. No.6 and 7	Mapping of Cropping Pattern and Crop intensity of India/ Karnataka. Weaver's Method, Bhatia's Method. Calculation and mapping of Irrigation intensity.	10
Ex.no.8	Human Development Index: Concept, Calculation and Mapping	6
Ex.no.9	Gender Development Index: Concept, Calculation and Mapping	6
Ex.no.10	Human Poverty Index: Concept and Calculation and Mapping	6

Reference:

- 1) Hartshorne, T.A., & Alexander, J.W. (2010). Economic Geography. New Delhi: PHI Learning.
- 2) Knox, P., Agnew, J., & Mc Carthy, L. (2008). The Geography of the World Economy. London: Hodder Arnold.
- 3) Lloyd, P., & Dicken, B. (1972). Location in Space: A Theoretical Approach to Economic Geography. New York: Harper and Row.
- 4) Siddhartha, K. (2000). Economic Geography: Theories, Processes and Patterns, New Delhi: Kishore Publications.
- 5) Smith, D.M. (1971). Industrial Location: An Economic Geographical Analysis, New York: John Wiley and Sons.

Websites:

1. <https://www.india.gov.in> › india-glance
2. <https://www.mapsofindia.com>
3. <https://en.wikipedia.org>
4. <https://kids.nationalgeographic.com>
5. <https://byjus.com> › UPSC Preparation

Course Articulation Matrix - 221444

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	2	1	1	1	2	3
CO2	3	2	-	-	-	3	3	2	1	-	1	3
CO3	2	2	2	1	1	2	3	1	-	-	-	2
CO4	2	2	1	1	-	2	2	1	-	-	-	2
Weighted Average	2.5	2	1.66	1.33	1.5	2.25	2.5	1.25	1	1	1.5	2.5

OE(4) Geography Syllabus for All Programs(Except Arts)

Semester IV

Course Code: 22OEGEO401	Course Title: Geography of Karnataka
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 3 Hours (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours (Theory)	Semester End Examination Marks: 60

Course Outcomes (COs):

- 1.Acquire the knowledge of basic Physical features , climate and vegetation in reference to specific landscape of Karnataka.
2. Analyze the different aspects of Soil, Irrigation and Agriculture and their interrelation.
3. Examine the natural resources and their utilization in the Industries; especially in special Economic zones (SEZ's).
- 4.Analyze the emergence and growth of transport and Information technology in the context of Karnataka; and also describe the socio-demographics distinctly .

Course Content

UNIT - 1 Physical Background	12 HOURS
1.1.Location, size and Administrative divisions.	
1.2.Physiographic Divisions: Coastal Regions, Malnad Regions and Maidan Regions.	
1.3.Weather and Climate: Seasons, Distribution of Rainfall and Temperature, Climatic regions, Drought prone areas in Karnataka.	
1.4.Drainage Systems: Major Drainage Systems in Karnataka. East flowing rivers and West flowing rivers.	
1.5.Natural Vegetation: Types of vegetation, Distribution of forests in Karnataka, Protection and Conservations. Reserve Forests and Protected Forests in Karnataka, National Parks and Bird Sanctuaries in Karnataka.	
UNIT - 2 Soil, irrigation and Agriculture	10 HOURS
2.1.Soil: Types and Distribution, Regional Issues of Soil Quality and Management.	
2.2.Water Resources: Distribution of Water Resources, Irrigation – Sources of irrigation, Multipurpose River Valley Projects.	

2.3. River Water Disputes with the neighbouring states.

2.4. Agriculture regions of Karnataka. Major Food Crops – Paddy, Ragi, Maize, Pulses.

2.5. Commercial Crops – Cotton, Sugarcane, Tobacco, Coffee, Spices,

2.6. Livestock and Fishing.

Assignment: Students need to visit local fields and get to know how soil conservation plans are prepared and submit report

UNIT - 3 Minerals, Energy and Manufacturing:

10 HOURS

3.1. Major Mineral resources of Karnataka and their Regionalization. Iron ore, Manganese, Gold, Bauxite

3.2. Energy Resources: Types and their Distributions. Conventional and Non-Conventional Sources.

3.3. Industries: Textile Industries, Iron and Steel Industries, Sugar Industries. Industrial Regions and Special Economic Zones of Karnataka.

UNIT –4. Transport, Information & Communication Technology and Population 10 HOURS

4.1. Transportation: Types, Distribution of Transportation.

4.2. Growth and Distribution of Information Technology in Karnataka.

4.3. Population Growth, Distribution and Density of Population. Population Composition – Sex Ratio, Literacy. Human Development in Karnataka (HDI)

Reference:

1. Ranganath (2015), Geography of Karnataka, Publisher: Mysore Book House
2. S.S.Nanjannavar (2016), Geography of Karnataka, Prabhu publications
3. R. N. Tikka (2002), Physical Geography
4. Misra R.P (1969) Geography of Mysore State
5. Sarmah Dipak (2019), Forest of Karnataka-A Panoramic View, Notion Press
6. Director, Census Reports Published by Govt. of Karnataka
7. Karnataka State Gazetteer Volume- I & II

Websites:

1. <https://ksrsac.karnataka.gov.in/>
2. <https://ksdma.karnataka.gov.in/english>
3. <https://raitamitra.karnataka.gov.in/english>
4. <https://www.karnatakaturism.org/tourism-department/>

Course Articulation Matrix – 22OEGEO401

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	2	1	1	1	2	3
CO2	3	2	-	-	-	3	3	2	1	-	1	3
CO3	2	2	2	1	1	2	3	1	-	-	-	2
CO4	2	2	1	1	-	2	2	1	-	-	-	2
Weighted Average	2.5	2	1.66	1.33	1.5	2.25	2.5	1.25	1	1	1.5	2.5

OE(4) Geography Syllabus for All Programs(Except Arts)

Course Code: 22OEGEO402	Course Title: Population and Settlement Geography
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 3 Hours (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours (Theory)	Semester End Examination Marks: 60

Course Outcomes (COs):

1. Understand the basic concepts of Socio- demographics in Population and Human Settlement.
2. Determine and explain the dynamics of human Demography.
3. Analyze of the interaction between man-environment and its influence on Human settlements.
4. Classify and interpret the nature and structure of Human settlements in rural and urban contexts.

Course Content

UNIT - 1 Population Geography	12 HOURS
1.1. Meaning, Definitions, Scope and nature of population geography 1.2. Global Population size and growth, Malthus Theory, Demographic Transition Theory 1.3. Over, Under and Optimum Population 1.4. Population Policies in the world – Social Well being, Quality of Life	
UNIT - 2 Population Dynamics	10 HOURS
2.1. Fertility – Measures and Distribution 2.2. Mortality – Measures and Distribution 2.3. Migration – Types, Causes and Consequences	
UNIT - 3 Settlement Geography	10 HOURS
3.1. Meaning, Definitions, nature and importance of settlement geography, 3.2. Origin of settlement, influencing factors 3.3. Site and situation of settlement – Stable and Unstable settlement	
UNIT -4. Classification of Settlements- Rural and Urban Settlements	10 HOURS
4.1. Rural Settlement – Types, Pattern, Functions 4.2. Rural-Urban Continuum and Fringe 4.3. Urban Settlement - Definition of urban place, Hierarchy, 4.4. Functional classification of towns, Concept of Urban morphology. 4.5. Primate City, Rank Size Rule	

References:

1. Alan Bowman and Andrew Wilson (2011), Settlement, Urbanization, and Population, Oxford University Press, UK.
2. Chandna R.C (2011), Geography of Population, Kalyani publishers, Bangalore.
3. Izzi Howell (2019), Population and Settlement Geography (Geographics), Franklin Watts, UK.
4. John Pallister (2004), GCSE Geography: Human - Population and Settlement, Hodder Education Group, UK.
5. Majid Husain (2011) Human Geography, Rawat Publication, Jaipur.
6. Prithvish Nag, Debnath (2021), Population Geography, BharatiPrakashan, Bangalore.
7. Rama Yagya Singh (1994), Geography of Settlement, Rawat Publications, Jaipur
8. Sumita Ghosh (1998), Introduction to Settlement Geography, Orient Longman, Hyderabad.

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2. <https://www.thegeographeronline.net>
3. <https://lotusarise.com> › introduction-to-settlement-
4. <https://www.geographypods.com>
5. <https://en.wikipedia.org>
6. <http://www.rnlkwc.ac.in>

Course Articulation Matrix – 22OEGEO402

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	1	-	3	3	1	-	-	-	2
CO2	2	2	2	1	1	2	2	2	-	-	-	2
CO3	2	1	1	1	2	-	2	2	1	-	-	2
CO4	2	2	2	2	1	2	2	1	-	-	1	3
Weighted Average	2.25	1.66	1.66	1.25	1.33	2.33	2.25	1.5	1	-	1	2.25

Course Structure (NEP)

AECC (Hindi)

II YEAR

Course Type, Code and Name	HOURS/ WEEK		CREDITS			MARKS			Durati on of Exam	Total			
						IA	EXA M			Marks			
	L	T	L	T	P	C1	C2	C3					
HINDI III SEM													
AECC-3	2		2			2:1:0			20	20	60	2½ Hours	100
हिन्दी कविता + सरकारी पत्राचार, पारिभाषिक, शब्दावली. B.Com/BBA(All) - 22HIN306													
AECC-3	2		2			2:1:0			20	20	60	2½ Hours	100
हिन्दी नाटक साहित्य +संचार माध्यम और हिंदी BCA/BSc/ BA - 22HIN307													
HINDI IV sem													
AECC-4	2		2			2:1:0			20	20	60	2½ Hours	100
हिन्दी नाटक साहित्य +संचार माध्यम और हिंदी B.Com/BBA(All) - 22HIN406													
AECC-4	2		2			2:1:0			20	20	60	2½ Hours	100
हिन्दी गद्य + सरकारी पत्राचार, शब्दावली पारिभाषिक, BCA/BSc/ BA - 22HIN407													

AECC (3) HINDI Syllabus for B.Com/BBA(All)

Semester III Course Code: 22HIN306	Course Title: AECC(3) हिन्दी कविता + सरकारी पत्राचार, पारिभाषिक, शब्दावली
Course Credits: 02 (2:1:0)	No. of Teaching Hours/Week: 02 Hours (Theory) 02 Hours (Tutorials))
Total Contact Hours: 32 Hours (Theory) 32 Hours (Tutorials)	Formative Assessment Marks: 40
Exam Duration: 2½ Hours (Theory)	Semester End Examination Marks: 60 (Theory)

Course Outcomes (COs):

- CO1: Awareness of the richness of Indian tradition and culture; Imbibe values for life-long character shaping.
- CO2: Strong decision making skills with a vision for clear goal setting.
- CO3: Insight into the current Socio-political and economic situation of the Society; reverence for struggle and sacrifice of the freedom fighters.
- CO4: Ability to use learned skills as a mechanism for better communication; Adopt values in life for Harmonious living.

Course Content:

Course Content	Hours
UNIT - 1	
मैथिलीशरण गुप्त- भारत की श्रेष्ठता. सुमित्रानंदन पंत- बापू सूर्यकांत त्रिपाठी निराला- तोडती पत्थर.	12
UNIT - 2	
केदारनाथ अग्रवाल- यह धरती है उस किसान की हरिवंशराय बच्चन- पथ की पहचान सुभद्राकुमारी चौहान- झाँसी* की रानी	14
UNIT - 3	
भवानी प्रसाद मिश्र- गीतफरोश नागार्जुन- प्रेत का बयान	12
UNIT - 4	16

सरकारी पत्राचार - सरकारी पत्र व्यवहार और पारिभाषिक शब्दावली. 1.सरकारी पत्र व्यवहार का सामान्य परिचय- गुण-लक्षण, सरकारी पत्र के विभिन्न प्रकार, अ) सामान्य सरकारी पत्र, आ) परिपत्र, इ) कार्यालय ज्ञापन ई) प्रेस-विज्ञप्ति और प्रेस नोट	
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Activity : विद्यार्थियों को पाठ पढ़ाना, सप्ताह में एक दिन समाप्त किये गये पाठ का सार लिखकर कक्षा में (संगोष्ठी), पाठ का संदेश लिखना, शुद्ध हिन्दी लिखना (कार्यशाला) ।

पढ़ना

10

Text Book: पद्य संचयन-सुष्मा अग्रवाल

Recommended Books :

- राजभाषा हिंदी राजकीय पत्रव्यवहार – डॉ. घनश्याम अग्रवाल, जयभारती प्रकाशन, माया प्रेस रोड, इलाहाबाद-3
- अभिनव व्यावहारिक हिन्दी-डॉ.परमानन्द गुप्त.विद्या मंदिर. बेंगलूर-२.
- <https://www.youtube.com/watch?v=iW-1sCzWHNM>
- <https://www.youtube.com/watch?v=5qjlpP7i70>

Course Articulation Matrix – 22HIN306

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	1	1	2	1	3	2	3	1	2
CO 2	2	2	1	1	1	2	1	3	2	3	1	2
CO 3	2	2	1	1	1	2	1	3	2	3	1	2
CO 4	3	2	1	1	1	1	1	-	1	3	1	2
Weighted Average	2.25	2	1	1	1	1.75	1	2.22	1.25	3	1	2

AECC(3) HINDI Syllabus for BA/BCA/BSc

Semester III Course Code: 22HIN307	Course Title: AECC(3) Hindi Natak aur Sanchar Madyam our Hindi
Course Credits: 02 (2:1:0)	No. of Teaching Hours/Week: 02 Hours (Theory) 02 Hours (Tutorials)
Total Contact Hours: 32 Hours (Theory) 32 Hours (Tutorials)	Formative Assessment Marks: 40
Exam Duration: 2½ Hours (Theory)	Semester End Examination Marks: 60 (Theory)

Course Outcomes (COs):

CO1: Understand the concept of drama and process of dramatics to pursue acting as a career.

CO2: Obtain Knowledge of Indian art, architecture, heritage and historical events.

CO3: Imbibe good morals and values to shape as a better humanbeing with rationale thinking.

CO4: Equipped with skills of communicative Hindi for various digital and non-digital platforms.

Course Content:

Course Content Content	Hours
UNIT - 1	
Chaper I of the Drama	12
UNIT - 2	
Chaper II of the Drama	14
UNIT - 3	
Chaper III of the Drama	12

UNIT - 4	16
<p>संचार माध्यम और हिंदी 1 to 02 Hours</p> <ul style="list-style-type: none"> -संचार माध्यम प्रस्तावना, 1 to 02 Hours - परिभाषा, स्वरूप 1 to 02 Hours - भेद (प्रकार) एवं महत्व, 1 to 02 Hours -उद्देश्य. 1 Hour - संचार भाषा के रूप में हिन्दी 1 to 02 Hours -संचार माध्यमों से जनता पर प्रभाव. 1 to 02 Hours 	

Activity : विद्यार्थियों को पाठ पढ़ाना, सप्ताह में एक दिन समाप्त किये गये पाठ का सार लिखकर कक्षा में (संगोष्ठी), पाठ का संदेश लिखना, शुद्ध हिन्दी लिखना (कार्यशाला) ।

पढ़ना

10

Text Book: कोणार्क-जगदीश चन्द्र माथुर

Recommended Books :

- पत्रकारिता की विविध विधियाँ- डॉ. राजकुमार श्रीवास्तव- जयभारती प्रकाशन, माया प्रेस रोड, इलाहाबाद-
- व्यावसायिक संप्रेषण- अनुपचंद भयानी- प्रकाशक- राजपास एण्ड सन्स, दिल्ली
- संचार, सूचना, कम्प्यूटर और प्रयोजनमूलक हिन्दी जगत-डॉ. एम. वासन्ती-जवाहर पुस्तकालय, मथुरा-281001.
- <https://www.youtube.com/watch?v=IWf2InPiwb8>
- <https://www.youtube.com/watch?v=OlbtgjVBVcw>
- <https://www.youtube.com/watch?v=Vgcb9TIS-2w>
- <https://www.youtube.com/watch?v=1YrhckUjdtI>

Course Articulation Matrix – 22HIN307

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	1	1	2	1	3	2	3	1	2
CO 2	2	2	1	1	1	2	1	3	2	3	1	2
CO 3	2	2	1	1	1	2	1	3	2	3	1	2
CO 4	3	2	1	1	1	1	1	-	1	3	1	2
Weighted Average	2.25	2	1	1	1	1.75	1	2.22	1.25	3	1	2

AECC(4) HINDI Syllabus for B.Com/BBA(All)

Semester IV Course Code: 22HIN406	Course Title: AECC(4) Hindi Natak aur Sanchar Madyam Aur Hindi
Course Credits: 02 (2:1:0)	No. of Teaching Hours/Week: 02 Hours (Theory) 02 Hours (Tutorials)
Total Contact Hours: 32 Hours (Theory) 32 Hours (Tutorials)	Formative Assessment Marks: 40
Exam Duration: 2½ Hours (Theory)	Semester End Examination Marks: 60 (Theory)

Course Outcomes (COs):

CO1: Grasp about Enacting Drama, one should become the actor, Knowing Great Indian Traditions and Heritage .Art and Architecture. Culture. Believes. Character Building, Analyze and adopt the good Character in the life, Develop a New Ideas. Inculcate Communication Skills.

CO2: Patriotism, Selfish character in the society. Ability to take right Decisions.

CO3: Dramatic turn in the life. Delicacy, Study of Indian Historical events and Hummanity.

CO4: Usage of Communicative Hindi in Different Digital Non digital Platforms.

Course Content:

Course Content Content	Hours
UNIT - 1	
Chapter I of the Drama	12
UNIT - 2	
Chapter II of the Drama	14
UNIT - 3	
Chapter III of the Drama	12

UNIT - 4	16
<p>संचार माध्यम और हिंदी 1 to 02 Hours</p> <ul style="list-style-type: none"> -संचार माध्यम प्रस्तावना, 1 to 02 Hours - परिभाषा, स्वरूप 1 to 02 Hours - भेद (प्रकार) एवं महत्व, 1 to 02 Hours -उद्देश्य. 1 Hour - संचार भाषा के रूप में हिन्दी 1 to 02 Hours -संचार माध्यमों से जनता पर प्रभाव. 1 to 02 Hours 	

Activity : विद्यार्थियों को पाठ पढ़ाना, सप्ताह में एक दिन समाप्त किये गये पाठ का सार लिखकर कक्षा में (संगोष्ठी), पाठ का संदेश लिखना, शुद्ध हिन्दी लिखना (कार्यशाला) । 10

पढ़ना

Text Book:कोणार्क-जगदीश चन्द्र माथुर

Recommended Books :

- पत्रकारिता की विविध विधाएँ- डॉ. राजकुमार श्रीवास्तव- जयभारती प्रकाशन, माया प्रेस रोड, इलाहाबाद-
- व्यावसायिक संप्रेषण- अनुपचंद्र भयानी- प्रकाशक- राजपास एण्ड सन्स, दिल्ली
- संचार, सूचना, कम्प्यूटर और प्रयोजनमूलक हिन्दी जगत-डॉ. एम. वासन्ती-जवाहर पुस्तकालय, मथुरा-281001.
- <https://www.youtube.com/watch?v=IWf2InPiwb8>
- <https://www.youtube.com/watch?v=OlbtgjVBVcw>
- <https://www.youtube.com/watch?v=Vgcb9TIS-2w>
- <https://www.youtube.com/watch?v=1YrhckUjdtl>

Course Articulation Matrix – 22HIN406

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	1	1	2	1	3	2	3	1	2
CO 2	2	2	1	1	1	2	1	3	2	3	1	2
CO 3	2	2	1	1	1	2	1	3	2	3	1	2
CO 4	2	2	1	1	1	1	1	-	1	3	1	2
Weighted Average	2	2	1	1	1	1.75	1	2.22	1.25	3	1	2

AECC(4) HINDI Syllabus for BA/BCA/BSc

Semester IV Course Code: 22HIN407	Course Title: AECC(4) Hindi Gadya aur Sarakari Patra.
Course Credits: 02 (2:1:0)	No. of Teaching Hours/Week: 02 Hours (Theory) 02 Hours (Tutorials)
Total Contact Hours: 32 Hours (Theory) 32 Hours (Tutorials)	Formative Assessment Marks: 40
Exam Duration: 2½ Hours (Theory)	Semester End Examination Marks: 60 (Theory)

Course Outcomes (COs):

- CO1: Familiarly with Socio-economic disparity, identity good character traits for character building.
- CO2: Learn to accept divergent opinions to build strong intrapersonal skills personally and professionally.
- CO3: Understand the pluralistic nature of Society; respect other people's values and live in harmony.
- CO4: Using this as a tool for any type of Communication through Hindi. and Capacity to lead the life.

Course Content:

Course Content Content	Hours
UNIT - 1	
कहानी-1.नमक का दारोगा 3 hours 2.गैंग्रिन-3 3.रानी माँ का चबुतरा- 3	12
UNIT - 2	
रेखाचित्र-काळया 3 यात्रा वृत्तांत-जहाँ आकाश नहीं दिखाई देता 3 संस्मरण-यशपाल 'बडा ठोस आदमी है' 3	14

UNIT - 3	
व्यंग्य-तथागत नई दिल्ली में 3 एकांकी-महाभारत की एक सांझ 3	12
UNIT - 4	
सरकारी पत्राचार - सरकारी पत्र व्यवहार और पारिभाषिक शब्दावली. 1.सरकारी पत्र व्यवहार का सामान्य परिचय- गुण-लक्षण, सरकारी पत्र के विभिन्न प्रकार, अ) सामान्य सरकारी पत्र, आ) परिपत्र, इ) कार्यालय ज्ञापन 2. सरकारी पत्र-आवेदन पत्र-प्राचार्य को, सरकारी अधिकारियों को, 1 to 02 Hours	16

Activity : विद्यार्थियों को पाठ पढ़ाना, सप्ताह में एक दिन समाप्त किये गये पाठ का सार लिखकर कक्षा में (संगोष्ठी), पाठ का संदेश लिखना, शुद्ध हिन्दी लिखना (कार्यशाला) ।

पढ़ना

10

Text Book:साहित्य सोपान- प्रो. प्रतिभा मुदलियार

Recommended Books

- राजभाषा हिंदी राजकीय पत्रव्यवहार – डॉ. घनश्याम अग्रवाल, जयभारती प्रकाशन, माया प्रेस रोड, इलाहाबाद-3
- अभिनव व्यावहारिक हिन्दी-डॉ.परमानन्द गुप्त.विद्या मंदिर. बेंगलूर-२.
- <https://www.youtube.com/watch?v=iW-1sCzWHNM>
- <https://www.youtube.com/watch?v=5qnjlpP7i70>

Course Articulation Matrix – 22HIN407

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	1	1	2	1	3	2	3	1	2
CO 2	2	2	1	1	1	2	1	3	2	3	1	2
CO 3	2	2	1	1	1	2	1	3	2	3	1	2
CO 4	2	2	1	1	1	1	1	-	1	3	1	2
Weighted Average	2	2	1	1	1	1.75	1	2.22	1.25	3	1	2

Continuous Formative Evaluation/Internal Assessment (AECC)

Total marks for each course shall be based on continuous assessments and semester end examinations. The pattern is 40:60 for IA and Semester End Theory Examinations respectively and 50:50 for IA and Semester End Practical Examinations respectively.

	THEORY
TOTAL MARKS	100
Continuous Assessment – 1 (C1)	20
Continuous Assessment – 2 (C2)	20
Semester End Examination (C3)	60

Evaluation Process of IA Marks shall be as follows:

- a) The first component (C1) of assessment is for 20% marks. This shall be based on test, assignment, seminar, case study, field work, project work etc. This assessment and score process should be completed after completing 50% of syllabus of the course and within 45 working days of semester program.
- b) The second component (C2) of assessment is for 20% marks. This shall be based on test, assignment, seminar, case study, field work, internship/industrial practicum/project work, quiz etc. This assessment and score process should be based on completion of remaining 50% of syllabus of the course of the semester.
- c) During the 17th – 19th week of the semester, a semester end examination shall be conducted by the college for each course. This forms the third and final component of assessment (C3) and the maximum marks for the final component will be 60%.
- d) In case of a student who has failed to attend the C1 or C2 on a scheduled date, it shall be deemed that the student has dropped the test. However, in case of a student who could not take the test on scheduled date due to genuine reasons, such a candidate may appeal to the Program Coordinator/Principal. The Program Coordinator/Principal in consultation with the concerned teacher shall decide about the genuineness of the case and decide to conduct special test to such candidate on the date fixed by the concerned teacher, but before commencement of the concerned semester end examinations.
- e) For assignments, tests, case study analysis etc., of C1 and C2, the students should bring their own answer scripts (A4 size), graph sheets etc., required for such tests/assignments and these be sealed/signed by the concerned department at the time of conducting tests/assignment/project work etc.
- f) The outline for continuous assessment activities for Component-I (C1) and Component-II (C2) of a course shall be as under:

	C1	C2	TOTAL
Session Test	20	-	20
Seminar/Presentation/Assignment/Activity/Case Study/Field Work/Project Work/Quiz etc.	-	20	20
TOTAL	20	20	40

- Conduct of Test, Seminar, Case study/Assignment etc., can be either in C1 or in C2 component as decided by the college and concerned department/teacher.
 - The teachers concerned shall conduct test/seminar/case study etc., The students should be informed about the modalities well in advance. The evaluated courses assignments during component I (C1) and component II (C2) of assessment are immediately provided to the candidates after obtaining acknowledgement in the register by the concerned teacher(s) and maintained by the Department. Before commencement of the semester end examination, the evaluated test, assignment etc., of C1 and C2 shall be obtained back to maintain them till the announcement of the results of the examination of the concerned semester.
- g) The marks of the internal assessment shall be published on the notice board of the department/college for information of the students.
- h) The internal assessment marks shall be communicated to the CoE at least 10 days before the commencement of the semester end examinations and the CoE shall have access to the records of such periodical assessments.
- i) There shall be no minimum in respect of internal assessment marks.
- j) Internal assessment marks may be recorded separately. A candidate, who has failed or rejected the result, shall retain the internal assessment marks.

QUESTION PAPER PATTERN
For Ability Enhancement Compulsory Course
B.Com., B.B.A, BBA(H&H) BBA (Avi &Int.Tour) B.C.A, B.SC, B.A.,
Text Book-40 Marks.
Grammar-20 Marks

Max Marks 60

Exam Duration-2.30Hours

Qn. No.	Particulars		Marks	Total
SECTION – A				
I	Objective Type Questions (Compulsory) From Grammar only	10 out of 10	01	10
II	Reference to Context From Text Book only 1. 2. 3. 4.	2 out of 4	05	10
SECTION – B				
III	Short Answer Questions (From Text Book) 1. 2. 3.	2 out of 3	05	10
IV	Short Answer Questions From Grammer/Prayojanamulak) 1. 2. 3.	2 out of 3	05	10
SECTION – C				
V	Essay type Answer Questions From Text Book only	2 out of 4	10	20
Total				60

II BA – III Semester

DSC-5 Rise of Modern West (1600-1871) Course Code: 221329

Course Title: Rise of Modern West (1600-1871)	
Total Contact Hours: 39 to 42	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 60
Syllabus Authors: BOS (UG)	Summative Assessment Marks: 100

Course Outcomes (Cos):

- CO1.** Comprehend how the geographical discoveries impact on the economy, polity and society of Western Countries. Students will develop an understanding of the significant transformation in European polity and society between sixteenth to nineteenth centuries.
- CO2.** Acquire the knowledge of various themes like capitalism, mercantilism, Renaissance and Reformation. Understand how scientific view helps western countries to achieve scientific revolution and industrial revolution.
- CO3.** Recognize how the liberal and democratic ideas helped to achieve all round developments in western world.

II BA – III Semester

DSC-5

Title of the Course: Rise of Modern West (1600-1871) Course Code: 221329

Course-1		Course-2	
Number of Theory Credits	Number of lecture hours/ semester	Number of Theory Credits	Number of lecture hours/semester
3	39 or 42	3	39 or 42
Content of Course-1			39/42Hrs
Unit-1			13/14
Chapter-1 : Europe Expands and Divides The Overseas Discoveries and Conquests of Portugal and Spain			04
Chapter-2 : Transition from feudalism to Capitalism Capitalism – Mercantilism and the Commercial Revolution			04
Chapter-3 : Early Colonial Expansion and Overseas Trade Motives Beginning of the Era of Colonization –Mining and Plantation –African Slaves			04

Unit – II	13/14
Chapter-4 : Renaissance and Reformation Meaning of Renaissance – Spread of Renaissance – Renaissance of Art, Architecture – Music – Literature – Science – Reformations and Counter Reformation	05
Chapter-5 : The New Absolute Monarchies Emergence of Nation States – Theories of Government – Divine Right of Kings – Absolutism in Various States – Spain – Portugal – England – France – Austria – Russia	04
Chapter-6 : Scientific Revolution and the Age of Enlightenment Emergence of Scientific View of the World – Promotion of Science – The work of Early Scientists – Growth of Chemistry, Geology and Biology. The Age of Enlightenment – Major Events of Enlightenment – Classism and Romanticism – Humanitarianism – Nationalism – Enlightened Despotism	05
UNIT-III	13/14
Chapter-7 : The Growth of Liberalism and Democracy Basic Feature of Liberalism – Growth of Liberalism The Rise of Democracy – Democratic struggle in various countries public opinion and Polity	05
Chapter-8 : Industrial Revolution Scientific and Technological background to Industrialised Revolution – the Factory System – Stages and Effects of Industrial Revolution – Socialist Movement – Labour Movements	04
Chapter-9 : Consolidation of Large Nation States Unification of Italy – The Founding of the German Empire	04

- **No Historical Maps**

Suggested Readings:

1. Wells H.G. : An Outline History of the World
2. Wells H.G. : A Short History of the World
3. Hayes et.al : World History
4. Savelle Max (Ed.) : A History of World Civilisation (2 Vols)
5. Davies : World History
6. Ketelby C.D.M. : A History of Modern Time
7. Palmer R.R. and J.Colton : A History of Modern World
8. Grant and Temperley : Europe in the Nineteenth and Twentieth Century
9. Fisher HAL : A History of Europe
10. Thomson David : Europe since Napoleon
11. Hoskins H.L. : European Imperialism in Africa
12. Edward MacNall Burns : World Civilization (3 Vols.)

Course Articulation Matrix - 221329

COs/ POS	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	1	2	1	2	3	1	3	3	1	1	3
C02	3	1	2	-	2	3	1	3	3	1	1	2
C03	3	1	2	1	2	3	1	3	3	1	1	2
Weighted Average	3	1	2	1	2	3	1	3	3	1	1	2.33

II BA – III Semester

DSC-6 History of Modern India 1757-1947 Course Code: 221330

Course Title: History of Modern India 1757-1947	
Total Contact Hours: 39 to 42	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 60
Syllabus Authors: BOS (UG)	Summative Assessment Marks: 100

Course Outcomes (Cos):

- CO1.** The students will be able to trace the British colonial expansion in the political contacts of 18th century India. They will learn about the changes in society, politics, religion and economy during the period. They will also acquire knowledge about the freedom struggle.
- CO2.** The contents of the syllabus are designed to cover core issues pertaining to vast canvass of nationalist history so that the student at the under graduate level is equipped to focus upon the core ideas of national movement in its conceptuality. India's national movement has vast and divergent ideological base with inner contradictions.
- CO3.** Understand how the colonial rule was overthrown by the Indian nationalists. Identify the various phases of National Movement. Appreciate the ideals and values of Gandhi that resulted in freedom.

II BA – III Semester

DSC-6

Title of the Course: History of Modern India 1757-1947

Subject Code: 221330

Course-1		Course-2	
Number of Theory Credits	Number of lecture hours/ semester	Number of Theory Credits	Number of lecture hours/semester
3	39 or 42	3	39 or 42

Content of Course-1	39/42 Hrs
Unit-1	13/14
<p>Chapter-1 : The Arrival of Europeans in India and Rise of British Supremacy</p> <p>The Portuguese – The Dutch – The English – The French – Pattern of European Trade- English East India Company: From Trading Company to Political Power – Anglo – French Struggle for Supremacy: The Carnatic Wars – British Conquest of Bengal – Plassey to Buxar (1757-1765)</p>	03
<p>Chapter-2 : British Expansion in South and North India – Beyond Indian Frontiers</p> <p>Conquest of Mysore and the Marathas, 1767-1818- Anglo – Mysore Wars (during 1767-1799) - Anglo – Maratha Wars (1775-1818) – British Expansion in North India – Conquest of Sindh, Punjab and Awadh, 1843-57.</p>	04
<p>Chapter-3 : British and their Impact on Indian Economy, Polity, Administration and Society</p> <p>Economy: Economic Model of British East India Company – Changes in Indian Agrarian Structure and Impact on Economy – New Land Revenue Settlements and their Impact – Permanent Settlement – Ryotwari System – Mahalwari System – Economic Impact of British Rule in India.</p> <p>Polity : Constitutional Development – Regulating Act 1773, Pitt’s India Act 1784and Government of India Act 1858.</p> <p>Administration: Indian Administration under the British – Evolution of Government – The Financial and Revenue Administration - The Civil Services, the Army. The Police and Judicial System– Social and Cultural Policy – Spread of Modern Education.</p>	06
Unit – II	13/14
<p>Chapter-4 : Resistance to the British Rule: Early Uprisings and the Revolts of 1857</p> <p>Revolts in Bengal and Eastern India - Munda Rising –Santhal Rebellion – Revolts in Western India – Bhil Uprising – Waghera Rising –Revolts in Southern India – The Revolt of the Raja of Vizianagaram –Revolts in Northern India –Revolt of 1857 – Nature, Events and Failures – Causes of Failure – Significance – Impact of the Revolt.</p>	05
<p>Chapter-5 : Socio Religious Reform Movements</p> <p>The BrahmaSamaj–AryaSamaj -PrarthanaSamaj –Ramakrishna Mission and Swami</p>	03

Vivekananda, Satyashodak Samaj – Aligarh Movement – Shri Narayana Guru and SNDP Yogam	
Chapter-6 : Administrative Changes After 1858 Administration – Changes in the Army – Public Services – Relation with the Princely States – Administrative Policies of Lord Lytton and Lord Ripon – Rise of Middle Class.	04
Unit-III	13/14
Chapter-7 : The Nationalist Movement, 1885-1919 Factors for the Rise and Growth of National Consciousness – The Foundation of the Indian National Congress – Moderate Phase (1885-1905) – The Rise of Neo-Nationalism or the Extremism (1905-19) – Lord Curzon and Partition of Bengal – Boycott and the Swadeshi Movement – Surat Split. – The Muslim League – The Hindu Mahasabha – Lucknow Pact (1916) Home Rule Movement	05
Chapter-8 : Struggle for Swaraj Phase – I (1919-1927) Beginning of the Gandhian Era – The Rowlatt Bills and Jallianwalla Bagh Incident – Khilafat and Non-Co-operation Movement – The Swarajist Party.	03
Chapter-9 : Struggle for Swaraj Phase – II (1927-1947) Simon Commission and Indians Agitation – Bardoli Satyagraha – The Nehru Report and Jinnah’s Fourteen Points – Lahore Session and resolution on Poorna Swaraj – Civil Disobedience Movement – Revolutionary Movement – Chandrashekar Azad – Bhagath Singh – Round Table Conferences – Ambedkar and Poona Pact – The Government of India Act 1935 – National Movement during the Second World War – The Cripps Mission – Quit India Movement – Subhash Chandra Bose and INA – Wavell Plan – Simla Conference – Cabinet Mission Plan – Attlee’s Declaration – Mountbatten Plan – The Indian Independence Act, of 1947.	06
Historical Places 1. Calcutta, 2. Calicut 3. Pondichery 4. Bassein 5. Lahore 6. Plassey 7. Thiruchanapally 8. Hoogly 9. Surat 8. Dacca 9. Nagpur 10. Madras 11. Delhi 12. Bombay 13. Poona 14. Lucknow 15. Kanpur 16. Banaras 17. Wandiwash 18. Srirangapatna 19. Machalipattanam 20. Gwalior	02

Historical Maps:

- 1) Presidency States of British Empire.
- 2) Sikh Empire under Ranjith Singh
- 3) Partition of Bengal -1905.
- 4) Partition of India-1947

Suggested Readings:

1. Bipin Chandra : Indian Struggle for Independence
: Freedom Struggle
2. Majumdar R.C. : Struggle for Freedom
British Paramountcy and Indian Renaissance
(Part-I)
3. Bipin Chandra : Rise Growth of Nationalism
4. SekharBandopadya : Nationalist Movement in India
5. B.L.Grover : A New Look at Modern Indian History
6. SailendraNathSen : An Advanced History of Modern India
7. A.R.Desai : Social Background of Indian Nationalism
8. SumitSarkar : Modern India 1885-1947
9. M.N.gupta : History of the Revolutionary Movement in India
10. Tarachand : History of freedom movement in India Vol.03
11. S.R.Mahrotra : The Emergence of Indian National Congress
12. Stein Burton : The making of Agrarian Policy in British India
1770-1900
13. Thompson & garret : Rise and Fulfillment of British Rule in India
14. A.C.Banerjee : The new History of Modern India (1707-1900)
15. C.A. Bayle : An illustrated History of Modern India 1600-
1947
16. Dr. Sreedhara H : History of Modern India & Indian National
Movement.
17. ಡಾ.ಕೆ.ಸದಾಶಿವ : ಆಧುನಿಕಭಾರತದ ಇತಿಹಾಸ
ಭಾರತದ ಸ್ವಾತಂತ್ರ್ಯ ಹೋರಾಟ
18. ಎಂ.ಅಬ್ದುಲ್‌ರಹಮಾನ್ ಪಾಷಾ : ರಾಷ್ಟ್ರೀಯ ಆಂದೋಲನ
19. ಸಿ.ಆರ್.ಕೃಷ್ಣರಾವ್ : ಸ್ವತಂತ್ರ ನಂತರದ ಭಾರತ
20. ಆರ್.ಪೂರ್ಣಿಮಾ : ಕ್ರಾಂತಿಕಾರಿ ಘಟನೆಗಳು
21. ಎನ್.ಪಿ.ಶಂಕರನಾರಾಯಣರಾವ್ : ಸ್ವಾತಂತ್ರ್ಯಗಂಗೆಯ ಸಾವಿರ ತೊರೆಗಳು
22. ಕೆ.ಎಸ್.ಪಾರ್ಥಸಾರಥಿ : ಭಾರತದ ಪ್ರಥಮ ಸ್ವಾತಂತ್ರ್ಯ ಸಂಗ್ರಾಮ
23. ಬಿಪಿನ್ ಚಂದ್ರ (ಕನ್ನಡಕ್ಕೆ ಅನುವಾದ) : ಎಚ್.ಎಸ್.ಗೋಪಾಲ್ : ಆಧುನಿಕ ಭಾರತ ಇತಿಹಾಸ
24. ಕೆ.ಎಸ್.ಪಾರ್ಥಸಾರಥಿ : ಭಾರತದ ರಾಷ್ಟ್ರೀಯತೆಯ ಪರಿಕಲ್ಪನೆ
25. ಸಿ.ಬಿ.ಕಮಲಿ : ಸ್ವಾತಂತ್ರ್ಯೋತ್ತರ ಭಾರತ

26. ಸೂರ್ಯನಾಥಯು. ಕಾಮತ್ : ಸ್ವಾತಂತ್ರ್ಯ ಹೋರಾಟದ ಸ್ಮೃತಿಗಳು
 27. ಬಿ.ಪರಮೇಶ್ವರ : ಭಾರತ ಸ್ವಾತಂತ್ರ್ಯ ಚಳುವಳಿ
 28. <https://dceclirsp.weebly.com>
 29. <https://ndl.iitkgp.ac.in>
 30. <https://www.doabooks.org>
 31. <https://dceclirsp.weebly.com>
 32. <https://ndl.iitkgp.ac.in>
 33. <https://www.doabooks.org>

Course Articulation Matrix - 221330

COs/ POS	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
CO1	3	1	1	1	2	3	1	3	3	1	1	2
CO2	3	1	1	-	2	3	1	3	3	1	1	2
CO3	3	1	2	1	2	2	1	3	3	1	1	2
Weighted Average	3	1	1.33	1	2	2.66	1	3	3	1	1	2

II BA – III Semester

OE.-3 Freedom Struggle in India (1857-1947)

Course Code: 22OEHIS301

Course Title: Freedom Struggle in India (1857-1947)	
Total Contact Hours: 39 to 42	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 60
Syllabus Authors: BOS (UG)	Summative Assessment Marks: 100

Course Outcomes (Cos):

- CO1.** Identify the causes that led to the rise of nationalism in India. Understand the various stages of the National Movement in India.
- CO2.** Trace the emergence of Indian National Congress.
- CO3.** Realize the harmful effects of division and disintegration. Develop a sense of patriotism, cooperation and belongingness

II BA – III Semester

OE-3

Title of the Course: Freedom Struggle in India (1857-1947)

Course-1		Course-2	
Number of Theory Credits	Number of lecture hours/ semester	Number of Theory Credits	Number of lecture hours/semester
3	39 or 42	3	39 or 42

Content of Course-1	39/42 Hrs
Unit-1	13/14
Chapter-1 : The Rise and Growth of National Consciousness Factors Responsible for the Rise and Growth of Indian Nationalism	04
Chapter-2 : Emergence of Organized Nationalism Political Associations before Indian National Congress – Background to the birth of Indian National Congress – Formation of the Indian National Congress– Safety Valve Theory.	04

Chapter-3 : The Moderate Phase (1885-1905) The Programme and Policies of the Moderates – DadabaiNavaraji – Economic Critique ofImperialism – and Drain Theory.	03
Unit – II	13/14
Chapter-4 : Growth of Extremist Nationalism (1905-1919) The Surat Split- Causes for the Rise of the Extremists – LalBal Pal – The Partition of the Bengal – The Swadeshi and the Boycott –Home Rule Movement.	03
Chapter-5 : Emergence of Mahatma Gandhi in Indian Politics and his ideology Gandhi’s Political Career in South Africa (1893-1914) – Gandhi’s Entry into Indian Politics: Champaran, Ahmedabad and Kheda (1917-18)	04
Chapter-6 : Struggle for Swaraj Phase – I (1919-1927) The Montague – Chelmsford Reforms – The Rowlatt Act – JallianwalaBagh Massacre – The Khilafat and Non-Cooperation Movement (1919-1922) – The Swarajists – Swarajist Party.	06
Unit-III	13/14
Chapter-7 : Rise and Growth of Communalism and Socialism in India Factors Responsible for the Rise and Growth of Communalism and Socialism in Indiaand Muslim League - Formation of the Hindu Mahasabha-Lucknow Pact (1916) –Growth of Socialist and Labour Ideals in the Indian National.	05
Chapter-8 : Struggle of Swaraj Phase – II (1927-1947) Simon Commission – Nehru Report– The Lahore Session of the Congress – Declaration of PoornaSwaraj - Civil Disobedience Movement 1930-34 – Dandi March – Gandhi Irwin Pact – Round Table Conferences – Poona Pact and Ambedkar– The Individual Satyagrah, 1940-41- The Cripps Mission and Proposal Quit India Movement – Subash Chandra Bose and INA – Wavell Plan – Simla Conference- Cabinet Mission plan –Attlee’s Declaration –Mountbatten Plan- The Indian Independence Act, of 1947.	05
Chapter-9 : Other Important Freedom Fighters SurendranathaBanerji –V.D. Savarkar, Ambedkar, VallabhaBhai Patel-Sarojini Naidu – Chandrashekhar Azad – Bhagat Singh– Madam BhikajiCama– BabuJagajivanram– Udam Singh, Jawaharalal Nehru – VallabaBhai Patel – KasturiBai.	04
Historical Places 1) Bombay 2) Madras 3) Kolkata 4) Dandi 5) Dhaka 6) Lahore 7) Poona 8) Delhi 9) Amritsar 10) Lucknow 11) Bardoli 12) Karachi 13) Kanpura 14) Gwalior 15) Surat 16) Belgaum 17) Noukhali 18) Cuttack 19) Allahabad 20) Karawara.	02

❖ Historical Maps

1. Partition of Bengal -1905.
2. Important Sathyagraha Places of Gandhiji-(1917-1948)
3. Important Places of Quit India Movement of 1942.
4. Partition of India-1947.

Suggested Readings:

1. Bipin Chandra : Indian Struggle for Independence
2. Majumdar R.C. : Struggle for Freedom
3. SekhBandopadhyaya : Nationalist Movement in India
4. B.L.Grover : A New look at Modern Indian History
5. Sailendranathsen : An advanced History of Modern India
6. A.R.Desai : Social background of Indian Nationalism
7. ಡಾ.ಕೆ.ಸದಾಶಿವ : ಆಧುನಿಕ ಭಾರತದ ಇತಿಹಾಸ
ಭಾರತದ ಸ್ವಾತಂತ್ರ್ಯ ಹೋರಾಟ
8. ಎಂ.ಅಬ್ದುಲ್‌ರಹಮಾನ್ ಪಾಷಾ : ರಾಷ್ಟ್ರೀಯ ಆಂದೋಲನ
9. ಆರ್.ಪೂರ್ಣಿಮಾ : ಕ್ರಾಂತಿಕಾರಿ ಘಟನೆಗಳು
10. ಎನ್.ಪಿ.ಶಂಕರನಾರಾಯಣರಾವ್ : ಸ್ವಾತಂತ್ರ್ಯಗಂಗೆಯ ಸಾವಿರ ತೊರೆಗಳು
11. ಕೆ.ಎಸ್.ಪಾರ್ಥಸಾರಥಿ : ಭಾರತದ ಪ್ರಥಮ ಸ್ವಾತಂತ್ರ್ಯ ಸಂಗ್ರಾಮ
12. ಪರಮೇಶ್ವರ ಬಿ. : ಭಾರತದ ಸ್ವಾತಂತ್ರ್ಯ ಹೋರಾಟ
13. <https://dceclirsp.weebly.com>
14. <https://ndl.iitkgp.ac.in>
15. <https://www.doabooks.org>
16. <https://dceclirsp.weebly.com>
17. <https://ndl.iitkgp.ac.in>
18. <https://www.doabooks.org>

Course Articulation Matrix -22OEHS301

COs/ POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	1	2	1	1	2	1	3	2	1	1	2
C02	2	1	-	1	1	1	1	2	2	1	-	2
C03	3	1	1	-	1	1	-	2	2	1	1	2
Weighted Average	3	1	1.5	1	1	1.33	1	2.33	2	1	1	2

II BA – III Semester

OE-3 Introduction to Epigraphy CourseCode: 22OEHis302

Course Title: Introduction to Epigraphy	
Total Contact Hours: 39 to 42	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 60
Syllabus Authors: BOS (UG)	Summative Assessment Marks: 100

Course Outcomes (Cos):

- CO1.** To understand the definition and importance of Palaeography, Brahmi, Kharosthi scripts, dating and Erasand identify the writing materials – Engraving – forged records – Seals.
- CO2.** To understand the Evolution and Development of one of the scripts mentioned above with reference to estampages and understanding the differences and similarities of inscriptions of North and South India.
- CO3.** To learn about Practical Training in taking estampages of stone and copper plate inscriptions.

II BA – III Semester

OE-3

Title of the Course: Introduction to Epigraphy

Course-1		Course-2	
Number of Theory Credits	Number of lecture hours/ semester	Number of Theory Credits	Number of lecture hours/semester
3	39 or 42	3	39 or 42

Content of Course-1	39/42 Hrs
Unit-1	13/14
Chapter-1 : Introduction Definition and importance of Palaeography – origin and antiquity of writing in India.	04
Chapter-2 : Evolution and development of Scripts – Indus Valley Script – Kharosthi Script – Brahmi Script	04
Chapter-3 : Writing materials – Engraving – forged records – Seals	04
Unit – II	13/14
Chapter-4 : Introduction Nature – Scope – Importance of Epigraphy	05
Chapter-5 : Types of Inscriptions - the languages of Inscriptions – writing Materials – Stone, Copper, Palm Leaves, Terracotta	04
Chapter-6 : Study of Important North Indian Inscriptions 1) Ashoka’s Rock Edict No.13 2) Hatigumpha Inscription of Kharavela	05

3) Nasik Cave Inscription of Nahapana 4) Mehrauli Pillar Inscription of Chandraguptha – II 5) Samudraguptha's Allahabad Pillar Inscription	
Unit-III	13/14
Chapter-7 : Study of Important South Indian Inscriptions 1) Brahmagiri and Maski edicts of Ashoka 2) Halmidi Inscription 3) Aihole Inscription of Pulakeshi-II 4) Uttaramerur Inscription of ParantakaCholal-I 5) Shravanabelagola Inscription of Bukka-I	05
Chapter-8 : Contribution of Important Epigraphists – B.L.Rice – J.F.Fleet- D.L.Narasimhachar – M.H.Krishna	04
Chapter-9 : Visit to Local Inscription Sites Practical training in taking Estampages of stone or copper plate inscriptions – preparation of Field Study Report for assignment is mandatory.	04
Map for Study – Locate the Important Inscriptions and Its Importance 1.Besnagar 2.Hathigumpa 3.Junagada 4.Mathura 5.Banavasi 6.Badami 7.Arjunawada 8.Beluru 9.Kudiyanamalai 10.Nasik 11.Allahabad 12.Brahmagiri 13.Talagunda 14.Saranath 15.Maski 16.Sannathi 17.Gujarra 18.Nagarjunakonda 19.Halmidi 20.Shabazgarhi	02

Suggested Readings:

- | | |
|----------------------------|------------------------------------|
| 1. D.C.Sircar | : Indian Epigraphy |
| 2. R.B.Pandey | : Indian Palaeography |
| 3. Gai G.S. | : Introduction to Indian Epigraphy |
| 4. ನರಸಿಂಹಮೂರ್ತಿ ಎ.ವಿ. | : ಕನ್ನಡ ಲಿಪಿಯ ಉಗಮ ಮತ್ತು ವಿಕಾಸ |
| 5. ಅಣ್ಣಿಗೇರಿ ಎಂ.ಎಂ. | : ಶಾಸನಗಳ ಸಂಗ್ರಹ |
| 6. ಡಾ.ಚಿದಾನಂದಮೂರ್ತಿ | : ಕನ್ನಡ ಶಾಸನಗಳ ಸಾಂಸ್ಕೃತಿಕ ಅಧ್ಯಯನ |
| 7. ಸುಂದರ ಅ. | : ಇತಿಹಾಸ ಮತ್ತು ಪುರಾತತ್ವ |
| 8. ಹಿರೇಮಠ ಎಂ.ಎಸ್. | : ಶಾಸನಾಧ್ಯಯನ |
| 9. ಕೃಷ್ಣಮೂರ್ತಿ ಸಿ.ಪಿ. | : ಶಾಸನಶಾಸ್ತ್ರ ಪ್ರವೇಶ |
| 10. ರಮೇಶ ಕೆ.ವಿ. | : ಕರ್ನಾಟಕ ಶಾಸನ ಸಮೀಕ್ಷೆ, ಬೆಂಗಳೂರು |
| 11. ಶ್ರೀನಿವಾಸ ವಿ. ಪಾಡಿಗಾರ್ | : ಭಾರತೀಯ ಶಾಸನ ಆಕರಗಳು |

Course Articulation Matrix - Course Code: 22OEHIS302

COs/ POS	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	2	1	2	1	1	3	3	2	1	2
C02	3	2	2	1	2	1	1	3	2	2	-	2
C03	2	2	1	1	2	1	1	2	2	1	1	2
Weighted Average	2.66	2	1.66	1	2	1	1	2.66	2.33	1.66	1	2

II BA – IV Semester

Course Code: 221429

DSC-7 History of Karnataka (From Earliest times to 10th Century CE)

Course Title: History of Karnataka (From Earliest times to 10th Century CE)	
Total Contact Hours: 39 to 42	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 60
Syllabus Authors: BOS (UG)	Summative Assessment Marks: 100

Course Outcomes (Cos):

- CO1.** Develop a bird view on the historical development of Polity, economy and culture of Karnataka. Cultural transitions of Karnataka from earliest times to 10th century CE.
- CO2.** To understand how the different ruling powers develop a harmony in society through their religious policies.
- CO3.** Develop a strong cultural understanding of Karnataka's language, literature and different cultural aspects. To identify the makers of Karnataka and how they helped to preserve the continuity of long cultural heritage.

II BA – IV Semester

DSC-7 Subject Code: 221429

Content of Course-1	39/42 Hrs
Unit-1	13/14
Chapter-1 : Survey of Sources – Pre Historic Culture – Stages –Important Sites – Brahmagiri, Sanganakallu – T.Narasipura – Proto Historic Culture – Sannati – Rajaghatta.	05
Chapter-2 : The Maurya's in Karnataka – Ashoka – Mauryan influences on Polity of Karnataka – Inscriptions – Royal Edicts.	04
Chapter-3 : The Satavahanas – GautamiputraSatakarni – Polity and Administration	04

Unit – II : The Rise of Karnataka	13/14
Chapter-4 : The Kadambas of Banavasi Mayuravarma and Kakusthavarma – Polity – Administration – Land Grant Policy	04
Chapter-5 : The Gangas of Talakadu Konganivarma – Durvineeta – Sri Purusha – Chavundaraya – Polity – Administration – Land Grant Policy	05
Chapter-6 : The Chalukyas of Badami Pulakeshi-II, Vikramaditya-II, Polity – Administration – Land Grant Policy	05
Unit-III : The Ages of Empires	13/14
Chapter-7 : The Rastrakutas Krishna-I, Govinda-III, AmoghavarshaNrupatunga – Expansion Policy – Polity and Administration	05
Chapter-8 : The Chalukyas of Kalyana Tailapa –II, Vikramaditya-VI, Someshwara-III, Polity – Administration	04
Chapter-9 : Minor Dynasties of Anglent Karnataka The Punnatas –The Nolambas – The Banas	04
Map for Study Kadamba State during Kakustavarma Ganga State during Durvineeta BadamiChalukyan Empire during Pulikeshi II Rastrakuta Empire under AmoghavarshaNrupathunga	02
Important Historical Places: 1. Talakadu 2.T.Narasipura 3.Sanganakallu 4.Chandravalli 5.Siddapura 6.Jatingameshwara 7.Manyakheta 8.Badami 9.Pattadakallu 10.Aihole 11.Banavaasi 12.Kalyana 13.Maski 14.Sannati 15.Shravanabelagola.	

Suggested Readings:

- | | |
|----------------------|--|
| 1. B.Sheik Ali | : The Western Gangas |
| 2. G.R.Rangaswamaiah | : DakshinaBaratadaItihasa |
| 3. A.Sundara (Ed.) | : Kannada VishayaVishwakosha –
IthihasamattuPuratatva |
| 4. K.R.Basavaraju | : History and Culture of Karnataka |
| 5. P.B.Desai | : A History of Karnataka |
| 6. A. Sundara (Ed.) | : Karnataka Charitre – Vol.I |

7. B.SurendraRao (E.d) : Karnataka CharitreVol.II
8. K.A.NilakantaSastri : A History of South India
9. R.S.Mugali : The Heritage of Karnataka
10. Suryanath U. Kamath : Karnataka SankshiptaIthihasa

(1) <https://www.k11news.com>

(2) <https://kn.m.wikipedia.org>

(3) <https://www.loc.gov>

(4) <https://m.youtube.com>

Course Articulation Matrix - 221429

COs/ POS	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	1	1	1	1	3	1	2	2	2	1	2
C02	3	1	-	-	-	2	1	1	2	1	-	2
C03	3	-	1	1	-	2	1	2	2	1	1	2
Weighted Average	3	1	1	1	1	2.33	1	1.66	2	1.33	1	2

II BA – IV Semester

DSC-8 History of Modern Europe (1871-1945) Course Code: 221430

Course Title: History of Modern Europe (1871-1945)	
Total Contact Hours: 39 to 42	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 60
Syllabus Authors: BOS (UG)	Summative Assessment Marks: 100

Course Outcomes (Cos):

- CO1.** It provides a critical overview of the Europe from 1871 to 1945. It shall also trace the patterns and outcomes of social upheaval throughout Europe in the first half of 19th century. To understand the debates on the development and impact of industrial capitalism. The birth of new social movements, political ideas and structures shall be contextualized within developing capitalism of the nineteenth century. And investigates the political, social and economic developments that shaped and continue to shape the modern age.
- CO2.** Students would be expected to develop on her/his understanding of the social and economic dimensions of the Industrial revolution in eighteenth century Britain to compare and understand the specific case studies of France. Germany and Russia in the nineteenth century.
- CO3.** Examined changes since the 18th century in European social economic and political structure. Locating Europe's place in World history its development.

II BA – IV Semester

DSC-8

Title of the Course: History of Modern Europe (1871-1945) Course Code: 221430

Content of Course-1	39/42 Hrs
Unit-1 : Introduction	13/14
Chapter-1 : The German Empire from 1871-1914 German Constitution – Domestic and Foreign Policies of Bismark and William Kaiser II	04
Chapter-2 : III Republic of France Domestic and Foreign Policies of France Colonialism and Imperialism in Asia and Africa in the 19th and 20th Century	04
Chapter-3 : Eastern Question : Interests of Various Powers in Bolkan States Stages: 1. Serbian Independence to Treaty of Paris 2. Paris Treaty to Treaty of Berlin 3. Berlin Treaty of Bucharest 4. Congress of Berlin 5. Balkan Crisis and Wars – Causes – Failures- Consequences – Results	06
Unit – II	13/14
Chapter-4 : International Diplomacy Before the First World War Power Block and Alliances : Expansion of European Empires from 1870-1914 - Three Emperors League– Relations between England and France – Anglo- Russian Alliance of 1907.	04
Chapter-5 : First World War Causes – Course – Results – The Paris Peace Conference and the Treaty of Paris – Treaty of Versailles – Fourteen Points of Woodrow Wilson.	04
Chapter-6 : League of Nations The assembly – The Council – Organisations – Achievements and Failures	03

Unit-III	13/14
Chapter-7 : Rise of Totalitarianism in Europe Russian Revolution, 1917 – Causes and Its results Rise of Totalitarianism in Russia under Lenin and Stalin.	04
Chapter-8 : Failure of Weimar Republic and Rise of Nazism in Germany Adolf Hitler – Home and Foreign Policies – Formation of the Greater Germany – Fascism in Italy – Benito Mussolini – Home and Foreign Policies	05
Chapter-9 : Quest for Security and Road to Second World War International Issues leading to Second World War – Causes – Course – Results and Treaties Formation of UNO – its Organisation – Achievements and Failures.	05
❖ No Historical Maps	

Course-1		Course-2	
Number of Theory Credits	Number of lecture hours/ semester	Number of Theory Credits	Number of lecture hours/semester
3	39 or 42	3	39 or 42

Suggested Readings:

1. C.D.Hazen : Modern Europe Since 1789
2. E.H.Carr : International Relations between to World Wars (1919-1939)
3. R.D.Cornwall : World History in 20th Century
4. A.J.P. Taylor : Struggle for Mastery of Europe 1848-1918
5. A.J.Grant& Templeton : Europe in 19th and 20th Century
6. C.D.M.Ketelby : A History of Modern Times from 1789
7. C.J.H. Hayes : Cultural and Political History of Europe Vol.1 (1500-1830)
8. George Lichtheim : A Short History of Socialism
9. Peter Mathias : First Industrial Revolution
10. Alec Nove : An Economic History of the USSR
11. Andrew Porter : European Imperialism 1870-1914 (1994)
12. Clyde and Beer : History of the far East
13. Hayes (ed.) : World History
14. Durant, Will : Lesson of History
15. Palmer, R.R. and J.Cotton : A History of the modern world
16. Fisher HAL : A History of Europe
17. Hays C.J.H : Contemporary Europe since 1870
18. Grosvenor, Edwin : Contemporary History of the world.

Course Articulation Matrix - 221430

COs/ POS	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
CO1	3	1	1	1	1	2	1	2	2	1	-	2
CO2	2	1	-	-	-	1	1	2	2	1	1	2
CO3	2	1	1	1	-	1	1	2	2	1	1	2
Weighted Average	2.33	1	1	1	1	1.33	1	2	2	1	1	2

II BA – IV Semester

Course Code: 22OEHIS401

OE-4 Freedom Movements in Karnataka (1800-1947)

Course Title: Freedom Movements in Karnataka (1800-1947)	
Total Contact Hours: 39 to 42	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 60
Syllabus Authors: BOS (UG)	Summative Assessment Marks: 100

Course Outcomes (Cos):

- CO1.** Understand nature of freedom struggle in Karnataka and analyses the different stages of freedom struggle in Karnataka
- CO2.** To know the Swadeshi and Non-Cooperation Movement in Karnataka
- CO3.** To know the influence of Gandhi on freedom struggle and understand the prominent freedom fighters of Karnataka

II BA – IV Semester

OE-4

Title of the Course: Freedom Movements in Karnataka (1800-1947)

Course-1		Course-2	
Number of Theory Credits	Number of lecture hours/ semester	Number of Theory Credits	Number of lecture hours/semester
3	39 or 42	3	39 or 42

Content of Course-1	39/42 Hrs
Unit-1	13/14
Introduction : Introduction to Historical Background	02
Chapter-1 : The disintegration of Karnataka and absorption of Karnataka areas into Madras, Bombay Provinces and Hyderabad State – Economic Background to Karnataka National Movement.	04
Chapter-2 : Armed Resistances against the British Rule in Karnataka Rani of Kittur (1824) – SangolliRayann(1829-30) – Nagar Revolt (1830-31)Resistance in Kodagu.	04
Chapter-3 : The Impact of the Rebellion of 1857 on Karnataka Against anti – Arms Act – Bedas of Halagali – 1857 – VenkatappaNayaka of Surapura – Baba Saheb of Naragunda – Bhimarao of Mundaragi –Effects of the Struggle.	04
Unit – II	13/14
Chapter-4 : The National Movement in Bombay Karnataka Rise of Nationalism in Karnataka – Early activities – Influence of BalagangadharTilak – The response to Swadeshi Movement – Home Rule Movement – Influence of Mahatma Gandhi- Non Cooperation Movement – Belgaum Congress Session of 1924 – Civil Disobedience Movement.	05
Chapter-5 : The National Movement in Hyderabad Karnataka Early activities – The response to Swadeshi and Non-Cooperation Movement- Influence of Mahatma Gandhi and SwamyRamanandaTheertha – Razakar Movement	04

Chapter-6 : National Movement in Princely Mysore Early activities – Influence of Tilak and the Response to Swadeshi Movement – Establishment of Indian National Congress in Mysore – Civil Disobedience Movement – Forest Satyagraha and No Tax campaign	05
Unit-III	13/14
Chapter-7 : Foundation of Mysore Congress Shivapura Congress Session – Vidhurashwatha Tragedy –Quit India Movement – Esuru Tragedy – Mysore Chalo Movement	05
Chapter-8 : Congress Constructive Programmers in Karnataka Propogation of Khadi – Rejuvenation of Village Industries –Removal of Untouchability – Prohibition of Liquor.	04
Chapter-9 : Prominent Freedom Fighters of Karnataka HardikarManjappa – GanghadharaRaoDeshpande – Kamala Devi Chattopadhyaya – TagaduruRamachandraRao – Nijalingappa S. – T.Siddalingaiah – K.C.Reddy – YashodharaDasappa – AluruVenkataraya.	04
❖ No Historical Maps.	

Suggested Readings:

1. S.Chandrashekhar : ದಕ್ಷಿಣ ಭಾರತ: ವಸಾಹತುಶಾಹಿ ಮತ್ತು ಸಂಘರ್ಷ
ಆಧುನಿಕಕರ್ನಾಟಕದಆಂದೋಲನಗಳು
2. R.R.Diwakar : Karnataka through the ages
3. P.B.Desai : History of Karnataka
4. K.Veerathappa : Studies in Karnataka History and Culture
5. James Manor : Political changes in an Indian State Mysore 1917-1955
6. M.Shamarao : Modern Mysore (2 Vols.)
7. Sunanath U. Kamath : A Concise History of Karnataka
ಕರ್ನಾಟಕದ ಸಂಕ್ಷಿಪ್ತಇತಿಹಾಸ
8. ಷೇಕ್ ಅಲಿ ಬಿ. (ಪ್ರ.ಸಂ.) : ಕರ್ನಾಟಕಚರಿತ್ರೆ ಸಂಪುಟ-6 ಮತ್ತು 7
9. ಎಚ್.ಎಸ್.ಗೋಪಾಲರಾವ್ : ಕರ್ನಾಟಕಕುಶೀಕರಣದಇತಿಹಾಸ
10. ದೊರೆಸ್ವಾಮಿಎಚ್.ಎಸ್. : ಸ್ವಾತಂತ್ರ್ಯ ಚಳವಳಿ: ಕರ್ನಾಟಕ
11. ದಿವಾಕರ್‌ಆರ್.ಆರ್. : ಕರ್ನಾಟಕದ ಪರಂಪರೆ, ಸಂಪುಟ-2

Course Articulation Matrix - Course Code: 22OEHS401

COs/ POS	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	-	-	1	-	2	2	2	2	1	1	2
C02	2	-	-	-	-	2	2	2	2	1	-	2
C03	3	1	1	1	-	2	1	2	2	1	1	2
Weighted Average	2.66	1	1	1	-	2	1.66	2	2	1	1	2

II BA – IV Semester

OE.-4 Principles and Practice of Museology

Course Code: 22OEHIS402

Course Title: Principles and Practice of Museology	
Total Contact Hours: 39 to 42	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 60
Syllabus Authors: BOS (UG)	Summative Assessment Marks: 100

Course Outcomes (Cos):

- CO1.** Understand the concepts of Museum, Museology, Museographer. Learn how to make museum and cultural center as a destination of cultural tourism
- CO2.** To identify properly both Cultural and Natural Heritage objects and other cultural organizations as resource center for local communities. To know the acquisition methods, proper collection of objects for cultural centers
- CO3.** Documentation of Tangible, Intangible and Natural Heritage objects

II BA – IV Semester

OE-4

Title of the Course: Principles and Practice of Museology

Course-1		Course-2	
Number of Theory Credits	Number of lecture hours/ semester	Number of Theory Credits	Number of lecture hours/semester
3	39 or 42	3	39 or 42

Content of Course-1	39/42 Hrs
Unit-1	13/14
Introduction	
Chapter-1 : Definition and concepts of Museology and Museum	04
Chapter-2 : Origin and development of Museology and Museography	04
Chapter-3 : Functions of Museum	04

Collection, Documentation – Index and Catalogue – Numbering the objects	
Unit – II	13/14
Chapter-4 : A brief History of Museum Movement in India and Abroad	05
Chapter-5 : Types of Museums – Archaeology Museums – Art Museums – History Museums – Maritime Museums – Military and war Museums – Open air Museum – Industrial Museums, Science Museums.	04
Chapter-6 :Indian Legislative Measures Relating to Museums – Treasure Trove Act, Antiquity Registration Act. Role of Professional Organizations – Museums Association of India UNESCO – ICOM – ICOMOS	05
Unit-III	13/14
Chapter-7 : Important National Museums of India National Museum, New Delhi- Salarjung Museum Hyderabad – Calcutta Museum – Mathura Museum – Government Museum Chennai	05
Chapter-8 : Regional Museums – Natural History Museum – Mysore Government Museum, Hassan Government Museum Bangalore – Manjusha Museum, Dharmasthala – Suttur Museum	04
Chapter-9 : Exhibition Equipment's in Museum Showcase – Pedestals – Audio Visual Equipment – Labeling. Visit to nearest Museums or Preparation project report on Museums for assignment is mandatory	04
Historical Places : 1.New Delhi 2.Calcutta 3.Hyderabad 4.Mumbai 5.Chennai 6.Bengaluru 7.Bhuvaneshwar 8.Patna 9.Kochi 10.Ahmadabad 11.Poona 12.Mysuru 13.Dharmasthala 14.Hassan 15.Amritsar 16.Jaipur 17.Madras 18.Dakshina Chitra (Muttukad) 19.Indore 20.Goa	

Suggested Readings:

- | | |
|----------------------|--|
| 1. Grace Morley | : Museums To-day, Department of Museology, M.S.University of Baroda, 1968 |
| 2. Diwadi V.P. (Ed.) | : Museums and Museology : New Horizons |
| 3. VasantHariBedkar | : New Museology for India, National Museum Institute of History of Art, Conservation and Museology, 1985 |
| 4. ShivaramMurthi C. | : Directory of Museums, Museology and New Museology, New Delhi, 1985 |
| 5. Nigam M.L. | : Fundamentals of Museology, NavhindPrakashan, |

- | | |
|------------------------------|---|
| 6. AgrawalUsha | 1966.
Museum in India – a brief directory |
| 7. Seth, Manvi | Communication and Education in Indian
Museums |
| 8. Roy. Shilpi | Museum documentation : A Potent tool for
collection Management |
| 9. Smith Bautista, Susana | Museums in the Digital Age: Changing Meaning
of Places, Community and Culture. |
| 10. Nigam M.L. | Museums in India |
| 11. Nigam M.L. | Fundamentals of Museology |
| 12. Ghosh D.P. | A Studies in Museology |
| 13. ಸಣ್ಣಯ್ಯ ಬಿ.ಎಸ್. (ಅನುವಾದ) | : ವಸ್ತುಸಂಗ್ರಹಾಲಯ ಮೂಲತತ್ವ |

Course Articulation Matrix - Course Code: 22OEHIS402

COs/ POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	1	2	1	2	3	1	1	2
CO2	2	2	2	1	1	2	1	2	3	1	1	2
CO3	2	-	1	-	-	1	-	1	2	1	-	2
Weighted Average	2	2	1.66	1	1	1.66	1	1.66	2.66	1	1	2

DSC 1: INTRODUCTION TO JOURNALISM

Course Title and Code	DSCC 3- NEWS REPORTING AND ANALYSIS (With Practical) Subject Code :		
Programme Title	Bachelor of Arts in Journalism and Mass Communication		
Credits	06	Semester	III
Course Type	Core	Academic Year	2022-23

Pedagogy: Theory: 4 hrs / Week

**Total Number of Working
Hours : 64 Hours**

Practical: 2 hrs / week (2 +2 = 4 hrs)

Sem / Code	Paper Title	Week / hour	Duration of Examination	Exam Marks C3	IA C1+C2 Marks	Duration of Practical Exam	Practical Exam C3	Practical IA C1+C2 Marks	Total	Credits - 6		
										L	T	P
DSCC 3	NEWS REPORTING AND ANALYSIS (With Practical)	06	2½ hrs	60	20 +20	3 hrs	25	10 + 15	150	4	0	2

Course Objectives:

- To introduce the concept News.
- To familiarize the students with Reporting Methods in General and Reporting for Print & Electronic Media.
- To educate the students about the Types and Techniques of Reporting.

Learning Outcome:

- To Identify events and issues and turn them into news.
- To events and issues and turn them into news.
- To make use of career opportunities in reporting.
- To upgrade the students with the current skill and practices in Media.

Unit – I:

News : Definitions, nature, concepts, elements and values. **Sources of news:** *Types of sources:* News agencies and internet as a source. Techniques of news gathering; Wire service and news flow; Structure and components of news story; News writing skills; Finding story ideas; Inverted pyramid and other styles; Leads and types of Leads in news story.

16 hrs.

Unit –II:

Reporter: Organisation of reporting section, Principles of reporting, functions, qualities, and responsibilities. Professional norms and ethics. Cultivation of news sources. Kinds of reporting: investigative, interpretative, in-depth, and narrative. Classification of reporting: Civic, political, crime, sports, business, court reporting, International reporting, mofussil, beat and weather reporting.

16 hrs

Unit – III:

Types of news events: Speeches, seminars & conferences, press conferences, demonstrations, rallies and agitations. Reporting governmental and non-governmental communications; Covering communal riots and crimes. Interviewing: principles, importance, techniques and types of news interviews, difference between print, television and broadcast interviews.

Unit – IV:

Specialized reporting: Legislative, court, science and technology, defence, human rights, women and child, health, sports, tourism, education, financial reporting, agriculture, lifestyle, cinema and culture.

DSCC3 - NEWS REPORTING AND ANALYSIS (PRACTICAL COMPONENT)

1. Preparing the events news reports -05
(Events are held in your college/Campus/university)
2. Collect five different lead types from different newspapers-05
3. Revise and rewriting special news stories-05
4. Analyze the news stories appeared in newspaper with special interest-05
5. Preparation of press notes & press release-05
6. Press conference reports- 05
(Students is attending the press conference in your place and preparing the news reports)
7. Photographs and Captions-05
(Students have shooting any events in your college and given captions)
8. Features article: 02
(Students have to write a feature article their own choice topic)
9. Write an editorial on a current issue-02

Assignments

1. Analyze at least 5 newsworthy events for news elements
2. Interview any personalities of your choice
3. Write at least 5 news scripts of different types
4. 2 assignments of specialized reporting
5. 2 assignments each of crime, sports and political newsBooks for

Reference:

1. **Bill Kovach and Tom Rosenstiel**, (2001) The Elements of Journalism, Three Rivers Press.
2. **Brooks, B. S., Pinson, J. L., & Wilson, J. G.** (2013). "Writing as a Journalist," chapter 11 in Working with Words: A handbook for media writers and editors. Boston; New York: Bedford / St. Martin's.
3. **Deborah Potter**, (2006) Handbook of Independent Journalism, Bureau of International-Information Programs, U.S. Department of State.
4. **Brooks, B. S., Kennedy, G., Moen, D. R., & Ranly, D.** (2014). The inverted pyramid. In News reporting and writing (11th edition). Boston; New York: Bedford / St. Martin's.
5. **Lorenz, Alfred L, and John Vivian.** (1995) News: Reporting and Writing Pearson Education POD.
6. **Izard, Ralph S.** (1994) Fundamentals of News Reporting, 6th edition. Dubuque, Iowa: Kendall/Hunt.
7. **Melvin Mencher**, (2010), News Reporting and Writing, 12th Ed McGraw-Hill, New York.
8. **The Missouri Group.** (2014) News Reporting and Writing, 11th edition, Bedford-St. Martin.
9. **Steward, Charles J., and William B. Cash, Jr.** (2003) Interviewing: Principles and Practices; Boston: McGraw-Hill.
10. **Tompkins, A.** (2012). The art of the interview. In Aim for the heart: Write, shoot, report and produce for TV and multimedia (pp. 77-96). Washington, D.C.: CQ Press.

OE 3 – FEATURE WRITING AND FREELANCING

Pedagogy:

Course Title and Code	OE 3- Feature Writing & Freelancing : Subject Code :		
Programme Title	Bachelor of Arts in Journalism and Mass Communication		
Credits	03	Semester	III
Course Type	Core	Academic Year	2022-23

Theory: 3 hrs / week

Total Number of Working Hours : 48 Hours

Sem / Code	Paper Title	Week / hour	Duration of Examination	Exam Marks	IA C1+C2 Marks	Practical Exam	IA C1+C2 Marks	Total	Credits - 3		
									L	T	P
OE-3	Feature Writing & Freelancing	03	2½ hrs	60	20 +20	-	-	100	3	0	0

Course Objectives:

- To introduce various aspects of Feature Writing.
- To familiarize with trends in Feature Writing and Freelancing.
- To impart skills in news / feature writing.

Learning Outcome:

- To write features for print media.
- To use professional skills in structuring and presenting features.
- To write with social concern.

Unit I:

Introduction Feature: Definition and Characteristics – Structure of a Feature Difference between news, features, articles and columns– Process and techniques of feature writing, feature headlines, Sources of Feature, Feature Syndicates.

Unit-II:

Types of features: Different feature articles – science feature, news feature, cultural

feature, environmental feature, lifestyle feature; Modern trends in feature writing; Reviews and its Types – Film, Theatre and Book.

Unit-III:

Freelancing – Meaning, Definition and Scope of Freelancing, Freelancing as a profession, Qualities of a Freelancer, Trends in Freelancing, Legal and ethical aspects of freelancing, Scope of freelancing in print and electronic media, freelancing in online media

IA / Assignments

1. Letters to the Editor to be published in any registered newspaper.
2. Write an Article on any Features.
3. Write an Review on Film / Theatre / Book.

Allotted Hours

16 hrs.

Books for Reference:

1. History How to Criticize books- O Hinkle and J Henry
2. Effective Feature Writing – C A Sheenfeld
3. Modern Feature Writing – H F Harrington and Elmer Scott Watson
4. Writing Feature Articles – A Practical Guide to methods and Markets –Hennessey
5. Before My Eyes: Film Criticism and Comment –Kauffmann
6. Beyond the Facts – A Guide to the Art of Feature Writing
7. Freelancing – R K Murthy
8. Suddiyashte Alla – Niranjana Vanalli

DSCC 4: NEWS PROCESSING AND EDITING

Course Title and Code	DSE 4- News Processing & Editing : Subject Code :		
Programme Title	Bachelor of Arts in Journalism and Mass Communication		
Credits	06	Semester	IV
Course Type	Core	Academic Year	2022-23

Pedagogy: Theory: 4 hrs / week Practical: 2 hrs/ week (2 hrs+2 hrs = 4 hrs)

Total Number of Working Hours : 64 Hours

Sem / Code	Paper Title	Week / hour	Duration of Examination	Exam Marks	IA C1+C2 Marks	Duration of Practical Exam	Practical Exam C3	Practical IA C1+C2 Marks	Total	Credits - 6		
										L	T	P
DSCC 4	News Processing & Editing	06	2½ hrs	60	20 +20	3 hrs	25	10 + 15	150	4	0	2

Course Objectives:

- To introduce the basics of editing and publication
- To provide an overview of the editing process
- To train in writing and editing techniques

Learning Outcome:

- To understand editing and publication process
- To write and edit news stories.
- To design newspaper / magazine pages.

Unit I:

Introduction: Editing- Definitions, importance, principles, functions and techniques of editing. Types of editing; Editing in the age of convergence and software application; Importance of design in print media, Visualizing a page; Types of designs; Designing special supplements; Data and Information graphics; Editing and ethics; Style sheet.

Unit II:

Techniques of Editing: Editorial Page; Editorial writing and its significance; Types of Editorials;, Op-ed Page, Letters to the Editor, Middles; Headlines – functions and types; Photo Editing and Caption Writing; Column writing and types of columns; Ethical Aspects of Editing

Unit III:

Concept of Newspaper Design: Types of Newspaper Layouts, Principles of Designing, Style SheeDummy; Front Page Design, Pagination software; Trends in pagination; Translation - Meaning, Principles, Techniques and Types.

Unit IV:

Newsroom Setup: Organizational structure and functions of a typical newsroom; Editor; Role and responsibilities of an Editor; Executive Editor; News Editor; Chief Sub-editor, Sub-editor, Sections in editorial. Editing supplements

Allotted Hours **16 hrs.**

Practical Component:

1. Write an editorial on any current issue.
2. Write a letter to the editor about any civic issues.
3. Translate a news report from a Source Language to Target Language.
4. Choose 5 news stories and provide suitable headlines.
5. Capture 5 photographs & caption them.

Assignments:

- 1) Editing at least 5 stories
- 2) Rewriting at least 5 poorly written stories
- 3) Headline writing and caption writing exercises
- 4) Designing news paper and magazine pages
- 5) Editing at least 5 wire service stories; Rewriting poorly drafted copies

Books for Reference:

1. The Elements of Editing: a modern guide for editors and journalists by Arthur Plotnik: Collier Macmillan
2. Outline of Editing by K M Joseph: Anmol Publication
3. Advanced Journalism by Adarsh Kumar Varma: Har-Anand Publications Ltd
4. Words on Words by John M Bremner: Columbia University Press
5. The Glamour of Grammar: A Guide to Magic and Mystery of Practical English by Roy Peter Clark: Little, Brown company
6. Editing and Design by Harold Evans: William Heinemann Ltd
7. News Reporting and Editing by K M Shrivastva: Sterling Publishers Private Limited
8. Computer Application for Journalism by Rahul Singhai: EssEss Publication
9. Editing: A handbook for Journalists by T J S George; IIMC Publication
10. Editing by B N Ahuja and S Schhabra: Surjeet Publication

OE 4: TRANSLATION FOR MEDIA

Course Title and Code	OE-4 Translation for Media :		Subject Code :
Programme Title	Bachelor of Arts in Journalism and Mass Communication		
Credits	03	Semester	IV
Course Type	Core	Academic Year	2022-23

Pedagogy:

Theory: 3 hrs /
week

**Total Number of Working Hours :
48 Hours**

Sem / Code	Paper Title	Week / hour	Duration of Examination	Exam Marks	IA C1+C2 Marks	Practical Exam	IA C1+C2 Marks	Total	Credits - 3		
									L	T	P
OE-4	Translation for Media	03	2½ hrs	60	20 +20	-	-	100	3	0	0

Course Objectives:

- To examine journalistic discourse.
- To focus on differences in language use in print media.
- follow current print media and practice translating media texts and build journalistic terminology

Learning Outcome:

- Students will be able to translate print media news items.
- Differentiate different text types in media such as news, articles, and advertisements.
- To compare the various discourses in different types of media texts.

Unit-I

Translation: Meaning, Definition, Nature, Scope and Significance; Principles and Techniques of Translation; Difference between literary translation and translation for media; Tools for translation
16 hrs.

Unit-II

Process of Translation: Source language, Target Language, Co-ordination, Guidelines for Translation; Free, Paraphrasing, Summarized, Semantic and Word to Word Translation. Machine translators
16 hrs.

Unit-III

Process of Translation: Source language, Target Language, Co-ordination, Guidelines for Translation; Free, Paraphrasing, Summarized, Semantic and Word to Word Translation.
Machine translators **16 hrs.**

IA / Assignment Component:

1. Translate a Report from one Source Language to Destination Language.

Books for Reference:

1. Understanding Media: Marshall Mchuhan – Pub: Rantidge Classics.
2. Language the Basics: R. L. Tansk
3. Semiotics: The Basics: Divid Chandar – Pub: Foundation Books, New Delhi.
4. Aspects of Language and Translation: Steiner G – Pub: Oxford University Press
5. The Scandals of Translation: Lawrence Venuti
6. Media and Translation – Christina Schaeffineo – Pub: Cambridge Scholars Publishing
7. Good Writing for Journalist – Angela Phillips – Sage Publications.

Sri L. Ravi Chairman- BoS

Journalism & Mass Communication University of Mysore, Mysuru

ಬಿ.ಎ.

ಸೆಮಿಸ್ಟರ್-3

Course Code: 22KAN301	Course Title: ಕನ್ನಡಭಾಷೆ - 3
Course Credits (L:T:P): 03 (2:1:0)	Hours of Teaching/Week: 02 (Theory) + 02 (Tutorials)
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO 1: ರಾಷ್ಟ್ರಪ್ರೇಮವನ್ನು ಹೊಂದಿದ ಉತ್ತಮ ಭಾರತೀಯ ನಾಗರಿಕರಾಗುತ್ತಾರೆ.

CO 2: ಕೃಷಿಯ ಮಹತ್ವವನ್ನು ಅರಿತು, ಕೃಷಿಯಲ್ಲಿ ತೊಡಗಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.

CO 3: ಸಾಹಿತ್ಯ ಮತ್ತು ಕ್ರೀಡೆಯ ಮಹತ್ವ ಅರಿತು, ವಿವಿಧ ಕ್ರೀಡಾಪಟುಗಳ ಜೀವನಚರಿತ್ರೆ ಮತ್ತು ಆತ್ಮಚರಿತ್ರೆಗಳನ್ನು ಓದಿಕೊಳ್ಳುತ್ತಾರೆ.

CO 4: ವಚನ ಸಾಹಿತ್ಯದ ಸಮಕಾಲೀನತೆಯನ್ನು ಅರಿತು, ಮೈಗೂಡಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.

ಘಟಕ - 1 ರಾಷ್ಟೀಯತೆ

14 ಗಂಟೆಗಳು

1. ವಿಶ್ವಭಾರತಿಗೆ ಕನ್ನಡದಾರತಿ - ಚೆನ್ನವೀರ ಕಣವಿ
2. ಆಗಸ್ಟ್ ವೀರ - ಸಿಕಂದರ್ ಕಾಪು
3. ಈಗ ಎಂಥ ರಾಷ್ಟೀಯತೆ ಬೇಕು? - ವಸಂತ್ ಶೆಟ್ಟಿ

ಘಟಕ - 2 ಕೃಷಿ

14 ಗಂಟೆಗಳು

1. ಉಳುವ ಒಕ್ಕಲು ಮಗನ ತಪ್ಪು ನೋಡದೆ ಒಪ್ಪುಗೊಳ್ಳಯ್ಯ - ಒಕ್ಕಲಿಗ ಮುದ್ದಣ್ಣ
2. 'ಅವರ ಪೈಕಿ ನಾನೂ ಒಬ್ಬ' - ಅರ್ಚಕ ಬಿ ನಂಜುಂಡಸ್ವಾಮಿ
3. ಧನ್ಯಂತರಿ ಚಿಕ್ಕಿಲೆ - ಕುವೆಂಪು

ಘಟಕ - 3 ಕ್ರೀಡೆ

14 ಗಂಟೆಗಳು

1. ನೆತ್ತಮನಾಡಿ ಭಾನುಮತಿ ಸೋಲೋಡೆ - ಪಂಪ
2. ಮೇರಿ ಕೋಮ್ ಸಂತತಿ ಸಾವಿರವಾಗಲಿ - ಗಿರಿಜಾಶಾಸ್ತ್ರಿ
3. ಓಟ್ಟರ್ಗೆ ಪಾಠ ಕಲಿಸಿದ ಕಪ್ಪು ಸುಂದರ - ಪಿ. ಲಂಕೇಶ್

1. ಬೆಟ್ಟದ ಮೇಲೊಂದು ಮನೆಯ ಮಾಡಿ - ಅಕ್ಕಮಹಾದೇವಿ
2. ಶರವೆ ಬಿಡು ಪರಹಿಂಸೆ ದೋಷವು - ಕನಕದಾಸರು
3. ಕಂಗಾಲಾಗಿ ಕುಳಿತು - ಎಸ್. ತುಕಾರಾಂ

ಪಠ್ಯಪುಸ್ತಕ : ಕಲಾಗಂಗೋತ್ರಿ - 3

Course Articulation Matrix – 22KAN301

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2	3	1	3	2	2	2	3
CO 2	3	3	3	2	3	3	3	3	2	2	2	3
CO 3	3	3	3	2	2	3	1	3	3	3	3	3
CO 4	3	3	3	2	2	3	3	3	3	2	3	3
Weighted Average	3	3	3	2	2.75	3	2	3	2.5	2.75	2.5	3

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ಸೆಮಿಸ್ಟರ್-3

Course Code: 22KAN302	Course Title: ಕನ್ನಡಭಾಷೆ - 3
Course Credits (L:T:P): 03 (2:1:0)	Hours of Teaching/Week: 02 (Theory) + 02 (Tutorials)
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO 1: ಜೀವನದಲ್ಲಿ ಮಾನವೀಯ ಗುಣಗಳನ್ನು ಅಳವಡಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.

CO 2: ಪ್ರವಾಸಕಥನಗಳನ್ನು ಓದುವುದರಿಂದ ಹಲವು ಪ್ರಾದೇಶಿಕ ವಿಶೇಷತೆಗಳನ್ನು ಗುರುತಿಸುತ್ತಾರೆ.

CO 3: ಶರಣರ ವೈಚಾರಿಕ ಪ್ರಜ್ಞೆ ಸಮಾಜ ಸುಧಾರಕರ ವಿಚಾರ ಸಾಹಿತ್ಯವನ್ನು ಅವಲೋಕಿಸುತ್ತಾರೆ.

CO 4: ಆರೋಗ್ಯಯುತ ಜೀವನವನ್ನು ರೂಢಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.

ಘಟಕ - 1 ಮಾನವೀಯತೆ

14 ಗಂಟೆಗಳು

1. ಚಂದ್ರಹಾಸನ ಪ್ರಸಂಗ - ಲಕ್ಷ್ಮೀಲ
2. ನನ್ನ ನಾಯಿ - ಪು.ತಿ.ನ3.
3. ಪ್ರೇಮಭಿಕ್ಷು (ಕಾದಂಬರಿಯ ಆಯ್ದು ಭಾಗ) - ಪ್ರಭುಶಂಕರ

ಘಟಕ - 2 ಪ್ರವಾಸ

14 ಗಂಟೆಗಳು

1. ಜೋಗದ ಗುಂಡಿ - ಮೂಗೂರು ಮಲ್ಲಪ್ಪ
2. ಮಹಾನ್ ಗೋಡೆ - ಶೂದ್ರ ಶ್ರೀನಿವಾಸ್
3. ಅನಫಿಲ್ಲಮ್ ಮತ್ತು ಕದಂಬ - ಬಿ.ಜಿ.ಎಲ್. ಸ್ವಾಮಿ

ಘಟಕ - 3 ವಿಚಾರ ಕ್ರಾಂತಿ

14 ಗಂಟೆಗಳು

1. ಯಜಮಾನರಿಗೊಂದು ಪತ್ರ - ಎನ್.ಕೆ. ಹನುಮಂತಯ್ಯ
2. ಮೈಮೇಲೆ ದೆವ್ವ ಬರುವುದೇ - ಡಾ. ಸಿ.ಆರ್. ಚಂದ್ರಶೇಖರ್
3. ಮಿಂಚಿನ ಅಕ್ಷರ ಮಾಲೆ - ಮೊಗ್ಗಿ ಗಣೇಶ್

ಘಟಕ : 4 ಸಂಕೀರ್ಣ

14 ಗಂಟೆಗಳು

1. ಗಂಡಾಗಿ ಹುಟ್ಟಬೇಕಿತ್ತು - ಶ್ರೀದೇವಿ ಕೆರಮನೆ
2. ಕುಸಿಯುತ್ತಿರುವ ಸಾಂಸ್ಕೃತಿಕ ಮೌಲ್ಯಗಳು - ರಂಜಾನ್ ದರ್ಗಾ
3. ಹೃದಯ ದುರ್ಬಲವಾಗುತ್ತಿದೆಯೇ ? - ಡಾ. ಆರ್.ಕೆ. ಸರೋಜ

ಪಠ್ಯಪುಸ್ತಕ : ವಿಜ್ಞಾನಗಂಗೋತ್ರಿ - 3

Course Articulation Matrix - 22KAN302

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	3	2	3	2	3	2	2	2	3
CO 2	3	3	3	2	2	3	2	3	3	3	2	3
CO 3	3	3	3	2	1	3	2	2	2	2	2	2
CO 4	3	3	2	2	2	3	2	3	2	3	1	3
Weighted Average	3	3	2.75	2.25	1.75	3	2	2.75	2.25	2.5	1.75	2.75

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ಸೆಮಿಸ್ಟರ್-3

Course Code: 22KAN303	Course Title: ಕನ್ನಡಭಾಷೆ - 3
Course Credits (L:T:P): 03 (2:1:0)	Hours of Teaching/Week: 02 (Theory) + 02 (Tutorials)
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: $2\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes

CO 1: ಅತ್ಯಾಧುನಿಕ ತಂತ್ರಜ್ಞಾನದೊಂದಿಗೆ ಮನೋರಂಜನಾ ಮಾಧ್ಯಮದ ಮಹತ್ವವನ್ನು ಗುರುತಿಸುತ್ತಾರೆ

CO 2: ಲಾಭಕ್ಕಾಗಿ ಬದುಕುವುದನ್ನು ಬಿಟ್ಟು, ಮನುಷ್ಯ ಸಂಬಂಧಗಳಿಗಾಗಿ ಬದುಕುವುದನ್ನು ರೂಢಿಸಿಕೊಳ್ಳುವರು

CO 3: ಸಾಮಾಜಿಕ ಸಮಾನತೆ ಮತ್ತು ಸೌಹಾರ್ದಯುತ ಬದುಕನ್ನು ರೂಪಿಸಿಕೊಳ್ಳುವರು.

CO4: ಸಾಹಿತ್ಯದಲ್ಲಿ ಚರ್ಚಿತವಾದ ಪರಿಸರ, ತಂತ್ರಜ್ಞಾನ, ಜೀವನಚರಿತ್ರೆ, ಆತ್ಮಕತೆ, ಆಧುನಿಕತೆಯ ಪ್ರೇರಣೆ ಮತ್ತು ಪ್ರಭಾವಗಳನ್ನು ಗುರುತಿಸುತ್ತಾರೆ.

ಘಟಕ - 1 ಮನೋರಂಜನಾ ಮಾಧ್ಯಮ

14 ಗಂಟೆಗಳು

1. ಕೌರವಸೇನೆ ಕಡೆದುದು ನಗೆಯ ಕಡಲೊಳಗೆ - ಕುಮಾರವ್ಯಾಸ
2. ಹೆದ್ದಂಡೆ - ಪಿ.ಕೆ.ರಾಜಶೇಖರ
3. ಜೀವಕೇಂದ್ರಿತ - ಡಾ. ಚಕ್ರೇ ಶಿವಶಂಕರ

ಘಟಕ - 2 ಮಾರುಕಟ್ಟೆ

14 ಗಂಟೆಗಳು

1. ಕೆಲಸವಿಲ್ಲದವರ ಹಾಡು - ದ.ರಾ. ಬೇಂದ್ರೆ
2. ಎಲ್ಲಾ ಮಾಯ - ಗೊಲ್ಲಹಳ್ಳಿ ಶಿವಶಂಕರ್
3. ಮೇದರಹಳ್ಳಿಯ ಅವಸಾನ - ಪೂ.ಚಂ.ತೇ

ಘಟಕ - 3 ಲಿಂಗಸಮಾನತೆ

14 ಗಂಟೆಗಳು

1. ಆಯ್ದು ವಚನಗಳು -
2. ಬೆಂಕಿಮಳೆ - ಬಾನು ಮುಷ್ತಕ್
3. ಮನೆಕೆಲಸ - ಉಮಾರಾವ್

1. ಸಮಾಧಿಯ ಸತ್ತ - ಮಾಸ್ತಿ
2. ಅಳು - ಮನುಬಳಿಗಾರ್
3. ಹೈಟೆಕ್ ರಣವೈದ್ಯ - ನಾಗೇಶ್ ಹೆಗ್ಡೆ

ಪಠ್ಯಸುತ್ತಕ : ವಾಣಿಜ್ಯಗಂಗೋತ್ರಿ - 3

Course Articulation Matrix - 22KAN303

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	3	3	-	3	2	3	3	3
CO 2	3	3	2	3	2	3	1	3	2	3	3	3
CO 3	3	3	2	3	1	3	1	3	3	3	3	3
CO 4	3	3	2	3	3	3	3	3	3	3	3	3
Weighted Average	3	3	2.25	2.75	2.25	3	1.66	3	2.5	3	3	3

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ಸೆಮಿಸ್ಟರ್ - 3

Course Code: 22KAN304	Course Title: ಕನ್ನಡಭಾಷೆ - 3
Course Credits (L:T:P): 03 (2:1:0)	Hours of Teaching/Week: 02 (Theory) + 02 (Tutorials)
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes

- CO 1:** ಸಾಮಾಜಿಕ ಸಾಮರಸ್ಯವನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವರು.
- CO 2:** ಮೌಢ್ಯತೆ ಬಿಟ್ಟು, ವೈಚಾರಿಕ ದೃಷ್ಟಿಕೋನ ಬೆಳೆಸಿಕೊಳ್ಳುತ್ತಾರೆ.
- CO 3:** ಸೃಜನಶೀಲ, ಕೌಶಲ್ಯಯುತ, ಸುಸಂಸ್ಕೃತ ಬದುಕನ್ನು ರೂಢಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.
- CO 4:** ಅಹಿಂಸೆ, ಭ್ರಾತೃತ್ವ, ಸಹಬಾಳ್ವೆಯನ್ನು ಕಲಿಯುತ್ತಾರೆ.

ಘಟಕ - 1 ಸಮಾಜ

14 ಗಂಟೆಗಳು

- ಮಾದಾರಾ ಚನ್ನಯ್ಯನ ರಗಳೆ - ಹರಿಹರ
- ಪುರಂದರದಾಸರ ಕೀರ್ತನೆಗಳು - ಪುರಂದರದಾಸರು
- ಜಿವಾರ್ಯಕ್ಕೆ ಕೊನೆಯಂತೆ - ತ.ಸು. ಶಾಮರಾವ್

ಘಟಕ - 2 ವೈಚಾರಿಕತೆ

14 ಗಂಟೆಗಳು

- ಧರೆಗೆ ಒಬ್ಬನೇ ದಾನಶೂರ ಕರ್ಣ - ಪಿ.ಕೆ. ರಾಜಶೇಖರ
- ಅತಿಹಿತದಲಿ ನೀವಿಹಿದು - ಕನಕದಾಸರು
- ಅಕ್ಕು - ವೈದೇಹಿ

ಘಟಕ - 3 ಜೀವನ ಮತ್ತು ಕಲೆ

14 ಗಂಟೆಗಳು

- ನಾಟಕ ರತ್ನ ಗುಬ್ಬಿವೀರಣ್ಣನವರ್ - ಅನಕೃ
- ಪರಮಕಲೆ ಜೀವನದ ಲಲಿತ ಕಲೆ - ಡಿ.ವಿ. ಗುಂಡಪ್ಪ
- ಡಾ. ರಾಜ್‌ಕುಮಾರ್ : ನಾಡಿನ ನುಡಿ - ದೊಡ್ಡಪುಲ್ಲೂರ ರುಕ್ಕೂಜಿ

1. ಪರಿಹರಿಸುವ ಮೂಲ ಮಾನವ ಬಾಳುವಿಕೆ - ಅಕ್ಷೀಕರಣ
2. ಕೋಪವ್ಯಸರಿಸಿತು ಹೃದಯ ತಂಪಾಯ್ತು - ರತ್ನಾಕರವರ್ಣಿ
3. ಶೂದ್ರತಪಸ್ವಿ ನಾಟಕದ ಭಾಗ (ದೃಶ್ಯ 2) - ಕುವೆಂಪು

ಪಠ್ಯಪುಸ್ತಕ : ನಿರ್ವಹಣಾಗಂಗೋತ್ರಿ - 3

Course Articulation Matrix - 22KAN304

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2	3	2	3	3	3	2	3
CO 2	3	3	3	3	2	3	3	3	2	2	1	3
CO 3	3	3	3	3	3	3	-	3	2	2	3	3
CO 4	3	3	3	2	2	3	3	3	2	2	2	3
Weighted Average	3	3	3	2.5	2.25	3	2.66	3	2.25	2.25	2	3

ಸೆಮಿಸ್ಟರ್ - 3

Course Code: 22KAN305	Course Title: ಕನ್ನಡಭಾಷೆ - 3
Course Credits (L:T:P): 03 (2:1:0)	Hours of Teaching/Week: 02 (Theory) + 02 (Tutorials)
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes

- CO 1:** ದೈನಂದಿನ ಜೀವನದಲ್ಲಿ ಶಾಂತಿಯುತ ನೆಮ್ಮದಿಯ ಬದುಕನ್ನು ರೂಪಿಸಿಕೊಳ್ಳುವರು.
- CO 2:** ಸೌಹಾರ್ದಯುತ ಸಾಮಾಜಿಕ ಜೀವನ ವಿಧಾನವನ್ನು ರೂಢಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.
- CO 3:** ಸ್ವಾತಂತ್ರ್ಯ ಪದದ ಅರ್ಥವ್ಯಾಪ್ತಿಯನ್ನು ಅರಿತು, ಸ್ವಾತಂತ್ರ್ಯದ ಆಶೋತ್ತರಗಳನ್ನು ಪಾಲಿಸುತ್ತಾರೆ.
- CO 4:** ಹಳಗನ್ನಡ ಮತ್ತು ನಡುಗನ್ನಡ ಕಾಲದ ಕವಿಗಳು ಮತ್ತು ಸಾಹಿತ್ಯವನ್ನು ಓದುವರು.

ಘಟಕ - 1 ದೈನಂದಿನ ಲಯ

14 ಗಂಟೆಗಳು

- ಜನಪದ ತ್ರಿಪದಿಗಳು - ಅಜ್ಞಾತ ಕವಿ
- ರಾಮನ್ ಸತ್ತ ಸುದ್ದಿ - ಕೆ.ಎಸ್. ನಿಸಾರ್ ಅಹಮದ್
- ಶೆಟ್ಟಿಯ ಕೊನೆ ಅಗುಳು - ಸುನಂದಾ ಕಡಮೆ

ಘಟಕ - 2 ಸೌಹಾರ್ದ

14 ಗಂಟೆಗಳು

- ರೊಟ್ಟಿ ಮತ್ತು ಕೋವಿ - ಸು.ರಂ. ಎಕ್ಕುಂಡಿ
- ಎಲುವಿನ ಹಂದರದೊಳಗೆ - ಮೂಡುಕ್ಕೂಡು ಚಿನ್ನಸ್ವಾಮಿ
- ಭಾರತೀಯ ಸಮಾಜ, ಸಂಸ್ಕೃತಿ, ಮಹಿಳೆ - ಸಾ.ರಾ. ಅಬೂಬಕ್ಕರ್

ಘಟಕ - 3 ಸ್ವಾತಂತ್ರ್ಯ

14 ಗಂಟೆಗಳು

- ನಲವತ್ತೇಳರ ಸ್ವಾತಂತ್ರ್ಯ - ಸಿದ್ದಲಿಂಗಯ್ಯ
- ಮಾಡಿ ಮಡಿವವರು(ಕಾದಂಬರಿಯ ಆಯ್ದ ಭಾಗ) - ಬಸವರಾಜ ಕಟ್ಟೀಮನಿ
- ಗಿರಿಜವ್ವನ ರೊಟ್ಟಿ - ಅನಕೃ

1. ಸಾರಥಿಯಾಗು ನಡೆ - ಕುಮಾರವ್ಯಾಸ
 2. ಸೋಮೇಶ್ವರ ಶತಕ - ಸೋಮೇಶ್ವರ
 3. ನಿಷಿದ್ಧ ಗಡಿಗಳ ದಾಟಿದ ಡಾ. ರುಕ್ಮಾಬಾಯಿ - ಡಾ. ಎಚ್.ಎಸ್. ಅನುಪಮ

ಪಠ್ಯಪುಸ್ತಕ : ಗಣಕಗಂಗೋತ್ರಿ - 3

Course Articulation Matrix - 22KAN305

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2	3	3	3	1	1	1	3
CO 2	3	3	3	2	2	3	-	3	2	2	2	3
CO 3	3	3	3	2	3	3	3	3	2	3	3	3
CO 4	3	3	3	2	2	3	3	3	2	2	3	3
Weighted Average	3	3	3	2	2.25	3	3	3	1.75	2	2.25	3

ಕನ್ನಡ ಮುಕ್ತ ಆಯ್ಕೆ (OE)

ಸೆಮಿಸ್ಟರ್ - 3

Course Code: 22OEKAN301	Course Title: ಆಧುನಿಕ ಪೂರ್ವ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಚಯ ಮತ್ತು ಪಠ್ಯ
Course Credits (L:T:P): 03 (3:0:0)	Hours of Teaching/Week: 03 (Theory)
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes

CO 1: ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಾಚೀನತೆಯ ಪರಿಚಯವಾಗುತ್ತದೆ.

CO 2: ಪ್ರಾಚೀನ ಕನ್ನಡ ಕವಿಗಳ ಕಾವ್ಯಗಳನ್ನು ಓದುವನ್ನು ಕಲಿಯುತ್ತಾರೆ.

CO 3: ವಚನ ಸಾಹಿತ್ಯದ ಮಹತ್ವವನ್ನು ತಿಳಿಯುತ್ತಾರೆ.

CO 4: ಭಾಗವತ ಸಾಹಿತ್ಯದ ಮಹತ್ವವನ್ನು ತಿಳಿಯುತ್ತಾರೆ.

ಭಾಗ 1 - ಆಧುನಿಕ ಪೂರ್ವಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಚಯ

ಘಟಕ 1 - ಪೂರ್ವದ ಹಳಗನ್ನಡ : ಸಾಹಿತ್ಯ ಚರಿತ್ರೆಯ ಸ್ವರೂಪ , ಶಾಸನ ಸಾಹಿತ್ಯ,

ಕವಿರಾಜಮಾರ್ಗ, ವಡ್ಡಾರಾಧನೆ

08 ಗಂಟೆಗಳು

ಘಟಕ 2 - ಹಳಗನ್ನಡ : ಪಂಪ, ರನ್ನ, ಜನ್ನ, ನಾಗಚಂದ್ರ, ಆಂಡಯ್ಯ

07 ಗಂಟೆಗಳು

ಘಟಕ 3 - ನಡುಗನ್ನಡ : ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಬಸವಣ್ಣ, ಅಲ್ಲಮಪ್ರಭು, ಅಕ್ಕಮಹಾದೇವಿ,

08 ಗಂಟೆಗಳು

ಹರಿಹರ.

ಘಟಕ 4 - ಕುಮಾರವ್ಯಾಸ, ಲಕ್ಷ್ಮೀಶ, ರತ್ನಾಕರವರ್ಣಿ

07 ಗಂಟೆಗಳು

ಭಾಗ 2: ಪಠ್ಯ

1. ಮೊಸಳೆಯಂ ಕಪಿ ವಂಚಿಸಿದ ಕಥೆ - ದುರ್ಗಸಿಂಹ

03 ಗಂಟೆಗಳು

2. ನಿನ್ನ ಕುಲವಳಿದಲ್ಲದಳಿಯದು - ರಾಘವಾಂಕ

03 ಗಂಟೆಗಳು

3. ಅ. ಪಾಪಿ ಬಲ್ಲನೆ ಪರರ ಸುಖದುಃಖವ - ಪುರಂದರದಾಸ

03 ಗಂಟೆಗಳು

ಆ. ಸ್ನಾನವ ಮಾಡಿರೋ ಜ್ಞಾನತೀರ್ಥದಲ್ಲಿ - ಕನಕದಾಸ

4. ಗಂಡ ಹೆಂಡರ ಜಗಳ ಗಂಧ ತೀಡಿದ್ಯಾಂಗ - ಸಂ. ಸೋಮಶೇಖರ ಇಮ್ಮಾಪುರ

03 ಗಂಟೆಗಳು

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು

1. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ : ರಂ.ಶ್ರೀ ಮುಗಳಿ
2. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟಗಳು : ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ ಪ್ರಕಟಣೆ
3. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಮಗ್ರ ಚರಿತ್ರೆ ಸಂಪುಟಗಳು : ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯ
4. ಸಾಮಾನ್ಯನಿಗೆ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟಗಳು : ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯ
5. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ : ಕೆ. ವೆಂಕಟರಾಮಪ್ಪ
6. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ : ತ.ಸು.ಶಾಮರಾಯ

Course Articulation Matrix - 22OEKAN301

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2	3	3	2	3	3	3	3	3	2
CO 2	3	3	3	2	2	3	3	2	2	2	3	2
CO 3	3	1	1	2	2	1	1	2	1	1	1	2
CO 4	3	2	1	2	1	1	1	2	1	2	1	2
Weighted Average	3	2.25	1.75	2.25	2	2	2	2.25	1.75	2	2	2

ಬಿ.ಎ.

ಸೆಮಿಸ್ಟರ್-4

Course Code: 22KAN401	Course Title: ಕನ್ನಡಭಾಷೆ - 4
Course Credits (L:T:P): 03 (2:1:0)	Hours of Teaching/Week: 02 (Theory) + 02 (Tutorials)
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO 1: ಯಾವುದೇ ಕೆಲಸವನ್ನು ಪ್ರೀತಿಯಿಂದ ಮಾಡುವುದನ್ನು ಕಲಿಯುತ್ತಾರೆ.

CO 2: ಬಡತನದ ಧಾರುಣಸ್ಥಿತಿಯ ಪರಿಚಯವಾಗುವುದರಿಂದ, ಬಡಜನರ ಬಗ್ಗೆ ಅನುಕಂಪ ಮೂಡುತ್ತದೆ.

CO 3: ಕಾಲದ ಮಹತ್ವವನ್ನು ಅರಿತು, ಸಮಯದ ಸದುಪಯೋಗವನ್ನು ಪಡೆದುಕೊಳ್ಳುತ್ತಾರೆ.

CO 4: ಹಳಗನ್ನಡ ಕಾಲದ ಕವಿಗಳು ಮತ್ತು ಕಾವ್ಯಗಳನ್ನು ಓದುತ್ತಾರೆ.

ಘಟಕ - 1 ಕಾಯಕ

14 ಗಂಟೆಗಳು

1. ಕಾಯಕಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ವಚನಗಳು - ಆಯ್ದ ವಚನಗಳು
2. ರಸ್ತೆ ನಕ್ಷತ್ರ ಕೃತಿಯ ಆಯ್ದ ಭಾಗ - ಟಿ.ಕೆ. ದಯಾನಂದ
3. ಮಹಿಳೆಯನು ಒಳಗೊಳ್ಳದೆ - ಕೆ.ಪಿ.ಸುರೇಶ

ಘಟಕ - 2 ಬಡತನ

14 ಗಂಟೆಗಳು

1. ಕುಮಾರವ್ಯಾಸ ಭಾರತದ ಆಯ್ದ ಭಾಗ - ಕುಮಾರವ್ಯಾಸ
2. ಧನಿಯರ ಸತ್ಯನಾರಾಯಣ - ಕೊರಡ್ಡಲ್ ಶ್ರೀನಿವಾಸ ರಾವ್
3. ಬೂದಿಯಾಗದ ಕೆಂಡ ಕೃತಿಯ ಆಯ್ದ ಭಾಗ - ವಿಜಯಕುಮಾರ್ ಸಿಗರಪಳ್ಳಿ

ಘಟಕ - 3 ಕಾಲ

14 ಗಂಟೆಗಳು

1. ದಡಿಗವಣಂಗಳನೆ ಮೆಟ್ಟಿ ಮೆಲ್ಲದೆ ನಡೆದಂ - ರನ್ನ
2. ಮಜ್ಜಿನಿಂದ ಮಜ್ಜಿಗೆ - ಜಿ.ಎಸ್.ಶಿವರುದ್ರಪ್ಪ
3. ಹಗಲು ಇರುಳುಗಳ ನಡುವೆ - ಕಾ.ತ. ಚಿಕ್ಕಣ್ಣ

ಘಟಕ - 4 ಸಂಕೀರ್ಣ

14 ಗಂಟೆಗಳು

1. ಮುನ್ನೀರ್ ಬೆನ್ನೀರೆನೆ ಬೆರೆಸಲಣ್ಣ ತಣ್ಣೀರೊಳವೆ - ನಾಗಚಂದ್ರ
2. ಒಲವಾದೊಡೆ ರೂಪಿನ ಕೋಟಲೆಯೇವುದೊ - ಜನ್ನ
3. ನಮ್ಮ ಸಂಸ್ಕೃತಿಯ ಹೆಮ್ಮೆ ಸಾಲದು - ಶಿವರಾಮ ಕಾರಂತ

ಪಠ್ಯಪುಸ್ತಕ : ಕಲಾಗಂಗೋತ್ರಿ - 4

Course Articulation Matrix - 22KAN401

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	3	3	3	3	2	2	3	3
CO 2	3	3	3	2	2	3	1	3	2	1	3	3
CO 3	3	3	3	2	2	3	-	3	1	2	2	3
CO 4	3	3	3	2	1	2	-	2	2	2	1	3
Weighted Average	3	3	3	2	2	2.75	2	2.75	1.75	1.75	2.25	3

ಸೆಮಿಸ್ಟರ್-4

Course Code: 22KAN402	Course Title: ಕನ್ನಡಭಾಷೆ - 4
Course Credits (L:T:P): 03 (2:1:0)	Hours of Teaching/Week: 02 (Theory) + 02 (Tutorials)
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: $2\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO 1: ದಮನಿತರ ಕುರಿತಾದ ಅಧ್ಯಯನವು ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಹೊಸ ಸಂಶೋಧನೆಗೆ ದಾರಿ ಮಾಡಿಕೊಡುತ್ತದೆ.

CO 2: ಸಾಮಾಜಿಕ ಸಹಿಷ್ಣುತಾ ಮನೋಭಾವವನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವರು

CO 3: ಸಾಮಾನ್ಯ ಜನರ ಶ್ರಮಸಂಸ್ಥಿತಿಯ ಪರಿಚಯವಾಗಿ, ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಶ್ರಮಿಕವರ್ಗದ ಪರವಾದ ಕಾಳಜಿ ಹೆಚ್ಚುತ್ತದೆ.

CO 4: ತಂದೆ-ತಾಯಿಯನ್ನು ಗೌರವದಿಂದ ಕಾಣುವ ಮನೋಭಾವ ರೂಢಿಸಿಕೊಳ್ಳುವರು.

ಘಟಕ - 1 ದಮನಿತ ಲೋಕ

14 ಗಂಟೆಗಳು

- | | |
|-----------------|------------------|
| 1.ಕುಲಂ ಕುಲಮಲ್ಲು | - ಪಂಪ |
| 2.ಅಲ್ಲೇ ಕುಂತವರೆ | - ಸಿದ್ಧಲಿಂಗಯ್ಯ |
| 3.ಮಾರಿಕೊಂಡವರು | - ದೇವನೂರು ಮಹಾದೇವ |

ಘಟಕ - 2 ಸಹಿಷ್ಣುತೆ

14 ಗಂಟೆಗಳು

- | | |
|---------------------------|-------------------------|
| 1. ಭಿನ್ನ ಭೇದವ ಮಾಡಬ್ಯಾಡಿರೋ | - ಅಜ್ಜಾತ ತತ್ವಪದಕಾರ |
| 2. ಕುಲ ಕುಲ ಕುಲವೆಂದು | - ಕನಕದಾಸ |
| 3. ನಮ್ಮ ನೆರೆಯಲ್ಲಿ ದೀಪಾವಳಿ | - ಫಕೀರ್ ಮಹಮ್ಮದ್ ಕಟ್ಟಾಡಿ |

ಘಟಕ - 3 ಶ್ರೀಸಾಮಾನ್ಯನ ಬದುಕು

14 ಗಂಟೆಗಳು

- | | |
|-----------------------------|---------------------|
| 1.ಶ್ರೀ ಸಾಮಾನ್ಯನ ದೀಕ್ಷಾ ಗೀತೆ | - ಕುವೆಂಪು |
| 2.ಅಮ್ಮನ ಸೀರೆ | - ಬಾನು ಮುಷ್ಠಾಕ್ |
| 3.ಮುಖ | - ಕೃಷ್ಣಮೂರ್ತಿ ಹನೂರು |

ಘಟಕ : 4 ಸಂಕೀರ್ಣ

14 ಗಂಟೆಗಳು

- | | |
|---------------------------------------|-----------------------|
| 1.ಅಮ್ಮನಾಗುವುದೆಂದರೆ | - ರೂಪ ಹಾಸನ |
| 2.ಸೂರ್ಯಕಾಂತಿಯ ಕನಸು | - ಎಚ್ ಆರ್ ಸುಜಾತ |
| 3.ಹದಿಹರೆಯದ ವಿದ್ಯಾರ್ಥಿಗಳ ಸ್ಥಿತಿ-ಗತಿಗಳು | - ಡಾ. ಕೆ.ಆರ್. ಶ್ರೀಧರ್ |

ಪಠ್ಯಪುಸ್ತಕ : ವಿಜ್ಞಾನಗಂಗೋತ್ರಿ - 4

Course Articulation Matrix - 22KAN402

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2	3	-	3	2	2	2	3
CO 2	3	3	2	2	2	3	2	3	2	2	1	3
CO 3	3	3	2	2	2	3	3	3	2	2	1	2
CO 4	3	3	3	2	2	3	3	3	2	2	2	3
Weighted Average	3	3	2.5	2	2	3	2.66	3	2	2	1.5	2.75

ಸೆಮಿಸ್ಟರ್-4

Course Code: 22KAN403	Course Title: ಕನ್ನಡಭಾಷೆ - 4
Course Credits (L:T:P): 03 (2:1:0)	Hours of Teaching/Week: 02 (Theory) + 02 (Tutorials)
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes

CO 1: ಭೂಮಿ ಮತ್ತು ಕಡಲಿನ ಮಹತ್ವವನ್ನು ಅರಿತು, ಕಾವ್ಯ ನಿರ್ಮಾಣದಲ್ಲಿ ತೋಡಗುತ್ತಾರೆ.

CO 2: ಸಹಬಾಳ್ವೆಯಿಂದ ಕೂಡಿದ ಬದುಕನ್ನು ರೂಢಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.

CO 3: ಆದರ್ಶ ಮತ್ತು ಮೌಲ್ಯಯುತ ಜೀವನವಿಧಾನವನ್ನು ಅನುಸರಿಸುತ್ತಾರೆ.

CO 4: ಕನ್ನಡ ಸಾಹಿತ್ಯದ ವಿವಿಧ ಪ್ರಕಾರಗಳನ್ನು ಓದುತ್ತಾರೆ.

ಘಟಕ - 1 ಕಡಲು

14 ಗಂಟೆಗಳು

1. ಆಯ್ದ ಕಾವ್ಯಭಾಗಗಳು - ಪಂಪ, ಕುಮಾರವ್ಯಾಸ
2. ಸಾವಿನೆಡೆಗೆ ಸವಾರರು (ನಾಟಕ) - ಸಿಂಚ್.ಜೆ.ಎಂ (ಮೂಲ) ಬಸವರಾಜ್ ನಾಯ್ಕರ್ (ಅನುವಾದ)
3. ಪ್ರವಾಸ ಕಥನಗಳ ಆಯ್ದ ಭಾಗಗಳು - ಬಿ.ಜಿ.ಎಲ್ ಸ್ವಾಮಿ

ಘಟಕ - 2 ಸಹಬಾಳ್ವೆ

14 ಗಂಟೆಗಳು

1. ಜನಪದ ತತ್ವಪದಗಳು - ಕೈವಾರ ತಾತಯ್ಯ
2. ಆಯ್ದ ಕೀರ್ತನೆ ಮತ್ತು ತ್ರಿಪದಿಗಳು - ಸರ್ವಜ್ಞ
3. ಸಹಬಾಳ್ವೆ ಸಹಿಷ್ಣುತೆ ಒಂದು ವಿವೇಚನೆ - ವಿ. ಮುರಾರಿ

ಘಟಕ - 3 ಸಾವು

14 ಗಂಟೆಗಳು

1. ತಿರುಕೊಳವಿನಾಚಿಯ ಪ್ರಸಂಗ - ಷಡಕ್ಷರ ದೇವ
2. ಚಂದ್ರಮತಿಯ ದುಃಖ - ರಾಘವಾಂಕ
3. ಸಾವು (ಲಲಿತ ಪ್ರಬಂಧ) - ವಿ. ಸೀತಾರಾಮಯ್ಯ

ಘಟಕ - 4 ಸಂಕೀರ್ಣ

14 ಗಂಟೆಗಳು

1. ನಾಗವಲ್ಲಿ ಸ್ವಯಂವರನೆಂಬ ನಾಟ್ಯಶಾಸ್ತ್ರ - ಲಲಿತಾ ಸಿದ್ದಬಸವಣ್ಣ
2. ಚಪ್ಪಲಿಗಳು - ಸಾ.ರಾ. ಅಬೂಬಕರ್
3. ನರಿಯಮಾತಂ ನಂಬಿ ಸತ್ತ ಬೆಳ್ಳೆತೆಯ ಕಥೆ - ದುರ್ಗಸಿಂಹ

Course Articulation Matrix – 22KAN403

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	3	2	3	3	3	2	1	-	3
CO 2	3	3	3	2	3	3	2	3	2	2	3	3
CO 3	3	3	3	2	2	3	2	3	2	2	1	3
CO 4	3	3	2	2	1	3	-	3	2	2	1	3
Weighted Average	3	3	2.75	2.25	2	3	2.33	3	2	1.75	1.66	3

ಸೆಮಿಸ್ಟರ್ - 4

Course Code: 22KAN404	Course Title: ಕನ್ನಡಭಾಷೆ - 4
Course Credits (L:T:P): 03 (2:1:0)	Hours of Teaching/Week: 02 (Theory) + 02 (Tutorials)
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: $2\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes

CO 1: ಯುದ್ಧವಿರೋಧಿ ಮನೋಭಾವವನ್ನು ರೂಢಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.

CO 2: ದೇಶಪ್ರೇಮವನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುತ್ತಾರೆ.

CO 3: ನಮ್ಮದಿಯುತ ಬದುಕನ್ನು ರೂಢಿಸಿಕೊಳ್ಳುವರು.

CO 4: ವಿಜ್ಞಾನ, ಸಂಶೋಧನೆ, ತಂತ್ರಜ್ಞಾನದ ಅರಿವನ್ನು ಪಡೆಯುತ್ತಾರೆ.

ಘಟಕ - 1 ಯುದ್ಧ

14 ಗಂಟೆಗಳು

- ಇವರ ಯುದ್ಧವೆಂಬುದತಿ ಕ್ರೂರಗ್ರಹ ಯುದ್ಧದಂತೆ - ಪಂಪ
- 'ಶೃಶಾನ ಕುರುಕ್ಷೇತ್ರಂ' (ಆಯ್ದಭಾಗ) - ಕುವೆಂಪು
- ಅಣ್ಣಸ್ತೆಯುದ್ಧ - ಜಿ. ಬಾಲಕೃಷ್ಣ

ಘಟಕ - 2 ರಾಷ್ಟೀಯತೆ

14 ಗಂಟೆಗಳು

- ತಾಯ್ನಾಡು - ಮಹಮ್ಮದ್ ಧರ್ಮೇಶ್
ಅನುವಾದ (ಶ್ರೀವಿಜಯ ವಾಮನ)
- ಕಿತ್ತೂರ ಚೆನ್ನಮ್ಮ - ಜನಪದ ಕವಿ
- ಸೆರೆಯಿಂದ ಹೊರಗೆ - ಬಸವರಾಜಕಟ್ಟಿಮನೆ

ಘಟಕ - 3 ಶಾಂತಿ

14 ಗಂಟೆಗಳು

- ಶ್ರೀ ಕೃಷ್ಣ ರಾಯಭಾರ ಪ್ರಸಂಗ - ಕುಮಾರವ್ಯಾಸ
- ಗೋಲ್ಕೊಥಾ - ಎಂ. ಗೋವಿಂದಪ್ಪ
- ಶ್ವೇತಭವನದ ಮುಂದೆ - ನೇಮಿಚಂದ್ರ

1. ಮಗಳು ಕಂಡ ಕುವೆಂಪು (ಆಯ್ದುಭಾಗ) - ತಾರಣಿ ಚಿದಾನಂದ
2. ಅಗ್ನಿರೇಖೆಗಳು - ಎ.ಪಿ.ಜೆ. ಅಬ್ದುಲ್ ಕಲಾಂ
3. ನ್ಯಾನೋ ತಂತ್ರಜ್ಞಾನ - ಜೆ.ಆರ್. ಲಕ್ಷ್ಮಣರಾವ್

ಪಠ್ಯಪುಸ್ತಕ : ನಿರ್ವಹಣಾಗಂಗೋತ್ರಿ - 4

Course Articulation Matrix - 22KAN404

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2	3	3	3	2	3	-	3
CO 2	3	3	3	2	2	3	2	3	2	3	2	3
CO 3	3	3	3	3	3	3	-	3	2	3	1	3
CO 4	3	3	3	2	3	3	-	3	3	3	3	3
Weighted Average	3	3	3	2.25	2.5	3	2.5	3	2.25	3	2	3

ಸೆಮಿಸ್ಟರ್-4

Course Code: 22KAN405	Course Title: ಕನ್ನಡಭಾಷೆ - 4
Course Credits (L:T:P): 03 (2:1:0)	Hours of Teaching/Week: 02 (Theory) + 02 (Tutorials)
Total Contact Hours: 56 Hours	Formative Assessment Marks: 40
Exam Duration: 2 $\frac{1}{2}$ Hours	Semester End Examination Marks: 60

Course Outcomes

CO 1: ಉತ್ತಮ ನಾಗರೀಕರಾಗಿ ತಮ್ಮ ಕರ್ತವ್ಯಗಳನ್ನು ಪಾಲಿಸುತ್ತಾರೆ.

CO 2: ಮನುಕುಲದ ಅಭಿವೃದ್ಧಿಗೆ ಒತ್ತು ನೀಡುವರು.

CO 3: ಕರುಣಾಮಯಿ ಗುಣವನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವರು.

CO 4: ಕನ್ನಡ ಸಾಹಿತ್ಯದ ವಿವಿಧ ಪ್ರಕಾರಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.

ಘಟಕ- 1 ನಾಗರಿಕತೆ

14 ಗಂಟೆಗಳು

- 1.ಇಟ್ಟಿಗೆಯ ಪಟ್ಟಣ - ಚಂದ್ರಶೇಖರ ಕಂಬಾರ
2. ಒಂದು ಸರೀ ಕಡ್ಡಿಗಾಗಿ - ಜಯಂತ ಕಾಯ್ಕಿಣಿ
3. ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಗರಿಕತೆ - ಬಾನುಮುಷ್ಠಾಕ್

ಘಟಕ - 2 ಅಭಿವೃದ್ಧಿ

14 ಗಂಟೆಗಳು

1. ಪರದೆ ಸಂದಂತೆ - ಡಿ.ಬಿ. ರಜಿಯಾ
2. ಡಾಂಬರು ಬಂದುದು - ದೇವನೂರು ಮಹಾದೇವ
3. ಲೂಟಿಯ ಹೆದ್ದಾರಿಗಳು - ನಾಗೇಶ ಹೆಗಡೆ

ಘಟಕ - 3 ಕರುಣೆ

14 ಗಂಟೆಗಳು

1. ಶಿವಭೂತಿಯ ಕಥೆ - ಪಂಚತಂತ್ರ
2. ಕೊನೆಯ ಗಿರಾಕಿ - ನಿರಂಜನ
3. ಹಿಂಸೆಯ ಸ್ವರೂಪಗಳು ಬಲಿ-ಬಲಿದಾನ - ಮುರಾರಿ ಬಲ್ಲಾಳ

ಘಟಕ - 4 ಸಂಕೀರ್ಣ

14 ಗಂಟೆಗಳು

- 1.ಬಾಹುಬಲಿಯ ವೈರಾಗ್ಯ - ಪಂಪ
- 2.ಚಿಕ್ಕಾಪ್ಪಿನ್ - ಕುಂ. ವೀರಭದ್ರಪ್ಪ
3. ಚಿಗುರೊಡೆಯುತ್ತಿರುವ ಗಿಡದ ತನ್ಮಯತೆ - ಕ್ಷೀರಸಾಗರ

Course Articulation Matrix - 22KAN405

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2	3	2	3	2	2	2	3
CO 2	3	3	3	2	2	3	3	3	2	2	1	3
CO 3	3	3	3	2	-	3	3	3	2	2	2	3
CO 4	3	3	3	2	1	3	3	3	2	2	1	3
Weighted Average	3	3	3	2	1.66	3	2.75	3	2	2	1.5	3

ಕನ್ನಡ ಮುಕ್ತ ಆಯ್ಕೆ (OE)

ಸೆಮಿಸ್ಟರ್ - 4

Course Code: 22OEKAN401	Course Title: ಆಧುನಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಚಯ ಮತ್ತು ಪಠ್ಯ
Course Credits (L:T:P): 03 (3:0:0)	Hours of Teaching/Week: 03(Theory)
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Exam Duration: 2½ Hours	Semester End Examination Marks: 60

Course Outcomes

CO 1: ಆಧುನಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯದಲ್ಲಿ ನವೋದಯ ಸಾಹಿತ್ಯದ ವಿಶಿಷ್ಟತೆಯನ್ನು ಅರಿಯುವರು.

CO 2: ಆಧುನಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯದಲ್ಲಿ ಪ್ರಗತಿಶೀಲ ಮತ್ತು ನವ್ಯ ಸಾಹಿತ್ಯದ ಪ್ರಭಾವದ ಪರಿಚಯವಾಗುತ್ತದೆ.

CO 3: ಕನ್ನಡ ದಲಿತ ಬಂಡಾಯ ಸಾಹಿತ್ಯದ ಧೋರಣೆಗಳನ್ನು ತಿಳಿದುಕೊಳ್ಳುವರು.

CO 4: ಕನ್ನಡ ಮಹಿಳಾ ಸಾಹಿತ್ಯದ ಮಹತ್ವವನ್ನು ಅರಿಯುತ್ತಾರೆ.

ಭಾಗ 1 : ಆಧುನಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಚಯ

ಘಟಕ 1 ಅ. - ನವೋದಯಪೂರ್ವ ಸಾಹಿತ್ಯ : (1870 - 1920) ಮುದ್ದಣ, ಆರಂಭಿಕ ಅನುವಾದ ಸಾಹಿತ್ಯದ ಸಂಕ್ಷಿಪ್ತ ಪರಿಚಯ (ಚುರಮುರಿ ಶೇ ಗಿರಿಯರು, ಬಸವಪ್ಪಾಸ್ತಿ, ಬಿ.ವೆಂಕಟಾಚಾರ್ಯ, ಎಂ.ಎಲ್. ಶ್ರೀಕಂಠೇಶಗೌಡ, ಎಸ್.ಜೆ. ನರಸಿಂಹಾಚಾರ್ಯ) ಪಂಜೆ ಮಂಗೇಶರಾವ್, ಗೋವಿಂದ ಪೈ.

ಆ. - ನವೋದಯ ಸಾಹಿತ್ಯ : ಪ್ರೇರಣೆ ಮತ್ತು ಹಿನ್ನೆಲೆ,

ಬಿ.ಎಂ.ಶ್ರೀ., ದ.ರಾ. ಬೇಂದ್ರೆ, ಕುವೆಂಪು, ಮಾಸ್ತಿ ವೆಂಕಟೇಶ ಐಯ್ಯಂಗಾರ್, ಶಿವರಾಮ ಕಾರಂತ, ಟಿ.ಪಿ. ಕೈಲಾಸಂ, ಶ್ರೀರಂಗ.

07 ಗಂಟೆಗಳು

ಘಟಕ 2 - ಪ್ರಗತಿಶೀಲ ಮತ್ತು ನವ್ಯ ಸಾಹಿತ್ಯ : ಪ್ರೇರಣೆ ಮತ್ತು ಹಿನ್ನೆಲೆ

07 ಗಂಟೆಗಳು

ಪ್ರಗತಿಶೀಲ ಸಾಹಿತ್ಯ : ಅ.ನ. ಕೃಷ್ಣರಾಯ, ಚದುರಂಗ

ನವ್ಯ ಸಾಹಿತ್ಯ : ವಿ.ಕೃ. ಗೋಕಾಕ್, ಗೋಪಾಲ ಕೃಷ್ಣ ಅಡಿಗ, ಯಶವಂತ ಚಿತ್ತಾಲ,

ಯು.ಆರ್. ಅನಂತಮೂರ್ತಿ, ಗಿರೀಶ್ ಕಾರ್ನಾಡ, ಚಂದ್ರಶೇಖರ ಕಂಬಾರ

ಘಟಕ 3 - ದಲಿತ ಮತ್ತು ಬಂಡಾಯ ಸಾಹಿತ್ಯ : ಪ್ರೇರಣೆ ಮತ್ತು ಹಿನ್ನೆಲೆ.

08 ಗಂಟೆಗಳು

ಸಿದ್ದಲಿಂಗಯ್ಯ, ಬರಗೂರು ರಾಮಚಂದ್ರಪ್ಪ, ದೇವನೂರು ಮಹಾದೇವ.

ಘಟಕ 4 - ಮಹಿಳಾ ಸಾಹಿತ್ಯ : ಪ್ರೇರಣೆ ಮತ್ತು ಹಿನ್ನೆಲೆ

07 ಗಂಟೆಗಳು

ನಂಜನಗೂಡು ತಿರುಮಲಾಂಬ, ಗೀತಾನಾಗಭೂಷಣ, ವೈದೇಹಿ, ಸಾರಾ ಅಬೂಬಕರ್

ಭಾಗ 2 : ಪಠ್ಯ

1. ಅ. ನೆರಳು - ಪುತಿನ

ಆ. ಸಂಕಲ್ಪ ಗೀತೆ - ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ

04 ಗಂಟೆಗಳು

2. ರಂಗವ್ಯಾಭರಣವಿರಸ : ಕರಿಯನಿಗೆ ಕೆಲಸ

(ಪಿ. ಲಂಕೇಶ್ ಅವರ 'ಮುಸ್ಸಂಜೆಯಕಥಾ ಪ್ರಸಂಗ'ದಿಂದ ಆಯ್ದ ಭಾಗ)

03 ಗಂಟೆಗಳು

3. ಹೋಗಿಯೇ ಬಿಟ್ಟಿದ್ದ ! - ಕೊಡಗಿನ ಗೌರಮ್ಮ

03 ಗಂಟೆಗಳು

4. ಮಾರ್ವೆಲಸ್ ಐಡಿಯಾ - ಕೆ.ಪಿ. ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ

03 ಗಂಟೆಗಳು

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು

1. ಹೊಸಗನ್ನಡ ಕವಿತೆಯ ಮೇಲೆ ಇಂಗ್ಲಿಷ್ ಕಾವ್ಯದ ಪ್ರಭಾವ : ಎಸ್. ಅನಂತನಾರಾಯಣ
2. ಸಂಕ್ಷಿಪ್ತ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ : ಎಂ.ಮರಿಯಪ್ಪ ಭಟ್ಟ
3. ಯುಗಧರ್ಮ ಹಾಗೂ ಸಾಹಿತ್ಯ ದರ್ಶನ : ಕೀರ್ತಿನಾಥ ಕುರ್ತಕೋಟಿ
4. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ : ಕೀರ್ತಿನಾಥ ಕುರ್ತಕೋಟಿ
5. ಹೊಸಗನ್ನಡದ ಅರುಣೋದಯ : ಶ್ರೀನಿವಾಸ ಹಾವನೂರ
6. ಸಾಲುದೀಪಗಳು : ಕರ್ನಾಟಕ ಸಾಹಿತ್ಯ ಕಾಡಮಿ
7. ಹೊಸಗನ್ನಡದ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ : ಎಲ್.ಎಸ್.ಶೇಷಗಿರಿರಾವ್
8. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಚಾರಿತ್ರಿಕ ಬೆಳವಣಿಗೆ : ಸಿ.ವೀರಣ್ಣ
9. ಮಹಿಳಾ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ : ಹೆಚ್.ಎಸ್.ಶ್ರೀಮತಿ
10. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಮೀಮಾಂಸೆ : ರಹಮತ್ ತರೀಕೆರೆ
11. ವಚನ ಚಿಂತನ ಮಾಲೆ ಸಂಪುಟಗಳು : ಬರಗೂರು ರಾಮಚಂದ್ರಪ್ಪ
12. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಕೋಶ : ರಾಜಪ್ಪ ದಳವಾಯಿ
13. ಕನ್ನಡ ರಾಷ್ಟ್ರೀಯತೆ : ಬಂಜಗರೆ ಜಯಪ್ರಕಾಶ
14. ಕರ್ನಾಟಕ ಸಮಗ್ರ ತತ್ವಪದಗಳ ಸಂಪುಟಗಳು : ಪ್ರ. ಸಂ. ಕಾ. ತ. ಚಿಕ್ಕಣ್ಣ

Course Articulation Matrix - 22OEKAN401

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	3	2	3	3	3	2	2	2
CO 2	3	2	3	2	3	3	3	3	2	3	3	2
CO 3	3	2	1	2	1	2	1	2	1	2	1	2
CO 4	3	2	2	2	2	1	2	1	2	1	2	2
Weighted Average	3	2.25	2.25	2	2.25	2	2.25	3	2	2	2	2

DSC(3) Mathematics Syllabus for B.Sc. Mathematics (Basic and Honors)

Semester III

Course Code: 222339	Course Title: DSC(3) : Algebra–III and Differential Equations – I DSC(3) Lab : Theory based Practical's on Algebra–III and Differential Equations – I
Course Credits: 06 (4:0:2)	Hours of Teaching/Week: 04 (Theory) + 04 (Practical)
Total Contact Hours: 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2 ½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs):

CO1 :Acquiring the knowledge and structure of group, subgroup, cyclic group and group of permutation.

CO2 :Analyzing and applying the concepts of normal subgroup, quotient group , homomorphism and isomorphism for groups.

CO3 :Identifying and evaluating differential equations using different techniques.

CO4 :Applying various methods to solve first order and higher degree differential equations. Designing solutions for ordinary differential equations and simultaneous equations with constant coefficients by constructing complementary function and particular integral.

Course Content

Content	Hours
UNIT – 1	
Group Theory – I : Definition and examples of groups – Some general properties of Groups, Subgroups, Group of permutations – Cyclic permutations – Even and odd permutations. Order of an element of a group – Cyclic groups problems and theorems.	14
UNIT – 2	

Group Theory – II : Cosets, Index of a group, Lagrange's theorem, consequences, Normal Subgroups, Quotient groups – Homomorphism. – Kernel of homomorphism – Isomorphism – Automorphism -Fundamental theorem of homomorphism, Cayley's theorem.	14
UNIT – 3	
Differential Equations – I : Recapitulation of Definition, examples of differential equations, Formation of differential equations by elimination of arbitrary constants, Differential equations of first order – Separation of variables, Reducible to separation of variables, Homogeneous differential equations, Reducible to homogeneous, Exact differential equations, Reducible to exact, Integrating factors found by inspection and the determination of integrating factors, Linear differential equations, Bernoulli's differential equations.	14
UNIT – 4	
Differential Equations – II: Equations of First order and higher degree – Solvable for p, Solvable for x, Solvable y, Clairaut's equations – Singular and General solutions. Ordinary Linear differential equations with constant coefficients – Complementary function – particular integral – Inverse differential operators. Simultaneous differential equations (two variables with constant coefficients).	14

Books for References:

1. Daniel A Murray – Introductory Course to Differential equations
2. Earl David Rainville and Philip Edward Bedient – A short course in Differential equations, Prentice Hall College Div; 6th edition.
3. I N Herstien – Topics in Algebra.
4. Joseph Gallian – Contemporary Abstract Algebra, Narosa Publishing House, New Delhi, Fourth Edition.
5. G. D. Birkhoff and S Maclane – A brief Survey of Modern Algebra.
6. J B Fraleigh – A first course in Abstract Algebra.
7. Michael Artin – Algebra, 2nd ed. New Delhi, India: PHI Learning Pvt. Ltd., 2011.
8. Vashista, A First Course in Modern Algebra, 11th ed.: Krishna Prakasan Mandir, 1980.
9. R Balakrishnan and N.Ramabadran, A Textbook of Modern Algebra, 1st ed. New Delhi, India: Vikas publishing house pvt. Ltd., 1991.
10. M D Raisinghanian, Advanced Differential Equations, S Chand and Co. Pvt. Ltd., 2013.
11. F Ayres, Schaum's outline of theory and problems of Differential Equations, 1st ed. USA McGraw-Hill, 2010.
12. S Narayanan and T K Manicavachogam Pillay, Differential Equations .: S V Publishers

Private Ltd., 1981.

13. E Kreyszig- Advanced Engineering Mathematics, Wiley India Pvt. Ltd.

G F Simmons, Differential equation with Applications and historical notes, 2nd ed.: McGraw-Hill Publishing Company, Oct 1991.

Mathematics Weblinks:

1. <http://scienceworld.wolfram.com/biography/topics/Mathematicians.html>
2. <http://teachers.sduhsd.k12.ca.us/abrown/index2.html>
3. <http://www.maths.tcd.ie/pub/HistMath/People/RBallHist.html>
4. <http://www.geometry.net/math.html>
5. http://www-history.mcs.st-andrews.ac.uk/history/Indexes/Full_Alph.html
6. <http://mathforum.org>
7. <http://www.cut-the-knot.org>
8. <http://nrich.maths.org>
9. <http://archives.math.utk.edu/>
10. <http://www-groups.dcs.st-and.ac.uk/~history/>
11. <http://www.maa.org/>
12. <http://e-math.ams.org/>
13. [Website on Books in Mathematics](#)

Practical/Lab Work to be performed in Mathematics Lab (FOSS) Suggested Software's:

Maxima/Scilab /Python/R.

Introduction to the software and commands related to the topic.

1. Generate Cayley's table.
2. Verifying whether given operator is binary or not.
3. Finding identity and inverse elements of a group.
4. Finding left and right cosets of a group.
5. To find all the Cyclic subgroups of a given group.
6. Verification of Normality of a given subgroup of a group.
7. Solution of Differential equation and plotting the graph of the solution: Variable Separable.
8. Solution of Differential equation and plotting the graph of the solution: Homogeneous Equations.
9. Solution of Differential equation and plotting the graph of the solution: Linear differential equations.
10. Solution of Differential equation and plotting the graph of the solution: Bernoulli's equations.
11. Solution of Differential equation and plotting the graph of the solution: Exact equations.
12. Finding Complementary function and particular Integral of constant coefficients.

Note: Student has to execute a minimum of 8 programs in each part to complete the Lab course.

Course Articulation Matrix - 222339

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	-	-	1	1	1	1	2	1	1	2
CO 2	3	2	1	-	1	1	1	1	2	1	1	2
CO 3	3	3	1	1	2	2	1	1	1	1	1	2
CO 4	3	3	1	1	2	2	1	1	1	1	1	2
Weighted Average	3	2.25	1	1	1.5	1.5	1	1	1.5	1	1	2

OE(3) Mathematics Syllabus for All Programs (Except Science)

Semester III

Course Code: 22OEMAT301	Course Title: OE(3) Discrete Mathematics
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2 ½ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO 1: Apply set theoretic identities involving, Unions, Intersections, Cartesian product, Relation & Ordering, Compatibility and Composition of Binary relation.

CO 2: Applying the Applications of Graph theory involving path, connectedness, trees, matrix representation of graphs in real life problems

CO 3: Formulate the negation, converse, contrapositive, conditional, Biconditional, Technologies & equivalence relation of a quantified implication, both linguistically and in symbolic form.

Course Content

UNIT – 1	Basics of Set The	14 HOURS
Notation, Inclusion and Equality of sets, The power set, Operation on sets, Venn diagram, Set identities, Ordered pairs and Cartesian products. Relations and ordering – Properties of binary relation in a set, Relation matrix and Graph of a relation. Equivalence relations, Compatibility relations, composition of Binary relation.		
UNIT – 2	Graph Theory	14 HOURS
Basic definitions, Paths and Connectedness, Matrix representation of Graphs, Trees.		
UNIT – 3	Mathematical Logic	14 HOURS
Statements and Notation, Connectives, Negation, Conjunction, Disjunction,, Statement formulas and Truth tables, Conditional and Bi-conditional, Tautologies, Equivalence of formulas, Tautological Implications.		

OE(3) Mathematics Syllabus for All Programs (Except Science)

Semester III

Course Code: 22OEMAT302	Course Title: OE(3) Mathematical Aptitude - III
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2 ½ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO 1: Examine and Develop solution for polynomial equations, linear equation and problems based on Ages.

CO 2: Evaluate the problems on Area, Volume and Surface area for some conic sections.

CO 3: Analysis of Direction test, Relation test and seating puzzles using various techniques.

Course Content

UNIT – 1	14 HOURS	
Algebraic Expressions, Polynomials, Fundamental operations on Algebraic expressions, Factorization, Linear equations and problems based on Ages, Quadratic equations.		
UNIT – 2	Mensuration	14 HOURS
Area, Volume and Surface area (Cylinder, Cone, Sphere).		
UNIT – 3	Verbal Reasoning	14 HOURS
Direction Test, Relation Test, Venn Diagram Analysis Test, Seating puzzles.		

Books for References:

1. R.S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", Revised Edition, S. Chand and Co. Ltd, New Delhi, 2018.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude : Numerical Ability (Fully Solved) Objective Questions, Kiran Prakashan, Pratogita prakasan, Kic X, Kiran Prakashan publishers.
4. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw hill publications.

DSC(4) Mathematics Syllabus for B.Sc. Mathematics (Basic and Honors)

Semester IV

Course Code:222439

Course Title:

DSC(4) : Real Analysis – I and Differential Equations – II

DSC(4) Lab: Theory based Practical's on Real Analysis – I and Differential Equations – II

Course Credits:06 (4:0:2)

Hours of Teaching/Week:

04 (Theory) + 04 (Practical)

Total Contact Hours:	Formative Assessment Marks:
56 Hours (Theory)	40 (Theory)
56 Hours (Practical)	25 (Practical)

Exam Duration: 2 ½ Hours (Theory)

3 Hours (Practical)

Semester End Examination Marks:

60 (Theory)

25 (Practical)

Course Outcomes (COs):

CO1 : Interpreting the behavior of convergence , divergence, oscillatory and monotonic sequences with their general principles.

CO2 : Evaluation of convergence, divergence and oscillatory series applying various methods.

CO3 : Apply various methods to evaluate linear differential equations and total differential equations.

CO4 : Formation of Partial differential equations and designing solutions for first order non-linear partial differential equations using standard methods.

Course Content

Content	Hours
UNIT – 1	
<p>Sequences : Sequence of real numbers – Bounded and unbounded sequences – Infimum and supremum of a sequence – Limit of a sequence – Sum, product and quotient of limits – Standard theorems on limits – Convergent, divergent and oscillatory sequences – Discuss the convergence x^n, $n^{\frac{1}{n}}$, $\left(1 + \frac{1}{n}\right)^n$ and standard problems – Monotonic sequences and their properties – Cauchy's general principle of convergence.</p>	14
UNIT – 2	
<p>Infinite Series : Infinite series of real numbers – Convergence and Divergence - Oscillation of series – Properties of convergence – Series of positive terms – Geometric series – p – series – Comparison tests – D'Alembert's ratio test – Raabe's test – Cauchy's root test – Leibnitz's test for alternating series.</p>	14
UNIT – 3	
<p>Linear differential equations : Cauchy – Euler differential equations, Solution of ordinary second order linear differential equations with variable coefficients by various methods such as: (i) When a part of complementary function is given. (i) Changing the independent variable. (ii) Changing the dependent variable. (iii) By method of variation of parameters. (iv) Exact method. Total differential equations - Necessary and sufficient condition for the equation $Pdx + Qdy + Rdz = 0$ to be exact (proof only for the necessary part) – Simultaneous equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.</p>	14
UNIT – 4	
<p>Partial differential equations (14 hrs) : Basic concepts – Formation of a partial differential equations by elimination of arbitrary constants and functions – Solution of partial differential equations – Solution by Direct integration, Lagrange's linear equations of the form $Pp + Qq = R$, Standard types of first order non-linear partial differential equations – Charpit's method – Homogenous linear equations with constant coefficient – Rules for finding the complementary function – Rules for finding the particular integral, Method of separation of variables (product method).</p>	14

Books for References:

1. G. Stephenson – An introduction to Partial Differential Equations.
2. B. S. Grewal – Higher Engineering Mathematics
3. E Kreyszig- Advanced Engineering Mathematics, Wiley India Pvt. Ltd.
4. E D Reinville and P E Bedient – A Short Course in Differential Equations
5. D A Murray – Introductory Course in Differential Equations.
6. G P Simmons – Differential Equations
7. F. Ayres – Differential Equations (Schaum Series)
8. Martin Brown – Application of Differential Equations.
9. M D Raisinghania, Advanced Differential Equations, S Chand and Co. Pvt. Ltd., 2013.
10. S C Malik –Real Analysis
11. Leadership project – Bombay university- Text book of mathematical analysis
12. S S Bali – Real analysis.
13. Richard R Goldberg, Methods of Real Analysis, Indian ed.

Mathematics Web links:

1. <http://scienceworld.wolfram.com/biography/topics/Mathematicians.html>
2. <http://teachers.sduhsd.k12.ca.us/abrown/index2.html>
3. <http://www.maths.tcd.ie/pub/HistMath/People/RBallHist.html>
4. <http://www.geometry.net/math.html>
5. http://www-history.mcs.st-andrews.ac.uk/history/Indexes/Full_Alph.html
6. <http://mathforum.org>
7. <http://www.cut-the-knot.org>
8. <http://nrich.maths.org>
9. <http://archives.math.utk.edu/>
10. <http://www-groups.dcs.st-and.ac.uk/~history/>
11. <http://www.maa.org/>
12. <http://e-math.ams.org/>
13. [Website on Books in Mathematics](#)

Practical/Lab Work to be performed in Computer Lab Suggested Software's:

Maxima/Scilab//Python/R.

1. To test the convergence of the Sequence.
2. To test the convergence of the sequence using Cauchy's criterion.
3. To verify whether the given sequence is monotonically Increasing or Decreasing.
4. To test the convergence of the series.
5. To test the convergence of the series by D'Alembert's ratio test and Raabe's test.
6. To solve second order LDE when a part of the complementary function is known.
7. To solve second order LDE by changing the dependent variable (Normal form).
8. To find the Wronskian of second order LDE.
9. To test for exactness and solving second order LDE.
10. To verify the condition for Integrability of a total D.E.
11. To solve first order non linear PDE containing p and q only.
12. To solve first order non linear PDE of the form $f_1(x,p)=f_2(y,q)$.

Course Articulation Matrix - 222439

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	-	3	-	-	-	1	1	-	1
CO 2	1	2	2	-	3	1	1	1	1	1	-	1
CO 3	2	3	2	1	3	-	-	1	2	2	1	1
CO 4	1	2	2	-	3	-	-	-	1	-	-	1
Weighted Average	1.5	2.25	1.75	1	3	1	1	1	1.25	1	1	1

OE(4) Mathematics Syllabus for All Programs (Except Science)

Semester IV

Course Code: 22OEMAT401	Course Title: OE(4) Basic of Number Theory
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2 ½ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO 1: Analyzing Binomial theorem and Mathematical induction in solving real life problems.

CO 2: Acquiring the knowledge of divisibility, GCD, LCM and relation between GCD & LCM.

CO 3: Apply the properties of congruences, Binary & Decimal representation of integers with Chinese remainder theorem in evaluating practical problems.

Course Content

UNIT – 1	14 HOURS	
Binomial Theorem, Mathematical Induction.		
UNIT – 2	Number System	14 HOURS
Test for Divisibility, Number of divisors and Sum of divisors of a number, Greatest Common Divisor (GCD), Least Common Multiple (LCM), Relation between GCD and LCM, Representation of a GCD as a linear combination of given two numbers.		
UNIT – 3	Congruence	14 HOURS
Basic properties of congruence, Binary and Decimal representations of integers, Linear Congruences and the Chinese Remainder Theorem.		

Books for References:

1. An Introduction to the Theory of Numbers by Ivan Niven, Herbert S. Zuckerman, Hugh L. Montgomery.
2. Elementary Number Theory by David M. Burton.

Course Articulation Matrix - 22OEMAT401

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	-	2	1	1	1	1	1	1	1
CO 2	1	1	2	-	1	-	-	-	1	-	-	1
CO 3	1	1	2	-	1	-	-	-	1	-	-	1
Weighted Average	1.33	1.33	1.66	-	1.33	1	1	1	1	1	1	1

OE(4) Mathematics Syllabus for All Programs (Except Science)

Semester IV

Course Code: 22OEMAT402	Course Title: OE(4) Mathematical Aptitude – IV
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2 ½ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO 1: Analysing & Interpretation of Data.

CO 2: Apply the properties of Surds, Indices and logarithm in solving problems.

CO 3: Enhancing analytical reasoning through classification, series test,

Course Content

UNIT – 1	14 HOURS	
Data interpretation, Data sufficiency.		
UNIT – 2	14 HOURS	
Surds & Indices, Logarithm and its properties.		
UNIT – 3	Non - Verbal Reasoning	14 HOURS
Series Test, Analogy, Classification, Cube and Dice, Analytical Reasoning.		

Books for References:

1. R.S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", Revised Edition, S. Chand and Co. Ltd, New Delhi, 2018.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude : Numerical Ability (Fully Solved) Objective Questions, Kiran Prakashan, Pratogita prakasan, Kic X, Kiran Prakashan publishers.
4. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw hill publications.

DSC (3) Syllabus for B.Sc. Microbiology (Basic and Honors)

Semester III

Course Code: 222379	Course Title: Microbial Diversity (Theory) Microbial Diversity Lab (Practical)
Course Credits (L:T:P) : 06 (4:0:2)	Hours of Teaching/Week: 04 (Theory) + 04 (Practical)
Total Contact Hours: 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs):

CO 1: Appreciate the comprehension of Microbial Diversity.

CO 2: Illustrate the characters, classification and economic importance of Prokaryotic microbes.

CO 3: Emphasize the characters, classification and economic importance of Eukaryotic microbes.

CO 4: Acquire broader facts of viruses and their diversity.

Course Content

Content	Hours
UNIT – 1 Biodiversity and Microbial Diversity	
Concept, definition, and levels of biodiversity; Biosystematics – Major classification systems- Numerical and Chemotaxonomy. Study and measures of microbial diversity; Conservation and Economic values of microbial diversity.	14
UNIT – 2: Diversity of Prokaryotic Microorganisms	
Diversity of Prokaryotic Microorganisms : Distribution, factors regulating distribution, general characteristics, classification and economic importance of the following: Bacteria and Archaea- An overview of Bergey's Manual of Systematic Bacteriology. Bacteria- <i>Escherichia coli</i> , <i>Bacillus subtilis</i> Cyanobacteria- <i>Nostoc</i> , <i>Microcystis</i> , <i>Spirulina</i> Archea- <i>Thermus aquaticus</i> , <i>Methanogens</i> Actinomycetes: <i>Streptomyces</i> Rickettsiae- <i>Rickettsia rickettsii</i> Chlamydiae – <i>Chlamydia trachomatis</i> Spirochaetes- <i>Treponema pallidum</i>	14
UNIT - 3: Diversity of Eukaryotic Microorganism	
Diversity of Eukaryotic Microorganism: General characters, Classification and Economic importance. Fungi: Ainsworth classification- detailed study up to the level of classes, Salient features and reproduction. Type study: <i>Rhizopus</i> , <i>Aspergillus</i> , <i>Agaricus</i> , <i>Fusarium</i> . Algae: Occurrence, distribution and symbiotic association - Lichen; Thallus organization and Economic importance of <i>Chlorella</i> , <i>Cosmarium</i> , <i>Gracilaria</i> . Protozoa: Structure and Reproduction of <i>Amoeba</i> , <i>Euglena</i> , <i>Paramecium</i> .	14
UNIT - 4: Diversity of Virus	
Diversity of Virus: General properties and structure, Isolation and Identification of Viruses. Principles of Viral Taxonomy- Baltimore and ICTV and the recent trends. Capsid symmetry- Icosahedral, Helical, Complex	14

Structure and Replication of the following:**Human and Animal Viruses:** HIV, Corona, Oncogenic virus**Plants Viruses:** TMV, Bean Mosaic Virus**Microbial Viruses:** T4/Lambda/Cyano/Mycophages. Viroids and Prions.**References:**

1. Prescott, Harley, Klein's Microbiology, J.M. Willey, L.M. Sherwood, C.J. Woolverton, 7th International, edition 2008, McGraw Hill.
2. A Textbook of Microbiology, R. C. Dubey and D. K. Maheshwari, 1st edition, 1999, S. Chand & Company Ltd.
3. Brock Biology of Microorganisms, M.T.Madigan, J.M.Martinko, P. V. Dunlap, D. P.Clark- 12th edition, Pearson International edition 2009, Pearson Benjamin Cummings.
4. Microbiology – An Introduction, G. J.Tortora, B. R.Funke, C. L. Case, 10th ed. 2008,Pearson Education.
5. Flint, S.J., Enquist, L.W., Drug, R.M., Racaniello, V.R. and Skalka, A.M. 2000. Principles of Virology- Molecular Biology, Pathogenesis and Control. ASM Press, Washington, D.C
6. Vashishta B.R, Sinha A.K and Singh V. P. Botany – Fungi 2005, S. Chand and Company Limited, New Delhi
7. Kotpal R.L Protozoa 5th Edition 2008, Rastogi Publications, Meerut, New Delhi.
8. Alexopoulos, C.J., Mims, C.W., and Blackwell, M. 2002. Introductory Mycology. John Wiley and Sons (Asia) Pvt. Ltd. Singapore. 869 pp.
9. Microbiology- Concepts and Applications, Pelczar Jr. Chan, Krieg, International ed, McGraw Hill

Weblinks:

1. <https://www.sciencedirect.com/topics/immunology-and-microbiology/microbial-diversity>
2. <https://pressbooks-dev.oer.hawaii.edu/biology/chapter/prokaryotic-diversity/>
3. <https://academic.oup.com/femsre/article/42/5/543/5045018>
4. http://medbox.iiab.me/kiwix/wikipedia_en_medicine_2019-12/A/Virus_classification
5. <https://www.nature.com/articles/s41564-020-0709-x>

DSC (3): Practical Microbial Diversity

(4Hrs/week) 2 Credits

1. Study of morphology of bacteria.
2. Isolation of bacteria from soil.
3. Isolation of bacteria from air.
4. Isolation of bacteria from water.
5. Isolation of fungi from soil.
6. Isolation of fungi from air.
7. Isolation of fungi from water.
8. Cultivation of Cyanobacteria.
9. Cultivation of Actinomycetes.
10. Study of Cyanobacteria - *Nostoc*, *Microcystis*, *Spirulina*.
11. Study of Algae - *Chlorella*, *Cosmarium*, *Gracilaria*.
12. Study of Fungi- *Rhizopus*, *Fusarium*, *Agaricus*.
13. Study of Protozoa(Permanent slides) - *Amoeba* *Paramecium* *Euglena*.
14. Study of Photographs or Models - HIV, TMV, Corona virus.
15. T4Phage, Lambda, Oncogenic viruses.

Course Articulation Matrix – 222379

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	-	-	-	2	1	1	-	3	2	-	1
CO 2	2	-	-	-	2	1	1	-	3	2	-	1
CO 3	2	-	-	-	2	1	1	-	3	2	-	1
CO 4	2	-	-	-	2	1	-	-	-	2	-	1
Weighted Average	1.75	-	-		2	1	1	-	3	2	-	1

OE (3) Microbiology Syllabus for All Programs (Except Science)

Semester III

Course Code: 22OEMIB301	Course Title: Microbial Entrepreneurship
Course Credits (L:T:P): 03 (3:0:0)	Hours of Teaching/Week: 3 Hours (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2½ Hours (Theory)	Semester End Examination Marks: 60

Course Outcomes (COs):

CO 1: Exhibit entrepreneurial skills.

CO 2: Erudition of industrial entrepreneurship.

CO 3: Proficiency in Healthcare Entrepreneurship.

Course Content

Content	Hours
UNIT – 1 General Entrepreneurship	
Entrepreneurship and microbial entrepreneurship - Introduction and scope, Business development, product marketing, HRD, Biosafety and Bioethics, IPR and patenting, Government organization/ institutions/ schemes, Opportunities and challenges.	14
UNIT – 2 Industrial Entrepreneurship	
Microbiological industries – Types, processes and products, Dairy products, Fermented foods, Alcoholic products and Beverages, Enzymes – Industrial production and applications. Biofertilizers and Biopesticides, SCP (Mushroom and <i>Spirulina</i>) etc.	14
UNIT – 3 Healthcare Entrepreneurship	
Production and applications: Sanitizers, Antiseptic solutions, Polyphenols (Flavonoids), Alkaloids, Cosmetics, Biopigments and Bioplastics, vaccines, Diagnostic tools and kits.	14

References:

1. Srilakshmi B, (2007), Dietetics. New Age International publishers. New Delhi
2. Srilakshmi B, (2002), Nutrition Science. New Age International publishers. New Delhi
3. Swaminathan M. (2002), Advanced text book on food and Nutrition. Volume I. Bappco
4. Gopalan.C., RamaSastry B.V., and S.C.Balasubramanian (2009), Nutritive value of Indian Foods. NIN.ICMR.Hyderabad.
5. Mudambi S R and Rajagopal M V, (2008), Fundamentals of Foods, Nutrition & diet therapy by New Age International Publishers, New Delhi

Weblinks:

1. <https://microbiologysociety.org/publication/past-issues/making-money-from-microbes.html>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3570996/>
3. https://www.researchgate.net/publication/356668525_The_Use_of_Mushrooms_and_Spirulina_Alga_as_Supplements_to_Prevent_Growth_Inhibition_in_a_Pre-Clinical_Model_for_an_Unbalanced_Diet

Course Articulation Matrix – 22OEMIB301

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	1	1	-	-	1	-	2	-	2	-	1
CO 2	1	1	1	-	1	1	1	-	-	2	-	1
CO 3	1	1	1	1	1	1	1	-	-	2	-	1
Weighted Average	1	1	1	-	1	1	1	2	-	2	-	1

DSC (4) Syllabus for B.Sc. Microbiology (Basic and Honors)

Semester IV

Course Code: 222479	Course Title: Microbial Enzymology and Metabolism (Theory) Microbial Enzymology and Metabolism (Practical)
Course Credits (L:T:P): 06 (4:0:2)	Hours of Teaching/Week: 04 (Theory) + 04(Practical)
Total Contact Hours: 56Hours(Theory) 56 Hours(Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs):

CO 1: Delineate the Enzyme activity.

CO 2: Swotting the enzyme kinetics and regulation.

CO 3: Extricate the concepts of Chemoheterotrophic metabolism and Chemolithotrophic metabolism.

CO 4: Differentiating concepts of aerobic and anaerobic respiration and how these are manifested in the form of different metabolic pathways in microorganisms.

Course Content:

Content	Hours
UNIT - 1 Basics of Enzymes	
Definitions of terms – enzyme unit, specific activity and turnover number, exo/ endoenzymes, constitutive/ induced enzymes, isozymes. Monomeric, Oligomeric and Multimeric enzymes. Multienzyme complex: pyruvate dehydrogenase; isozyme: lactate dehydrogenase. Ribozymes, abzymes. Structure of enzyme: Apoenzyme and cofactors, prosthetic group-TPP, coenzyme, NAD, metal cofactors. Classification of enzymes, Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis and Induced Fit hypothesis. Multisubstrate reactions. Enzyme catalysis: Catalytic mechanisms with type examples.	14
UNIT - 2 Enzyme Kinetics and Regulation	
Enzyme Kinetics: Kinetics of one substrate reactions. i.e. Equilibrium assumptions ii. Steady state assumptions iii. Michaelis-Menten equations. Kinetics of enzyme inhibition. Competitive, non-competitive and uncompetitive inhibition. Effect of changes in pH and temperature on enzyme catalysed reaction. Kinetics of two substrate reactions. Kinetics of immobilized enzymes. Enzyme regulation: Allosteric enzyme - general properties, Hill equation, Koshland-Nemethy-Filmer model. Covalent modification by various mechanisms. Regulation of multi-enzyme complex-	14

Pyruvate dehydrogenase. Feedback inhibition. HIV enzyme inhibitors and drug design. Microbial Enzymes: sources- Bacterial, Fungal, and their applications.	
UNIT – 3 Metabolism of Carbohydrates	
Chemoheterotrophic Metabolism- Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway, Phosphoketolase pathway. TCA cycle. Fermentation - Fermentation balance, concept of linear and branched fermentation pathways. Fermentation pathways: Alcohol fermentation and Pasteur effect; Butyric acid and Butanol-Acetone Fermentation, Mixed acid and 2,3-butanediol fermentation, Propionic acid Fermentation (Succinate pathway and Acrylate pathway), acetate fermentation. Chemolithotrophic Metabolism: Chemolithotrophy - Hydrogen oxidation, Sulphur oxidation, Iron oxidation, Nitrogen oxidation.	14
UNIT – 4 Metabolism of Aminoacids, Nucleotides and Lipids	
Nitrogen Metabolism Introduction to biological nitrogen fixation, Ammonia assimilation, Assimilatory nitrate reduction, dissimilatory nitrate reduction, denitrification. 2. Biosynthesis of ribonucleotides and deoxyribonucleotides The de novo pathway. Regulation by feedback mechanisms. Recycling via the salvage pathway. 3. Amino acid degradation and biosynthesis. 4. Lipid degradation and biosynthesis. 5. Metabolism of one carbon compounds: Methylotrophs :i. Oxidation of methane, methanol, methylamines; ii. Carbon assimilation in methylotrophic bacteria and yeasts. Methanogens: i. Methanogenesis from methylamines; ii. Energy coupling and biosynthesis in methanogenic bacteria. Acetogens: Autotrophic pathway of acetate synthesis. 6. Metabolism of two-carbon compounds: Acetate: i. Glyoxylate cycle. Acetic acid bacteria: Ethanol oxidation, sugar alcohol oxidation. Glyoxylate and glycolate metabolism: i. Dicarboxylic acid cycle, ii. Glycerate pathway iii. Beta hydroxyaspartate pathway , Oxalate as carbon and energy source.	14

References:

1. Philipp. G. Mannual of Methods for General Bacteriology.
2. David T. Plummer. An Introduction to Practical Biochemistry
3. Biochemistry- A Problem Approach, Wood W. B. Wilson J.H., Benbow R.M. and Hood L.E.2nd ed., 1981, The Benjamin/ Cummings Pub.co
4. Biochemical calculations, Segel I.R., 2nd ed., 2004, John Wiley and Sons
5. Biochemical Calculations, Irwin H. Segel, 2nd Edition John Wiley & Sons

Weblinks:

1. <https://www.medicalnewstoday.com/articles/319704>
2. <https://www.toppr.com/guides/biology/mineral-nutrition/metabolism-of-nitrogen/>
3. <https://courses.lumenlearning.com/suny-ap2/chapter/carbohydrate-metabolism-no-content/>
4. <https://teachmephysiology.com/biochemistry/molecules-and-signalling/enzyme-kinetics/>
5. <https://www.britannica.com/science/metabolism/The-synthesis-of-macromolecules>

DSC (4): Practical Microbial Enzymology and Metabolism

(4Hrs/week) 2 Credits

1. Handling of micropipettes and checking their accuracy.
2. Acid and gas production from Carbohydrates – Demonstration of fermentation of lactose.
3. Detection of amino acids by paper chromatography.
4. Screening of fungi for pectin degradation.
5. Starch Hydrolysis.
6. Gelatin Hydrolysis.
7. Catalase activity.
8. Microscopic examination of root nodules.
9. Demonstration of citric acid production.
10. Casein hydrolysis.
11. Demonstration of lipolytic activity.
12. Demonstration of Ammonification/ Dinitrification/Nitrification.
13. Demonstration of alcoholic fermentation – Fermentation of glucose using Kuhne’s fermentation vessel.
14. Effect of variables on enzyme activity (amylase): a. Temperature b. pH c. substrate concentration d. Enzyme concentration.
15. Study of Photographs – Methanogens, lactose fermentation, Alcohol fermentation, Lock and key hypothesis, Induced Fit hypothesis, ribozymes, abzymes, Allosteric enzymes, results of Experiments.

Course Articulation Matrix – 222479

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	1	-	-	-	-	-	2	-	2
CO 2	3	2	2	1	-	-	-	-	-	2	-	2
CO 3	3	2	2	1	-	-	-	-	-	2	-	2
CO 4	3	2	2	1	-	-	-	-	-	2	-	2
Weighted Average	3	2	2	1	-	-	-	-	-	2	-	2

OE (4) Microbiology Syllabus for All Programs (Except Science)

Semester IV

Course Code: 22OEMIB401	Course Title: HUMAN MICROBIOME
Course Credits (L:T:P): 03 (3:0:0)	Hours of Teaching/Week: 3 Hours (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2½ Hours (Theory)	Semester End Examination Marks: 60

Course Outcomes (COs):

CO 1: Articulate a deeper understanding on biological complexities of human microbiome.

CO 2: Acquire broader goals of biological anthropology.

CO 3: Compare and contrast the microbiome of different human body sites and impact human health promotion.

Course Content

Content	Hours
UNIT - 1 Introduction to Microbiome	
Evolution of microbial life on Earth, Symbiosis host-bacteria. Microbial association with plants and animals, Symbiotic and parasitic, Normal human microbiota and their role in health. Microbiomes other than digestive system.	14
UNIT - 2 Microbiomes and Human health	
Microbiome in early life, Nutritional modulation of the gut microbiome for metabolic health- role of gut microbiomes in human obesity, human type 2 diabetes and longevity. Probiotics-Criteria for probiotics, Development of Probiotics for animal and human use; Pre and synbiotics. Functional foods-health claims and benefits, Development of functional foods.	14
UNIT - 3 Culturing of Microbes from Microbiomes	
Culturing organisms of interest from the microbiome: bacterial, archaeal, fungal, yeast and viral. Extracting whole genomes from the microbiome to study microbiome diversity Microbiomes and diseases: Microbiome and disease risks: The gut microbiome and host immunity, bacteriocins and other antibacterial. Human microbiome research in nutrition	14

References:

1. Prescott, Harley, Klein's Microbiology, J.M. Willey, L.M. Sherwood, C.J. Woolverton, 7th International, edition 2008, McGraw Hill.
2. A Textbook of Microbiology, R. C. Dubey and D. K. Maheshwari, 1st edition, 1999, S.Chand & Company Ltd.
3. Brock Biology of Microorganisms, M.T.Madigan, J.M.Martinko, P. V. Dunlap, D. P. Clark-12th edition, Pearson International edition 2009, Pearson Benjamin Cummings.
4. Microbiology- Concepts and Applications, Pelczar Jr, Chan, Krieg, International ed, McGraw Hill.

Weblinks:

1. <https://uta.pressbooks.pub/microbiomeshealthandtheenvironment/chapter/an-introduction-to-microbiomes/>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5962619/>
3. <https://microbiologysociety.org/our-work/75th-showcasing-why-microbiology-matters/unlocking-the-microbiome/the-microbiome-and-human-health.html>
4. <https://www.technologynetworks.com/immunology/articles/an-introduction-to-culturing-bacteria-355566>

Course Articulation Matrix – 22OEMIB401

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	-	-	2	-	1	1	-	-	2	-	1
CO 2	2	2	2	2	-	1	1	-	-	2	-	1
CO 3	2	1	1	2	-	1	1	-	-	2	-	1
Weighted Average	2	1.5	1.5	2	-	1	1	-	-	2	-	1

DSC(3)SyllabusforB.Sc.Physics(BasicandHonors)

Semester III

CourseCode: 222329	Course Title: DSC(3)-WavemotionandOptics(Theory) DSC(3)-lab
CourseCredits: 06 (4:0:2)	Hours ofTeaching/Week: 04(Theory)+04(Practical)
TotalContactHours: 56Hours(Theory) 56Hours(Practical)	FormativeAssessment Marks: 40 (Theory) 25 (Practical)
ExamDuration: 2 ¹ / ₂ Hours(Theory) 3Hours(Practical)	Semester-EndExaminationMarks: 60 (Theory) 25 (Practical)

CourseOutcomes(COs)

CO1	Identify different types of waves, wave equations and different parameters for the wave and superposition of waves for different amplitude and frequency.
CO2	Analyze the formation of standing waves and how the energy is transferred along the standing wave in different methods, applications and mathematical models in the case of stretched string and vibration of a rod and identify the different parameters that affect the acoustics in a building, measure it, and control it.
CO3	Gain knowledge on various theories of light and apply the phenomenon of interference.
CO4	Implement the knowledge gained on diffraction and Polarization.

CourseContent

Content		Hrs
Unit-1:WavesandSuperpositionof HarmonicWaves		
<p>Waves: Plane and Spherical Waves. Longitudinal and Transverse Waves. Characteristics of wave motion, Plane Progressive (Travelling) Wave and its equation, Wave Equation – Differential form (derivation). Particle and Wave Velocities: Relation between them, Energy Transport – Expression for the intensity of progressive wave, Newton’s Formula for VelocityofSound.Laplace’s Correction(Derivation).AbriefaccountofRippleandGravityWaves. NumericalProblems.</p>		06
<p>Superposition of Harmonic Waves Linearity and Superposition Principle. Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats) – Analytical treatment. Superposition of two perpendicular Harmonic Oscillations: Lissajous Figures with equal and unequal frequency- Analytical treatment, graphical method. Uses of Lissajous’ figures. Numerical Problems.</p>		06
SuggestedActivities		02
ActivityNo.1	<p>Weknowthatsoundisproducedbecauseofvibration. Lookintoatleast10 musical instruments and identify the regions of vibrations that produce the sound and those parts which enhance the sound because of reverberation.</p> <ol style="list-style-type: none"> 1. Identifyonecommonelement inall of these. 2. Identify equipment that creates beats and try to explain the underlyingbasic principles. Demonstrate examples of beats using two tuning forks. 3. Identify what will happen when you drop a stone in standing water, and when your drop two stones side by side. 4. Make yourobservations sketchthemand commentonthem in a report. 	
ActivityNo.2	<p>Drawtwosinewaves(Amplitudevstime)oneshiftedwiththeotherin phase.Identitywheretheresonationoccursforeachphaseshift.Plotphase vstimetakenfor resonance.</p>	
ActivityNo.3	<p>Take smooth sand, and place a pointed-edged pen vertically on the sand.To the mid of the pen, connect two perpendicular threads. Pull these perpendicular threads by varying the forces and timings. Note down the differentshapesproducedonthesand.Trytointerpretthesapes.Makea reportofit.</p>	
ActivityNo.4	<p>Hangapotwithsand, which has aholein thebottom.Gentlypull the potto onesideandobservethepatternformedby thesandonthefloor.Report the observations.</p>	

ActivityNo.5	Designacoupledpendulum.Studytheimpactofthemotionofone pendulumovertheotherpendulumbyvaryingthelength,directionofthe motionofonependulum,andmassofthependulum,andobservethe resultant changes. Trace the path of the bobs and make a report.
ActivityNo.6	<p>Noteforthe teachersfortheactivity: Make3 groupsamongstudentsand assign each group the activity of drawing one of the 3 graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p> <ol style="list-style-type: none"> 1. Thefirst slide willexplain theprocessof doingthe experiment. 2. Inthesecondslide.Studentswillshowthegraphofmeasurement. 3. In the third slide, they will list three observations from that study. <p>Activity: Take a stretched spring. Stretch it across two edges. Put a weight onthestring,pluckitandmeasuretheamplitudeofthevibration.All groupswillmeasurethetotaldampingtimeofthe oscillatingspring.(Using mobile or scale) And plot a graph of the-</p> <ol style="list-style-type: none"> 1. Varyingload on thespringandamplitudeat thecenter. 2. Takeanotherweightandputthatinanotherplaceandmeasurethe amplitude of vibration at the center. <p>Vary the loadin thecenterof thespring andmeasure the amplitudeat the center.</p>

Unit- 2:Standing Wavesand Acoustics	
Standing Waves: Velocity of transverse waves along a stretched string (derivation), Standing(Stationary)Waves in a String - Fixed and Free Ends (qualitative). Theory of Normal modes of vibration in a stretched string, Energy density and energy transport of a transverse wavealong a stretched string. Vibrations in rods – longitudinal and transverse modes (qualitative). The velocity of Longitudinal Waves in gases (derivation).NormalModesofvibrationsinOpenandClosedPipes– Analytical treatment. Concept of Resonance, Theory of Helmholtz resonator. Numerical Problems.	08
Acoustics: Intensity and loudness of sound, Intensity level, Absorption coefficient, Reverberation and Reverberation time, Sabine’s Reverberationformula (derivation), Factors affecting acoustics in buildings, Requisites for good acoustics. Acoustic measurements – intensity and pressure levels. Numerical Problems.	04
SuggestedActivities	
02	
ActivityNo. 7	Listdifferentphenomenawherestandingwavesarefoundin nature. Identifythephenomenaandreasonforstandingwaves.Also,identifythe standing waves in musical instruments. Make a report.

<p>ActivityNo. 8</p>	<p>1. Go to 5 different newly constructed houses when they are not occupied and when they are occupied. Make your observations on the sound profile in each room. Give the reasons. Make a report.</p> <p>2. Visit three very good auditoriums, and list out different ways in which the acoustic arrangements have been done (as decoration and Civil works). Look for the reasons in Google and identify which is acoustically the best auditorium among the three you visited. Make a report.</p>	
<p>ActivityNo. 9</p>	<p>Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p> <p>1. The first slide will explain the process of doing the experiment.</p> <p>2. In the second slide, students will show the graph of measurement.</p> <p>3. In the third slide, they will list three observations from that study.</p> <p>Activity: Take a bowl of different liquids (water, milk, kerosene, salt water, and Potassium Permanganate (KMNO₄) solution). Place a small non-oily floating material (ex: thin plastic) on the surface of the liquid. Drop a marble on the liquid at the center of the bowl. Repeat the experiment by dropping the marble from different heights. Plot a graph of-</p> <p>1. Height v/ stime of oscillation 2. Weight of the marble v/ s time of oscillation.</p>	
<p>ActivityNo. 10</p>	<p>Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p> <p>1. The first slide will explain the process of doing the experiment.</p> <p>2. In the second slide, students will show the graph of measurement.</p> <p>3. In the third slide, they will list three observations from that study.</p> <p>Activity: Take two marbles of the same weight. Drop both marbles on the surface of the liquid from some height. With the help of the mobile take the picture and measure the position of an interface of two wave fronts formed in the liquid. Plot graphs for different activities by doing the following activities.</p> <p>1. By dropping two marbles of the same weight from different heights. 2. By dropping two marbles of different weights from the same height.</p>	

Unit-3:NatureoflightandInterference					
Nature of light: The types of fringes using Michelson interferometer. The corpuscular model of light - The wave model - Maxwell's electromagnetic waves- Wave-Particle Duality. Numerical Problems.				02	
Interference of light by division of wavefront: Huygen's theory-Concept of wave- front-Interference pattern produced on the surface of water-Coherence- Interference of light waves by division of wave-front- Young's double slit experiment- derivation of expression for fringe width-Fresnel Biprism, Loyd's Mirror (description only) - Interference with white light- Numerical Problems.					
Interference of light by division of amplitude: Interference by division of amplitude- Interference by a plane parallel film illuminated by a plane wave- Interference by a film with two non-parallel reflecting surfaces- the colour of thin films—Newton's rings- (Reflected light)-Michelson Interferometer-Determination of the wavelength of light. Numerical Problems.				05	
Suggested Activities				02	
Activity No. 11	In the table given below explore which phenomenon can be explained by what and make a report.				
	Sl.No	Phenomenon	Particle of Light	Wave Nature	Dual Nature
		Pinhole camera			
	1.	Formation of images on lenses			
	2.	Formation of images on mirror			
	3.	Interference			
	4.	Polarization			
	5.	Diffraction due to single slit			
	6.	Blackbody radiation			
	7.	Photoelectric effect			
8.	De-Broglie hypothesis				
9.	Davisson & Germer Experiment				
Activity No. 12	Why color strips are seen in paddles on roads in rainy season? Try to simulate the same. Give the reasons. Make a report.				

	ActivityNo. 13	<p>Note fortheteachersfortheactivity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p>	
		<p>1. The first slide will explain the process of doing the experiment. 2. In the second slide, students will show the graph of measurement. 3. In the third slide, they will list three observations from that study. Activity: Take a bowl of different liquids (water, milk, kerosene, salt water, and Potassium Permanganate (KMNO₄) solution). Place a small non-oily floating material (ex: thin plastic) on the surface of the liquid. Drop two marbles of the same weight (mass) from the same height onto the surface of the water but at different time intervals. Plot graph for the different observations. For teachers: Demonstrate the formation of a Lissajous Figure using a CRO. Give different shapes of Lissajous Figure with varying frequency and amplitude. Ask the students to comment on the observations.</p>	
Unit-4: Diffraction and Polarisation			
	<p>Fraunhofer diffraction: Introduction- Fraunhofer diffractions- Single slit diffraction pattern-position of Maxima and Minima (Qualitative arguments)- Two slit diffraction pattern-position of Maxima and minima-Theory of plane diffraction grating-Grating spectrum-normal and oblique incidence-Resolving power and dispersive power of a grating Single slit; Double Slit. Multiple slits & Diffraction grating. Numerical Problems.</p>		04
	<p>Fresnel Diffraction: Fresnel Diffraction- Fresnel half-period zones- Diffraction by a circular aperture- diffraction by an opaque disc- The zone plate -comparison between zone plate and convex lens. Numerical Problems.</p>		04
	<p>Polarisation: Introduction-Production of polarized light- The wire Grid polarizer and Polaroid- Superposition of two disturbances-Phenomenon of double refraction- Quarter wave plates and half wave plates- Analysis of polarized light-optical activity. Numerical Problems.</p>		04
	Suggested Activities		02

	ActivityNo.14	<ul style="list-style-type: none"> • Explainthepolarizationoflightthroughachart. • Listoutthesurfaceshatreflectpolarizedlight. • Learnhowthepolarizationoflightcanbedonebybothtransmission and reflection. • Perform an experiment and make a report. using CDs and DVDs as diffraction gratings. Ref:https://www.nnin.org/sites/default/files/files/Karen_Rama • ObtainthediffractionspectrausingaCDanddesignanexperiment to find the distance between the tracks on it (Ref:https://www.brighthubeducation.com/science-lessons-grades-9-12/39347-diffraction-experiment-measuring-groove-spacing-on-CDs/,https://silo.tips/download/diffraction-from-a-compact-disk). 	

ActivityNo.15	What is the physics behind making 3D movies? Group Discussion (https://www.slideserve.com/rae/physics-behind-3d-movies-powerpoint-ppt-presentation) Make a report.
ActivityNo.16	List out different types of zone plates and lookfor their applications inday-to-day life. Make a report.
ActivityNo.17	Collect information and study how optically polarizing lenses are made. Visitanearbylens-makingfacility. Learn theprinciplebehind sunglasses.Makea report.
ActivityNo.18	<p>Note for the teachers for the activity: Make 3 groups among students and assign each group the activity of drawing one of the graphs given below.Provideafewdaystocompletetheactivity.On aspecificday,eachgrouphasto make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marksto each group, wherein all members of the group will get equal marks.</p> <ol style="list-style-type: none"> 1. Thefirstslidewillexplaintheprocessofdoingthe experiment. 2. Inthesecondslide.Studentswillshowthegraphofmeasurement. 3. Inthethirdslide,theywillistthreeobservationsfromthat study. <p>Activity: Identify any 3 sharp edges of varying thickness and assign them to 3 groups. Shine a laser light pointing towards the edge of the needle. Observe the patterns formed on the wall or screen and measure the distance between the bands. Correlate the distance between the bands formed with the thickness oftheedgeandthedistancefromtheedgetothescreen.Bythis,calculatethe wavelengthofthelaserlightused.</p>

Textbooks

Sl No	TitleoftheBook	AuthorsName	Publisher	Year of Publication
1.	ThePhysicsOfWaves and Oscillations,	NKBajaj	TataMcGraw-HillPublishing Company Ltd., Second Edition,	1984
2.	WavesandOscillations	NSubramanyam andBrijLal	VikasPublishingHousePvt. Ltd.,SecondRevised Edition	2010
3.	A Text Bookof Sound	DRKhanna and RS Bedi	AtmaRam&Sons,Third Edition	1952
4.	OscillationsandWaves	SatyaPrakash	PragathiPrakashan,Meerut, Second Edition	2003
5.	Optics	AjoyGhatak	McGrawHillEducation (India)PvtLtd	2017
6.	AtextBookofOptics	Brij Lal, M N Avadhanulu&N Subrahmanyam	S.ChandPublishing	2012

ReferencesBooks

Sl No	Titleofthe Book	AuthorsName	Publisher	Year of Publication
1.	BerkeleyPhysicsCourse - Waves,	FrankSCrawfordJr.	Tata Mc Graw-Hill PublishingCompanyLtd., Special Indian Edition,.	2011
2.	Optics	EugeneHecht	PearsonPaperback	2019
3.	IntroductionT o Optics	PedrottiandFrankL ,	PearsonIndia	3rd Edition
4.	Fundamentalso f Optics	FrancisJenkins Harvey White	McGrawHill Education	2017

Weblinks

- <https://www.britannica.com/science/wave-motion>
- <https://testbook.com/learn/physics-wave-motion/>
- <http://hyperphysics.phy-astr.gsu.edu/hbase/Sound/wavplt.html>
- <https://cnx.org/exports/waves-and-optics-33.7.pdf>

DSC(3)lab**List of Experiments****Credit:L:T:P****0:0:2****(Minimum EIGHT experiments must be completed)**

SI No	Experiments
1	The velocity of sound through a wire using a Sonometer.
2	Determination of unknown concentration of sugar solution by a graphical method using a polarimeter
3	Study of Lissajous Figures
4	Helmholtz resonator using tuning fork.
5	To determine the refractive index of the material of a prism using a sodium source.
6	To determine the Cauchy's constants of the material of a prism using a mercury source.
7	To determine the wavelength of sodium light using Fresnel Biprism.
8	To determine the radius of curvature of planoconvex using Newton's Rings
9	To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.
10	To determine the wavelength of spectral lines of Hg source using a plane diffraction grating.

Reference Book for Laboratory Experiments

SI No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Advanced Practical Physics for students	B.L. Flint and H.T. Worsnop	Asia Publishing House.	1971
2	A Text Book of Practical Physics	I. Prakash & Ramakrishna	Kitab Mahal, 11 th Edition	2011
3	Advanced level Physics Practicals	Michael Nelson and Jon M. Gbourn	Heinemann Educational Publishers, 4 th Edition	1985
4	A Laboratory Manual of Physics for undergraduate classes	D.P. Khandelwal	Vani Publications.	1985

CourseArticulationMatrix-coursecode-222329

Course outcome s	Programoutcomes											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	1	1	1	2	2	2	1	1	1	—	2
C02	3	2	1	1	2	2	2	1	1	1	—	2
C03	3	2	1	1	2	2	2	1	2	2	—	2
C04	3	3	1	1	2	2	2	1	2	2	1	2
Weighte d average	3	2	1	1	2	2	2	1	1.5	1.5	1	2

OE Physics Syllabus for All Programs (Except Science)

Semester III

Course Code: 22OEPHY301	Course Title: OE(5): Optical Instruments
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Exam Duration: $2\frac{1}{2}$ Hours	Semester-End Examination Marks: 60

Course Outcomes (COs)	
CO1	Comprehending the basic knowledge of different laws and principles of optics and assimilating the different formulae of optics.
CO2	Gaining knowledge about the construction and working of various microscopes and cameras and their utilization.
CO3	Acquiring the knowledge of construction, working and application of different types of telescopes and spectrosopes.

Course Content

Content	Hrs
Unit - 1	
<p>Basics of Optics: Scope of optics, optical path, laws of reflection and refraction as per Fermat's principle, magnifying glass, Lenses (thick and thin), convex and concave lenses, Lens makers formulae for double concave and convex lenses, lens equation.</p> <p>Focal and nodal points, focal length, image formation, a combination of lenses, Dispersion of light: Newton's experiment, angular dispersion and dispersion power. Dispersion without deviation.</p> <p>(Expressions need not be derived, but have to be discussed qualitatively).</p>	13
Unit - 2	
<p>Camera and microscopes: Human eye (constitution and working), Photographic camera (principle, construction and working), construction, working and utilities of Simple microscopes, Compound microscope, Electron microscopes, Binocular microscopes.</p>	13
Unit - 3	
<p>Telescopes and Spectrometer: Construction, working and utilities of Astronomical telescopes, Terrestrial telescopes, Reflecting telescopes, Construction, working and utilities of Eyepieces or Oculars (Huygen, Ramsden's, Gauss)</p> <p>Spectrometer - Construction, working and utilities, measurement of refractive index.</p>	13
<p>Activities:</p> <ul style="list-style-type: none"> ➤ Find the position and size of the image in a magnifying glass and magnification. ➤ Observe rainbows and understand optics. ➤ Create a rainbow. ➤ Find out what makes a camera to be of good quality. ➤ Observe the dispersion of light through a prism. ➤ Make a simple telescope using magnifying glass and lenses. ➤ Learn the principle of refraction using prisms. ➤ Check the bending of light in different substances and find out what matters here. ➤ Learn about different telescopes used to see galaxies and their ranges. ➤ Many more activities can be tried to learn optics by going through you tubes and websites such as https://spark.iop.org, http://www.yenka.com, https://publiclab.org etc. 	03

Text books

- Fundamentals and Basic Optical Instruments, 1st Edition, Volume 1 Edited By Daniel Malacara Hernández and Brian J Thompson
- Basic Optics and Optical Instruments, Revised Edition By Fred A. Carson.

Reference books

- Fundamentals and basic optical instruments; Advanced optical instruments and techniques by Malacara & Daniel & Thompson & Brian J
- Introduction to Optics by Anchal Srivastava, R K Shukla, T Pandys.

Weblinks

- https://en.wikipedia.org/wiki/Optical_instrument
- <https://byjus.com/physics/optical-instruments/>
- <https://www.vedantu.com/physics/different-optical-instruments>

Course Articulation Matrix- 22OEPHY301												
Course outcomes	Program outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	2	2	1	1	1	—	1
CO2	3	1	1	1	2	2	2	1	2	1	—	1
CO3	3	1	1	1	2	2	2	1	2	1	1	1
Weighted average	3	1	1	1	2	2	2	1	1.66	1	1	1

OE Physics Syllabus for All Programs (Except Science)

Semester III

Course Code: 22OEPHY302	Course Title: OE(6): Sports Science
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Exam Duration: $2\frac{1}{2}$ Hours	Semester-End Examination Marks: 60

Course Outcomes (COs)	
CO1	Comprehension of measurements, Newton's laws of motion and assimilating the knowledge of projectile motion.
CO2	Gaining knowledge about the law of conservation, a center of mass and gravitational law, and Archimedes's principles.
CO3	Enlightening the significance of nutrients in food for physical exercise and briefing about the energy sources that are required in day-to-day life.

Course Content

Content	Hrs
Unit - 1	
Measurement: Physical quantities. Standards and Units. An international system of Units. Standards of time, length and mass. Precision and significant figures. Newton's laws of motion: Newton's first law. Force, mass. Newton's second law. Newton's third law. Mass and weight. Applications of Newton's laws. Projectile motion: Shooting a falling target. Physics behind Shooting, Javelin throw and Discus throw.	13
Unit - 2	
Conservation laws: Conservation of linear momentum, collisions – elastic and inelastic. Angular momentum. (Physics behind Carom, Billiards, Racing). Centre of mass: Physics behind Cycling, rock climbing, Skating. Gravitation: Origin, Newton's law of gravitation. Archimedes's principle, Buoyancy (Physics behind swimming)	13

Unit - 3		
Food and Nutrition: Proteins, Vitamins, Fat, Blood pressure. Problems due to the deficiency of vitamins. Energy: Different forms of Energy, Conservation of mass-energy. Physical exercises: Walking, Jogging and Running, Weight management.		13
Suggested Activities		03
Activity 1:	Identify the methods of measurement of time, length and mass from ancient times and build models for them. Reference: History of measurement - Wikipedia https://en.wikipedia.org › wiki > History_of_measurement.	
Activity 2:	Identify Physics principles behind various Sports activities. https://www.real-world-physics-problems.com/physics-of-sports.html.	
Activity 3:	List the difficulties experienced in Gymnastics, Cycling and weightlifting	
Activity 4:	List the difficulties experienced in swimming.	
Activity 5:	Learn breathing exercises. Reference: 1) Simple Breathing Exercise for Beginners Swami Ramdev 2) https://www.yogajournal.com.	
Activity 6:	Write an essay on Physical health v/s Mental health or conduct a debate on Physical health v/s Mental health.	

Text books				
Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1.	Physics for Entertainment	Yakov Perelman	Createspace Independent Pub.	2012
2.	Physics Everywhere	Yakov Perelman	Prodinnova	2014
3.	Mechanics for Entertainment	Yakov Perelman	Prodinnova	2014
4.	Handbook of Food and Nutrition	M.Swaminathan	Bangalore Press 2012	2012
5.	Food Science	B. Srilakshmi	New Age International Pub	2015

References Books				
Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1.	Physics	Resnick, Halliday and Krane, Vol 1	Wiley Student Edition.	2011
2.	For the love of Physics	Walter Lewin	Taxmann Publications Private Limited	2012
3.	An Introduction to the Physics of Sports	VassiliosMcInnesSp athopoulos	CreateSpace Independent Publishing Platform	2013

Weblinks

- <https://www.topendsports.com/biomechanics/physics.htm>
- <https://www.real-world-physics-problems.com/physics-of-sports.html>
- <https://www.healthline.com/>
- <https://www.mayoclinic.org/>
- <https://www.who.int/news-room/>

Course Articulation Matrix- 22OEPHY302												
Course outcomes	Program outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	3	2	1	1	1	—	2
CO2	3	2	1	1	2	3	2	1	2	1	—	2
CO3	3	1	1	1	2	3	2	1	2	1	1	2
Weighted average	3	1.66	1	1	2	3	2	1	1.66	1	1	2

DSC(4)SyllabusforB.Sc.Physics(BasicandHonors)

Semester IV

CourseCode: 222429	Course Title: DSC(4)- ThermalPhysicsandElectronics(Theory) DSC(4)-lab
CourseCredits: 06 (4:0:2)	Hours ofTeaching/Week: 04(Theory)+04(Practical)
TotalContactHours: 56Hours(Theory) 56Hours(Practical)	FormativeAssessment Marks: 40 (Theory) 25 (Practical)
ExamDuration: 2 ¹ / ₂ Hours(Theory) 3Hours(Practical)	Semester-EndExaminationMarks: 60 (Theory) 25 (Practical)

Course Outcomes (COs)

CO1	Apply the laws of thermodynamics, laws of kinetic theory and radiation laws to the ideal and practical thermodynamics systems through derived thermodynamic relations.
CO2	Use the concepts of semiconductor to comprehend different Semiconductor devices such as diode transistors, BJT, FET, etc and explain their functioning.
CO3	Acquire knowledge on the functioning of OP-AMPS and apply it as the building blocks in logic gates.
CO4	Implement the use of logic gates in different theorems of Boolean Algebra followed by logic circuits.

Course Content

Content		Hrs
Unit- 1		
Laws of Thermodynamics: Review of the concepts of Heat and Temperature.		01
First Law of Thermodynamics: Differential form, Internal Energy. Equation of state for an adiabatic process, Work Done during Isothermal and Adiabatic Processes. Numerical Problems.		04
Second Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Reversible and Irreversible processes with examples. Heat Engines: Carnot engine & efficiency (no derivation). Refrigeration & coefficient of performance, Applications of Carnot engine in locomotion, Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale. Concept of Entropy, Second Law of Thermodynamics in terms of Entropy. Numerical Problems.		05
Third Law of Thermodynamics: Statement, Significance and Unattainability of Absolute Zero. Numerical Problems.		02
Suggested Activities		02
Activity No.1	<ul style="list-style-type: none"> • Feel cold because coldness enters my body. Discuss the statement in day-to-day life. Approximately give examples of <ol style="list-style-type: none"> (i) open system (ii) closed system and (iii) isolated system • Discuss when the temperature of the body is locked until what time you hold the thermometer in contact with the body. Discuss it in contact with the laws of thermodynamics. • Discuss why when a person works or does exercise, he sweats. Reason it with the laws of thermodynamics. 	
Activity No.2	<p>Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p> <ol style="list-style-type: none"> (i) The first slide will explain the process of doing the experiment. (ii) In the second slide, students will show the graph of measurement. (iii) In the third slide, they will list three observations from that study. 	

	<p>Activity: Take four different sizes of the same metal, preferably of the same shape and give one piece to each group. Heat it uniformly on a hot plate. Keep a beaker of water with a thermometer immersed in it. Drop one hot metal into the water and record the temperature with time. Repeat the experiment for the other heated metal pieces of different sizes.</p> <p>(i) Plot a graph for the volume of the metal piece used v/s respective temperature change observed.</p> <p>(ii) Determine the heat capacity and specific heat of the metal used.</p>	
Activity No.3	<p>Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides.</p> <p>On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p> <p>(i) The first slide will explain the process of doing the experiment.</p> <p>(ii) In the second slide, students will show the graph of measurement.</p> <p>(iii) In the third slide, they will list three observations from that study.</p> <p>Activity: Take ice cubes of different sizes and immerse them in water and measure the temperature change with time and repeat the experiment. Graph the observations.</p>	
Unit-2		
	Thermodynamics Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy. Their Definitions, Properties and Applications. Numerical Problems.	02
	Maxwell's thermodynamic Relations Derivations and applications of Maxwell's Relations (1) First order Phase Transitions with examples, Clausius-Clapeyron Equation (2) Values of $C_p - C_v$ (3) Joule-Thomson Effect and $J - T$ coefficient (Derivation) for Vander Walls gas. Attainment of low temperature by liquefaction of gases and adiabatic demagnetization. Numerical Problems.	03
	Kinetic Theory Of Gases: Distribution of Velocities: Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas: Mean, RMS and Most Probable Speeds. Degrees of Freedom, Law of Equipartition of Energy (no derivation). Specific heats of Gases. Numerical Problems.	04

	<p>Radiation:Blackbodyradiation,spectraldistribution,Lummer-Pringsheim experiment-Result, the concept of energy density and pressure of radiation (no derivation). Derivation of Planck's law, Wein'slaw,Rayleigh-Jeanlaw, deductionofStefan-BoltzmannlawandWien'sdisplacementlawfromPlanck's law.NumericalProblems.</p>	03
SuggestedActivities		02
<p>ActivityNo.4</p>	<p>(i) Measuringthe Solar Constant Materials:Simpleflat-sidedJarandThermometer. Activity: A bottle containing water is exposed to solar radiation. The risein temperature and time took are noted. Calculate the heat absorbed by water and relate it to the output of the Sun.</p> <p>(ii) Thermoemf Materials: Suitable for two dissimilar metal wires, and voltage measuring devices. Activity: In this experiment, students will assemble the thermocouple and study the three effects namely, Seebeck, Peltier, and Thompson.</p> <p>(iii) Inversesquarelawof radiation Materials:A cardboardwithagrid, cardboardwithahole,supportingclips, a ruler, candle. Activity: Students set the device. They count the lighted squares on the cardboard with the grid by varying the distance. And make necessary measurements and calculations to arrive at the inverse square law of radiation. Ref:Activity-BasedPhysicsThinkingProblemsinThermodynamics: Kinetic Theory http://www.physics.umd.edu/perg/abp/think/thermo/kt.htm</p>	
<p>ActivityNo.5</p>	<p>Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the dayofthepresentation select amemberfromeach grouprandomlyto make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p> <p>(i) Thefirst slide willexplainthe processof doingtheexperiment. (ii) Inthesecondslide. Studentswillshow thegraphofmeasurement. (iii) In the third slide, they will list three observations from that study. Activity:Take twodissimilarmetalwires.Spotweldthemformingtwo junctions. Dip one junction in ice and heat the other junction with a burner. Plotagraphofthetimeofheatingv/sThermoEFMgeneratedinthe voltmeter.</p>	

ActivityNo.6	Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, where in all members of the group will get equal marks.
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	<p>(i) The first slide will explain the process of doing the experiment. (ii) In the second slide. Students will show the graph of measurement. (iii) In the third slide, they will list three observations from that study. Activity: Make 4 groups and give different-sized balloons to each group. Fit different-sized nozzles into the mouth of the large balloons. Measure the temperature or the EMF generated using a thermocouple placed at the mouth of the nozzle as the pressurized gas is released. Plot a graph of time v/s temperature. Vary the volume of the balloon and repeat the experiment. Plot the graph of volume v/s temperature difference created.</p> <p style="text-align: center;">Unit-3</p> <p>Semiconductor devices: Review of Intrinsic and Extrinsic semiconductors, p-n junction and its Characteristics and Parameters, Diode approximations, Half-wave rectifier, Full-wave rectifier, Zener diode voltage regulators: Regulator circuit with no load, Loaded Regulator. Numerical problems. 06</p> <p>Junction Transistors: Basics of Bipolar Junction Transistors (BJT), BJT operation, Common Base, Common Emitter and Common Collector Characteristics. Field Effect Transistor (FET) and its characteristics. Transistor as an Amplifier and Oscillator. Numerical problems. 06</p> <p style="text-align: center;">Suggested Activities 02</p>
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	<p>ActivityNo.7 WirearegulatedDCpowersupplyonabreadboardorgrooveboardto give a regulated output voltage of + 5 V; +15 V; Dual power output: ± 5 V;Dual power output: ± 15 V. Use: 3-pin voltage regulators. Componentsrequired:1. Stepdowntransformer- 1No.(5 Vtapping, 100 – 500 mA current rating), BY 127 semiconductor diodes – 4 Nos, Inductor - 1, Capacitor - 1, 3 pins 5V regulator-1 Searchforcircuitdiagramsin books/net. Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the dayofthepresentation select amemberfromeach grouprandomlyto make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks. (i) Thefirst slide willexplain the processof doingtheexperiment. (ii) Inthesecondslide. Studentswillshow thegraphofmeasurement. (iii) In the third slide, they will list three observations from that study. Activity: Form 3 groups and tell them to make a DC supplyof low current of different voltages like 5V, 10V, and 15V on a breadboard. (i) Learntoidentifytheterminalsofdifferent types(packages)of BJTs. (ii) Inthecaseofpowertransistors,learnhowtofixaheatsinkforthe transistor. (iii) LearnthedifferencebetweenBJTandFETintheiroperational characteristics.</p>
<p>ActivityNo.9</p>	<p>Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the dayofthepresentation select amemberfromeach grouprandomlyto make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks. (i) Thefirst slide willexplain the processof doingtheexperiment. (ii) Inthesecondslide. Studentswillshow thegraphofmeasurement. (iii) Inthethirdslide,theywilllistthreeobservationsfromthatstudy.</p> <p>Activity: Take any 3 diodes and assign one to each group. Measure its resistance when dipped in ice and heat the ice till it boils. Using this data, plot the calibration curve of temperature v/s resistance and also the cooling curve of temperature V/s time for the diode by each group.</p>
<p>Unit-4</p>	

	<p>Electronics: Integrated Circuits (Analog and Digital), Operational Amplifiers, Ideal characteristics of Op-Amp, Inverting and Non-Inverting Configurations. Applications- Voltage Follower, Addition and Subtraction. Numerical problems.</p>	04
	<p>Digital: Switching and Logic Levels, Digital Waveform. Number Systems: Decimal Number System, Binary Number System, Converting Decimal to Binary, Hexadecimal Number System: Converting Binary to Hexadecimal, Hexadecimal to Binary.</p>	04
	<p>Boolean Algebra Theorems: De Morgan's theorem. Digital Circuits: Logic gates, NOT Gate, AND Gate, OR Gate, NAND Gate, NOR Gate, Algebraic Simplification, Implementation of NAND and NOR functions.</p>	04
Suggested Activities		02
<p>Activity No. 10</p>	<p>Learn how to implement logic functions (AND, OR, NOT) using just diodes and resistors. A circuit diagram shows how different types of gates can be built by X-NOR gates.</p>	
<p>Activity No. 11</p>	<p>Operational Amplifiers (i) Understand the concept of virtual ground of an OP-AMP. (ii) Learn the different types of op-amps used for different applications. (iii) What is a buffer? Prepare a report on buffers and their application in instrumentation electronics.</p>	
<p>Activity No. 12</p>	<p>(i) Aman has to take a wolf, a goat, and some cabbage across a river. His rowboat has enough room for the man plus either the wolf or the goat or the cabbage. If he takes the cabbage with him, the wolf will eat the goat. If he takes the wolf, the goat will eat the cabbage. Only when the man is present</p>	
	<p>are the goat and the cabbage safe from their enemies. All the same, the man carries a wolf, goat, and cabbage across the river. How? Write the truth table for the above story and implement using gates. (ii) A locker has been rented in the bank. Express the process of opening the locker in terms of digital operation. (iii) A bulb in a staircase has two switches, one switch being at the ground floor and the other one at the first floor. The bulb can be turned ON and also can be turned OFF by and one of the switches irrespective of the state of the other switch. The logic of switching of the bulb resembles.</p>	

Textbooks				
Sl No	TitleoftheBook	AuthorsName	Publisher	Year of Publication
1	ElectronicDevicesand Circuits	DavidA.Bell	PHI,NewDelhi	2004
2	IntegratedElectronics	JacobMillmanand CCHalkias		
3.	DigitalFundamentals	Floyd	PHI,NewDelhi	2001

ReferencesBooks				
Sl No	TitleoftheBook	AuthorsName	Publisher	Yearof Publication
1	Heatand Thermodynamics	M.W.Zemansky, RichardDittman	McGraw-Hill.	1981
2	ThermalPhysics	S.Garg,R.Bansaland Ghosh	TataMcGraw-Hill	2ndEdition,1993
3	ATreatiseonHeat	MeghnadSaha,and B.N.Srivastava,	IndianPress	1958
4	ModernThermodynamics withStatisticalMechanics	CarlS. Helrich,	Springer.	2009
5	Thermodynamics,Kinetic Theory & Statistical Thermodynamics.	Sears& Salinger	Narosa.	1988
6	AnIntroductiontoThermal Physics	DanielV Schroeder	OxfordUniversity Press	2020

Weblinks

- https://deepblue.lib.umich.edu/bitstream/handle/2027.42/75853/ayd_1.pdf/
- <https://sites.ualberta.ca/gingrich/courses/phys395/notes/phys395/>
- <https://www.researchgate.net>

DSC(4)lab

List of Experiments

Credit:L:T:P

0:0:2

(Minimum EIGHT experiments must be completed)

1	Verification of Gaussian distribution law and calculation of standard deviation – Monte Carlo experiment.
2	Determination of Unknown Temperature using Platinum resistance thermometer.
3	Verification of Stefan's Boltzmann fourth power law using Meter bridge.
4	V-I Characteristics of Silicon & Germanium PN Junction diodes (FB & RB).
5	V-I Characteristics of Zener Diode and voltage regulator.
6	Characteristics of BJT in Common Emitter Configuration.
7	Frequency response of CE Amplifier.
8	Half Wave and Full Wave Rectifier with and without Filter.
9	Truth table verification of logic gates using TTL 74 series ICs.
10	Verification of basic logic gates using transistors.
11	Non-inverting and Inverting op-amp circuits.
12	Voltage follower, Adder and Subtractor circuits using OPAMP.

Sl No	Title of the Book	Publisher	Year of Publication
1	Basic Electronics Lab (P242) Manual 2015-16	National Institute of Science Education and Research Bhubaneswar	2015

Suggested Readings:

1. B.L. Worsnop, H.T. Flint, —Advanced Practical Physics for Students , Methuen & Co., Ltd., London, 1962, 9e.
2. S. Panigrahi, B. Mallick, —Engineering Practical Physics , Cengage Learning India Pvt. Ltd., 2015, 1e.

CourseArticulationMatrix-Coursecode-222429												
Course outcomes	Programoutcomes											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	1	1	1	2	2	2	1	1	1	—	2
C02	3	2	1	1	2	2	2	1	1	1	—	2
C03	3	2	1	1	2	2	2	1	2	2	—	2
C04	3	3	1	1	2	2	2	1	2	2	1	2
Weighted average	3	2	1	1	2	2	2	1	1.5	1.5	1	2

OE Physics Syllabus for All Programs (Except Science)

Semester IV

Course Code: 220EPHY401	Course Title: OE(7): Nanotechnology
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Exam Duration: 2 ¹ Hours 2	Semester-End Examination Marks: 60

Course Outcomes (COs)	
CO1	Acquiring the knowledge of Nanomaterials, Application of the Schrödinger equation and confinement of nanostructure and its consequences in 1D,2D and 3D.
CO2	Gaining knowledge on various methods used in the processing, synthesizing and characterization of nanostructure materials
CO3	Comprehending the properties and application of nanomaterial by implementing various nanomaterial devices.

Course Content

Content	Hrs
Unit - 1	
<p>Introduction to nanomaterials Length scales in physics, Nanostructures: 1D, 2D and 3D nanostructures (nanodots, thin films, nanowires, nanorods), Band structure and density of states of materials at the nanoscale, Size Effects in nanosystems, Quantum confinement: Applications of Schrodinger equation Infinite potential well, potential step, potential box, quantum confinement of carriers in 3D, 2D, 1D nanostructures and its consequences.</p>	13
Unit - 2	
<p>Synthesis and Characterization of nanostructure materials Top-down and Bottom-up approach, Photolithography. Ball milling. Gas phase condensation. Vacuum deposition. Physical vapor deposition (PVD): Thermal evaporation, E-beam evaporation, Pulsed Laser deposition. Chemical vapor deposition (CVD). Sol-Gel. Electrodeposition. Spray pyrolysis. Hydrothermal synthesis. Preparation through colloidal methods. MBE growth of quantum dots. X-Ray Diffraction. Optical Microscopy. Scanning electron microscopy. Transmission Electron Microscopy. Atomic Force Microscopy. Scanning Tunneling Microscopy.</p>	13
Unit - 3	
<p>Properties and applications of nanomaterials Coulomb interaction in nanostructures. Concept of dielectric constant for nanostructures and charging of nanostructure. Quasi-particles and excitons. Excitons in direct and indirect bandgap semiconductor nanocrystals. Quantitative treatment of quasiparticles and excitons, charging effects. Radiative processes: General formalization- absorption, emission and luminescence. Optical properties of heterostructures and nanostructures. Applications of nanoparticles, quantum dots, nanowires and thin films for photonic devices (LED, solar cells). Nanomaterial Devices: Quantum dots heterostructure lasers, optical switching and optical data storage. Magnetic quantum well; magnetic dots - magnetic data storage.</p>	13
Suggested Activities	03

1. Synthesis of metal nanoparticles by chemical route.
2. Synthesis of semiconductor nanoparticles.
3. XRD pattern of nanomaterials and estimation of particle size.
4. To study the effect of size on the color of nanomaterials.
5. Growth of quantum dots by thermal evaporation.
6. Prepare a disc of ceramic of a compound using ball milling, pressing and sintering, and study its XRD.
7. Fabricate a thin film of nanoparticles by spin coating (or chemical route) and study transmittance spectra in the UV-Visible region.
8. Prepare a thin film capacitor and measure capacitance as a function of temperature or frequency.
9. Visit nearby research labs to study the working of XRD, SEM, and UV-Visible Spectrophotometer instruments.
10. Visit nearby research labs for project work and interaction with scientists at IISc, JNCRSR, Universities, etc.

Text books

- C.P. Poole, Jr. Frank J. Owens, Introduction to Nanotechnology (Wiley India Pvt. Ltd.).
- S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publishing Company)
- K.K. Chattopadhyay and A. N. Banerjee, Introduction to Nanoscience and Technology (PHI Learning Private Limited).
- Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons).

Reference books

- M. Hosokawa, K. Nogi, M. Naita, T. Yokoyama, Nanoparticle Technology Handbook (Elsevier, 2007).
- Introduction to Nanoelectronics, V.V. Mitin, V.A. Kochelap and M.A. Stroscio, 2011, Cambridge University Press.
- Bharat Bhushan, Springer Handbook of Nanotechnology (Springer-Verlag, Berlin, 2004).

Weblinks

- <https://www.twi-global.com/technical-knowledge/faqs/what-is-a-nanomaterial>
- <https://en.wikipedia.org/wiki/Nanomaterials>
- <https://www.mdpi.com/journal/nanomaterials>

Course Articulation Matrix- 22OEPHY401												
Course outcomes	Program outcomes											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	1	1	1	2	2	2	1	1	1	—	1
C02	3	1	1	1	2	2	2	1	1	2	1	1
C03	3	1	1	1	2	3	2	1	2	1	—	1
Weighted average	3	1	1	1	2	2.33	2	1	1.33	1.33	1	1

OE Physics Syllabus for All Programs (Except Science)

Semester III

Course Code: 22OEPHY302	Course Title: OE(6): Sports Science
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Exam Duration: 2 ¹ / ₂ Hours	Semester-End Examination Marks: 60

Course Outcomes (COs)	
CO1	Comprehension of measurements, Newton's laws of motion and assimilating the knowledge of projectile motion.
CO2	Gaining knowledge about the law of conservation, a center of mass and gravitational law, and Archimedes's principles.
CO3	Enlightening the significance of nutrients in food for physical exercise and briefing about the energy sources that are required in day-to-day life.

Course Content

Content		Hrs
Unit – 1		
Measurement: Physical quantities. Standards and Units. An international system of Units. Standards of time, length and mass. Precision and significant figures. Newton's laws of motion: Newton's first law. Force, mass. Newton's second law. Newton's third law. Mass and weight. Applications of Newton's laws. Projectile motion: Shooting a falling target. Physics behind Shooting, Javelin throw and Discus throw.		13
Unit – 2		
Conservation laws: Conservation of linear momentum, collisions – elastic and inelastic. Angular momentum. (Physics behind Carom, Billiards, Racing). Centre of mass: Physics behind Cycling, rock climbing, Skating. Gravitation: Origin, Newton's law of gravitation. Archimedes's principle, Buoyancy (Physics behind swimming)		13
Unit – 3		
Food and Nutrition: Proteins, Vitamins, Fat, Blood pressure. Problems due to the deficiency of vitamins. Energy: Different forms of Energy, Conservation of mass-energy. Physical exercises: Walking, Jogging and Running, Weight management.		13
Suggested Activities		03
Activity 1:	Identify the methods of measurement of time, length and mass from ancient times and build models for them. Reference: History of measurement - Wikipedia https://en.wikipedia.org/wiki/History_of_measurement .	
Activity 2:	Identify Physics principles behind various Sports activities. https://www.real-world-physics-problems.com/physics-of-sports.html .	
Activity 3:	List the difficulties experienced in Gymnastics, Cycling and weightlifting	
Activity 4:	List the difficulties experienced in swimming.	
Activity 5:	Learn breathing exercises. Reference: 1) Simple Breathing Exercise for Beginners Swami Ramdev 2) https://www.yogajournal.com .	
Activity 6:	Write an essay on Physical health v/s Mental health or conduct a debate on Physical health v/s Mental health.	

Textbooks

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1.	Physics for Entertainment	Yakov Perelman	Createspace Independent Pub.	2012
2.	Physics Everywhere	Yakov Perelman	Prodinnova	2014
3.	Mechanics for Entertainment	Yakov Perelman	Prodinnova	2014
4.	Handbook of Food and Nutrition	M.Swaminathan	Bangalore Press 2012	2012
5.	Food Science	B. Srilakshmi	New Age International Pub	2015

References Books

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1.	Physics	Resnick, Halliday and Krane, Vol 1	Wiley Student Edition.	2011
2.	For the love of Physics	Walter Lewin	Taxmann Publications Private Limited	2012
3.	An Introduction to the Physics of Sports	VassiliosMcInnesSp athopoulos	CreateSpace Independent Publishing Platform	2013

Weblinks

- <https://www.topendsports.com/biomechanics/physics.htm>
- <https://www.real-world-physics-problems.com/physics-of-sports.html>
- <https://www.healthline.com/>
- <https://www.mayoclinic.org/>
- <https://www.who.int/news-room/>

Course Articulation Matrix- 22OEPHY302

Course outcomes	Program outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	3	2	1	1	1	—	2
CO2	3	2	1	1	2	3	2	1	2	1	—	2
CO3	3	1	1	1	2	3	2	1	2	1	1	2
Weighted average	3	1.66	1	1	2	3	2	1	1.66	1	1	2

DSC(4) Syllabus for B.Sc. Physics (Basic and Honors)

Semester IV

Course Code: 222429	Course Title: DSC(4)-Thermal Physics and Electronics (Theory) DSC(4)-lab
Course Credits: 06 (4:0:2)	Hours of Teaching/Week: 04 (Theory) + 04 (Practical)
Total Contact Hours: 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2 $\frac{1}{2}$ Hours (Theory) 3 Hours (Practical)	Semester-End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs)	
CO1	Apply the laws of thermodynamics, laws of kinetic theory and radiation laws to the ideal and practical thermodynamics systems through derived thermodynamic relations.
CO2	Use the concepts of semiconductors to comprehend different Semiconductor devices such as diode transistors, BJT, FET, etc and explain their functioning.
CO3	Acquire knowledge on the functioning of OP-AMPS and apply it as the building blocks in logic gates.
CO4	Implement the use of logic gates in different theorems of Boolean Algebra followed by logic circuits.

Course Content

Content		Hrs
Unit – 1		
Laws of Thermodynamics: Review of the concepts of Heat and Temperature.		01
First Law of Thermodynamics: Differential form, Internal Energy. Equation of state for an adiabatic process, Work Done during Isothermal and Adiabatic Processes. Numerical Problems.		04
Second Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Reversible and Irreversible processes with examples. Heat Engines: Carnot engine & efficiency (no derivation). Refrigeration & coefficient of performance, Applications of Carnot engine in locomotion, Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale. Concept of Entropy, Second Law of Thermodynamics in terms of Entropy. Numerical Problems.		05
Third Law of Thermodynamics: Statement, Significance and Unattainability of Absolute Zero. Numerical Problems.		02
Suggested Activities		02
Activity No. 1	<ul style="list-style-type: none"> • Feel cold because coldness enters my body. Discuss the statement in day-to-day life. Approximately give examples of <ol style="list-style-type: none"> (i) open system (ii) closed system and (iii) isolated system • Discuss when the temperature of the body is locked until what time you hold the thermometer in contact with the body. Discuss it in contact with the laws of thermodynamics. • Discuss why when a person works or does exercise, he sweats. Reason it with the laws of thermodynamics. 	
Activity No. 2	<p>Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p> <ol style="list-style-type: none"> (i) The first slide will explain the process of doing the experiment. (ii) In the second slide. Students will show the graph of measurement. (iii) In the third slide, they will list three observations from that study. 	

	<p>Activity: Take four different sizes of the same metal, preferably of the same shape and give one piece to each group. Heat it uniformly on a hot plate. Keep a beaker of water with a thermometer immersed in it. Drop one hot metal into the water and record the temperature with time. Repeat the experiment for the other heated metal pieces of different sizes.</p> <p>(i) Plot a graph for the volume of the metal piece used v/s respective temperature change observed.</p> <p>(ii) Determine the heat capacity and specific heat of the metal used.</p>
Activity No. 3	<p>Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p> <p>(i) The first slide will explain the process of doing the experiment.</p> <p>(ii) In the second slide. Students will show the graph of measurement.</p> <p>(iii) In the third slide, they will list three observations from that study.</p> <p>Activity: Take ice cubes of different sizes and immerse them in water and measure the temperature change with time and repeat the experiment. Graph the observations.</p>
Unit – 2	
Thermodynamics Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy. Their Definitions, Properties and Applications. Numerical Problems.	02
Maxwell's thermodynamic Relations Derivations and applications of Maxwell's Relations (1) First order Phase Transitions with examples, Clausius-Clapeyron Equation (2) Values of C_p-C_v (3) Joule-Thomson Effect and $J-T$ coefficient (Derivation) for Vander Walls gas. Attainment of low temperature by liquefaction of gases and adiabatic demagnetization. Numerical Problems.	03
Kinetic Theory Of Gases: Distribution of Velocities: Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas: Mean, RMS and Most Probable Speeds. Degrees of Freedom, Law of Equipartition of Energy (no derivation). Specific heats of Gases. Numerical Problems.	04
Radiation: Blackbody radiation, spectral distribution, Lummer-Pringsheim experiment-Result, the concept of energy density and pressure of radiation (no derivation). Derivation of Planck's law, Wein's law, Rayleigh-Jean law, deduction of Stefan-Boltzmann law and Wien's displacement law from Planck's law. Numerical Problems.	03

Suggested Activities		02
Activity No. 4	<p>(i) Measuring the Solar Constant Materials: Simple flat-sided Jar and Thermometer. Activity: A bottle containing water is exposed to solar radiation. The rise in temperature and time took are noted. Calculate the heat absorbed by water and relate it to the output of the Sun.</p> <p>(ii) Thermo emf Materials: Suitable for two dissimilar metal wires, and voltage measuring devices. Activity: In this experiment, students will assemble the thermocouple and study the three effects namely, Seebeck, Peltier, and Thompson.</p> <p>(iii) Inverse square law of radiation Materials: A cardboard with a grid, cardboard with a hole, supporting clips, a ruler, candle. Activity: Students set the device. They count the lighted squares on the cardboard with the grid by varying the distance. And make necessary measurements and calculations to arrive at the inverse square law of radiation. Ref: Activity-Based Physics Thinking Problems in Thermodynamics: Kinetic Theory http://www.physics.umd.edu/perg/abp/think/thermo/kt.htm</p>	
Activity No. 5	<p>Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p> <p>(i) The first slide will explain the process of doing the experiment. (ii) In the second slide. Students will show the graph of measurement. (iii) In the third slide, they will list three observations from that study. Activity: Take two dissimilar metal wires. Spot weld them forming two junctions. Dip one junction in ice and heat the other junction with a burner. Plot a graph of the time of heating v/s Thermo EFM generated in the voltmeter.</p>	
Activity No. 6	<p>Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p>	

	<p>(i) The first slide will explain the process of doing the experiment. (ii) In the second slide. Students will show the graph of measurement. (iii) In the third slide, they will list three observations from that study. Activity: Make 4 groups and give different-sized balloons to each group. Fit different-sized nozzles into the mouth of the large balloons. Measure the temperature or the EMF generated using a thermocouple placed at the mouth of the nozzle as the pressurized gas is released. Plot a graph of time v/s temperature. Vary the volume of the balloon and repeat the experiment. Plot the graph of volume v/s temperature difference created.</p>	
Unit – 3		
	Semiconductor devices: Review of Intrinsic and Extrinsic semiconductors, p-n junction and its Characteristics and Parameters, Diode approximations, Half-wave rectifier, Full-wave rectifier, Zener diode voltage regulators: Regulator circuit with no load, Loaded Regulator. Numerical problems.	06
	Junction Transistors: Basics of Bipolar Junction Transistors (BJT), BJT operation, Common Base, Common Emitter and Common Collector Characteristics. Field Effect Transistor (FET) and its characteristics. Transistor as an Amplifier and Oscillator. Numerical problems.	06
Suggested Activities		02
Activity No. 7	<p>Wire a regulated DC power supply on a breadboard or groove board to give a regulated output voltage of + 5 V; +15 V; Dual power output: ± 5 V; Dual power output: ± 15 V. Use: 3-pin voltage regulators. Components required: 1. Step down transformer- 1 No. (5 V tapping, 100 – 500 mA current rating), BY 127 semiconductor diodes – 4 Nos, Inductor - 1, Capacitor - 1, 3 pins 5V regulator-1 Search for circuit diagrams in books/net. Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks. (i) The first slide will explain the process of doing the experiment. (ii) In the second slide. Students will show the graph of measurement. (iii) In the third slide, they will list three observations from that study. Activity: Form 3 groups and tell them to make a DC supply of low current of different voltages like 5V, 10V, and 15V on a breadboard.</p>	
Activity No. 8	<p>(i) Learn to identify the terminals of different types (packages) of BJTs. (ii) In the case of power transistors, learn how to fix a heat sink for the transistor. (iii) Learn the difference between BJT and FET in their operational characteristics.</p>	

Activity No. 9	<p>Note for the teachers for the activity: Make 3-4 groups among students and assign each group the activity of drawing one of the graphs given below. Provide a few days to complete the activity. On a specific day, each group has to make a ppt presentation of the following three slides. On the day of the presentation select a member from each group randomly to make the presentation. Based on the work and presentation, a teacher shall assign marks to each group, wherein all members of the group will get equal marks.</p> <p>(i) The first slide will explain the process of doing the experiment. (ii) In the second slide. Students will show the graph of measurement. (iii) In the third slide, they will list three observations from that study.</p> <p>Activity: Take any 3 diodes and assign one to each group. Measure its resistance when dipped in ice and heat the ice till it boils. Using this data, plot the calibration curve of temperature v/s resistance and also the cooling curve of temperature V/s time for the diode by each group.</p>
Unit – 4	
Electronics: Integrated Circuits (Analog and Digital), Operational Amplifiers, Ideal characteristics of Op-Amp, Inverting and Non-Inverting Configurations. Applications- Voltage Follower, Addition and Subtraction. Numerical problems.	04
Digital: Switching and Logic Levels, Digital Waveform. Number Systems: Decimal Number System, Binary Number System, Converting Decimal to Binary, Hexadecimal Number System: Converting Binary to Hexadecimal, Hexadecimal to Binary.	04
Boolean Algebra Theorems: De Morgan's theorem. Digital Circuits: Logic gates, NOT Gate, AND Gate, OR Gate, NAND Gate, NOR Gate, Algebraic Simplification, Implementation of NAND and NOR functions.	04
Suggested Activities	02
Activity No. 10	Learn how to implement logic functions (AND, OR, NOT) using just diodes and resistors. A circuit diagram shows how different types of gates can be built by X-NOR gates.
Activity No. 11	<p>Operational Amplifiers</p> <p>(i) Understand the concept of virtual ground of an OP-AMP. (ii) Learn the different types of op-amps used for different applications. (iii) What is a buffer? Prepare a report on buffers and their application in instrumentation electronics.</p>
Activity No. 12	(i) A man has to take a wolf, a goat, and some cabbage across a river. His rowboat has enough room for the man plus either the wolf or the goat or the cabbage. If he takes the cabbage with him, the wolf will eat the goat. If he takes the wolf, the goat will eat the cabbage. Only when the man is present

are the goat and the cabbage safe from their enemies. All the same, the man carries a wolf, goat, and cabbage across the river. How? Write the truth table for the above story and implement using gates.

(ii) A locker has been rented in the bank. Express the process of opening the locker in terms of digital operation.

(iii) A bulb in a staircase has two switches, one switch being at the ground floor and the other one at the first floor. The bulb can be turned ON and also can be turned OFF by and one of the switches irrespective of the state of the other switch. The logic of switching of the bulb resembles.

Textbooks

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Electronic Devices and Circuits	David A. Bell	PHI, New Delhi	2004
2	Integrated Electronics	Jacob Millman and CC Halkias		
3.	Digital Fundamentals	Floyd	PHI, New Delhi	2001

References Books

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Heat and Thermodynamics	M.W. Zemansky, Richard Dittman	McGraw-Hill.	1981
2	Thermal Physics	S. Garg, R. Bansal and Ghosh	Tata McGraw-Hill	2nd Edition, 1993
3	A Treatise on Heat	Meghnad Saha, and B.N.Srivastava,	Indian Press	1958
4	Modern Thermodynamics with Statistical Mechanics	Carl S. Helrich,	Springer.	2009
5	Thermodynamics, Kinetic Theory & Statistical Thermodynamics.	Sears & Salinger	Narosa.	1988
6	An Introduction to Thermal Physics	Daniel V Schroeder	Oxford University Press	2020

Weblinks

- https://deepblue.lib.umich.edu/bitstream/handle/2027.42/75853/ayd_1.pdf/
- <https://sites.ualberta.ca/gingrich/courses/phys395/notes/phys395/>
- <https://www.researchgate.net>

DSC(4) lab**List of Experiments****Credit : L:T:P****0:0:2****(Minimum EIGHT experiments must be completed)**

1	Verification of Gaussian distribution law and calculation of standard deviation – Monte Carlo experiment.
2	Determination of Unknown Temperature using Platinum resistance thermometer.
3	Verification of Stefan's Boltzmann fourth power law using Meter bridge.
4	V-I Characteristics of Silicon & Germanium PN Junction diodes (FB & RB).
5	V-I Characteristics of Zener Diode and voltage regulator.
6	Characteristics of BJT in Common Emitter Configuration.
7	Frequency response of CE Amplifier.
8	Half Wave and Full Wave Rectifier with and Without Filter.
9	Truth table verification of logic gates using TTL 74 series ICs.
10	Verification of basic logic gates using transistors.
11	Non-inverting and Inverting op-amp circuits.
12	Voltage follower, Adder and Subtractor circuits using OPAMP.

Sl No	Title of the Book	Publisher	Year of Publication
1	Basic Electronics Lab (P242) Manual 2015-16	National Institute of Science Education and Research Bhubaneswar	2015

Suggested Readings:

1. B.L. Worsnop, H.T. Flint, -Advanced Practical Physics for Students , Methuen & Co.,Ltd., London, 1962, 9e.
2. S. Panigrahi, B. Mallick, -Engineering Practical Physics , Cengage Learning India Pvt.Ltd., 2015, 1e.

Course Articulation Matrix-Course code-222429

Course outcomes	Program outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	2	2	1	1	1	—	2
CO2	3	2	1	1	2	2	2	1	1	1	—	2
CO3	3	2	1	1	2	2	2	1	2	2	—	2
CO4	3	3	1	1	2	2	2	1	2	2	1	2
Weighted average	3	2	1	1	2	2	2	1	1.5	1.5	1	2

OE Physics Syllabus for All Programs (Except Science)

Semester IV

Course Code: 22OEPHY401	Course Title: OE(7): Nanotechnology
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Exam Duration: 2½ Hours 2	Semester-End Examination Marks: 60

Course Outcomes (COs)

CO1	Acquiring the knowledge of Nanomaterials, Application of the Schrödinger equation and confinement of nanostructure and its consequences in 1D,2D and 3D.
CO2	Gaining knowledge on various methods used in the processing, synthesizing and characterization of nanostructure materials
CO3	Comprehending the properties and application of nanomaterials by implementing various nanomaterial devices.

Course Content

Content	Hrs	
Unit – 1		
<p>Introduction to nanomaterials Length scales in physics, Nanostructures: 1D, 2D and 3D nanostructures (nanodots, thin films, nanowires, nanorods), Band structure and density of states of materials at the nanoscale, Size Effects in nanosystems, Quantum confinement: Applications of Schrodinger equation Infinite potential well, potential step, potential box, quantum confinement of carriers in 3D, 2D, 1D nanostructures and its consequences.</p>	13	
Unit – 2		
<p>Synthesis and Characterization of nanostructure materials Top-down and Bottom-up approach, Photolithography. Ball milling. Gas phase condensation. Vacuum deposition. Physical vapor deposition (PVD): Thermal evaporation, E-beam evaporation, Pulsed Laser deposition. Chemical vapor deposition (CVD). Sol-Gel. Electrodeposition. Spray pyrolysis. Hydrothermal synthesis. Preparation through colloidal methods. MBE growth of quantum dots. X-Ray Diffraction. Optical Microscopy. Scanning electron microscopy. Transmission Electron Microscopy. Atomic Force Microscopy. Scanning Tunneling Microscopy.</p>	13	
Unit – 3		
<p>Properties and applications of nanomaterials Coulomb interaction in nanostructures. Concept of dielectric constant for nanostructures and charging of nanostructure. Quasi-particles and excitons. Excitons in direct and indirect bandgap semiconductor nanocrystals. Quantitative treatment of quasiparticles and excitons, charging effects. Radiative processes: General formalization-absorption, emission and luminescence. Optical properties of heterostructures and nanostructures. Applications of nanoparticles, quantum dots, nanowires and thin films for photonic devices (LED, solar cells). Nanomaterial Devices: Quantum dots heterostructure lasers, optical switching and optical data storage. Magnetic quantum well; magnetic dots - magnetic data storage.</p>	13	
Suggested Activities		
<ol style="list-style-type: none"> 1. Synthesis of metal nanoparticles by chemical route. 2. Synthesis of semiconductor nanoparticles. 3. XRD pattern of nanomaterials and estimation of particle size. 4. To study the effect of size on the color of nanomaterials. 5. Growth of quantum dots by thermal evaporation. 6. Prepare a disc of ceramic of a compound using ball milling, pressing and sintering, and study its XRD. 7. Fabricate a thin film of nanoparticles by spin coating (or chemical route) and study transmittance spectra in the UV-Visible region. 8. Prepare a thin film capacitor and measure capacitance as a function of temperature or frequency. 9. Visit nearby research labs to study the working of XRD, SEM, and UV-Visible Spectrophotometer instruments. 10. Visit nearby research labs for project work and interaction with scientists at IISC, JNCSR, Universities, etc. 		03

Text books

- C.P. Poole, Jr. Frank J. Owens, Introduction to Nanotechnology (Wiley India Pvt. Ltd.).
- S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publishing Company)
- K.K. Chattopadhyay and A. N. Banerjee, Introduction to Nanoscience and Technology (PHI Learning Private Limited).
- Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons).

Reference books

- M. Hosokawa, K. Nogi, M. Naita, T. Yokoyama, Nanoparticle Technology Handbook (Elsevier, 2007).
- Introduction to Nanoelectronics, V.V. Mitin, V.A. Kochelap and M.A. Stroscio, 2011, Cambridge University Press.
- Bharat Bhushan, Springer Handbook of Nanotechnology (Springer-Verlag, Berlin, 2004).

Weblinks

- <https://www.twi-global.com/technical-knowledge/faqs/what-is-a-nanomaterial>
- <https://en.wikipedia.org/wiki/Nanomaterials>
- <https://www.mdpi.com/journal/nanomaterials>

Course Articulation Matrix- 22OEPHY401												
Course outcomes	Program outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	2	2	1	1	1	—	1
CO2	3	1	1	1	2	2	2	1	1	2	1	1
CO3	3	1	1	1	2	3	2	1	2	1	—	1
Weighted average	3	1	1	1	2	2.33	2	1	1.33	1.33	1	1

OE Physics Syllabus for All Programs (Except Science)

Semester IV

Course Code: 22OEPHY402	Course Title: OE(8) : Electrical Instruments
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours	Formative Assessment Marks: 40
Exam Duration: 2 ¹ Hours 2	Semester-End Examination Marks: 60

Course Outcomes (COs)	
CO1	Developing knowledge of Kirchoff's laws and experimental application of circuit elements.
CO2	Gaining knowledge about the different types of galvanometers, potentiometers and DC/AC bridges.
CO3	Acquiring knowledge on lead acid batteries, working of CRO and transducers.

Course Content

Content		Hrs
Unit – 1		
Voltage and current sources, Kirchoff's current and voltage laws, loop and nodal analysis of simple circuits with dc excitation. Ammeters, voltmeters: (DC/AC). Representation of sinusoidal waveforms, peak and RMS values, and power factor. Analysis of single-phase series and parallel R-L-C ac circuits. Three-phase balanced circuits, voltage and current relations in star and delta connections. Wattmeters: Induction type, single phase and three phase wattmeter, Energy meters: AC. Induction-type single-phase and three-phase energy meters. Instrument Transformers: Potential and current transformers, ratio and phase angle errors, phasor diagram, methods of minimizing errors; testing and applications.		13
Unit – 2		
Galvanometers: General principle and performance equations of D'Arsonval Galvanometers, Vibration Galvanometer and Ballistic Galvanometers. Potentiometers: DC Potentiometer, Crompton potentiometer, construction, standardization, application. AC Potentiometer, Drysdale polar potentiometer; standardization, application. DC/AC Bridges: General equations for bridge balance, measurement of self-inductance by Maxwell's bridge (with variable inductance & variable capacitance), Hay's bridge, Owen's bridge, measurement of capacitance by Schering bridge, errors, Wagner's earthing device, Kelvin's double bridge.		13
Unit – 3		
Transducer: Strain Gauges, Thermistors, Thermocouples, Linear Variable Differential Transformer (LVDT), Capacitive Transducers, Piezo-Electric transducers, Optical Transducer, Hall Effect Transducer. CRO: Block diagram, Sweep generation, vertical amplifiers, use of CRO in the measurement of frequency, phase, Amplitude and rise time of a pulse. Digital Multi-meter: Block diagram, the principle of operation. Basics of lead-acid batteries, Lithium Ion Battery, Battery storage capacity, Coulomb efficiency, Numerical of high and low charging rates, Battery sizing.		13
Suggested Activities		03
Activity No. 1	Identify a variety of electrical switches and note down their applications/utility. Reference: Weblink/Youtube/Book	
Activity No. 2	Identify the hazards involved in handling electrical circuits and instruments, and make a list of safety precautions as well as first aid for electrical shocks. Reference: Weblink/Youtube/Book	
Activity No. 3	Make a study of the importance of grounding in electrical circuits Reference: Weblink/Youtube/Book	
Activity No. 4	Prepare a detailed account of various methods of earthing and their utility/applications Reference: Weblink/Youtube/Book.	
Activity No. 5	Prepare a document on the evolution of incandescent bulbs to the present-day LED lights Reference: Weblink/Youtube/Book.	
Activity No. 6	Make a comparative study of Fuses, MCB, ELCB, and Relays highlighting their use and applications. Reference: Weblink/Youtube/Book.	

Text Books

- AK. Sawhney, A Course in Elec. & Electronics Measurements & Instrumentation, Dhanpatrai & Co. 1978.
- A.D. Helfrick & W.D. Cooper, Modern Electronic Instrumentation and Measurement Techniques PHI,2016

Reference book:

- D C Kulshreshtha, Basic Electrical Engineering, Mc Graw Hill Publications,2019
- David G Alciatore and Michel B Histan, Introduction to Mechatronics and Measurement Systems, 3rd, Tata McGraw Hill Education Private Limited, New Delhi., 2005
- Vincent Del Toro, Electrical Engineering Fundamentals Prentice Hall India2009

Weblinks

- https://en.wikipedia.org/wiki/List_of_electrical_and_electronic_measuring_equipment
- <https://www.electrical4u.com/electrical-measuring-instruments-types-accuracy-precision-resolution-speed/>
- <https://www.embibe.com/exams/electrical-instruments/>

Course Articulation Matrix- 22OEPHY402												
Course outcomes	Program outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2	2	2	1	1	1	—	1
CO2	3	1	1	2	2	2	2	1	2	1	—	1
CO3	3	1	1	2	2	2	2	1	2	1	1	1
Weighted average	3	1	1	1.66	2	2	2	1	1.66	1	1	1

Continuous Formative Evaluation/ Internal Assessment

Total marks for each course shall be based on continuous assessments and semester- end examinations. The pattern of 40:60 for IA and Semester End theory examinations respectively and 50:50 for IA and Semester End practical examinations respectively.

	Theory	Practical
Total Marks for each Course	100 marks	50 marks
Continuous assessment-1 (C1)	20 marks	10 marks
Continuous assessment-2 (C2)	20 marks	15 marks
Semester End Examination (C3)	60 marks	25 marks

The evaluation process of IA marks shall be as follows:

- a) The first component (C1) of the assessment is for 20% marks. This shall be based on test, assignment, seminar, case study, fieldwork, project work, etc. This assessment and score process should be completed after completing 50% of the syllabus of the course/s and within 45 working days of the semester program
- b) The second component (C2) of the assessment is for 20% marks. This shall be based on test, assignment, seminar, case study, field work, internship / industrial practicum/project work, etc. This assessment and score process should be based on the completion of the remaining 50 percent of the syllabus of the courses of the semester.
- c) During the 17th – 19th week of the semester, a semester-end examination shall be conducted by the University for each Course. This forms the third and final component of the assessment (C3) and the maximum marks for the final component will be 60%.
- d) In case of a student who has failed to attend the C1 or C2 on a scheduled date, it shall be deemed that the student has dropped the test. However, in case of a student who could not take the test on the scheduled date due to genuine reasons, such a candidate may appeal to the Principal. The Principal in consultation with the concerned teacher shall decide about the genuineness of the case and decide to conduct a special test for such candidate on the date fixed by the concerned teacher but before the commencement of the concerned semester-end examinations.
- e) For assignments, tests, case study analysis, etc., of C1 and C2, the students should bring their own answer scripts (A4 size), graph sheets, etc., required for such tests/assignments and these be stamped by the concerned department using their department seal at the time of conducting tests/assignment/work, etc.
- f) The outline for continuous assessment activities for Component-I (C1) and Component-II (C2) of a course shall be as under.

	C1 marks	C2 marks	Total Marks
Session Test	20	---	20
Seminars/Presentations/Activity/ Case study /Assignment / Fieldwork / Project work etc.	---	20	20
Total	20	20	40

- For the practical course of full credits, the Seminar shall not be compulsory. In its place, marks shall be awarded for Practical Record Maintenance. (the ratio is 25 (10 + 15) and 25. Evaluated for a total of 50 Marks).
- Conduct of Test , Seminar, Case study / Assignment, etc. can be either in C1 or in the C2 component at the convenience of the concerned department/teacher.
- The teachers concerned shall conduct test / seminar / case study, etc. The students should be informed about the modalities well in advance. The evaluated course assignments during component I (C1) and component II (C2) of the assessment are immediately provided to the candidates after obtaining acknowledgment in the register by the concerned teachers(s) and maintained by the Department. Before the commencement of the semester-end examination, the evaluated test, assignment, etc. of C1 and C2 shall be obtained back to maintain them till the announcement of the results of the examination of the concerned semester.
- g) The marks of the internal assessment shall be published on the notice board of the department/college for information of the students.
- h) The Internal assessment marks shall be communicated to the CoE at least 10 days before the commencement of the examinations and the CoE shall have access to the records of such periodical assessments.
- i) There shall be no minimum in respect of internal assessment marks.
- j) Internal assessment marks may be recorded separately. A candidate who has failed or rejected the result shall retain the internal assessment marks.

Scheme of Valuation for Practical Examinations for III and IV Sem

C1 and C2 are internal tests to be conducted during the 8th and 16th weeks respectively of the semester. C3 is the semester-end examination conducted for 3 hours. The student will be evaluated based on skill, comprehension and recording of the results. The student has to compulsorily submit the practical record for evaluation during C1 and C2. For C3, the record has to be certified by the Head of the Department.

- The student is evaluated for 25 marks in C1 and C2 as per the following

scheme: Experiment: 10 for C1 (10 marks)

Experiment: 10, Record: 05 for C2 (15 marks)

- The student is evaluated for 25 marks in C3 as per the

followingscheme: Experiment: 20, Viva: 05 for C3 (25 marks)

The experimental portion of the evaluation (C3) is carried out as per the following scheme:

formula with proper units and explanation	03
Setting up the apparatus/circuit connections	03
Taking readings and tabulating	07
Calculations and Graph	07
Viva	05
Total	25

DSC THEORY QUESTION PAPER PATTERN FOR III AND IV SEM

Max Marks: 60

Exam duration: $2\frac{1}{2}$ hours

Part-A

I. One question from each unit is to be given with an internal choice. Each question carries 10 marks

$4 \times 10 = 40$

1 (a)

OR

(a)

2 (a)

OR

(a)

3 (a)

OR

(a)

4 (a)

OR

(a)

Part-B

II. One numerical problem must be given for each unit. Any three to be answered.

$3 \times 4 = 12$

5

6

7

8

Part-C

I One question must be given from each unit. Any four to be answered.

$2 \times 4 = 08$

- 9 (a)
- (b)
- (c)
- (d)
- (e)
- (f)

OPEN ELECTIVE THEORY QUESTION PAPER PATTERN FOR III AND IV SEM

Max Marks: 60

Exam duration: $2\frac{1}{2}$ hours

Part-A

I. One question must be given from each unit. Any three to be answered out of four questions
 $3 \times 15 = 45$

1

2

3

4

Part-B

II Numerical problem or short essay-type question must be given from each unit. Answer any three out of four questions. $3 \times 5 = 15$


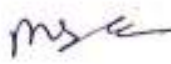
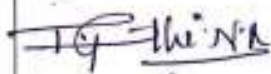
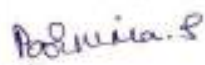

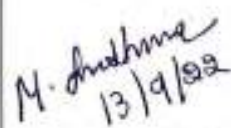
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6

7

8

Board of Studies

Sl.No.	Name and address	Designation	Signature
1	Manjunatha R HoD, Dept of Physics SBRR Mahajana First Grade College (Autonomous), Mysuru. Mob. 9611075347 manjukalp@yahoo.com	Chairman	
2	Dr. Chandrashekar. M.S DOS in Physics, Manasagangothri, Mysuru.Mob.9448600121 mse@physics.uni-mysore.ac.in mshandrashekara@gmail.com	Member	
3	Smt. Thejavathi N R Assistant Professor Department of Physics Govt. College (Autonomous) Mandya. Mob. 9481037230 thejavathi@gmail.com	Member	
4	Dr. Chethan Prathap K.N Assistant Professor Department of Physics University College of Science Tumkur University, Tumukur. Mob. 9686245523 cpforphysics@gmail.com	Member	Absent
5	Dr. Poornima S Assistant Professor SBRR Mahajana First Grade College (Autonomous), Mysuru. Mob: 9844815838 psmks2@gmail.com	Member	
6	Gayathri V Assistant Professor SBRR Mahajana First Grade College (Autonomous), Mysuru. Mob: 9980859170 gayatrivasu94@gmail.com	Member	
7	Smt. M. Sushma Assistant Professor Department of Physics Yuvaraja's College, Mysore sushmamraju77@gmail.com Mob:9986163654	Member	

Mahajana Education Society (R.)
Education to Excel
SBRR MAHAJANA FIRST GRADE COLLEGE (Autonomous)
Jayalakshmipuram, Mysuru – 570 012
Affiliated to University of Mysore Re-accredited by NAAC with ‘A’ Grade
College with Potential for Excellence

DEPARTMENT OF PSYCHOLOGY

Motto: Enriching scientific thought & Promoting Pro-Social Behavior.

**Vision: Thriving towards a scientifically driven environment for the
development of Psychological literacy.**

**Mission: Enabling the ‘Learner’ to develop the Research attitude and explore
new dimensions in Behavioral Sciences.**

Programme Outcomes (PO,s) - “Bachelors of Arts”	
PO1	Domain Knowledge: Inculcation of fundamental concepts, principles, methods and the application of the same in the realm of concerned domain.
PO2	Problem Analysis: This programme enhances the ability to define, identify and analyze appropriate means towards amicable solutions in the given area of Knowledge.
PO3	Design & Development of Solutions: Structuring theoretical knowledge and developing customized designs in terms of – Intervention strategies, Profiling, Reviews, Archives, Marketing strategies, Info-graphics and Approaches for arriving at relevant and desirable solutions.
PO4	Research & Investigation: Knowledge and application of “Research Methods” to investigate domain specific problems and derive scientific conclusions through testing of Hypotheses and relevant findings empirically.
PO5	Usage of Modern Tools and Techniques: Mastery in the academic enclave through skilled handling administering, assessing, validating and interpreting complex phenomena using advanced tools and techniques to create simple and sustainable solutions.
PO6	Social Sciences & Society – Promotes domain specific literacy to illuminate the significance of each discipline and its applicability for the well-being of Society.
PO7	Environment and Sustainability: Contemplate and Introspect prevailing environmental challenges and consequences. Further, channelize initiatives towards sustainability.
PO8	Moral and Ethical Values: Application of Professional Ethics, Humanitarian Values, Accountability and Social Responsibilities in emerging society towards attainment of harmony and co-existence.
PO9	Individual and Teamwork: Imbibe the qualities of Teamwork and function effectively as an emerging leader in the diversified and multidisciplinary areas.
PO10	Communication: Demonstrates Competency in comprehending and conceptualizing discipline specific concepts and ideas and communicates effectively through fluid communication within the professional and social setup.
PO11	Economics and Project Management: Understand the Economic Concept in the context of specific discipline and apply the same through initiating Planning, and Executing the Project Dynamics effectively towards successful Project Management.
PO12	Lifelong Learning: Identify and address their own educational needs in a changing world in ways sufficient to upgrade one’s skills and competencies through constant self-evaluation and eternal learning.

OBJECTIVES: Psychology

- 1.) Promote higher learning and research orientation among students, through effective establishment of the interface between the field of Psychology and its empirical nature.**

- 2.) Establish Introspective approach through – Educational tours, Internship Programmes, Minor Projects ect; to gear-up the Learner to explore the dynamics of Applied Psychology.**

- 3.) Kindle “Self – Enhancing and Innovative” skills among students through broader insights into the realm of Psychology.**

- 4.) Inspire Students to foresee various promising Career prospects available in the field of Mental Health Sciences through the pursuit of Psychology.**

- 5.) Endow a sense of ‘Professional Integrity’ in the learner through realizing the significance of Psychology in facilitating Mental Health services.**

List Of BOS Members in Psychology

Sl.No.	Category	Name	Designation	Address for Communication	E-mail and Mobile No.
1.	HoD	Smt. Sujata. M	Asst. Professor & HoD	Dept. of Psychology SBRR Mahajana First Grade College, Mysore	Sujatam.fgc@mahajana.edu.in 9886191174

2.	Two Experts from Outside the parent University	1.)	Dr Rekha	Associate Professor	Dept. of Psychology Govt. College for Women (Autonomous) Mandya.	rekhamsumesh@gmail.com 9986627024
		2.)	Dr Archana Bhatt K	Associate Professor	UG & PG Dept. of Psychology	archana.kallahalla@gmail.com 9538298660
				& HoD	Kateel Ashok Pai Memorial College – Shivamogga, Kuvempu University.	9538298660
					Dept. of Psychology	mridulasingh15@gmail.com
3.	Nominee by the Vice Chancellor		Dr. Mridula Singh	Associate Professor	Maharajas College, Mysore.	mridulasingh15@gmail.com 9448312327
4.	One Person from Industry /Corporate Sector /Allied area		Dr. Lancy D'Souza	Professor & HoD,	Dept. of Psychology, Maharaja's College Mysore	lancyd@gmail.com
				P G Student	Dept. of Clinical Psychology	ishasalim31@gmail.com
6.	Alumnus		Siyana Salim	M.Sc Clinical Psychology	St. Agnes College	ishasalim31@gmail.com 9071693910
					Mangalore	

Course Structure (NEP 2020)

Discipline Specific Courses (DSC) & Open Elective (OE)

III Sem	IV Sem
Course Code - 221365	Course Code - 221465

Course Type, Code and Name		Hours/Week		Credits	Maximum Marks			Exam Duration	Total	
		L	T/P		L:T:P	IA				Exam
						C1	C2		C3	
PSYCHOLOGY – III Sem										
DSC(3) - 221365	Child Development	4	0	4:0:2	20	20	60	2: 30 Hours	150	
	DSC (3) - Lab	0	4		10	15	25	3 Hours		
OE (3) 22OEPSY301	Psychology and Mental Health	3	0	3:0:0	20	20	60	2: 30 Hours	100	
PSYCHOLOGY – IV Sem										
DSC(4) - 221465	Developmental Psychology	4	0	4:0:2	20	20	60	2: 30 Hours	150	
	DSC(4) - Lab	0	4		10	15	25	3 Hours		
OE (4) 22OEPSY401	Psychology at Work	3	0	3:0:0	20	20	60	2: 30 Hours	100	

DSC (3) Syllabus for B.A PSYCHOLOGY (Basic and Honors)

Semester III

Course Code: 221365	Course Title: DSC(3) Child Development (Theory) DSC(3) Lab - Psychology (Practical)
Course Credits: 06 (4:0:2)	Hours of Teaching/Week: 04 (Theory) + 04 (Practical)
Total Contact Hours: 56 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2:30 Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs):

CO1 – Elucidate and analyze the nature of Human Lifespan Development across stages; with special relevance to Child Development.
CO2 – Identify and describe the nature of Pre-natal Development in humans; further conceptualize the dynamics involved in the phase.
CO3 – Demonstrate the pattern of growth and maturation in different domains of development across Infancy and Childhood.
CO4 – Systematically analyze and comprehend the Socio-emotional and Moral development through Infancy and Childhood.
CO5 – Determine and deconstruct the nature, symptomatology and pattern of Developmental disorders.

Course Content

Content	Hours
UNIT – 1	INTRODUCTION
<p style="text-align: center;">a)Development – Meaning & Nature – Heredity and Environment.</p> <p style="text-align: center;">b)Theories of child development – Cognitive theories, Behavioral and socio-cognitive theories; Ecological model – Bronfenbrenner.</p> <p style="text-align: center;">c)Methods and Designs – Longitudinal, Cross – sectional, Sequential, Correlation.</p> <p style="text-align: center;">d)Application of Child Psychology.</p>	12 Hrs
UNIT – 2	PRE-NATAL DEVELOPMENT
a) Stages in prenatal development – Conception, Germinal stage, Embryonic stage and Fetal	10 Hrs

<p>stage.</p> <p>b) Hazards- Environmental (Pollutants, Teratogens and Psychoactive drug, Infectious Diseases) and Incompatible Blood types.</p> <p>c) Child birth – Stages of child birth, Complications of child birth- Water Breaking Early, Perinatal Asphyxia, LBW (Low Birth Weight), Breech, Excessive bleeding, Umbilical cord issues.</p> <p>d) New Born Assessment – APGAR scale, Brazelton Neonatal Behavioural Assessment Scale.</p> <p>e) Chromosomal and Gene linked abnormalities – Chromosomal abnormalities - Down Syndrome; Abnormalities of the sex chromosomes - Klinefelters, Fragile x, Turner’s, XXX, XYY; Gene linked abnormalities - PKU, Sickle Cell Anaemia, Tay Sachs Disease.</p>	
<p>UNIT – 3 PHYSICAL, COGNITIVE AND LANGUAGE DEVELOPMENT (Infancy, Babyhood & Childhood)</p>	
<p>a) MOTOR DEVELOPMENT: Meaning; Reflexes, Sequence of motor development – Gross motor development & fine motor development.</p> <p>b) PERCEPTUAL DEVELOPMENT - Touch, Taste and Smell, Hearing, Vision.</p> <p>c) COGNITIVE DEVELOPMENT - Piaget’s theory of cognitive development., Vygotsky’s Theory of cognitive Development- Zone of Proximal Development and Scaffolding.</p> <p>d) LANGUAGE DEVELOPMENT – Pre-linguistic development – receptivity to language, first speech sounds. Phonological development; Semantic development; Grammatical Development, Pragmatic development; Bilingualism.</p>	<p>12 Hrs</p>
<p>UNIT – 4 EMOTIONAL, SOCIAL AND MORAL DEVELOPMENT (Infancy, Babyhood & Childhood)</p>	
<p>a) EMOTIONAL DEVELOPMENT - Development of emotional expression, Basic Emotions, Self-Conscious Emotions, Emotional self-Regulation, Acquiring Emotional Display Rules.</p> <p>b) SOCIAL DEVELOPMENT - Social Orientation, Development of attachment, sense of security, Cultural Influences - Self Awareness and Self Understanding.</p> <p>c) MORAL DEVELOPMENT - Kohlberg’s theory of Moral development.</p>	<p>11 Hrs</p>

UNIT – 5	DISORDERS OF CHILDHOOD
ADHD, Conduct disorder, Oppositional defiance disorder, Childhood depression, Symptom disorders (Enuresis, encopresis, sleep walking and tics); Pervasive developmental disorders – Autism, Intellectual Disability.	11 Hrs

References:

1. Carson, Butcher and Mineka, (2008) Abnormal Psychology. 13th edition, Pearson Education
2. John.W.Santrok (2014) - Child Development - 13th edition, Tata McGraw hill edition
3. Laura E. Berk (2013) - Child Development- 9th Edition, Easter economy edition, PHI publication
4. Levine, L.E. & Munsch,J (2014) Child Development: An Active Learning Approach, 2nd Edition, Sage Publications. Inc
5. Papalia,D.E., & Olds, S.W., **Human Development, 5th Ed., 7th Ed., 9th Ed.**, 1992, 1998, Mc Graw Hill Publication, New Delhi.
6. Hurlock, B. E., **Developmental Psychology, A life- span approach, 5th Ed**, Tata Mc Graw Hill, New Delhi.
7. Hoffman, I., *Developmental Psychology Today*, 5th Ed., 1988, Mc Graw Hill Publications, USA.
8. Santrock, J.W., Life- span Development, 7ed.,1999, Mc Graw Hill, North America.
9. Laura C Berk, **Child Development**, 7th Ed., (2007), Pearson Publication.
10. S. Venkateshan, **Children with Developmental Disabilities**, (2004), Sage Publication, India.
11. Lally, Martha, and Suzanned Valentine-French. (2017). **Lifespan development: a psychological perspective.**
12. Baltes, Paul & Lindenberger, Ulman & Staudinger, Ursula. (2006). Life Span Theory in Developmental Psychology.

Online / E-sources

- 1.) Duane F. Alwin, Linda A. Wray, A Life-Span Developmental Perspective on Social Status and Health, *The Journals of Gerontology: Series B*, Volume 60, Issue Special_Issue_2, 1 October 2005, Pages S7–S14, https://doi.org/10.1093/geronb/60.Special_Issue_2.S7

- 2.) Lally, Martha, and Suzanned Valentine-French. (2017). *Lifespan development: a psychological perspective*. <https://open.umn.edu/opentextbooks/textbooks/540>.

- 3.) Baltes, Paul & Lindenberger, Ulman & Staudinger, Ursula. (2006). Life Span Theory in Developmental Psychology. 10.1002/9780470147658.chpsy0111.

- 4.) Heckhausen, J., Wrosch, C., & Schulz, R. (2010). A motivational theory of life-span development. *Psychological review*, 117(1), 32–60.

<https://doi.org/10.1037/a0017668>

- 5.) Susan Krauss Whitbourne, PhD, University of Massachusetts, Amherst. (2012) LIFE SPAN DEVELOPMENT - a six-unit content developed by the American Psychological Association, December 2012

<https://www.apa.org/ed/precollege/topss/lessons/life-development.pdf>

BA/BSc III Semester With effect from Academic year 2022-23 and onwards

PRACTICALS: Total Hrs of Teaching 56 Hrs - 4 hours per week.

IA – 25 Marks

Semester End Exam – 25 Marks

Maximum Marks: 50 (Minimum 6 Practical to be conducted)

1. Children's Self Concept Scale / Any Self-concept Rating Scale
2. Learning Styles Inventory
3. Three-Dimensional Parental Behaviour Inventory
4. Vineland Social Maturity Scale
5. Shyness Assessment Test for children
6. General Health Questionnaire
7. Emotional Maturity Scale
8. Family Environment Scale

STATISTICS

Correlation

- Spearman's Rank Difference Method
- Pearson's Product Moment

Course Articulation Matrix - 221365

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	1	3	3	3	2	1	1	3	-	3
CO 2	3	3	1	1	3	2		-	-	2	-	1
CO 3	3	3	1	1	3	2	-	-	-	2	-	1
CO 4	3	3	1	1	3	3	-	1	-	2	-	1
CO 5	3	3	2	2	3	3	1	1	1	3	-	2
Weighted Average	3	2.8	1.2	1.6	3	2.6	1.5	1	1	2.4	0	1.6

c. Ethical issues	
UNIT – 2 Interpersonal approach to Mental Health	
<p>a. Interpersonal approaches to mental health: communication and conflict – Non-violence communication, the four horsemen of the apocalypse.</p> <p>b. Cognitive distortions - personalization, catastrophizing, polarised thinking, shoulds and musts, mental filtering, fallacies (control, change, and heaven’s reward), A-B-C model</p>	11 Hrs
UNIT – 3 Mental Health issues	
<p>a. Stress / Burnout</p> <p>b. Anxiety, fear, worry, phobia, depression</p> <p>c. Grief and trauma</p>	10 Hrs
UNIT – 4 Intervention and Management	
<p>a. Need for mental health intervention and strategies</p> <p>b. Coping Mechanisms: Grounding techniques, Mindfulness practices, Positive Management of emotions, Healthy Psychological and Social functioning (flourishing), Self care in mental health: A conceptual model.</p>	10 Hrs

References

- Augustus, J.o., Bold, Justine., Williams, B. An Introduction to Mental Health, Sage Publications Ltd
- Gurumani, G.D., *Text Book of Mental Health and Hygiene*
- Lucock, M., Gillard, S., Adams, K., Simons, L., White, R., & Edwards, C. (2011). *Self - care in mental health services: a narrative review. Health & Social Care in the Community*, 19 (6)
- Papalia., & C. D.E., Olds, S.W., & Feldmam, R.D. (2004). *Human Development*. 9th Edition. New Delhi: Tata Mc-Graw Hill Publishing Company Ltd.
- Piotrowski, N.A. (2010). *Psychology & Mental Health*. Salem Press.
- Robert Feldman (2011) *Essentials of Understanding Psychology* 10th Edition

Online/E-Resources

www.ipi.org.in/texts/ajit/dalal-psychology-of-health.pdf

- <https://egyankosh.ac.in> > handle BPCG-173 Psychology for Health and Well being – eGyanKosh

Course Code: 221465

Course Title: Developmental Psychology

DSC(4) (Theory)

DSC(4) Psychology Lab (Practical)

Course Credits: 06 (4:0:2)

Hours of Teaching/Week: 04 (Theory) + 04 (Practical)

Total Contact Hours: 56 Hours (Theory)
56 Hours (Practical)

Formative Assessment Marks: 40 (Theory)
25 (Practical)

- [Well-Being Concepts | HRQOL | CDC](#)
- [Psychological Health, Well-Being, and the Mind-Heart-Body Connection: A Scientific Statement From the American Heart Association | Circulation \(ahajournals.org\)](#)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	1	-	-	1	1	1	-	3	-	2
CO 2	3	3	1	-	-	1	1	1	1	3	-	2
CO 3	3	2	1	-	1	2	1	1	1	3	-	2
CO 4	3	2	1	1	2	2	1	1	-	3	-	2
Weighted Average	3	2.2	1	0	1.5	1.5	1	1	1	3	0	2

DSC (4) Syllabus for B.A Psychology (Basic and Honors)

Semester IV

Exam Duration: 2:30 Hours (Theory)
3 Hours (Practical)

Semester End Examination Marks: 60 (Theory)
25 (Practical)

Course Outcomes (COs):

CO1 – Enumerate the characteristics and illustrate the critical nature of Puberty and Adolescence stages of human development.
CO2 – Concretely analyze the dynamics and changes involved in Early Adulthood.
CO3 – Describe the nature of Middle Adulthood and deduce the complexities that center the stage.
CO4 – Demonstrate and conceptualize the attributes and challenges of Late Adulthood.
CO5 – Comprehensively determine the aspects of senility and the progress of life towards cessation.

Course Content

Content	Hours
UNIT – 1 PUBERTY & ADOLESCENCE	
a) Definition – Puberty and Adolescence. b) Biological & Physical changes: Sexual maturation in girls and boys - growth spurt, primary and secondary sexual characteristics, Physical Health issues. c) Psychological changes and Mental Health Issues during Adolescence. d) Identity formation - Gender identity and crisis, and Self- concept. e) ‘New media’: Influence on Adolescent behavior - Addiction to Social Media, Virtual Gaming, Antisocial tendencies and Juvenile Delinquency.	12 Hrs

UNIT – 2	EARLY ADULthood
<p>a) Early adulthood – Definition & Adjustment.</p> <p>b) Health and Physical Development: Health and Fitness during Early Adulthood.</p> <p>c) Psycho-social development: Single Lifestyle, Intimate Relationships - Marriage (Types of Marriage), Divorce (Reasons and Impact), co-habitation, LGBTQA+ issues; Responsible Parenthood, and Infertility (Causes). Work – choosing an occupation and importance of work.</p> <p>d) Cognitive development – Schaie’s Model.</p>	10 Hrs
UNIT - 3	MIDDLE ADULthood
<p>a) Definition and Adjustment during Middle Adulthood.</p> <p>b) Physical changes – Changes in appearance, sensory abilities, physiological functioning, Changes in Sexuality and Health issues.</p> <p>c) Cognitive Development - Integrative thought, Practical problem solving and creativity.</p> <p>d) Psycho-social Changes – Midlife Crisis, Vocational Hazards - Occupational stress, burnout, unemployment and retirement; Changes in Relationships - Maturing children and Aging Parents.</p>	10 Hrs
UNIT – 4	LATE ADULthood
<p>a) Physical Changes: Sensory & Psychomotor Functioning – Vision, Hearing, Taste & Smell, Strength, Endurance, Balance & Reaction time.</p> <p>b) Psychosocial Development - Life Style Changes and Social Issues related to aging (Successful retirement, Loss of Spouse and Empty Nest Syndrome).</p> <p>c) Health concerns – Alzheimer’s, Parkinson’s, (Changes in cognitive abilities), and Psycho-physiological Illnesses (Diabetes Mellitus, Hyper-tension and Coronary Heart Diseases).</p> <p>d) Living arrangements for the elderly and Successful aging.</p>	12 Hrs
UNIT – 5	LATE ADULthood (Old age)

<p>a) Spirituality and Wellbeing in late adulthood.</p> <p>b) Finding Meaning & purpose - Life & Death</p> <p>c) Death & Dying - Facing death & Loss - Psychological Issues - Confronting one's death; Patterns of grieving (Kubler Ross stages of Dying or Grieving).</p> <p>d) Issues related to Death - Medical, Legal and Ethical</p> <p>e) Care for the dying – Palliative and Hospice Care.</p>	<p>12 Hrs</p>
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REFERENCES

1. Carson, Butcher and Mineka, (2008) Abnormal Psychology. 13th edition, Pearson Education
2. John.W.Santrok (2014) - Child Development - 13th edition, Tata McGraw hill edition
3. Laura E. Berk (2013) - Child Development- 9th Edition, Easter economy edition, PHI publication
4. Levine, L.E. & Munsch,J (2014) Child Development: An Active Learning Approach, 2nd Edition, Sage Publications. Inc
5. Papalia,D.E., & Olds, S.W., **Human Development, 5th Ed., 7th Ed., 9th Ed.**, 1992, 1998, Mc Graw Hill Publication, New Delhi.
6. Hurlock, B. E., **Developmental Psychology, A life- span approach, 5th Ed**, Tata Mc Graw Hill, New Delhi.
7. Hoffman, I., *Developmental Psychology Today*, 5th Ed., 1988, Mc Graw Hill Publications, USA.
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9. Lally, Martha, and Suzanned Valentine-French. (2017). ***Lifespan development: a psychological perspective.***
10. Baltes, Paul & Lindenberger, Ulman & Staudinger, Ursula. (2006). Life Span Theory in Developmental Psychology.

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- 2.) Lally, Martha, and Suzanned Valentine-French. (2017). *Lifespan development: a psychological perspective*. <https://open.umn.edu/opentextbooks/textbooks/540>.
- 3.) Baltes, Paul & Lindenberger, Ulman & Staudinger, Ursula. (2006). Life Span Theory in Developmental Psychology. 10.1002/9780470147658.chpsy0111.
- 4.) Heckhausen, J., Wrosch, C., & Schulz, R. (2010). A motivational theory of life-span development. *Psychological review*, 117(1), 32–60.
<https://doi.org/10.1037/a0017668>
- 5.) Susan Krauss Whitbourne, PhD, University of Massachusetts, Amherst. (2012) LIFE SPAN DEVELOPMENT - a six-unit content developed by the American Psychological Association, December 2012 <https://www.apa.org/ed/precollege/topss/lessons/life-development.pdf>

BA/BSc IV Semester With effect from Academic year 2022-23 and onwards

PRACTICALS: Total Hrs of Teaching 56 Hrs - 4 hours per week.

**IA – 25 Marks
Marks**

Semester End Exam – 25

Maximum Marks: 50 (Minimum 6 Practical to be conducted)

1. College Student Problem Checklist
2. Life Satisfaction Scale
3. Social Intelligence Scale

4. Battle Ground Mobiles India - Addiction Test (PUBG addiction test)
5. Self Regulation Questionnaire
6. Social Adjustment scale for aged
7. Social Network Addiction Scale
8. Loneliness Inventory

STATISTICS

Tests of Difference

- 't' test
 - Independent Sample test
 - Paired Sample test

Course Articulation Matrix - 221465

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	1	3	3	3	1	1	1	3	-	3
CO 2	3	3	1	1	3	3	1	1	-	2	-	1
CO 3	3	3	1	1	3	2	1	1	-	2	-	1
CO 4	3	3	1	1	3	3	1	1	1	2	-	1
CO 5	3	3	2	2	3	3	1	1	1	3	-	2
Weighted Average	3	2.4	1.2	2.6	3	2.8	1	1	1	2.4	0	1.6

OE (4) Syllabus of B.A Psychology (Except B.A)

Semester IV

Course Code: 22OEPSY401	Course Title O.E (4): Psychology at Work
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 Hour (Theory)
Total Contact Hours: 42 Hours (Theory)	Formative Assessment Marks: 40
Exam Duration: 2:30 Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO1 – Conceptualize the nature and scope of Industrial Psychology.
CO2 – Elucidate and describe the attributes and challenges involved in Performance Appraisal and Work Motivation.
CO3 – Demonstrate and interpret the determinants of Leadership and Communication in Work setup.
CO4 – Enumerate the nature and sources of stress; further comprehend the intervention strategies to cope with Stress.

Course Content

Content	Hours
UNIT - 1 Industrial / Organizational Psychology	
a) Nature and Meaning, Goals, Role of a psychologist in Industries and Organization.	11 Hrs
b) Challenges at workplace: Stress, Burnout, Absenteeism, Work environment, Alcoholism, Substance abuse, Conflicts.	
UNIT – 2 Performance Appraisal & Motivation	
a) Definitions and Need for Performance Appraisal. Methods: Objective Performance Appraisal - Output measures, Computerized performance monitoring, Job related personal data, Essay methods, Critical incident method and Checklist method.	11 Hrs
b) Judgmental Performance Appraisal - Merit rating techniques, Behaviour Anchored Rating Scale and Behaviour Observation Scale.	
c) Management by objectives (MBO) and 360* Feedback.	
d) Meaning of work motivation. Types-Financial and Non-Financial motives.	
UNIT – 3 Leadership & Communication	

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	1	-	1	1	-	1	1	3	-	1
CO 2	3	3	1	-	1	1	1	1	1	3	-	1
CO 3	3	3	1	-	1	1	1	1	1	3	-	1
CO 4	3	2	1	-	1	1	1	1	1	3	-	1
Weighted Average	3	2.5	1	0	1	1	0.7	1	1	3	0	1

Continuous Formative Evaluation/Internal Assessment (DSC & OE)

Total marks for each course shall be based on continuous assessments and semester end examinations. The pattern is 40:60 for IA and Semester End Theory Examinations respectively and 50:50 for IA and SemesterEnd Practical Examinations respectively.

	THEORY	PRACTICAL
Total Marks	100 Marks	50 Marks
Continuous Assessment – 1 (C1)	20 Marks	10 Marks
Continuous Assessment – 2 (C2)	20 Marks	15 Marks
Semester End Examination (C3)	60 Marks	25 Marks

Evaluation Process of IA Marks shall be as follows:

- a) The first component (C1) of assessment is for 20% marks. This shall be based on test, assignment, seminar, case study, field work, project work etc. This assessment and score process should be completed after completing 50% of syllabus of the course and within 45 working days of semester program.

- b) The second component (C2) of assessment is for 20% marks. This shall be based on test, assignment, seminar, case study, field work, internship/industrial practicum/project work, quiz etc. This assessment and score process should be based on completion of remaining 50% of syllabus of the course of the semester.

	C1 Marks	C2 Marks	Total Marks
Session Test	20	-	20
Seminar/Presentation/Assignment/Activity/Case Study/Field Work/Project Work/Quiz etc.	-	20	20
Total	20	20	40

- c) During the 17th – 19th week of the semester, a semester end examination shall be conducted by the college for each course. This forms the third and final component of assessment (C3) and the maximum marks for the final component will be 60%.
- d) In case of a student who has failed to attend the C1 or C2 on a scheduled date, it shall be deemed that the student has dropped the test. However, in case of a student who could not take the test on scheduled date due to genuine reasons, such a candidate may appeal to the Program Coordinator/Principal. The Program Coordinator/Principal in consultation with the concerned teacher shall decide about the genuineness of the case and decide to conduct special test to such candidate on the date fixed by the concerned teacher, but before commencement of the concerned semester end examinations.
- e) For assignments, tests, case study analysis etc., of C1 and C2, the students should bring their own answer scripts (A4 size), graph sheets etc., required for such tests/assignments and these be sealed/signed by the concerned department at the time of conducting tests/assignment/project work etc.
- f) The outline for continuous assessment activities for Component-I (C1) and Component-II (C2) of a course shall be as under:
- For practical course of full credits, seminar shall not be compulsory. In its place, marks shall be awarded for Practical Record Maintenance, the marks are 25 (10 + 15) and 25. Evaluated for a total of 50 Marks.
 - Conduct of Test, Seminar, Case study/Assignment etc., can be either in C1 or in C2 component as decided by the college and concerned department/teacher.
 - The teachers concerned shall conduct test/seminar/case study/Assignment etc., the students should be informed about the modalities well in advance. The evaluated courses assignments during component I (C1) and component II (C2) of assessment are immediately provided to the candidates after obtaining

acknowledgement in the register by the concerned teacher(s) and maintained by the Department. Before commencement of the semester end examination, the evaluated test, assignment etc., of C1 and C2 shall be obtained back to maintain them till the announcement of the results of the examination of the concerned semester.

- g) The marks of the internal assessment shall be published on the notice board of the department/college for information of the students.
- h) The internal assessment marks shall be communicated to the CoE (Controller of Examination) at least 10 days before the commencement of the semester end examinations and the CoE shall have access to the records of such periodical assessments.
- i) There shall be no minimum in respect of internal assessment marks.
- j) Internal assessment marks may be recorded separately. A candidate who has failed or rejected the result, shall retain the internal assessment marks.

PRACTICAL COMPONENT

Scheme of Valuation for III & IV Sem: Practical Experimentation

C1 and C2 (Practical) are internal tests to be conducted during 8th and 16th weeks of the semester respectively. C3 (Practical Examination) is conducted during the end of the semester for the duration of 3 hours. The students are assessed and evaluated by the External and Internal Examiners - on various skills associated with Psychology Practical – Administration, Procedure, Instructions, Analysis and Interpretation of results of the Subjects performance in the Experiment conducted. The Practical Component is valued for 50 Marks (during each of the Semesters respectively).

The C1(Test) and C2 (Assignment – Case Study) components are - IA assessment. During the C1 and C2 elements the student is evaluated for 20 marks (collectively) as per the following scheme:

- a.) C1 – Test on Experiments - 10 marks (On first Half of the Practical Portions)
- b.) C2 – Test on Experiments / Assignment/Case Study/Statistics - 15 marks (On the second Half of Practical Syllabus + Record)

Though the C1 and C2 components are evaluated for 20 marks each for the ease of calculation, however the total marks scored by the student are then normalized to 10 under each component, (C1 and C2 Collectively – 20 + 5 Marks for Practical Record).

Record - 5 Marks; the Practical record has to be evaluated on 5 marks (IA) and then certified by the Head of the Department.

- The student is evaluated for 25 marks during C3 Examination as per the following scheme:

Heading	Marks
Experiment	5
Conduction	5
Group Discussion	5
Viva Voce	5
Statistics	5
TOTAL	25

General Pattern on Psychology PRACTICAL Question Paper (NEP-2020)

Term End Examination for Discipline Specific Paper

Scheme of Valuation for III & IV Sem: Practical Experimentation

Total marks = 50		
Internal assessment =25		
Content	Marks	
Test C1	10	
C2 Test/Assignment (Case Study/Reports/Seminar Presentations; Statistics etc) + Practical Record	10 05	Total 15
Total IA	25	
Practical examination =25		
Content	Marks	
Writing Plan and procedure (any one)	05	
Conduction / administration (any one)	05	
Discussion of results (any one)	05	
Statistics	05	
Viva voce	05	
Total Practical Examination	25	

Practical Exam Duration & Ordinance

- **The Exam duration for I.A Practicals (Test C1 component) is for 1 Hr and C3 the main Practical Examination is for 3 Hrs.**
- **The student is expected to reach the Examination venue 30 minutes before the schedule.**
- **If the student is delayed beyond 30 min of the given schedule of Practical Examination; then he/she is not entitled or allowed to write the Practical examination for that Semester and will be considered as absent.**

***** Practical Record** - 5 Marks; Record submission is compulsory prior to the scheduled Examination date failing which the student is considered as not eligible to take up the Practical Examination. The student has to compulsorily submit the written Practical Record during C3 - Final Practical Examination. While, the student is considered as eligible for the C3 component of Psychology Practical Examination, only if the Practical record has been submitted by the student to be evaluated on 5 marks (IA) and then certified by the Head of the Department. In case of an incomplete record the Department has every authority to either consider or penalize the student by deducting the marks for their negligence and lack of involvement.

DSC - Question Paper Pattern (Theory – III & IV Sem)

PSYCHOLOGY B.A PROGRAMME

B.A PSYCHOLOGY - DSC (For III & IV Semesters)

Time: 2:30 Hours

Max. Marks: 60

Part-A

I. Answer any five of the following questions.

5x2=10

- 1.).....
- 2.).....
- 3.).....
- 4.).....
- 5.).....
- 6.).....
- 7.).....

Part-B

II. Answer any Four of the following questions.

4x5=20

- 8.).....
- 9.).....
- 10.).....
- 11.).....
- 12.).....
- 13.).....
- 14.).....

Part-C

III. Answer any Four of the following questions.

3x10=30

15.).....

16.).....

17.).....

18.).....

19.).....

20.).....

O.E Psychology - Question Paper Pattern (Theory III & IV Sem)

PSYCHOLOGY B.A PROGRAMME

B.A PSYCHOLOGY – O.E (For III & IV Semesters)

Time: 2:30 Hours

Max. Marks: 60

Part-A

I. Answer any five of the following questions.

5x2=10

- 1.).....
- 2.).....
- 3.).....
- 4.).....
- 5.).....
- 6.).....
- 7.).....

Part-B

II. Answer any Four of the following questions.

4x5=20

- 8.).....
- 9.).....
- 10.).....
- 11.).....
- 12.).....
- 13.).....
- 14.).....

Part-C

III. Answer any Four of the following questions.

3x10=30

15.).....

16.).....

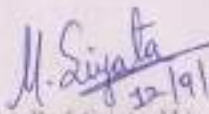
17.).....

18.).....


19.).....

20.).....

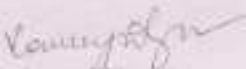
Approved by the Board of Studies in Psychology (2022-2023) and forwarded to the Academic Council and the Governing Council for further reference and consent.


12/19/2022
(Asst. Prof. Sujata. M)

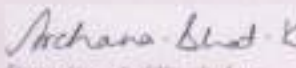
Chairperson
BOS/BOE in Psychology
SBRR Mahajana First Grade College
(Autonomous)
Jyotakshimpuram, Mysuru-570 012


(Dr. Mehdul Singh)

Vice Chancellor Nominee, University of Mysore.
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(Dr. Rekha)

(Siyana Salim)

(ABSENT)

AECC (3) Syllabus for BA/Bsc/BCA SANSKRIT

Course Code: BA/BSc/BCA – 22SAN309	Course Type & Title: AECC(3) Sanskrit Champu Kavya and Grammer
Course Credits (L:T:P): 3 (2:1:0)	No. of Teaching Hours/Week: 02 Hours (Theory) 02 Hours (Tutorials)
Total Contact Hours: 28 Hours (Theory) 28 Hours (Tutorials)	Formative Assessment Marks: 40
Exam Duration: 2½ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO1:. Know about origin and Development of Sanskrit champu kavyas

CO2: Goal for the future, Ability to take right Decisions, Ability to face downs in life, Maintain and follow Great Traditions of Indian Society.

CO3:. Understanding concepts

CO4:. Understanding the technique of chandass

Course Content:

Course Content	Hours
UNIT - 1	
Introduction to classical Sanskrit literature with special reference to Champu Kavya and its lakshanas. Introduction to Author and Text	14
UNIT - 2	
Introduction to Author and Text नीलकण्ठविजय चम्पू:-तृतीयाश्वासः, 24 श्लोक पर्यन्तम्	14
UNIT - 3	
नीलकण्ठविजय चम्पू:-तृतीयाश्वासः, 25 श्लोकतः 73 श्लोक पर्यन्तम्	14
UNIT - 4 अनुष्टुप्, इन्द्रवज्रा, वसन्ततिलका,मालिनी,मन्दाक्रान्ता	14

Text Book: नीलकण्ठविजय चम्पू:-तृतीयाश्वासः

Recommended Books

1. Samskruta Bhashashastra Mattu Sahitya charitre :vidwan Dr.K Krishnamurty, Vidwan N Ranganath Sharma ,Vidwan H k siddagangayya :Pubished By - Dr.K Krishnamurty Pratisthana @ Mysuru ,Page No .663 to 704
2. नीलकण्ठविजय चम्पू: Pubished By- Prasaranga ,University of Mysuru
3. Kuvalayananda ,written by Appayya Dixit

Digital Resources: www.archieve.org

<https://www.wikipedia.org/>

Course Articulation Matrix –22SAN309

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	1	1	2	1	3	2	2	2	2
CO 2	2	2	1	1	1	2	1	3	2	2	2	2
CO 3	2	2	1	1	1	2	1	3	2	2	2	2
CO 4	2	2	1	1	1	1	1	-	1	2	2	2
Weighted Average	2	2	1	1	1	1.75	1	2.22	1.25	2	2	2

AECC (3) Syllabus for B.Com/BBA/BBA(H&H) BBA (AIR& TR)SANSKRIT

Course Code: BCom/BBA (All) – 22SAN310	Course Type & Title: AECC(3) Sanskrit Champu Kavya and Grammer
Course Credits (L:T:P): 3 (2:1:0)	No. of Teaching Hours/Week: 02 Hours (Theory) 02 Hours (Tutorials)
Total Contact Hours: 28 Hours (Theory) 28 Hours (Tutorials)	Formative Assessment Marks: 40
Exam Duration: 2½ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO1:. Know about origin and Development of Sanskrit champu kavyas

CO2:Goal for the future, Ability to take right Decisions, Ability to face downs in life, Maintain and follow Great Traditions of Indian Society.

CO3:Understanding concepts

CO4:Know about Alankara (figures of speech)

Course Content:

Course Content	Hours
UNIT - 1	
Introduction to classical Sanskrit literature with special reference to Champu Kavya and its lakshanas	14
UNIT - 2	
Introduction to Author and Text. भोजराजविरचित चम्पूरामायणम्-किष्किन्धाकाण्डः, 24 श्लोक पर्यन्तम्	14
UNIT - 3	
भोजराजविरचित चम्पूरामायणम्-किष्किन्धाकाण्डः, 25 तः 48 श्लोक पर्यन्तम्	14
UNIT - 4	
उपमालङ्कारः, रूपकालङ्कारः, अनन्वयालङ्कारः, उत्प्रेक्षालङ्कारः, श्लेषालङ्कारः	14

Text Book: भोजराजविरचित चम्पूरामायणम्-किष्किन्धाकाण्डः

Recommended Books

1. Samskruta Bhashashastra Mattu Sahitya charitre :vidwan Dr.K Krishnamurty, Vidwan N Ranganath Sharma ,Vidwan H k siddagangayya :Pubished By - Dr.K Krishnamurty Pratisthana ® Mysuru ,Page No .663 to 704
2. भोजराजविरचित चम्पूरामायणम्-किष्किन्धाकाण्डः Pubished By- Prasaranga ,University of Mysuru
3. Kuvalayananda ,written by Appayya Dixit

Digital Resources: www.archieve.org

<https://www.wikipedia.org/>

Course Articulation Matrix – 22SAN310

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	1	1	2	1	3	2	2	1	2
CO 2	2	2	1	1	1	2	1	3	2	2	1	2
CO 3	2	2	1	1	1	2	1	3	2	2	1	2
CO 4	2	2	1	1	1	1	1	-	1	2	1	2
Weighted Average	2	2	1	1	1	1.75	1	2.22	1.25	2	1	2

AECC (4) Syllabus for BA/Bsc/BCA SANSKRIT

Course Code: BA/BSc/BCA – 22SAN409	Course Type & Title: AECC(4) Sanskrit Drama and Dramaturgy and □□□□□
Course Credits (L:T:P): 3 (2:1:0)	No. of Teaching Hours/Week: 02 Hours (Theory) 02 Hours (Tutorials)
Total Contact Hours: 28 Hours (Theory) 28 Hours (Tutorials)	Formative Assessment Marks: 40
Exam Duration: 2½ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO1: Know about origin and Development of Sanskrit Drama

CO2: Grasp about Enacting Drama, one should become the actor, Knowing Great Indian Traditions and Heritage .Art and Architecture. Culture. Believes. Character Building, Analyze and adopt the good Character in the life, Develop a New Ideas. Inculcate Communication Skills.

CO3: Understanding concepts

CO4: Understanding the technique of chandass

Course Content:

Course Content	Hours
UNIT - 1	
Unit-1 Introduction to Sanskrit Drama and Dramaturgy ,origin and Development of Sanskrit Drama, Dasarupakas and their lakshanas , Important Drushya Kavyas (Dramas) and Dramatists in Sanskrit Literature	14
UNIT - 2	
Introduction to Author and Text दूतवाक्यं -25 श्लोक पर्यन्तम्	14
UNIT - 3	

दूतवाक्यं -26 श्लोकतः 53 श्लोक पर्यन्तम्	14
UNIT - 4 अनुष्टुप्, इन्द्रवज्रा, वसन्ततिलका,मालिनी,मन्दाक्रान्ता.	14

Text Book: दूतवाक्यं Of भासः

Recommended Books

1. Samskruta Nataka, A R krishnashastry ,Prasaranga ,Manasagangotri ,Mysuru -1988
Page number 1 -58
2. दूतवाक्यं of भासः, Motilal Banarasidas Publishers ,Delhi-1998
3. वृत्तरत्नाकरः,भट्टकेदारविरचितः, Motilal Banarasidas,Delhi-1993

Digital Resources: www.archieve.org
<https://www.wikipedia.org/>

Course Articulation Matrix – 22SAN409

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	1	1	2	1	3	2	2	1	2
CO 2	2	2	1	1	1	2	1	3	2	2	1	2
CO 3	2	2	1	1	1	2	1	3	2	2	1	2
CO 4	2	2	1	1	1	1	1	-	1	2	1	2
Weighted Average	2	2	1	1	1	1.75	1	2.22	1.25	2	1	2

AECC (4) Syllabus for B.Com/BBA/BBA(H&H) BBA (AIR& TR)SANSKRIT

Course Code BCom/BBA (All) – 22SAN410	Course Type & Title: AECC(4) Sanskrit Drama and Dramaturgy and □□□□□
Course Credits (L:T:P): 3 (2:1:0)	No. of Teaching Hours/Week: 02 Hours (Theory) 02 Hours (Tutorials)
Total Contact Hours: 28 Hours (Theory) 28 Hours (Tutorials)	Formative Assessment Marks: 40
Exam Duration: 2½ Hours	Semester End Examination Marks: 60

Course Outcomes (COs):

CO1:. Know about origin and Development of Sanskrit Drama

CO2: Grasp about Enacting Drama, one should become the actor, Knowing Great Indian Traditions and Heritage .Art and Architecture. Culture. Believes. Character Building, Analyze and adopt the good Character in the life, Develop a New Ideas. Inculcate Communication Skills.

CO3: Understanding concepts

CO4:Understanding the technique of chandass

Course Content:

Course Content Content	Hours
UNIT - 1	
Introduction to Sanskrit Drama and Dramaturgy ,origin and Development of Sanskrit Drama, Dasarupakas and their lakshanas , Important Drushya Kavyas (Dramas) and Dramatists in Sanskrit Literature	14
UNIT - 2	
Introduction to Author and Text प्रतिमा नाटकं - भासः(प्रथमाङ्कः)	14
UNIT - 3	
प्रतिमा नाटकं - भासः(द्वितीय-तृतीयाङ्कौ)	14
UNIT - 4	14
अनुष्टुप्, इन्द्रवज्रा, वसन्ततिलका,मालिनी,मन्दाक्रान्ता	

Text Book: प्रतिमा नाटकं - भासः(प्रथम,द्वितीय,तृतीयाङ्काः)

Recommended Books

- Samskruta Nataka, A R krishnashastry ,Prasaranga ,Manasagangotri ,Mysuru -1988
- Page number 1 -58
- प्रतिमा नाटकं – भासविरचितम् , Motilal Banarasidas Publishers ,Delhi-1998
- वृत्तरत्नाकरः,भट्टकेदारविरचितः, Motilal Banarasidas,Delhi-1993
- **Digital Resources:** www.archieve.org
- <https://www.wikipedia.org/>

Course Articulation Matrix – 22SAN410

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	1	1	1	2	1	3	2	2	1	2
CO 2	2	2	1	1	1	2	1	3	2	2	1	2
CO 3	2	2	1	1	1	2	1	3	2	2	1	2
CO 4	2	2	1	1	1	1	1	-	1	2	1	2
Weighted Average	2	2	1	1	1	1.75	1	2.22	1.25	2	1	2

Continuous Formative Evaluation/Internal Assessment (AECC)

Total marks for each course shall be based on continuous assessments and semester end examinations. The pattern is 40:60 for IA and Semester End Theory Examinations respectively and 50:50 for IA and Semester End Practical Examinations respectively.

	THEORY
TOTAL MARKS	100
Continuous Assessment - 1 (C1)	20
Continuous Assessment - 2 (C2)	20
Semester End Examination (C3)	60

Evaluation Process of IA Marks shall be as follows:

- a) The first component (C1) of assessment is for 20% marks. This shall be based on test, assignment, seminar, case study, field work, project work etc. This assessment and score process should be completed after completing 50% of syllabus of the course and within 45 working days of semester program.
- b) The second component (C2) of assessment is for 20% marks. This shall be based on test, assignment, seminar, case study, field work, internship/industrial practicum/project work, quiz etc. This assessment and score process should be based on completion of remaining 50% of syllabus of the course of the semester.
- c) During the 17th - 19th week of the semester, a semester end examination shall be conducted by the college for each course. This forms the third and final component of assessment (C3) and the maximum marks for the final component will be 60%.
- d) In case of a student who has failed to attend the C1 or C2 on a scheduled date, it shall be deemed that the student has dropped the test. However, in case of a student who could not take the test on scheduled date due to genuine reasons, such a candidate may appeal to the Program Coordinator/Principal. The Program Coordinator/Principal in consultation with the concerned teacher shall decide about the genuineness of the case and decide to conduct

special test to such candidate on the date fixed by the concerned teacher, but before commencement of the concerned semester end examinations.

e) For assignments, tests, case study analysis etc., of C1 and C2, the students should bring their own answer scripts (A4 size), graph sheets etc., required for such tests/assignments and these be sealed/signed by the concerned department at the time of conducting tests/assignment/project work etc.

f) The outline for continuous assessment activities for Component-I (C1) and Component-II (C2) of a course shall be as under:

	C1	C2	TOTAL
Session Test	20	-	20
Seminar/Presentation/Assignment/Activity/Case Study/Field Work/Project Work/Quiz etc.	-	20	20
TOTAL	20	20	40

- Conduct of Test, Seminar, Case study/Assignment etc., can be either in C1 or in C2 component as decided by the college and concerned department/teacher.

- The teachers concerned shall conduct test/seminar/case study etc., The students should be informed about the modalities well in advance. The evaluated courses assignments during component I (C1) and component II (C2) of assessment are immediately provided to the candidates after obtaining acknowledgement in the register by the concerned teacher(s) and maintained by the Department. Before commencement of the semester end examination, the evaluated test, assignment etc., of C1 and C2 shall be obtained back to maintain them till the announcement of the results of the examination of the concerned semester.

g) The marks of the internal assessment shall be published on the notice board of the department/college for information of the students.

h) The internal assessment marks shall be communicated to the CoE at least 10 days before the commencement of the semester end examinations and the CoE shall have access to the records of such periodical assessments.

i) There shall be no minimum in respect of internal assessment marks.

j) Internal assessment marks may be recorded separately. A candidate, who has failed or rejected the result, shall retain the internal assessment marks.

QUESTION PAPER PATTERN
For Ability Enhancement Compulsory Course
(All Programs)

Max Marks 60
Hours

Exam Duration-2½

Qn. No.	Particulars		Marks	Total
SECTION – A				
I	Multiple Choice Questions	10 out of 10	01	10
II	Reference to Context From Text Book only 1. 2. 3. 4.	2 out of 4	05	10
SECTION – B				
III	Short Answer Questions (From Text Book) 1. 2. 3.	2 out of 3	05	10
IV	Questions from Grammar/Translation. as the case may be 1. 2. 3.	2 out of 3	05	10
SECTION – C				
V	Essay type Answer Questions From Text Book only	2 out of 3	10	20
Total				60

III SEMESTER

DSC (5) Social Stratification and Mobility

Unit – 1 Stratification - Features and Forms	14
Chapter No. 1. Basic characteristics of Stratification: Melvin M Tumin. Chapter No.2. Forms of Social Stratification - Caste, Class, Estate. Chapter No.3. Dimensions of Social Stratification - Income, Wealth, Power, Occupational Prestige, Schooling.	
Unit – 2 Perspectives on Stratification	14
Chapter No. 4. Functional Theory: Kingsley Davis and W E Moore's perspective and critique by Melvin M Tumin. Chapter No.5. Karl Marx's Theory: Class and Social Change. Chapter No.6. Weber's Theory: Class, Status and Power.	
Unit – 3 Social Mobility	14
Chapter No.7. Meaning of social mobility; forms of social mobility: horizontal and vertical, intergenerational and intragenerational mobility. Chapter No.8. Role of Education and Profession in the Rise of Middle Class. Chapter No.9. Mobility in Caste in Contemporary India.	

DSC (6) Sociology of UrbanLife in India

Unit - 1 Introducing Urban Sociology	14
Chapter No. 1. Meaning of Urban Sociology and its importance; a brief history of Urban Sociology in India and world. Chapter No.2. Meaning of Urban, Urbanism and the City; Types of City: Metropolitan, Megacity and Global City. Chapter No.3. Urbanization and its Challenges: Rural-Urban Continuum, Suburbs, Urban Fringe, Urban Sprawl, Edge Cities.	
Unit - 2 Perspectives on Urban Society	14
Chapter No. 4. Ecological Theory (Chicago School). Chapter No.5. World and Global Cities (SaskiaSassen). Chapter No.6 Spaces of Flows (Manuel Castells), Cities in the South.	
Unit - 3 Urban Policy	14
Chapter No.7. Inequalities: Caste, Class, Gated Communities and Social Exclusion. Chapter No.8. Urban Governance: 74th Amendment to the Indian Constitution, Urban Development and Planning. Chapter No.9. Urban Policy: Urbanization and Environmental Concerns, Smart cities.	

3)Sociology Syllabus for All Programs (Except Arts)

Course Code:22OESOC301	Course Title: OE (3) Sociology Of Tourism Management
Course Credits: 03(3:0:0)	Hours of Teaching/Week: 03
Total Contact Hours: 42Hrs	Formative Assessment Marks: 40
Exam Duration: 2$\frac{1}{2}$Hrs	Semester-End Examination Marks: 60

Course Outcomes(COs)

- CO1:**Explicate the relationship between Tourism, Culture and Cultural Heritage.
CO2:Determine the social, cultural and economic impact of tourism on local communities.
CO3:Acknowledge the principles of Tourism management.

Course Content

Unit – 1 Sociology, Tourism, Tourists	15
<p>Chapter No. 1. Definitions of Sociology, Culture, Tourism, Tourists, Tourist Gaze; Relation between Tourism, Leisure and Recreation; Sociology of Tourism. Chapter No.2. Types of Tourism: Cultural, Heritage, Medical, Food, Sports and Eco-Tourism. Chapter No.3.Tourism and Locals; Hosts and Guests: Mutual Impact.</p>	
Unit – 2 Tourism System	11
<p>Chapter No. 4. Development and Structure of the Tourist System - Motivation and Role of Tourist. Chapter No.5. Impact of Tourism on Host Place: Social, Economic, Climate and Environmental. Chapter No.6. Sustainable Tourism: Definitions of Sustainable and Sustainable Tourism; Sustainability of Tourism.</p>	
Unit – 3 Tourism Management	16
<p>Chapter No.7. Demand for Tourism at Individual and Market level; Tourism Consumer Behaviour: Roles and Decision Making Process; Accommodation: Definition and Management of Commercial Accommodation; Transportation as Tourist Product; Role of Intermediaries. Chapter No.8. Marketing for Tourism: Definition; Difference between Marketing and Selling; Tourism as a Service Industry: Product, Price, Promotion and Place. Chapter No.9. Information Technology and Tourism: ICT as a Business Tool; e-Tourism.</p>	

Course Articulation Matrix – 22OESOC301

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	2	1	2	2	1	2	2	2
CO2	2	1	1	1	1	2	3	2	2	2	2	2
CO3	2	2	3	3	3	2	3	2	2	2	2	2
Weighted Average	2	2	2	2	2	1.6	2.6	2	1.6	2	2	2

OE (3) Sociology of Tourism Management

Unit – 1 Sociology, Tourism, Tourists	15
<p>Chapter No. 1. Definitions of Sociology, Culture, Tourism, Tourists, Tourist Gaze; Relation between Tourism, Leisure and Recreation; Sociology of Tourism.</p> <p>Chapter No.2. Types of Tourism: Cultural, Heritage, Medical, Food, Sports and Eco-Tourism.</p> <p>Chapter No.3. Tourism and Locals; Hosts and Guests: Mutual Impact.</p>	
Unit – 2 Tourism System	11
<p>Chapter No. 4. Development and Structure of the Tourist System - Motivation and Role of Tourist.</p> <p>Chapter No.5. Impact of Tourism on Host Place: Social, Economic, Climate and Environmental.</p> <p>Chapter No.6. Sustainable Tourism: Definitions of Sustainable and Sustainable Tourism; Sustainability of Tourism.</p>	
Unit – 3 Tourism Management	16
<p>Chapter No.7. Demand for Tourism at Individual and Market level; Tourism Consumer Behaviour: Roles and Decision Making Process; Accommodation: Definition and Management of Commercial Accommodation; Transportation as Tourist Product; Role of Intermediaries.</p> <p>Chapter No.8. Marketing for Tourism: Definition; Difference between Marketing and Selling; Tourism as a Service Industry: Product, Price, Promotion and Place.</p> <p>Chapter No.9. Information Technology and Tourism: ICT as a Business Tool; e-Tourism.</p>	

OE (3) Sociology of Youth

Unit-1:Age Groups and Social Structure	14
<p>Chapter 1:Age Differentiation, Age Group, Age Sets, Problems of Generations; Cultural Lag (W F Ogburn);Structural Lag(Riley)</p> <p>Chapter 2:Youth Cultures, Subcultures, CounterCulture, ContraCulture.</p> <p>Chapter 3:Response of Youth to Caste and Class Inequalities.</p>	
Unit-2: Youth and Society	14
<p>Chapter 4: Youth Leisure, Music.</p> <p>Chapter 5: Globalization of Youth Culture; Marketing Youth Culture.</p> <p>Chapter 6:Youth, Media and Society.</p>	
Unit-3:Youth and Social Concern	14
<p>Chapter 7:Youth, Protest and Violence: Social, Political and Economic Issues.</p> <p>Chapter 8:Youth, Peer Group and Drug Culture</p> <p>Chapter 9:Youth, Nationalism and Globalization</p>	

OE (4) Sociology of Leisure

Unit-1:Introduction	14
<p>Chapter 1:Definition of Leisure and its attributes; the need for the study of leisure as a social activity.</p> <p>Chapter 2:Leisure, Recreation, Play, Pleasure and Leisure Identity; Leisure, Work and Post Work.</p> <p>Chapter 3:Types of Leisure: Serious, Casual, Postmodern, Therapeutic.</p>	
Unit-2: Constraints on Leisure Participation	14
<p>Chapter 4: Class Inequality and Exclusion from Leisure Participation.</p> <p>Chapter 5: Leisure Participation and Gender Relations- Leisure and Beauty System.</p> <p>Chapter 6:Leisure Participation, Age and Disability.</p>	
Unit-3: Commodification of Leisure	14
<p>Chapter 7:Cinema, OTTs, and Reality TV.</p> <p>Chapter 8: Leisure and Sports- Adding Leisurevalue like branded goods(Sony Walkman, iPod, Nike, Coke etc.); Malls as areas of leisure.</p> <p>Chapter 9:Social Media as leisure Activity- Role in Identity building.</p>	

IV SEMESTER

DSC (7)Sociology of Marginalized Groups

Unit - 1 Introduction	16
<p>Chapter No. 1. Marginalization: Meaning and Nature; Types of Marginalization: Social, Political, Economic; Relationship between Marginalization and Social Exclusion.</p> <p>Chapter No.2. Causes of Marginalization; Marginalized Groups: Caste, Gender, People with Disabilities, Minorities, Tribes and Elderly.</p> <p>Chapter No.3. Socio-economic Indices of Marginalization: Poverty, Relative Deprivation, Exploitation, Discrimination, Educational Backwardness, Inequality and Untouchability.</p>	
Unit - 2 Marginalization and Affirmative Action	14
<p>Chapter No. 4. Views of Dr B R Ambedkar and Affirmative Principle in the Constitution of India (Constitutional Provisions).</p> <p>Chapter No.5. Scheduled Castes, Scheduled Tribes and Status of Women in these groups; Status of Transgenders.</p> <p>Chapter No.6. Status of Landless Agricultural Labourers, Status of Land Ownership among Scheduled Caste and Scheduled Tribes.</p>	
Unit - 3 Marginalized Groups and Social Change	12
<p>Chapter No.7. Social Mobility among Marginalized Groups: Education, Employment, Political Participation, Conversion, Migration.</p> <p>Chapter No.8. Challenges of Privatization and Response by Marginalized Groups.</p> <p>Chapter No.9. Social Justice in the context of Globalization</p>	

DSC (8) Population and Society

Unit - 1 Introduction	14
Chapter No. 1. Relationship between society and population. Chapter No.2. Global Population Trends: role of fertility, mortality and migration; Power of Doubling. Chapter No.3. Age and Sex Composition in India and its Impact; Demographic Dividend.	
Unit - 2 Sources of Demographic Data	14
Chapter No. 4. Population Census: Uses and Limitations; Indian Censuses. Chapter No.5. Vital Registration System. Chapter No.6. National Sample Survey; Sample Registration System; National	
Unit - 3 Population Theories and Policy	14
Chapter No.7. Population Theories: Malthusian Theory, Optimum Theory of Population and Demographic Transition Theory. Chapter No.8. Need of Population Policy; Millennium Development Goals and Sustainable Development Goals. Chapter No.9. Population Policy of India; Programmes and their Evaluation.	

OE (4) Sociology of Food Culture

Unit-1: Introduction	14
Chapter 1: Sociological nature of Food and Eating; Sacred and Taboo Food, Sociality and Social Change. Chapter 2: Determinants of Food Consumption- Types of Food; Vegetarian, Non-Vegetarian, Vegan and Flexitarian. Chapter 3: Local Food Culture and Taste for Exotic.	
Unit-2: Food from Domestic to Industry	14
Chapter 4: Industrialization of Food Production and Distribution. Chapter 5: Hotels Restaurants and Catering Sectors. Chapter 6: Cooking as duty and cooking for self-pleasure.	
Unit-3: Food and Risk Society	14
Chapter 7: Diet and Body: Social Appearance and Beauty. Chapter 8: Global Overview: Consumption: Pattern and Reasons; overeating, Undereating and Hunger. Chapter 9: GM Foods, Organic Foods and Modern food practices as a risk factor.	

DSC(7) Syllabus for BBA Hotel and Hospitality

Semester III

Course Code: 226329	Course Title: DSC(7) : Food and beverage production-III DSC(7) Lab : Food and beverage production-III
Course Credits: 05 (3:0:1)	Hours of Teaching/Week: 03(Theory) + 01(Practical)
Total Contact Hours: 42 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2 ½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs):

CO 1: Illustrate the different types of cooking methods around the world.

CO 2: Knowledge of Food production and its importance in the contemporary world

CO 3: Knowledge of different meats and method of preparation

CO 4: Familiarize with different kinds of bakery items and its importance in acting as dessert.

CO 5: Types of pastry creams.

Course Content

Content	Hours
UNIT – 1	
ART OF COOKERY: Style of cooking-Oriental/Asian/European/Continental History and development of Modern cuisine, classical and contemporary Michelin star and its importance. Fusion cooking.	08
UNIT – 2	

BASIC PRINCIPLES OF FOOD PRODUCTION: Vegetable and fruit cookery Introduction, Classification of vegetables Pigment, color and cuts of vegetables Effects of heat on vegetables Salad and salad dressing	10
UNIT – 3	
STUDY OF MEAT COOKERY Introduction of meat cookery, cuts of beef/Veal, cuts of lamb/mutton. Cuts of pork, variety meats, specialty dishes of beef /mutton /pork.	08
UNIT – 4	
BAKERY AND PASTRY Short crust, laminated, choux, Rough Puff, uses of each pastries, care to be taken while preparing pastry, role of each ingredients, Temperature.	08
UNIT – 5	
PASTRY CREAMS Basic pastry creams, uses in confectionary, preparation and care in production. Storage and safety. Different ideas.	08

Textbooks:

1. **Oxford Food production by Parvinder S Bali.**
2. **Theory of Cookery by Krishna Arora.**
3. **Cooking recipes by Thangam Philip.**

Web links:

1. <http://www.food&beverage production.com>
2. <http://www.sudhir Andrews notes on F&B.com>
3. <http://www.F&B production manuals.com>

PRACTICAL :

Indian cuisine -10 Menus with four preparations in each.

Week 01 - Maharashtra cuisine

Week0 2 -Punjabi

Week 03 -West Bengal

Week04 - Gujarat

Week0 5 - Kashmiri

Week 06 - Tamil Nadu

Week0 7 - Assam

Week0 8 - Bihar

Week 09 - Kerala

Week 10– Andhra

Course Articulation Matrix – 226329

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1
CO 1	2	2	1	-	2	1	1	1	1	1	1	1	2
CO 2	1	1	2	-	1	-	-	-	1	-	-	1	2
CO 3	1	1	2	-	1	-	-	-	1	-	-	1	2
CO 4	2	1	1	2	1	1	2	1	2	1	1	-	2
CO 5	1	2	1	-	1	-	-	1	1	2	1	1	2
Weighted Average	1.4	1.4	1.4	0.4	1.2	0.4	0.6	0.6	1.2	0.8	0.6	0.8	2

DSC(8) Syllabus for BBA Hotel and Hospitality

Semester III

Course Code: 226330	Course Title: DSC(8) : Food and Beverage Service- III DSC(8) Lab : Food and Beverage Service- III
Course Credits:05 (3:0:1)	Hours of Teaching/Week: 03(Theory) + 01 (Practical)
Total Contact Hours: 42 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2 ½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs):

CO 1: Illustrate the different types of wines around the world.

CO 2: Knowledge of spirits and its economical importance in the contemporary world.

CO 3: Knowledge of different non alcoholic beverages and its categories.

CO 4: Familiarize with different kinds of liqueur items and its importance in acting as dessert beverages.

CO 5: Types of cocktails and its presentations.

Course Content

Content	Hours
UNIT – 1	
WINES Introduction and Definition of wines, classification of wines. Table/ Still/ Natural/ Fortified/ Sparkling/ Aromatized Wines. Wine Producing countries of the world including India.	08

Principal Wine regions – France, Germany, Italy, Spain, Portugal and New World	
UNIT – 2	
SPIRITS Introduction and Definition of spirits _ Production of Spirits. Pot still and patent Still Methods – Whiskey, Rum, Gin, Brandy, Vodka, tequila Other spirits, Proof of spirits, Scales and services.	10
UNIT – 3	
NON ALCOHOLIC BEVERAGES Importance and varieties of Mock-tails, juices, shakes, smoothies. Aerated Beverages, popular nourishing and Sports Drinks.	08
UNIT – 4	
LIQUEURS Definition and production of Liqueurs. Different brands of Liqueurs Service of Liqueurs.	08
UNIT – 5	
COCKTAILS Definition, History and Classification of Cocktails. Cocktail Bar preparations and equipments. Service of Cocktails..	08

Textbooks:

1. Food and Beverage Service by Singaravelam
2. Food and Beverage Service and management by Bobby George.
3. On Site Food Service Management by Dennis R Reynold.

Web links:

- a. <http://www.food&beverage Service.com>
- b. <http://www.sudhir Andrews notes on F&B.com>
- c. <http://www.F&B Service manuals.com>

PRACTICALS:

- WEEK 1- Service of Wines
- WEEK 2- Service of Whisky
- WEEK 3 -Service of Rum
- WEEK 4- Service of Gin
- WEEK 5- Service of Brandy
- WEEK 6- Service of Vodka
- WEEK 7 -Service of Tequila
- WEEK 8 -Service of Aperitifs
- WEEK 9- Service of Liqueurs
- WEEK10-Service of Cocktails

Course Articulation Matrix – 226330

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1
CO 1	2	2	1	-	2	1	1	1	1	1	1	1	2
CO 2	1	1	2	-	1	-	-	-	1	-	-	1	2
CO 3	1	-	-	1	1	1	1	-	-	1	1	1	2
CO 4	1	1	1	1	-	2	-	2	-	1	2	-	2
CO 5	1	2	1	-	1	-	-	1	1	2	1	1	2
Weighted Average	1.2	1.5	1.25	1	1.33	1.66	1	1.5	1.5	1.25	1.25	1	2

DSC(9) Syllabus for BBA Hotel and Hospitality

Semester III

Course Code: 226331	Course Title: DSC(9) Accommodation Operations DSC(9) Lab : Accommodation Operations
Course Credits: 05 (3:0:1)	Hours of Teaching/Week: 03(Theory) + 01 (Practical)
Total Contact Hours: 42 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2 ½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs):

- CO1:** Understand how accommodation is presented in different styles suiting the requirements.
- CO2:** Develop basic discipline and in hotel and resorts respecting towards better way of handling guest preferences.
- CO3:** Explain the characteristics, functions of front office and understand how to function smoothly.
- CO4:** Understand how the hierarchy is maintained in the star hotels.
- CO5:** Develop basic knowledge to know how the hotel industry functions with different kinds of reservations and registrations

Course Content

Content	Hours
UNIT – 1 INTRODUCTION TO HOSPITALITY	
Definition of Hospitality – Tourism and its importance with hospitality History and its origin – Hospitality and its growth Brief introduction to front office in the Hospitality sectors.	08
UNIT – 2 HOTELS AND FACILITIES	
Classification of Hotels – Size, Star, Location, Clientele, ownership Types of Rooms – Single, Double, twin, Suite, Meal Plans. Types of Rates – Rack, FIT, Crew, Group, Corporate, Weekend.	10
UNIT – 3 FRONT OFFICE DEPARTMENT	
Sections and layout of front office Coordination of front office with other departments of the hotel. Front office equipment (Non automated, Semi automated, Automated)	08
UNIT – 4 FRONT OFFICE ORGANIZATION	
Functional areas – Front office hierarchy Duties and responsibilities of staff and personal traits Rules of the House for Guests and staff	08
UNIT – 5 MAJOR FUNCTIONS	
Reservation and registrations process Procedures at Lobby and Bell Desk Check in and Checkout Procedures..	08

Textbooks:

1. Hotel front office by Sudhir Andrewa
2. Hotel front office training Manual by SG Ghosh
3. Hotel front office management by BK Chakravarthy

Web links:

1. <http://www.accommodation operations.com>
2. <http://www.sudhir Andrews notes on front office.com>
3. <http://www.front office manuals.com>

PRACTICALS:

1. Appraisal of front office equipment and furniture
2. Rack, Front desk counter & bell desk
3. Filling up of various forms in the front desk
4. Welcoming of guest
5. Telephone handling
6. Role-play:
 - a. Reservation
 - b. Arrivals
 - c. Luggage handling
 - d. Message and mail handling
 - e. Guest cycle

Course Articulation Matrix – 226331

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1
CO 1	2	2	1	-	2	1	1	1	1	1	1	2	1
CO 2	1	1	2	-	1	1	-	-	1	-	-	1	1
CO 3	1	1	2	-	1	1	-	-	1	-	-	1	1
CO 4	1	1	2	1	1	1	2	1	2	1	-	1	1
CO 5	1	1	2	-	1	1	1	1	-	1	1	-	1
Weighted Average	1.2	1.2	1.8	1	1.2	1	1.3	1	1.25	1	1	1.25	1

OE(3) BBA Hotel and Hospitality Syllabus for All Programs

(Except BBA)

Semester III

Course Code: 22OEHNH301

Course Title: OE(3) Event Management

Course Credits: 03 (3:0:0)

Hours of Teaching/Week: 03 Hour (Theory)

Total Contact Hours: 42 Hours
(Theory)

Formative Assessment Marks:40

Exam Duration:2 ½ Hours

Semester End Examination Marks:60

Course Outcomes (COs):

CO 1: Illustrate the different types of written communications and the role of various communications.

CO 2: Acquire knowledge of presentation skills.

CO 3: Apply with protocols

CO4: Analyse types of Image, branding and advertising abilities

CO5: Acquire knowledge of different liquors and its licenses.

Course Content

UNIT – 1	10 HOURS
EVENT COMMUNICATION & PRESENTATION SKILLS Written communications, (Official, demi-official, Invoice, tender, proposal). Verbal communications	
UNIT – 2	08 HOURS
Presentation skills and use of computer in events	
UNIT – 3	08 HOURS
Protocols, Dress codes, staging, staffing	
UNIT – 4	08 HOURS
Image, Branding, Advertising, Publicity and Public relations	
UNIT – 5	08 HOURS
Relevant legislations, liquor licenses, trade acts, stake holders and official bodies, contracts.	

Text books:

1. The art of gathering by Priya Parker
2. Event planning by Alex Genadinik
3. Vent planning by Judy allen

Web links:

<http://www.eventmanagement@youtube.com>

<http://www.hotel events.com>

<Http://www. Banquet events.com>

Course Articulation Matrix – 22OEHNH301

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1
CO 1	1	-	-	-	-	-	-	-	-	-	1	1	3
CO 2	2	-	-	-	-	-	-	-	-	-	2	2	3
CO 3	1	-	-	-	-	-	-	-	-	-	1	1	3
CO4	3	-	-	-	-	-	-	-	-	-	3	3	3
CO5	3	-	-	-	-	-	-	-	-	-	3	3	3
Weighted Average	2	-	-	-	-	-	-	-	-	-	2	2	3

DSC(10) Syllabus for BBA Hotel and Hospitality

Semester IV

Course Code: 226429

Course Title:

DSC(9) **Tourism Development**

Course Credits:04 (4:0:0)

Hours of Teaching/Week: 04 (Theory)

Total Contact Hours:56 Hours (Theory)

Formative Assessment Marks: 40 (Theory)

Exam Duration: 2 ½ Hours (Theory)

Semester End Examination Marks:

60 (Theory)

Course Outcomes (COs):

CO1: Understand the concept of tourism and how tourism is presented in different styles suiting the requirements.

CO2: Develop basic knowledge of different types of tourism and its importance.

CO3: Explain the characteristics, functions of tourism organization and understand how it functions.

CO4: Understand how the tourism behaviors are maintained in the industry.

CO5: Develop basic knowledge of know how to organize transportations for different purposes.

Course Content

Content	Hours
UNIT – 1 THE CONCEPT OF TOURISM	
Definition of travel and tourism, Components of Tourism. Historical Development of Tourism, Tourism Products. Attraction and Amenities, Transports, Accommodations and entertainments	08
UNIT – 2 TYPES OF TOURISM	

Mass Tourism and Alternative Tourism, Leisure Tourism, Cultural and Health Tourism. Eco, Sustainable, Adventure, Pilgrimage and Business Tourism.	10
UNIT – 3 TOURISM ORGANIZATION	
Need for Organization, National tourism organization. Importance of UNWTO, IATA, ICAO, UFTAA. Functions of WTTC, PATA, TAA, IATO, ITDC.	08
UNIT – 4 TOURISM BEHAVIOURS	
Tourism systems, Travel Motivators. Types of Tourists –Domestic and International. Interactional Models – Cognitive and Normative models.	08
UNIT – 5 TRANSPORTATIONS	
Major seaport and Water Transportation Airlines and Airports in India. Road and rail transportation in India.	08

Textbooks:

- Tourism scopes by Zulfikar ahmed
- Development in tourism by Anok pandey
- Tourism studies by BK Chakravarthy

Web links:

- <http://www.tourism operations.com>
- <http://www.Sikbir points on tourism.com>
- <http://www.Tourism manuals.com>

Course Articulation Matrix – 226429

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1
CO 1	2	1	1	1	1	1	2	1	1	2	1	2	2
CO 2	2	2	2	2	1	2	2	2	2	2	2	1	2
CO 3	2	1	2	2	1	2	1	2	1	1	1	2	2
CO 4	2	2	2	1	1	1	1	1	2	1	3	1	2
CO 5	3	2	1	1	1	2	1	2	2	2	1	2	2
Weighted Average	2.1	1.8	1.6	1.5	1	1.8	1.8	1.6	1.5	1.8	1.8	1.6	2

Syllabus for BBA Hotel and Hospitality

Semester IV

Course Code: 226430	Course Title: DSC(9) Bakery and confectionary DSC(9) Lab : Bakery and confectionary
Course Credits: 05 (3:0:1)	Hours of Teaching/Week: 03(Theory) + 01 (Practical)
Total Contact Hours: 42 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2 ½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs):

- CO1:** Understand how the cake is cooked in different ovens suiting the requirements, differences in texture, taste, aroma and color.
- CO2:** Develop basic knowledge of cake making processes.
- CO3:** Explain the characteristics, tastes and importance of chocolates in the contemporary world.
- CO4:** Understand how the dairy products are used in different styles of preparing biscuits and cookies
- CO5:** Develop basic knowledge to know how to handle and use creams and other dairy products.

Course Content

Content	Hours
UNIT – 1 CAKE	
Ingredients used in cake making Types and variants of flour and sugar Fats and oils used, Egg, Moistening agents, leavening agents	08
UNIT – 2 CAKE MAKING METHODS	
Sugar butter process, Genoise process, blending and ribbing method Pastry making principles and derivatives	10
UNIT – 3 CHOCOLATE	
Different forms of chocolates and cocoa Process of chocolate tempering Designs, garnishes, presentation of chocolates	08
UNIT – 4 COOKIES AND BISCUITS	
Method and preparation for making cookies/biscuits Factors affecting the quality of biscuits Famous brands of biscuits	08
UNIT – 5 CREAM AND ICE CREAMS	
various types of creams varieties of ice creams types of icing	08

Textbooks:

- Text book on bakery and confectionary by Ashok Kumar Y
- Bread and baking by Jeremy Hardy
- Classical bread making by Mathew Septimus

Web links:

- <http://www.Worldbakers.com>
- <http://www.cookiesandbiscuits.com>
- <http://www.confectionersandbakers.com>

Observation and Suggestions for the Board members-

To include:

Millets,

Indian Wines,

Bar tending,

Non-alcoholic beverages

Mock tails

Revenue Management

Michelin star

Fusion cooking

Course Articulation Matrix – 226430

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1
CO 1	2	2	1	-	2	1	1	1	1	1	1	1	2
CO 2	1	1	2	-	1	-	-	-	1	-	-	1	2
CO 3	1	-	-	1	1	1	1	-	-	1	1	1	2
CO 4	1	1	1	1	-	2	-	2	-	1	2	-	2
CO 5	1	2	1	-	1	-	-	1	1	2	1	1	2
Weighted Average	1.2	1.5	1.25	1	1.33	1.66	1	1.5	1.5	1.25	1.25	1	2

DSC(12) Syllabus for BBA Hotel and Hospitality

Semester IV

Course Code: 226431	Course Title: DSC(12) Hotel Accounts DSC(12) Lab : Hotel Accounts
Course Credits: 05 (3:0:1)	Hours of Teaching/Week: 03(Theory) + 01 (Practical)
Total Contact Hours: 42 Hours (Theory) 56 Hours (Practical)	Formative Assessment Marks: 40 (Theory) 25 (Practical)
Exam Duration: 2 ½ Hours (Theory) 3 Hours (Practical)	Semester End Examination Marks: 60 (Theory) 25 (Practical)

Course Outcomes (COs):

CO1: Understand how to organize accounts in the department supporting the management.

CO2: Develop basic knowledge of books and computers for calculations.

CO3: Explain the characteristics, importance of book keeping.

CO4: Understand how the revenue is generated and managed in safe hands.

CO5: Develop basic knowledge of trial balance and its importance.

Course Content

Content	Hours
UNIT – 1 MEANING AND DEFINITION	
Types, classification and principles of accounting Uniform system and contents of income statement Contents of financial statement, practical problems	08
UNIT – 2 PRIMARY BOOKS/JOURNALS	
Meaning and definition of primary books Format of journal, rules of debit and credits practical problems	10

UNIT – 3 SECONDARY BOOKS	
Ledger format and posting, practical problems of ledger Uses and classification of subsidiary books Purchase/sales/purchase return/sales return/cash book-double and triple	08
UNIT – 4 REVENUE MANAGEMENT	
Importance and steps to be used in revenue management Experts in revenue management Mismanagement of revenue management	08
UNIT – 5 TRIAL BALANCE	
Meaning, advantages, limitations, and practical problems Introduction of departmental accounting Allocation and appointment, advantages/drawback of allocation and problems	08

Textbooks:

- Accounting and auditing by Thomas r Weirich
- Accounts receivable management by John G Salek
- Accounting control by Steven M Bragg

Web links:

- <http://www.trial balance.com>
- <http://www.hotel accounts.com>
- <http://www.book keeping in hotels.com>

HOTEL ACCOUNTS: PRACTICALS

Week 1. Experiencing different books in accounting.

Week 2. Entries of primary and secondary books.

Week 3. Practicing of different ledger entries.

Week 4. Exercising debit and credit entries on board.

Week 5. Collecting data on foreign currencies.

Course Articulation Matrix – 226431

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1
CO 1	2	2	1	-	2	1	1	1	1	1	1	1	1
CO 2	1	1	2	-	1	-	-	-	1	-	-	1	1
CO 3	1	-	-	1	1	1	1	-	-	1	1	1	1
CO 4	1	1	1	1	-	2	-	2	-	1	2	-	2
CO 5	1	2	1	-	1	-	-	1	1	2	1	1	2
Weighted Average	1.2	1.5	1.25	1	1.33	1.66	1	1.5	1.5	1.25	1	1	1.4

OE(4) BBA Hotel and Hospitality Syllabus for All Programs

(Except BBA)

Semester IV

Course Code: 22OEHNH401

Course Title: OE(4) **FOOD SAFETY AND QUALITY CONTROL**

Course Credits: 03 (3:0:0)

Hours of Teaching/Week: 03 Hour (Theory)

Total Contact Hours: 42 Hours
(Theory)

Formative Assessment Marks:40

Exam Duration:2 ½ Hours

Semester End Examination Marks:60

Course Outcomes (COs):

CO 1: Illustrate types of food with chemical combinations

CO2: Apply the knowledge and scope of food chemistry

CO 3: Analyse and classify the lipids and its importance

CO4: Demonstrate different vitamins and minerals

CO5: Apply the regulations of sanitation and contamination

Course Content

UNIT – 1	10 HOURS
Types of foods: Based on the Shelf Life, Fermented Foods, Alcoholic and Non-Alcoholic Beverages, Processed Foods, Nutraceuticals, Functional foods, Dehydrated Foods, Ready to Eat Foods, Organic Foods, Ethnic Foods, Pre and Probiotics in Fermented Foods and Beverages, GM Foods and their safety Physico- Chemical Characterization of Food	
UNIT – 2	08 HOURS
importance of food and Scope of Food Chemistry. Water: Physical and Chemical properties, Water Activity Determination and its influence on Food Quality and Stability Carbohydrates: Chemical Reactions, Functional Properties of Sugars and Polysaccharides in Foods. Proteins: Nutritional Aspects – Amino Acids, Essential Amino Acid	
UNIT – 3	08 HOURS
Lipids: Classification, and Use of Lipids in Foods, Physical and Chemical Properties, Essential Fatty Acids	

UNIT – 4	08 HOURS
Vitamins and Minerals, in relation to Processing Effects. Enzymes in Foods associated with Processing, Food Deterioration	
UNIT – 5	08 HOURS
Food Sanitation: Definition and Regulation of Food Sanitation, Sources of Contamination, Sanitation and hygiene. Indices of Food Sanitary Quality	

Text books:

1. Food science by Jerold russ
2. Effects of science on food by Lorry W Bush
3. Science on food by Wallace bruce and brad

Web links:

4. <http://www.foodscience.com>
5. <http://www.hotel food science on you tube.com>
6. <Http://www. Food values.com>

Course Articulation Matrix – 22OEHNH401

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1
CO 1	1	-	-	-	-	-	-	-	-	-	1	1	3
CO 2	2	-	-	-	-	-	-	-	-	-	2	2	3
CO 3	1	-	-	-	-	-	-	-	-	-	1	1	3
CO4	3	-	-	-	-	-	-	-	-	-	3	3	3
CO5	3	-	-	-	-	-	-	-	-	-	3	3	3
Weighted Average	2	-	-	-	-	-	-	-	-	-	2	2	3

Semester-I/II/III/IV

Skill Enhancement Courses (SEC)

Course Code: 22NCC94	Course Title: NCC
Course Credits (L:T:P): 02 (0:0:2)	Teaching Hours/Week: 04 Hours
Total Contact Hours: 56 Hours	Formative Assessment Marks: 25
Exam Duration: 1 Hour (Practical)	Semester End Examination Marks: 25

Course Objective:

To develop Character, Comradeship, Discipline, Leadership, Secular Outlook, Spirit of Adventure and the Ideals of selfless Service among the youth of the Country.

Course Outcomes:

CO1:Acquire the concept of NCC

CO2:Improvised Outlookand Turnout

CO3:Work for the Social Well Being

Unit 1: Introduction to NCC, Aims and Objectives, Organisation structure, Ranks, NCC song, Incentives, Code of ethics and Conduct.

Unit 2: Drill-improve bearing and smartness, Turnout, Obedience to Orders, Types of Drill.

Unit 3: National integration, Health and Hygiene, Personality development and leadership, Social awareness and Community development, Environment awareness and Conservation.

Course Articulation Matrix – 22NCC94

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	1	2	2	2	2	2	-	2
CO2	2	1	1	-	-	1	1	2	3	2	1	2
CO3	2	1	1	1	1	2	2	2	3	2	1	2
Wtd. Avg.	2	1	1	1	1	1.6	1.6	2	2.6	2	1	2

Evaluation Pattern:

Assessment Criteria	Marks
C 1 - Assignment	10
C 2 - Viva	10
C 3 – Semester End Examination (Practical)	30
Total	50

Semester-I/II/III/IV Semester

Skill Enhancement Course

National Service Scheme

Course Code: 22NSS94	Course Title: National Service Scheme (NSS)
Course Credits (L:T:P): 02 (0:0:2)	Teaching Hours/Week: 04 Hours
Total Contact Hours: 56 Hours	Formative Assessment: 20 Marks
Exam Duration: 1 Hour (Practical)	Semester End Examination: 30 Marks

Course Outcomes:

CO1: Acquire the fundamentals concept of NSS

CO2: Understand the Volunteerism & Organization structure of NSS

CO3: Appreciate the culture of Campus Activities, Shramadhan and Awareness Program and its

Benefits through working as a team or group.

CO4: Develop overall personality of volunteers, Off Campus Activities and make them as leaders and responsible Citizens of our nation.

Course Contents	Hours: 56
Unit - I : Fundamentals of NSS	
Introduction to NSS, Origin of NSS, Aims and Objectives of NSS, NSS Motto, NSS Emblem, NSS Badge, NSS Day, NSS Songs.	14
Unit - II : Volunteerism & Organization structure of NSS	
Volunteerism and NSS: Volunteerism– Meaning, definition, basic qualities of volunteers, need of volunteerism for National development. Organization structure of NSS- National level, State level, University and Institutional Level.	14
Unit - III : Campus Activities	

<p>Shramadhan – Plantation, Cleaning, Watering, Weeding, Any other activities.</p> <p>Awareness Programmes – Seminar, Workshops, Celebration of National and International days, Personality Development Programmes, Group Activities, etc.,</p>	14
Unit - IV : Off Campus Activities	
<p>Rally, Jatha, Visit to Adopted villages, Swatchatha Programme, Visit and Conserving Ancient monuments and heritage site, Socio Economic Survey of village/slum, Nature Camp, Environmental Education, JOB Card (APL, BPL, Social security schemes), Women Empowerment Programme, Health Camps, Blood grouping awareness and Blood donation, Legal awareness Programme, Literacy Programme, Water Conservation Programme, One Day Special Camp in avillage (preferably in adopted village).</p>	14

References:

- a) Prof. B.K. Shivanna, “National Service Scheme” Printing Press KSOU, Mysore 2011
- b) MadhuAhuja, Students Leaders in the National Service Scheme (NSSS) in Delhi : A case study 1986 (New Delhi : Dept. of Management and Extension, Lady Irwin College, University of Delhi, 1986)
- c) Chattarjee, B., Social service opportunities for students in Slum Areas (reprint : Delhi : Delhi School of Social Work, University of Delhi 1973)
- d) Desai Bharat. H, A Social Psychological Study of the effectiveness of the National Service Scheme in developing some aspects of the Student Personality – (Ph. D Thesis submitted to university of Pune 1982)
- e) Dixit. P Sanjeeva, National Service Scheme in Andhra Pradesh, (Andhra University Press Publications, 1994)
- f) Dilshad. M.B National Service Scheme in Karnataka, (Ph. D Thesis submitted to Karnataka University Dharwad, 1997)
- g) Balan K., (1985), Youth Power in the Modern World, Ajanta Publications, NewDelhi

- h) Jones Gill, (2009), Youth, Polity Press,UK
 i) Kehily Jane Mary (Etd.) (2007), Understanding Youth:
 Perspectives, Identitiesand Practices, Sage Publication,
 London

- j) Landis H. Paul, (2011), Adolescence and Youth: The Process of
 Maturing, SarupBook Publishers Pvt. Ltd., New Delhi

Course Articulation Matrix- 22NSS94

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	1	3	3	2	3	2	1	3
CO2	1	2	1	1	-	3	3	3	3	2	1	2
CO3	2	2	2	1	-	3	3	3	3	2	1	3
CO4	2	3	1	1	1	3	3	3	3	3	2	3
Weighted Average	1.75	2.25	1.5	1	1	3	3	2.75	3	2.25	1.25	2.75

Scheme of Valuation

Assessment Criteria	Marks
C1 – Unit 1 & 2 Assignment / Test / Quiz	10
C2 – Campus / off campus Activities Assignment / Test / Quiz	10
C3 - Participation – 10 marks Leadership & Responsibility – 10 marks Report Submission – 10 marks	30
Total	50

Semester-I/II/III/IV

Skill Enhancement Course

Course Code: 22SPO94	Course Title: Sports
Course Credits (L:T:P): 02 (0:0:2)	Teaching Hours/Week: 04 Hours
Total Contact Hours: 56 Hours	Formative Assessment Marks: 20
Exam Duration: 1 Hour (Practical)	Semester End Examination Marks: 30

Course Outcome (CO): Plan, organize and execute sports events.

Content of Theory & Practical Course	Hours
Unit 1: Physical Education & Sports <ul style="list-style-type: none"> • Conditioning Exercises • Aerobics & Calisthenics • One Major Game and One Indigenous Game (Basic Skills) • One Track/Field Event • Intramural Competitions • Project/Record • Proficiency in Particular Sport Rules & Regulations, Marking and Ground Management, Officiating	56

Course Articulation Matrix – 22SPO94

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	1	1	1	2	1	1	2	1	2	1	2
Wt. Avg.	1	1	1	1	2	1	1	2	1	2	1	2

SBRR Mahajana First Grade College (Autonomous), PG Wing

Pooja Bhagavat Memorial Mahajana Education Centre

KRS Road, Metagalli, Mysuru-570016.

DEPARTMENT OF M.C.A. - 2022-2023

MOTTO

Enter to Learn Depart to Serve

VISION

Build a Strong Research and Teaching Environment that Responds
Swiftly to the Challenges of the 21st Century.

MISSION

1. To provide the highest quality education in Computer Science;
2. To perform research that advances the state-of-the-art in Computer Science;
3. To produce post graduates who are knowledgeable, articulate, principled, innovative, confident, and able to think critically;
4. To be engaged in local, State, and National issues to the benefit of both public and the private sector; and
5. To maintain a diverse college community.

Programme Outcomes – M.C.A.

PO 1: Use emerging tools, techniques and skills necessary for computing in the real world.

PO 2: Identify, formulate and solve complex computing problems to achieve substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domains.

PO 3: Analyse problems, suggest appropriate solutions and justify propositions for effective decision making in the professional field.

PO 4: Develop strong critical thinking skills to assess why certain solutions might not work and to save time in coming up with the right approach in the field of computing.

PO 5: Create, select and apply appropriate techniques and latest Information Technology tools to forecast an outcome by utilizing data that is available.

PO 6: Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.

PO 7: Develop and imbibe the principles of ethics and values in profession.

PO 8: Communicate effectively and efficiently as an individual, and as a member, or leader to present the technical knowledge in multi-disciplinary settings.

PO 9: Study and review literature, reports prepare documentation and make inferences to design better systems.

PO 10: Recognize and realize the need for, and develop an ability to engage in lifelong learning.

HC MINOR PROJECT 0:1:3

Objectives:

- To offer students a glimpse into real world problems and help the students learn how to apply the tools and techniques they learned in the respective courses.
- To help students develop openness to new ideas in computer science and create very precise specifications for the execution of the project idea.
- To promote team working skills, problem solving skills, and presentation skills among students working on the project.

Outcomes:

- Understanding the emerging trends of new technologies by conducting a survey of several available literatures in the preferred field of study.
- Develop real time Projects by comparing the several existing solutions for a research challenge.
- Demonstrate an ability to work in teams and manage the process of building the project within the stipulated time.
- Report and present the findings of the research study/project conducted in the preferred domain.

Students need to implement different kinds of problems using Java based Frameworks, Python, PHP, MYSQL, Cloud tools, IoT tools, Dot NET, CASE tools, Open source tools and Mobile application oriented tools, as well as data mining/machine learning tools and techniques.

Course articulation matrix:

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO										
CO1	-	-	3	-	2	2	2	-	-	3
CO2	3	-	-	3	2	2	2	-	-	3
CO3	-	-	-	-	2	2	2	3	-	3
CO4	-	3	-	-	2	2	2	-	3	3
Weighted Average	3	3	3	3	2	2	2	3	3	3

1: Low, 2: Moderate, 3: High

SC ADVANCED DATABASE MANAGEMENT SYSTEM 3:0:1

Objectives:

- Learning data modelling using the entity-relationship and developing database designs.
- Understand the use of Structured Query Language (SQL) and learn SQL syntax.
- Apply normalization techniques to normalize the database.
- Understand how NoSQL databases are often more scalable and provide superior performance.

Outcomes:

- Determine the basic concepts, E-R Mapping and SQL basic commands.
- Demonstrate the techniques of SQL, FD and Normalization.
- Develop Indexing, ACID and Transaction.
- Describe NoSQL database and PostgreSQL.

Unit I

Levels of abstraction in a DBMS, structure of a DBMS, people who work with databases, entity, entity types, entity sets, attributes, keys, relationship sets, participation constraints, weak entities and Enhanced Entity Relationship Model - Relational Database Design by ER- and EER-to- Relational Mapping, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL, Additional features of SQL.

Unit II

Data definition, constraints and schema changes in SQL, Joins in SQL, views in SQL, Aggregate Functions and Clauses. Informal design guidelines for relational schemas, functional dependencies & types, normal forms- first, second, third, boyce-codd, forth & fifth normal forms.

Unit III

Sequential file organization, heap file organization, clustered indexes primary and secondary indexes, hash based indexing and B+ tree-based indexing. ACID properties - consistency and isolation, atomicity and durability, transaction on schedules, concurrent execution of transactions, serializability, lock-based concurrency control, strict two phase locking.

Unit IV

Introduction to NoSQL Systems, CAP Theorem, Document-Based NOSQL Systems, NoSQL Key- Value Stores, Column-Based or Wide Column NOSQL Systems. A brief introduction on PostgreSQL.

References

1. Fundamentals of Database Systems by Navathe and Elmasri –Pearson Education, Fifth Edition.
2. Database Systems Concepts, 3rd edition by Abraham Silberschatz, Henry Korth and S. Sudarshan, Tata McGraw Hill.
3. Principles of database systems by Ullman, Computer Science press.
4. DBMS by Prof. S.Nandagopalan, 7th Revised Edition.

Course articulation matrix:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	2	2	2	1	1	-	-	-	-	-
CO 2	2	3	3	2	1	1	-	-	-	-
CO 3	3	3	3	2	2	1	2	1	1	1
CO 4	2	3	2	2	3	2	2	-	1	2
Weighted Average	2.25	2.75	2.5	1.75	1.75	1.33	2	1	1	1.5

1: Low, 2: Moderate, 3: High

SC MACHINE LEARNING USING PYTHON 3:0:1

Objectives:

- Understanding the importance of Machine Learning and demonstrate the use of data frames in Python
- Analyze the process of model building and evaluation
- Comprehend various classification problems
- Discuss the libraries required to implement the techniques of Machine Learning.

Outcomes:

- Identify the need for Machine Learning using Python, appropriate data frames and its operations.
- Ability to build and validate linear regression models
- Ability understand different classification techniques and build classification models
- Ability to use unsupervised learning techniques to cluster data and Apply Scikit library for Machine Learning.

UNIT – I: Introduction to Machine Learning

Introduction to Analytics and Machine Learning, Need for Machine Learning, Framework for Developing Machine Learning Models, Python for Machine Learning, Python Stack for Data Science, Getting Started with Anaconda Platform, Introduction to Python.

Descriptive Analytics: Working with Data Frames in Python, Handling Missing Values, Exploration of Data using Visualization

UNIT – II: Linear Regression

Simple Linear Regression, Steps in Building a Regression Model, Building Simple Linear, Regression Model, Model Diagnostics, Multiple Linear Regression.

UNIT – III: Classification Problems

Classification Overview, Binary Logistic Regression, Credit Classification, Gain Chart and Lift Chart, Classification Tree (Decision Tree Learning).

UNIT – IV: Advanced Machine Learning and Clustering

Scikit-Learn Library for Machine Learning Advanced Machine Learning Algorithms. Clustering: Overview, How Does Clustering Work?, K-Means Clustering, Creating Product Segments Using Clustering, Hierarchical Clustering.

References

1. Machine Learning using Python, Manaranjan Pradhan, U Dinesh Kumar, Wiley India Pvt. Ltd., 2019
2. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf, 2013.
3. Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey , Jeffrey Elkner, 2015.
4. Python Data Science Handbook: Essential tools for working with data, Jake Vander plas, O'Reilly Publishers, 1st Edition.

5. Hands-On Machine Learning with Scikit-Learn and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems, Aurelien Geron, O'Reilly Publisher , I edition, 2017

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO1	3	3	3	3	3	2	2	2	3	3
CO2	3	3	3	3	3	2	2	2	3	3
CO3	3	3	3	3	3	3	2	2	3	3
CO4	3	3	3	3	3	2	2	2	3	3
Weighted Average	3	3	3	3	3	2.25	2	2	3	3

1: Low, 2: Moderate, 3: High

Objectives:

- To understand and identifying the problems where AI is required.
- To compare and contrast different AI techniques.
- To understand the concepts of knowledge Representation.
- To understand the NLP techniques.

Outcomes:

- Express the modern view of AI and its foundation.
- Illustrate Search Strategies with algorithms and Problems.
- Implement Proportional logic and apply inference rules.
- Apply suitable techniques for NLP and Game Playing.

Unit-I: INTRODUCTION

Introduction to AI, The Foundations of AI, AI Technique -Tic-Tac-Toe. Problem characteristics, Production system characteristics, Production systems: 8-puzzle problem. Intelligent Agents: Agents and Environments, Good Behavior: The concept of rationality – The nature of Environments, The Structure of Agents.

Unit-II: LOCAL SEARCH ALGORITHM

Searching: Uninformed search strategies – Breadth first search, depth first search. Generate and Test, Hill climbing, simulated annealing search, Constraint satisfaction problems, Greedy best first search, A* search, AO* search.

Unit-III : KNOWLEDGE REPRESENTATION

Propositional logic - syntax & semantics - First order logic. Inference in first order logic, propositional Vs. first order inference, unification & lifts, Clausal form conversion, Forward chaining, Backward chaining, Resolution.

Unit-IV: GAME PLAYING, PLANNING and NLP

Overview, Minimax algorithm, Alpha-Beta pruning, Additional Refinements. Classical planning problem, Natural Language Processing: Language Models, Text classification, Information Retrieval, Information Extraction.

Reference Books:

1. Artificial Intelligence, E. Rich and K. Knight, , 3rd Edition, TMH.
2. Artificial Intelligence A Modern Approach, S. Russell and P. Norvig, 3rd Edition, Pearson Education.
3. Introduction to Artificial Intelligence, Eugene Charniak and Drew McDermott, 2nd Edition, Pearson Education.
4. Artificial Intelligence Structures and Strategies for Complex Problem Solving, George F Luger, 4th Edition, Pearson Education.
5. Artificial Intelligence: A New Synthesis, N.L. Nilsson, Morgan Kaufmann.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO										
CO1	3	3	3	3	3	3	2	2	2	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	2	2	2	3
CO4	3	3	3	3	3	3	2	2	3	3
Weighted Average	3	3	3	3	3	3	2.25	2	2.5	3

1: Low, 2: Moderate, 3: High

SBRR MAHAJANA FIRST GRADE COLLEGE (Autonomous)
POST GRADUATE WING
(Accredited by NAAC with 'A' grade)
Pooja Bhagavat Memorial Mahajana Education Centre.
Affiliated to University of Mysore.

M.Sc. in Computer
Science 2022-
2023

Motto: Enter to Learn, Depart to Serve.

Vision:

To Build a strong research and teaching environment that responds swiftly to the challenges of the 21st century.

The **Mission** of the Computer Science Department is to:

1. Provide the highest quality education in Computer Science;
2. Perform research that advances the state-of-the-art in Computer Science;
3. Produce post graduates who are knowledgeable, articulate, principled, innovative, confident, and able to think critically;
4. Be engaged in local, State, and National issues to the benefit of both public and the private sector; and
5. Maintain a diverse college community.

Programme Outcomes – M.Sc. Computer Science

PO 1: Apply the theoretical knowledge of Mathematics to design and develop models to solve real-time problems.

PO 2: Apply skills learnt in emerging technologies to construct and implement software systems of varying complexities.

PO 3: Communicate and engage effectively with diverse systems, processes and people to construct computer based solutions to problems.

PO 4: Recognize the need for and develop effective communication skills to engage in continuing professional development.

PO 5: Demonstrate the understanding of the concepts learnt relating to professional, ethical, legal, and social issues and responsibilities in real-life.

PO 6: Develop strong programming skills to implement research projects

HC

DATABASE TECHNOLOGIES

[3:0:1]

Objectives:

- Learn and practice data modelling using the entity-relationship and developing database designs.
- Understand the use of Structured Query Language (SQL) and learn SQL syntax.
- Apply normalization techniques to normalize the database.
- Comprehend the needs of database processing and learn techniques for controlling the consequences of concurrent data access.

Outcomes:

- Comprehend data models and schemas in DBMS.
- Use SQL- the standard language of relational databases.
- Understand the functional dependencies and design of the database.
- Understand the concept of Transaction and Query processing.

Unit I

Overview of Database Systems and Entity- Relationship Model

A historical perspective, file system versus a DBMS, advantages of a DBMS, levels of abstraction in a DBMS, structure of a DBMS, users of databases, entity, entity types, entity sets, attributes, keys, relationships, relationship sets and additional features of ER-model- key constraints, participation constraints and weak entities.

Unit II

Relational model, Relational Algebra and Structured Query Language

Relational model- Concepts, relational constraints and relational database schemas. Relational algebra - Basic and additional relational operations with examples. Data definition, constraints and schema changes in SQL, Basic queries in SQL: insert, delete and update statements and joins in SQL, views in SQL.

Unit III

Database Design, Overview of storage and indexing

Informal design guidelines for relational schemas, functional dependencies, normal forms, general definitions of first, second, third and boyce-codd normal forms.

File organization and indexing: sequential file organization, heap file organization, clustered indexes primary and secondary indexes, hash based indexing and B+ tree-based indexing.

Unit IV

Overview of transaction management

The ACID properties, consistency and isolation, atomicity and durability, transaction on schedules, concurrent execution of transactions, motivation for concurrent execution, serializability, anomalies due to interleaved execution, lock-based concurrency control, strict two phase locking and performance of locking.

References

1. Fundamentals of Database Systems by Navathe and Elmasri –Pearson

Education, Fifth Edition.

2. Database Systems Concepts, 3rd edition by Abraham Silberschatz, Henry Korth and S. Sudarshan, Tata McGraw Hill.
3. Principles of database systems by Ullman, Computer Science press.
4. DBMS by Prof. S.Nandagopalan, 7th Revised Edition.

Course articulation matrix:

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO						
CO 1	1	2	2	1	1	1
CO 2	2	3	3	1	2	2
CO 3	1	2	1	1	1	1
CO 4	1	2	1	1	1	-
Weighted Average	1.25	2.25	1.75	1	1.25	1

1: Low, 2: Moderate, 3: High

HC

MACHINE LEARNING

[3:0:1]

Objectives:

- Understanding the importance of Machine Learning and demonstrate the use of data frames in Python
- Analyze the process of model building and evaluation
- Comprehend various classification problems
- Discuss the libraries required to implement the techniques of Machine Learning.

Outcomes:

- Identify the need for Machine Learning using Python, appropriate data frames and its operations.
- Ability to build and validate linear regression models
- Ability understand different classification techniques and build classification models
- Ability to use unsupervised learning techniques to cluster data and Apply Scikit library for Machine Learning.

UNIT – I: Introduction to Machine Learning

Introduction to Analytics and Machine Learning, Need for Machine Learning, Framework for Developing Machine Learning Models, Using Python for Machine Learning, Python Stack for Data Science, Getting Started with Anaconda Platform, Introduction to Python.

Descriptive Analytics: Working with Pandas Data Frames in Python, Handling Missing Values, Exploration of Data using Visualization

UNIT – II: Linear Regression

Simple Linear Regression, Steps in Building a Regression Model, Building Simple Linear, Regression Model.

UNIT – III: Classification Problems

Classification Overview, Binary Logistic Regression, Gain Chart and Lift Chart, Classification Tree (Decision Tree Learning).

UNIT – IV: Advanced Machine Learning and Clustering

Scikit-Learn Library for Machine Learning, Advanced Machine Learning Algorithms.

Clustering: Overview, How Does Clustering Work?, K-Means Clustering, Hierarchical Clustering.

References

1. Machine Learning using Python, Manaranjan Pradhan, U Dinesh Kumar, Wiley India Pvt. Ltd., 2019
2. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf, 2013.
3. Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey , Jeffrey Elkner, 2015.
4. Jake Vander plas, “Python Data Science Handbook: Essential tools for working with data”, O’Reilly Publishers, 1st Edition.

5. Hands-On Machine Learning with Scikit-Learn and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems, Aurelien Geron, O'Reilly Publisher, I edition, 2017

Course Articulation Matrix

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO						
CO 1	1	3	1	-	1	1
CO 2	3	3	1	-	1	1
CO 3	3	3	1	1	1	1
CO 4	3	3	1	1	1	1
Weighted Average	2.5	3	1	1	1	1

1: Low, 2: Moderate, 3: High

Objectives:

- To offer students a glimpse into real world problems and help the students learn how to apply the tools and techniques they learned in the respective courses.
- To help students develop openness to new ideas in computer science and create very precise specifications for the execution of the project idea.
- To promote team working skills, problem solving skills, and presentation skills among students working on the project.

Outcomes:

- Understanding the emerging trends of new technologies by conducting a survey of several available literatures in the preferred field of study.
- Develop real time Projects by comparing the several existing solutions for a research challenge.
- Demonstrate an ability to work in teams and manage the process of building the project within the stipulated time.
- Report and present the findings of the research study/project conducted in the preferred domain.

Students need to implement different kinds of problems using Java based Frameworks, Python, PHP, MYSQL, Cloud tools, IoT tools, Dot NET, CASE tools, Open source tools and Mobile application oriented tools, as well as data mining/machine learning tools and techniques.

Course Articulation Matrix

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO						
CO 1	1	3	-	-	-	-
CO 2	1	3	-	-	-	3
CO 3	-	-	3	3	-	3
CO 4	-	-	-	3	2	3
Weighted Average	1	3	3	3	2	3

1: Low, 2: Moderate, 3: High



**POST-GRADUATE WING OF SBRR MAHAJANA FIRST GRADE
COLLEGE**

(Autonomous)

Accredited by NAAC with 'A' grade

**Pooja Bhagavat Memorial Mahajana Education Centre
K.R.S. Road, Metagalli, Mysuru-570016.**

Affiliated to University of Mysore.

DEPARTMENT OF STUDIES IN BIOCHEMISTRY

Program objectives

To enable students to become Teachers in academia.

To enable motivated researchers in research institutions or industries.

To enable entrepreneurial skills so as to serve the industries as well as initiate ownfirms.

PSO: Program specific outcomes:

1. Develop an ability to acquire in-depth theoretical and practical knowledge of Biochemistry
2. To demonstrate an understanding of structure and metabolism of biological macromolecules and tounderstand the regulation and disorders of metabolic pathways.
3. The principles of bioenergetics and enzyme catalysis;
4. Understanding of metabolic pathway among prokaryotes and eukaryotes.
5. Gain proficiency in laboratory techniques in biochemistry and biological sciences like immunology, physiology, molecular biology, enzymology and biotechnology.
6. Develop an ability to understand the technical aspects of existing technologies and to provide cost efficient solutions that help in addressing the biological and medical challenges faced by mankind.
7. The practical skills are improved which help their research experience among academic or industrial R&D programs.
8. Understand the published literature by using online and offline methods; to be able to apply the scientific method to the processes of experimentation and hypothesis testing.
9. Develop an ability to translate knowledge of Biochemistry to address environmental, intellectual, societal, and ethical issues through innovative thinking and research strategies.
10. Develop an ability to put forward the scientific perception to a person/ community belonging to non-science background.
11. To inculcate skills for teaching in academic institutions for undergraduate and postgraduate students.
12. Develop confidence in taking competitive examination in the field of life sciences both in India and abroad so that they can pursue higher education.

M.Sc. Biochemistry I Semester	Membrane Biology Course Code: 23F108	SC –Soft Core
Total Hours: 48	Credits: 03 (LTP - 3:1:0)	Total Marks: 15+15+70 = 100
Learning Objectives: Students should study this paper to know – To study biological membrane structure and function. To study physiological process of biological membranes		
Module	Course contents	
1	Physico-chemical properties of membranes: Compositions and supra molecular organization. Membrane lipid phases; bilayer phase, non- bilayer phase, phase transition and membrane potential. Models of membrane Evolution in concept of membrane models, Gorter and Grendel's experiment. Bilayer structure; Daniell - Davson model of membrane, Singer and Nicholson's model and Newer models. Membrane asymmetry; Membrane lipids, proteins and carbohydrates and their lateral diffusion. Biogenesis of lipids and proteins, polarized cells, membrane domains; caveolae, rafts and protein turnover. Intracellular targeting of proteins. Biogenesis of sub cellular organelles.	12h
2	Methods of study of membrane structure: Lipid transfer proteins phospholipases, chemical methods, amino-phospholipid translocation TNBS reagent, freeze fracture and freeze etching. Lipid vesicles; liposome preparations and application, function of sterols in membranes. FRET FRAP, single particle tracking, EM of membranes, calorimetry, confocal microscopy of membrane dynamics. Cell fusion, shedding of membrane.	12h
3	Membrane transport: Laws of diffusion across membranes; simple diffusion facilitated diffusion and active transport. Glucose transporters, Ca ²⁺ ATPase, Na ⁺ -K ⁺ ATPase (Structure and mechanism of action) Endocytosis, receptor mediated endocytosis, exocytosis, ion channels; gated and non-gated, aquaporin channel. Bacterial phosphor transfer system.	12h
4	Nerve transmission: Structure and types of Neuron. Acetylcholine receptor and neurotransmitters, mechanisms of nerve conduction, resting and action potential, ion channels, ionophores, patch clamp technique. Presynaptic and postsynaptic membranes. Nicotinic and muscarinic neurons. GABA, NMDA, structure and function. Muscle contraction: Mechanisms, role of calcium, calmodulin, and phospholamban.	12h

Learning Outcomes: Understand properties of biological membrane, and different models of membranes explaining the biological function.
Understand membrane asymmetry and other properties using various methods.
Understand the complex mechanism involved in transportation of biomolecules across membranes. Nerve transmission.

References: Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter, P. 2008. *Molecular Biology of the Cell*. (5th Ed.) New York: Garland Science.
 Cooper, G. M., and Hausman, R. E. 2013. *The Cell: a Molecular Approach* (6th Ed.). Washington: ASM, Sunderland.
 Lodish H., and Berk A. 2016. *Molecular Cell Biology* (8th Ed.). New York. W H Freeman.

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	3	3	2	3	3	3	3	3
CO3	1	2	3	3	3	2	3	3	3	3	3	3
CO4	2	2	3	3	3	3	3	3	3	3	3	3
Weighted average	2	2.5	3	3	3	2.75	2.75	3	3	3	3	3

M.Sc. Biochemistry II Semester	Endocrinology Course Code: 23F207	SC –Soft Core
Total Hours: 48	Credits: 03(LTP - 3:0:0)	Total Marks: 15+15+70 = 100
Module	Course contents	
1	Cell: Structure of a cell, mitosis, meiosis, cell cycle and its regulation different phases of cell cycle. Apoptosis, cyclins and CDKs. Cell-cell and cell-ECM interaction and ECM structure and function. Endocrine System: Endocrine organs in man. Location and inter relationship of endocrine glands in man; classification and chemistry of hormones hormones of hypothalamus, pituitary, thyroid, parathyroid, pancreas, liver, adrenals, gonads and intestine.	08h
2	Functions and abnormalities: Hypo and hyper production of hormones secreted by; pituitary, thyroid, pancreas, adrenals and gonads. Structure and control of hypothalamus function: Hormones produced; GRH, somatostatin, TRH, CRH, GnRH. Pituitary gland: Structure, hormones of anterior, posterior and median lobes. Pro- opiomelanocortin. Testes and ovaries: Structure, hormones produced by testes and ovaries, menstrual cycle. Regulation of hormone production and release: hypothalamus-pituitary- target organ axis and regulation by feedback mechanism.	14h
3	Mechanism of hormone action: Peptide hormones: General mechanisms of cell signaling by hydrophilic factors, transmembrane receptors, transmembrane receptors G protein coupled receptors, receptor tyrosine kinase, eicosanoid receptors. Second messengers: IP3, DAG, cAMP, protein kinases. Nitric oxide signaling; generation and action. Growth factors: Structure, mechanism of action and receptors of EGF, PDGF, NGF and IGF. insulin receptor.	12h
4	Mechanism of action of steroid hormones: Conversion of cholesterol to steroid hormone. Steroid receptors, isolation and characterization of steroid receptors. Receptor down regulation, desensitization and up regulation. Pineal gland, melatonin and circadian rhythm. Chemistry and action of prostaglandins, prostacyclins and thromoxanes. Newly discovered hormones Insect hormones: Structure and function of moulting hormone, ecdysone, juvenile hormones, Pheromones. Application of insect hormones.	14h
<p>Learning Outcomes: After studying this paper the students will know – Understand the detailed structure of a cell Involvement of various organelles in the synthesis of protein amino acid and steroid hormones.</p> <p>Understand the various endocrine organs in relation to the regulation of various metabolic processes.</p> <p>Understand the hypo and hyperactivities of all the endocrine organs and their manifestation in various disorders.</p>		

References: Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter, P. 2008. *Molecular Biology of the Cell*. (5th Ed.) New York: Garland Science.
 Cooper, G. M., and Hausman, R. E. 2013. *The Cell: a Molecular Approach* (6th Ed.). Washington: ASM, Sunderland.
 Lodish H., and Berk A. 2016. *Molecular Cell Biology* (8th Ed.). New York. W H Freeman.

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	3	3	2	3	3	3	3	3
CO3	1	2	3	3	3	2	3	3	3	3	3	3
CO4	2	2	2	3	3	3	3	2	3	3	3	3
Weighted average	2	2.5	2.75	3	3	2.75	2.75	2.75	3	3	3	3

M.Sc. Biochemistry II Semester	Nutrition in Health and Disease	OE-Open elective
Total Hours: 48	Credits: 03(LTP - 2:2:0)	Total Marks: 15+15+70 = 100
Course contents		
1	Introduction: History of Biology; Origin of Life-theories, The Scientific Study of Life; The Chemical Basis of Life ; The Molecules of Cells A Tour of the Cell ; The Working Cell Classification of Phyla, (microbes, plants and animals.) Photosynthesis: Using Light to Make Food; How Cells Harvest Chemical Energy	12h
2	The Cellular Basis of Reproduction and Inheritance Patterns of Inheritance	6h
3	Human Physiology: Basic structure and functioning, disorders of Nervous, renal, hepatic, muscle, blood, bone tissues. Reproduction, Hormones. Animal cell culture for research and therapy. Plant physiology: Meristems, primary and secondary growth, types of tissues, reproduction, flowers, fruits, seeds, germination. Plant hormones, Plant tissue culture for crop improvement.	18 h
4	Molecular Biology of the Gene. Importance of gene expression. DNA Technology and Genomics and Proteomics Human diseases: Communicable, non-communicable. Familial and Sporadic disorders.	12
<p>Learning outcomes Student would be able to work independently to use scientific methods during biology related investigations. Use critical thinking and scientific problem-solving to make informed decisions in a real-world context. Understand cellular processes in a living being. Human diseases.</p> <p>References: Renato A Dela Pena Jr. General Biology. 2016. JFS Publishing Holley D. General Biology I: Molecules, Cells and Genes. 2017. Dog Ear Publishing Dela Pena Jr et al., General Biology. JFS Publishing Services 2016</p>		

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	3	3	2	3	3	3	3	3
CO3	2	2	3	3	3	2	3	3	3	3	3	3
CO4	2	2	2	3	3	3	3	2	3	3	3	3
Weighted average	2.5	2.5	2.75	3	3	2.75	2.75	2.75	3	3	3	3

References: Bansal. Nutrition in disease. 2012. Pustak Mahal Chakraborty and Chakraborty. Textbook of Nutrition in Health and Disease. 2019. Springer Nisha. Diet Planning for Diseases. 2006. Kalpaz Publications. Esperanza J. Carcache de Blanco, Jay Mirtallo , " Nutrition: An Approach to Good Health and Disease Management ", Bentham Science Publishers (2016). <https://doi.org/10.2174/97816810810831160101> Esperanza J. Carcache de Blanco and Jay Mirtallo. Influence of Socio-economic Status and Culture in Diet and Nutrition. 2020. Bentham. Teresa Aldamiz- Echevarria Lois Maria, Recarte Garcia-Andrade Carlos and Millan Nunez-Cortes Jesus, Cardiovascular Risk Factors and Dietary Patterns, Current Nutrition & Food Science 2011; 7(2) <https://dx.doi.org/10.2174/157340111795713852> Berglund, Nutrition and Heart Disease: Causation and Prevention: 1st edition, edited by Ronald R Watson and Victor R Preedy, 2004, 354 pages, CRC Press, Boca Raton, FL, The American Journal of Clinical Nutrition, Volume 80, Issue 6, 2004 Martínez-González MA, Kim H, Prakash V, et al Personalised, population and planetary nutrition for precision health BMJ Nutrition, Prevention & Health 2021;4:doi: 10.1136/bmjnph-2021-000235 Lundstorm. Nutrition and Disease. Prevention and Therapy. Cambridge Scholars Publishing. 2020. Coulston et al., Nutrition in the Prevention and Treatment of Disease. 2017. Academic Press.

M.Sc. Biochemistry II Semester	Nutrition in Health and Disease Course Code: 23F209	OE-Open Elective
Total Hours: 48	Credits: 04 (LTP - 2:2:0)	Total Marks: 15+15+70 = 100
Module	Course contents	
1	<p>Food Physiology: Concept of balanced diet and energy content of foods; Basal and resting metabolism- influencing factors, Absorption of carbohydrates, lipids, proteins, nucleic acids, minerals and vitamins. Common metabolic disorders: Diabetes mellitus, disorders of HDL-cholesterol, LDL cholesterol, triglycerides, phenylketonuria, albinism. Antioxidants: Free radicals: definition, formation in biological Systems. Natural anti- oxidants, defense against free radicals. Role of free radicals and antioxidants in health and disease.</p> <p>Nutrition and lifestyle choices impact the life cycle before and during pregnancy, during lactation and infancy, during childhood and adolescence, and through adulthood and aging. The function of the RDA, DRI, and Tolerable Upper Intake Level.</p>	14h
2	<p>Vitamins: Dietary sources, biochemical functions and specific deficiency diseases associated with fat and water soluble vitamins; Hypervitaminosis symptoms of fat- soluble vitamins.</p> <p>Minerals: Dietary sources and deficiency disorders of dietary calcium, phosphorus, magnesium, iron, iodine, zinc and copper.</p> <p>Malnutrition and blood disorders: Etiology, clinical features, metabolic disorders and management of Marasmus and Kwashiorkor, Nutritional anemia - vitamin B12, folate and iron deficiency anemia; hemoglobinopathies and thalassemias.</p>	12h
3	<p>Selection of foods, preliminary preparation of food, principles of cooking, methods of cooking - Boiling, Steaming, Pressure cooking, Microwave oven, Frying (shallow, deep fat), Smoking point of oil, Combination method, methods of cooking: advantages and disadvantages. Effect of cooking on nutritive value, methods of enhancing nutritive value</p>	8h
4	<p>Obesity: Definition, classification and biochemical basis; Genetic and environmental factors leading to obesity; Obesity related diseases and management of obesity. Cardiovascular disease: Diseases of Liver, Gall bladder & Pancreas- Hepatitis, (A, B, and C), alcoholic liver disease, Gall stones, pancreatitis. Prevention and dietary management.</p> <p>Clinical significance of aspartate aminotransferase, alanine aminotransferase, lactate dehydrogenase, amylase, lipase and trypsin. Diagnosis of jaundice and clinical importance of bilirubin.</p>	14h
5	<p>Questionnaire based Survey by students.</p> <p>Setting up Diagnostic test camps. Arranging for nutrition counseling.</p> <p>Seminars by students.</p>	

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	3	3	2	3	3	3	3	3
CO3	3	2	3	3	3	2	3	3	3	3	3	3
CO4	3	3	2	3	3	3	3	2	3	3	3	3
Weighted average	2.75	2.75	2.75	3	3	2.75	2.75	2.75	3	3	3	3

M.Sc. Biochemistry III Semester	Human Physiology with clinical relevance Course Code: 23F307	SC –Soft Core
Total Hours: 48	Credits: 04 (LTP - 3:1:0)	Total Marks: 15+15+70 = 100
Learning Objectives: Students should study this paper to know – a. To study different systems operating in living organisms.		
Module	Course contents	
1	Blood: Composition, cells, plasma proteins and lipoproteins, preparation of plasma, serum, and different blood cells. Erythrocytes; shape and function. WBC; types, differential count and functions. Platelets and their function. Half-life of blood cells. Buffer systems, hemostasis, blood clotting, different pathways of blood clotting, mechanisms of initiation of clotting pathways, various enzyme complexes digestion of clot, anticoagulants, blood volume, blood pressure and its regulations. Plasma lipoproteins and their functions, HDL, LDL, VLDL, chylomicrons.	12h
2	Respiratory System: Lungs, structure and functions, gas exchange, oxygen binding by hemoglobin, factors affecting oxygenation and acid-base balance. Nervous system: Structure of a neuron, nerve transmission, mechanism of neurotransmission, action potential, synapse, different types of neurotransmitters, stimulatory and inhibitory, central and peripheral nervous system, neuro-muscular junction. Parts of brain, brain-gut interaction, ion channels, types of ion-channels, secretion of neurotransmitters, CSF; composition and function.	12h
3	Excretory System: Ultra structure of the nephron, glomerular filtration, filtration rate, mechanism of formation of urine, acid-base balance. Consequences of imbalance in acid-base balance, formation of kidney stones. Kidney function tests Hepatobiliary System: Anatomy of the liver, blood supply, cells; hepatocytes, endothelial cells and Kupffer cells, secretory and excretory functions and formation of bile. Role of liver in detoxification.	12h
4	Digestive System: GI tract, digestion and absorption of carbohydrates, proteins and lipids. Mechanism of HCl production in the stomach. Gastrointestinal hormones and role of pancreas in digestion. Muscle physiology: Types of muscle, structure of skeletal muscle and smooth muscle, muscle proteins; actin, myosin, tropomyosine, troponins. Mechanisms of skeletal and smooth muscle contraction, sliding filament model.	12h
Learning Outcomes: After studying this paper the students will know – Biological processes involving membranes. Importance of membranes in the biological system Nutritional significance Disorders related to nutrition and digestion.		
References: Berg J.M., Tymoczko J.L. and Stryer L. (2006). Biochemistry: international edition: WH Freeman & Company Limited. Devlin T.M. (2020). Textbook of biochemistry: with clinical correlations (8th Edition). New York: J. Wiley & Sons. Guyton and Hall. Human Physiology.		

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	2	3	3	3	3	3	2	3	3	3	3	3
CO3	3	2	3	3	3	2	3	3	3	3	3	3
CO4	3	3	2	3	3	3	3	2	3	3	3	3
Weighted average	2.75	2.75	2.75	3	3	2.75	2.75	2.75	3	3	3	3



**SBRR MAHAJANA FIRST GRADE COLLEGE
[AUTONOMOUS]**

(Accredited by NAAC with 'A' grade)

PG WING

**Pooja Bhagavat Memorial Mahajana Education
Centre**

**Affiliated to the
University of Mysore**

**KRS Road, Metagalli,
Mysuru-570016**

DEPARTMENT OF STUDIES IN COMMERCE

CHOICE BASED CREDIT SYSTEM

Program Outcomes

PO1: Enhance the in-depth knowledge of various fields of business and commerce such as Accounting, International Accounting, Financial derivatives, Business Environment, international business, Research Methodology, and Tax planning, etc.,

PO2: Provide practical knowledge to deal with the day-to-day activities of the business by using the techniques like an industrial visit, internship, case study analysis, field visit, role play, etc.,

PO3: Inculcate the knowledge of the application of information technology in the field of Commerce.

PO4: Educate the students on business ethics, values, and the responsibility of business towards society to contribute the society at large.

PO5: Encourage the students to develop an interest in Research.

PO6: Build the strong communication skills and interpersonal skills among the students.

PO7: Build team spirit among the students to face the real-life situations in their career.

PO8: Imparting career enhancement skills by providing training in various competitive exams.

HC O1: ADVANCED ACCOUNTING

Total Credits: 4 per week

Credit Pattern: 3:1:0

No of hours: 5

Course Contents

Module-1:Accounting Standards: Objectives, Benefits, Scope-Accounting Bodies- International Accounting Standards Board- Institute of Chartered Accountants of India- Accounting Standards Boards (IASB)- Financial Accounting Standards Board's (FASB)- Stages and Process of Standards settings in India- Accounting Standards issued by ICAI- Compliance and Applicability of Accounting Standards in India.

Module-2: Ind AS on General and Assets of Financial Statements: AS 1 Presentation of Financial Statement-AS 2 Inventories- AS 7 Statement of Cash Flow- AS 8 Disclosure-AS 11 Construction Contracts- - AS 16 Property Plant and Equipment- AS 17 Lease- - AS 23 Borrowing Cost-AS-33 Earning Per Share.AS 36 Impairments of Assets-AS 38 Intangible Assets-AS 116 Lease

Module-3: Ind AS on Liabilities, Impacting and Disclosures in Financial statement: AS 12 Income Taxes- AS 19 Employee Benefits- AS 21 The Effects of Changes in Foreign Exchange Rates-AS 33 Earnings Per Share.

Module-4:Financial Disclosures and Reporting: Objectives and Concepts- Developments on Financial Reporting Objectives- True Blood Report, Corporate Report- Stamp Report- Corporate Annual Report-Segment Reporting and Interim Financial Reporting.

Course Outcome:

CO1: Provides detailed insight into various Indian accounting standards

CO2: Stages and process of standards settings by ICAI in India along with compliance and applicability of accounting standards in India.

CO3: Understand the difference between Accounting Standard, IFRS, IASB and FASB and also gain knowledge on Convergence of Indian Accounting Standards with IFRS

CO4: Understand financial disclosures and preparation of accounting reporting.

References

- Indian Accounting Standards- Asish K Bhattacharjee- Tata Mc Graw Hill.
- Taxman Accounting Standards- Rawat D S-Taxmann Publication
- Accounting Standards- Vijaya kumar M.P -Snow White Publication
- Corporate Financial Reporting Theory and Practice - Jawaharlal- Taxman Publication

SC 05: SERVICES MARKETING

Total Credits: 4

Credit Pattern: 3:1:0

No of hours: 5 per week

Course Description:

Module 1: Introduction to services

Meaning of Services – Characteristics of services – Customer focus – Consumer behavior in services; Search, experience and acceptance properties – consumer choice – post-experience evaluation – Customer expectations of service – factors influencing customer expectation of service – Issues involving customer expectations – Case Study

Module 2: Understanding Customer Requirements

Understanding Customer Requirements through Marketing Research – Elements of Effective Marketing Research Programme – Relationship marketing – Customer profitability Segments – Service Recovery: Impact of Service Failure and Recovery – Customers' Response to Service Failures – Service Recovery Strategies – Case Study

Module 3: Service Innovation, Design and Standards

Concept of Service Innovation and Design – Challenges of Service innovation and Design – Types of service innovations – Stages in Service innovation and development – High- Performance Service Innovations – Customer service standards – Customer defined service standards – Types of customer defined service standards – Development of customer defined service standards – Case Study.

Module 4: Delivering and Performing Service

Employees' Roles in Service Delivery – Organizational Service Culture – Significant role of Service Employees – Customers' Roles in Service Delivery – Importance of Customers' roles – Customer Self-service technologies – Strategies for enhancing customer participation – Service through Intermediaries and Electronic Channels – Direct (Company owned Channels) – Franchising – Agents and Brokers – Electronic Channels – Effective service delivery through intermediaries – Case Study

Department of Studies in Commerce

Course Outcome:

CO1: Learn the Concept of Services and intangible products

CO2: Comprehend the characteristics of service industry

CO3: Visualise the significance of service innovation and design

CO4: Employ various modes of service delivery in service organizations

Reference Books:

1. Service Marketing – K Rama Mohana Rao, Pearson Education, New Delhi
2. Essentials of Service Marketing – Jochen Wirtz, Pearson Education, New Delhi
3. Service Marketing – Valarie A. Zethaml, Mary Jo Bitner, MCGraw Publication, New Delhi
4. Service Excellence: Creating Customer Experiences that Build relationships (Marketing Strategy

Mahajana Education Society (R)

**SBRR Mahajana First Grade College
(Autonomous)**

Affiliated to University of Mysore

Re-Accredited by NAAC with 'A' Grade, College with Potential for
Excellence

Post Graduate Wing



**REVISED SYLLABUS
FOR M.Sc. DEGREE CHEMISTRY
PROGRAMME**

Under

Choice Based Credit System (CBCS) and
Continuous Assessment Grading Pattern (CAGP)

Effective from 2022-23

GUIDELINES AND REGULATIONS LEADING TO MASTER OF SCIENCE IN CHEMISTRY (TWO YEARS - SEMESTER SCHEME UNDER CBCS-CAGP)

Programme details

Name of the Department	: PG Department of Chemistry
Subject	: Chemistry
Faculty	: Science
Name of the Programme	: Master of Science (M.Sc.) in Chemistry
Duration of the Programme	: 2 years divided into 4 semesters

Programme Objectives

- To provide the latest subject matter both theory as well as practicals in such a way to foster their core competency and discovery learning. A chemistry postgraduate as envisioned in this framework would be sufficiently competent in the field to understand further discipline specific studies as well as to begin domestic related employment.
- To mould a responsible citizen who is aware of most basic domain-independent knowledge including critical thinking and communication.
- Enable the graduate to prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC civil service examinations.

Programme Outcomes

- Students will have a strong foundation in the fundamentals and applications of current theoretical and practical chemistry in Analytical, Inorganic, Organic and Physical Chemistry.
- Students will be able to design and carry out scientific experiments and accurately record and analyze the results of the experiments.
- Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
- Students will be able to explore new areas of research in both chemistry and allied fields such as Biochemistry, Material Chemistry, Pharmaceutical chemistry and Chemical biology and related technology.
- Students will understand the central role of chemistry to our society which includes understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.

Programme Specific Outcomes

- Global level research opportunities to pursue Ph.D. programme, targeted approach of CSIR – NET and competitive civil service examinations.
- Enormous job opportunities at all levels of teaching, chemical, pharmaceutical, food products, life oriented material industries.
- Specific placements in R & D and many pharmaceutical & other industries.
- Facile development for the synthesis of biologically significant organic molecules using the green route for chemical reactions for sustainable properties.
- To inculcate the scientific temperament in the students and outside the scientific community.
- Learnt to handle sophisticated equipment for the determination and characterization of chemical compounds.
- Use of the latest chemistry software to avoid the laborious work in research.

Pedagogies used in the programme

- Conventional method such as black board and chalk, and modern methods like power point presentation and information and communications technology (ICT) are used in class room teaching.
- Molecular models are used to teach molecular symmetry, stereochemistry and solid state chemistry topics.
- Each student performs experiments as per the protocol in practical classes.
- For the preparation of new compounds, each student can adopt new experimental setup, and also exposed to different analytical instruments for qualitative and quantitative analyses. In addition to this, students will acquire skill to handle various instruments independently.
- Students will be presenting seminars in each semester.
- Each student will be subjected to viva-voce examinations in every semester.
- Every student will work for project on a small research problem.
- Rigorous training will be giving for every student to interpret spectral data in the respective course including their dissertation.
- Special lectures are delivered by eminent scholars from different intuitions.
- National/International conferences are organized to upgrade the subject knowledge.

GENERAL REQUIREMENTS

Scheme of instructions

1. A Masters Degree programme is of 4 semesters-two Years duration. A candidate can avail a maximum of 8 semesters – 4 years (in one stretch) to complete Masters Degree (including blank semesters, if any). Whenever a candidate opts for blank semesters, he/she has to study the prevailing courses offered by the department when he/she continues his/her studies.
2. A candidate has to earn a minimum of 76 credits, for successful completion of a Master Degree. The 76 credits shall be earned by the candidate by studying Hardcore, Soft Core and Open Elective. A candidate may earn another 04 credits by studying MOOCs/SWAYAM courses.
3. **Minimum for Pass:** In case a candidate secures less than 30% in C₁ and C₂ put together, the candidate is said to have DROPPED the course, and such a candidate is not allowed to appear for C₃.
4. In case a candidate secures less than 30% in C₃, or secures more than 30% in C₃ but less than 50% in C₁, C₂ and C₃ put together, the candidate is said to have not completed the course and he/she may either opt to DROP the course or to utilize PENDING option.
5. **Credits (Minimum) Matrix:** A candidate has to study 42 credits from hard Core, a minimum of 24 credits in Soft Core (sum total of 4 semesters) and 04 credits in Open Elective (II or III Semester) for the successful completion of the Masters Degree programme.
6. All other rules and regulations hold good which are governed by the University of Mysore from time to time.

Definitions

1. In the Choice Based Credit System – Continuous Assessment Grading Pattern (CBCS-CAGP), programme means a course and a course means a paper.
2. **HC:** Hard Core; **SC:** Soft Core; **OE:** Open Elective

GENERAL SCHEME WITH RESPECT TO ASSESSMENT OF CREDITS

Semester	Hard Core		Soft Core			Open Elective
	Theory			Theory	Practicals	
I	I	3+0+0=3	A	2+0+0=2*	0+0+4=4 ^a	--
	O	3+0+0=3	I	2+0+0=2*	0+0+4=4 ^a	
	P	3+0+0=3	O	2+0+0=2*	0+0+4=4 ^a	
	A	3+0+0=3	P	2+0+0=2*	0+0+4=4 ^a	
II	I	3+0+0=3	A	2+0+0=2*	0+0+4=4 ^a	4+0+0=4 ^b
	O	3+0+0=3	I	2+0+0=2*	0+0+4=4 ^a	
	P	3+0+0=3	O	2+0+0=2*	0+0+4=4 ^a	
	G	3+0+0=3	P	2+0+0=2*	0+0+4=4 ^a	
III	I	3+0+0=3	A	2+0+0=2	0+0+2=2 ^a	4+0+0=4 ^b
	O	3+0+0=3	I	2+0+0=2	0+0+2=2 ^a	
	P	3+0+0=3	O	2+0+0=2	0+0+2=2 ^a	
	G	3+0+0=3	P	2+0+0=2	0+0+2=2 ^a	
IV	I	3+0+0=3	A	2+0+0=2	0+0+2=2 ^a	--
	O	3+0+0=3	I	2+0+0=2	0+0+2=2 ^a	
	P	3+0+0=3	O	2+0+0=2	0+0+2=2 ^a	
	A	3+0+0=3	P	2+0+0=2	0+0+2=2 ^a	
			D	--	0+0+4=4 ^c	
Total Credits	48		24(48)			04

NOTE

A–Analytical; I–Inorganic; O–Organic; P–Physical; G–Spectroscopy; D–Dissertation/Project Work; (L+T+P)–Theory + Tutorial + Practical

*Courses are common for both first and second semesters.

^a All students should opt practicals in soft core compulsorily in all semesters.

^b Courses are common for both II and III Semesters and the candidate can opt either in II or III semester (For non-chemistry students only).

^c Dissertation/Project work which is offered by the department during IV semester.

**SCHEME OF STUDY AND EXAMINATION
FIRST SEMESTER
HARD CORE PAPERS**

Course Code	Title	Contact Hours/ week	Credits	Max. Marks	Internal Assessment Marks		Semester Exams (C ₃)		End
					C ₁	C ₂	Duration (hrs)	Marks	
CHI HCT: 1.1	Concepts & Models of Inorganic Chemistry	3	3	100	15	15	3	70	
CHO HCT:1.2	Stereochemistry & Reaction Mechanism	3	3	100	15	15	3	70	
CHP HCT: 1.3	Basic Physical Chemistry	3	3	100	15	15	3	70	
CHA HCT: 1.4	Analytical data assessment and separation techniques	3	3	100	15	15	3	70	

SOFT CORE PAPERS

Course Code	Title	Contact Hours/ week	Credits	Max. Marks	Internal Assessment Marks		Semester Exams (C ₃)		End
					C ₁	C ₂	Duration (hrs)	Marks	
CHA SCT:1.1/2.1	Titrimetric Analysis	2	2	100	15	15	3	70	
CHI SCT: 1.2/2.2	Chemistry of Selected Elements	2	2	100	15	15	3	70	
CHO SCT: 1.3/2.3	Chemistry of Natural Products-I	2	2	100	15	15	3	70	
CHP SCT: 1.4/2.4	Biophysical Chemistry	2	2	100	15	15	3	70	

SOFT CORE PRACTICALS

Course Code	Title	Contact Hours/ week	Credits	Max. Marks	Internal Assessment Marks		Semester Exams (C ₃)		End
					C ₁	C ₂	Duration (hrs)	Marks	
CHA SCP:1.1/2.1	AnalyticalPracticals-I	8	4	100	15	15	6	70	
CHISCP: 1.2/2.2	InorganicPracticals-I	8	4	100	15	15	6	70	
CHO SCP: 1.3/2.3	OrganicPracticals-I	8	4	100	15	15	6	70	
CHP SCP: 1.4/2.4	PhysicalPracticals-I	8	4	100	15	15	6	70	

**SECOND SEMESTER
HARD CORE PAPERS**

Course Code	Title	Contact Hours/ week	Credits	Max. Marks	Internal Assessment Marks		Semester Exams (C ₃)	
					C ₁	C ₂	Duration (hrs)	Marks
CHI HCT: 2.1	Coordination Chemistry	3	3	100	15	15	3	70
CHO HCT: 2.2	Synthetic Organic Chemistry	3	3	100	15	15	3	70
CHP HCT: 2.3	Principles of Physical Chemistry	3	3	100	15	15	3	70
CHG HCT: 2.4	Molecular Symmetry and Spectroscopy	3	3	100	15	15	3	70

NOTE

Soft Core Theory: All courses are same as that described in first semester.

Practicals: Same as that of I Semester. Students who have conducted Analytical and Inorganic or Organic and Physical Practicals in the I Semester will get interchanged during II Semester.

OPEN ELECTIVE (for Non-Chemistry Students only)

Course Code	Title	Contact Hours/ week	Credits	Max. Marks	Internal Assessment Marks		Semester Exams (C ₃)	
					C ₁	C ₂	Duration (hrs)	Marks
CHOET: 2.1/3.1	General Chemistry	4	4	100	15	15	3	70

NOTE: The students can study this course either in II or III Semester.

THIRD SEMESTER

HARD CORE PAPERS

Course Code	Title	Contact Hours/ week	Credits	Max. Marks	Internal Assessment Marks		Semester End Exams (C ₃)	
					C ₁	C ₂	Duration (hrs)	Marks
CHI HCT: 3.1	Advanced Inorganic Chemistry	3	3	100	15	15	3	70
CHO HCT: 3.2	Organometallic and Photochemistry	3	3	100	15	15	3	70
CHP HCT: 3.3	Advanced Physical Chemistry	3	3	100	15	15	3	70
CHG HCT: 3.4	Chemical Spectroscopy	3	3	100	15	15	3	70

SOFT CORE PAPERS

Course Code	Title	Contact Hours/ week	Credits	Max. Marks	Internal Assessment Marks		Semester Exams (C ₃)		End Marks
					C ₁	C ₂	Duration (hrs)	Marks	
CHA SCT: 3.1	Electrochemical methods of chemical analysis	2	2	100	15	15	3	70	
CHI SCT: 3.2	Frontiers in Inorganic Chemistry	2	2	100	15	15	3	70	
CHO SCT: 3.3	Chemistry of Natural Products-II	2	2	100	15	15	3	70	
CHP SCT: 3.4	Material Chemistry	2	2	100	15	15	3	70	

SOFT CORE PRACTICALS

Course Code	Title	Contact Hours/ week	Credits	Max. Marks	Internal Assessment Marks		Semester Exams (C ₃)		End Marks
					C ₁	C ₂	Duration (hrs)	Marks	
CHA SCP:3.1/4.1	Analytical Practicals - II	4	2	100	15	15	6	70	
CHI SCP:3.2/4.2	Inorganic Practicals - II	4	2	100	15	15	6	70	
CHO SCP:3.3/4.3	Organic Practicals - II	4	2	100	15	15	6	70	
CHP SCP:3.4/4.4	Physical Practicals - II	4	2	100	15	15	6	70	

Note:

OPEN ELECTIVE (for Non-Chemistry Students only)

The course is same as in II Semester

FOURTH SEMESTER

HARD CORE PAPERS

Course Code	Title	Contact Hours/ week	Credits	Max. Marks	Internal Assessment Marks		Semester Exams (C ₃)		End Marks
					C ₁	C ₂	Duration (hrs)	Marks	
CHI HCT: 4.1	Bioinorganic Chemistry	3	3	100	15	15	3	70	
CHO HCT: 4.2	Heterocyclic and Bioorganic Chemistry	3	3	100	15	15	3	70	
CHP HCT: 4.3	Nuclear, Radiation and Photochemistry	3	3	100	15	15	3	70	
CHA HCT: 4.4	Optical, Thermal and Kinetic methods of analysis	3	3	100	15	15	3	70	

SOFT CORE PAPERS

Course Code	Title	Contact Hours/ week	Credits	Max. Marks	Internal Assessment Marks		Semester Exams (C ₃)	
					C ₁	C ₂	Duration (hrs)	Marks
CHA SCT: 4.1	Automated and Methods Chemical Analysis	2	2	100	15	15	3	70
CHI SCT: 4.2	Bioinorganic Photochemistry	2	2	100	15	15	3	70
CHO SCT: 4.3	Medicinal Chemistry	2	2	100	15	15	3	70
CHP SCT: 4.4	Quantum Chemistry and Biosensors	2	2	100	15	15	3	70

NOTE:

Practicals: Same as that of III Semester. Students who have conducted Analytical and Inorganic or Organic and Physical Practicals in the III Semester will get interchanged during IV Semester.

SCHEME OF EXAMINATION FOR C1, C2 AND C3 COMPONENTS

Preamble

In view of the CBCS syllabus, following is the model distribution of marks for C₁, C₂ and C₃ Components. At a glance, the model includes HC, SC and OE courses for the assessment of marks.

The following is the scheme which will be followed for the assessment of marks for HC, SC and OE courses irrespective of the credits associated with each course. 30% of the marks will be assessed for internals (C₁ and C₂) and remaining 70% will be for the Semester end Examinations (C₃). Each course carries 100 marks and hence 30 marks will be allotted to internals and remaining 70 marks will be for Semester end Examinations. Out of 30 marks for internals, 15 marks will be allotted to each C₁ and C₂ components.

Each course (HC/SC/OE) consists of three components namely C₁, C₂ and C₃. C₁ and C₂ are designated as Internal Assessment (IA) and C₃ as Semester end Examination. Each course (HC/SC/OE) carries **100 Marks** and hence the allotment of marks to C₁, C₂ and C₃ Components will be 15, 15 and 70 marks, respectively. i.e.,

C ₁ Component	15 Marks	Assessment Marks
C ₂ Component	15 Marks	
C ₃ Component	70 Marks	Semester end Examination
Total	100 Marks	

The above Scheme will be followed for all the HC, SC and OE courses in all the four semesters.

1. HARD CORE (03 CREDIT COURSES)

Distribution of Marks for C₁ and C₂ Components

Assessment Marks (C₁ + C₂) consists of 30 marks. It will be divided into three parts *viz.*, **Internal Test, Home Assignment and Seminar**. Internal tests will be conducted during the 8th week of the semester for C₁ and 16th week of the semester for C₂. Home Assignment will be considered for C₁ Component and Seminar for C₂ Component only. Hence, a teacher from each unit of a course may be given one assignment (or in their personal interest one more may be given). Since each course has three units, the marks shall be divided equally. Allotment of marks for C₁ and C₂ is as follows: Out of 15 Marks for C₁, Internal test will be conducted for 30 Marks (10 Marks from each unit and reduced to 10 Marks) and Home Assignment will be given for 05 Marks (Each Home Assignment from every unit will be assessed for 05 Marks and finally reduced to 05 Marks). Assessment Marks for C₂ will be distributed as follows: Internal test will be conducted for 30 Marks (10 Marks from each unit and reduced to 10 Marks) and Seminar will be assessed for 20 Marks and finally its Marks will be distributed to each theory HC course. i.e.,

C ₁		C ₂	
Internal Test	30 Marks (10+10+10) Reduced to 10 Marks	Internal Test	30 Marks (10+10+10) Reduced to 10 Marks
Home Assignment	15 Marks (05+05+05) Reduced to 5 Marks	Seminar	20 Marks (05+05+05+05) 5 Marks will be distributed to each HC course
Total	15 Marks	Total	15 Marks

Distribution of Marks for C₃ Component (Semester end Examination)

The question paper is of 3 hrs duration with the Maximum of 70 Marks. The following question paper pattern will be followed for all the theory courses (HC/SC/OE). Question paper will have FIVE main questions. All the questions will cover all the units of the course with equal marks distribution. Q. No. 1 is of Medium/ Short Answer Type questions which will have nine questions and each question carries two marks. A student has to answer any seven questions. Q. No. 2 to 5 carries 14 marks each and a student has to answer all the four questions (*No Choice*). Each main question will have three sub-sections a, b, c. An examiner may set the questions like (4+4+6) or (4+5+5) or as his/her wish. However, sub-section 'c' will have an internal choice. i.e.,

Model Question Paper Pattern

Max. Duration: 3 Hr

Max. Marks: 70

Note: Answer all the questions. Each question carries 14 marks.

Q. No. 1: Nine Medium/ Short Answer Type Questions and any seven should be answered. Each question carries TWO marks. **(7 × 2 = 14)**

Q. No. 2 to 5: All the four questions have to be answered (*No Choice*). Each question carries **FOURTEEN** marks. An examiner may set the questions like (4+4+6) or (4+5+5) or as his/her wish. However, sub-section c will have an internal choice. (*Two marks questions shall be avoided for 2 to 5*). **(4 × 14 = 56)**

- a)
- b)
- c) **OR** c)

2. SOFT CORE (02 CREDIT COURSES)

Distribution of Marks for C₁ and C₂ Components

Assessment Marks (C₁ + C₂) consists of 30 marks. It will be divided into two parts viz., **Internal Test and Home Assignment**. Internal tests will be conducted during the 8th week of the semester for C₁ and 16th week of the semester for C₂. As far as Home Assignment is concerned, the concerned teacher will assign one or two Home Assignments to each student. Since each course has two units, the marks will be divided equally. Allotment of marks for C₁ and C₂ is as follows: Out of 15 Marks for IA, Internal tests will be conducted for 20 marks and reduced to 10 marks, whereas Home Assignment is for 05 Marks. i.e.,

C ₁		C ₂	
Internal Test	20 Marks (10+10) Reduced to 10	Internal Test	20 Marks (10+10) Reduced to 10
Home Assignment	10 Marks (05+05) Reduced to 05	Home Assignment	10 Marks (05+05) Reduced to 05
Total	15 Marks	Total	15 Marks

Distribution of Marks for C₃ Component (Semester End Examination)

The above described pattern (1.2) holds good in this case also.

3. PRACTICALS

The following Scheme will be applicable for all the four semesters (SC for chemistry students only)

Each practical consists of three components namely C₁, C₂ and C₃. C₁ and C₂ are designated as Internal Assessment (IA) and C₃ as Semester End Examination. Each practical carries **100 Marks** and hence the allotment of marks to C₁, C₂ and C₃ Components will be 15, 15 and 70 marks respectively. i.e.,

C ₁ Component	15 Marks	Internal Assessment Marks
C ₂ Component	15 Marks	
C ₃ Component	70 Marks	Semester End Examination
Total	100 Marks	

Distribution of Marks for C₁ and C₂ Components

IA consists of **15 Marks**. It will be divided into three parts viz., **Internal Test, Continuous Assessment and Record**. Continuous assessment refers to the daily assessment of each student based on his/her attendance, skill, results obtained etc. Thus, 05 marks are allotted for Continuous Assessment. Internal tests will be conducted for 05 Marks during the 8th week of the semester for C₁ and 16th week of the semester for C₂. Finally, remaining 05 Marks will be for the record. i.e.,

C ₁		C ₂	
Internal Test	05 Marks	Internal Test	05 Marks
Continuous Assessment	05 Marks	Continuous Assessment	05 Marks
Record	05 Marks	Record	05 Marks
Total	15 Marks	Total	15 Marks

Distribution of Marks for C₃ Component (Semester End Examination)

The end examination will be conducted for **70 Marks/course** with a maximum duration of 6 hours. Two experiments will be given to each student which carries 30 Marks each. Each student will be subjected to Viva-Voce Examination for which 10 Marks is allotted. i.e.,

Two Experiments	30+30 Marks
Viva-Voce	10 Marks
Total	70 Marks

Note: Examiners have to set at least one experiment from each part in the semester end Examination (C₃).

FIRST SEMESTER

CHI HCT: 1.1. CONCEPT AND MODELS OF INORGANIC CHEMISTRY

Objectives:

- To study the structures of ionic crystals and simple molecules through VSEPR model.
- To learn acid-base concepts and chemical reactions in non-aqueous, ionic liquids and supercritical fluids as media.
- To study the chemistry of f-block elements.

Course outcome:

- The periodic properties of the elements, structures of ionic solids and their lattice energy calculations. Further, the use of VSEPR concepts in analyzing the structures of simple molecules.
- Various acid-base concepts and their applications in different fields. Also, understand the utility of various non-aqueous solvents in inorganic synthesis.
- Complete understanding of the chemistry of lanthanides, actinides and their applications.

Pedagogy:

- Familiarize the students with the periodic properties of the elements using modern periodic table.
- Teaching through conventional method such as black board and chalk, and modern methods like power point presentation.
- For teaching structures of solids, crystal models (MX and MX₂ types) are used.

Course content

UNIT-I

[16 HOURS]

Structures and energetics of ionic crystals: Introduction, MX (NaCl, CsCl, ZnS) and MX₂ (fluorite, rutile, β -cristobalite, cadmium chloride and cadmium iodide) types. The perovskite and spinel structures. Thermodynamics of ionic crystal formation. Hydration energy and solubility of ionic compounds, Lattice energy, Born-Haber cycle, Born-Landé equation. The Kapustinskii's equation, Consequences of lattice enthalpies. Applications of lattice energetics. Ionic radii, factors affecting the ionic radii, radius ratio rules.

Structures and energetics of inorganic molecules: Introduction, Bent's rule, Energetics of hybridization. VSEPR model for explaining structure of molecules including fluxional molecule. M.O. treatment of homo-nuclear and heteronuclear diatomic molecules. M.O. treatment involving delocalized π -bonding (CO_3^{2-} , NO_3^- , NO_2^- , CO_2 and N_3^-), M.O. correlation diagrams (Walsh) for triatomic molecules.

UNIT-II

[16 HOURS]

Modern concept of acids and bases: Lux-Flood and Usanovich concepts, solvent system and leveling effect. Hard-Soft Acids and Bases, Classification and Theoretical backgrounds.

Non-aqueous solvents: Classification of solvents, Properties of solvents (dielectric constant, donor and acceptor properties) protic solvents (anhydrous H_2SO_4 , HF and glacial acetic acid)

aprotic solvents (liquid SO₂, BrF₃ and N₂O₄). Solutions of metals in liquid ammonia, hydrated electron. Super acids and super bases. Heterogeneous acid-base reactions.

Ionic liquids: Molten salt solvent systems, Ionic liquids at ambient temperature, Reactions in and applications of molten salt/ionic liquid media.

Supercritical fluids: Properties of supercritical fluids and their uses as solvents. Supercritical fluids as media for inorganic chemistry

UNIT-III

[16 HOURS]

Chemical Periodicity: Review of periodic properties

Lanthanoid chemistry: General trends, Electronic, optical and magnetic properties. Abundance and extraction, **General principles:** conventional, solvent extraction and ion-exchange methods. Separation from monazite. Chemistry of principal oxidation states (II, III and IV). Stability of tetrahalides, dihalides and aqua ions of simple lanthanide compounds. Redox potentials. **Uses:** lanthanides as shift reagents, lanthanides as probes in biological systems. High temperature super conductors.

Actinoid chemistry: General trends and electronic spectra. Occurrence and preparation of elements, **Isolation of the elements:** thorium and uranium, enrichment of uranium for nuclear fuel, uranium hydrides, oxides and chlorides. Chemical reactivity and trend. Chemistry of trans-uranium elements.

Supramolecular Chemistry: Introduction, selectivity and Supramolecular Interactions.

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2. Inorganic Chemistry, 3rd edition. James E. Huheey, Harper and Row Publishers (1983).
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4. Inorganic Chemistry, 6th edition. D.F. Shriver, M. Weller. T. Overton, J. Rourke and F. Armstrong, Oxford University Press (2014).
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8. Ionic liquids-Classes and Properties (Ed) by Scott T. Handy, Intech Publisher (2011).
9. Lanthanide and Actinide Chemistry, Simon Cotton, John Wiley and Sons Ltd., (2006).
10. Supramolecular Chemistry, Peter J. Cragg, Springer (2010).

CHO HCT: 1.2. STEREOCHEMISTRY AND REACTION MECHANISM

Objectives

- To understand detailed molecular structures of organic compounds.
- To learn bonding and chemical reactions of organic compounds.
- To study different chemical reactions involved in organic synthesis.

Course Outcome

- Optical and geometrical isomerism of Organic compounds. Application of stereochemistry in the study of regioselective and regiospecific reactions.
- The study of HMO and its applications to simple organic molecules, and also understand the concept of aromaticity and methods of determining reaction mechanism.
- Nucleophilic, electrophilic and elimination reactions.

Pedagogy

- Molecular models are used to teach stereochemistry.
- Teaching through conventional method such as black board and chalk, and modern methods like power point presentation.

Course content

UNIT-I

[16 HOURS]

Stereoisomerism: Projection formulae [flywedge, Fischer, Newman and sawhorse], enantiomers, diastereoisomers, mesomers, racemic mixture and their resolution, configurational notations of simple molecules, DL and RS configurational notations.

Optical isomerism: Conditions for optical isomerism: Elements of symmetry-plane of symmetry, centre of symmetry, alternating axis of symmetry (rotation-reflection symmetry). Optical isomerism due to chiral centers and molecular dissymmetry, allenes and biphenyls, criteria for optical purity.

Geometrical isomerism: Due to C=C, C=N and N=N bonds, *E*, *Z* conventions, determination of configuration by physical and chemical methods. Geometrical isomerism in cyclic systems.

Conformational analysis: Elementary account of conformational equilibria of ethane, butane and cyclohexane. Conformation of cyclic compounds such as cyclopentane, cyclohexane, cyclohexanones and decalins. Conformational analysis of 1,2-, 1,3- and 1,4- disubstituted cyclohexane derivatives and *D*-Glucose, Effect of conformation on the course and rate of reactions.

Stereoselectivity: Meaning and examples of stereospecific reactions, stereoselective reactions, diastereoselective reactions, regioselective, regiospecific reactions, enantioselective reactions and enantiospecific reactions.

UNIT-II

[16 HOURS]

Basics of organic reactions: Meaning and importance of reaction mechanism, classification and examples for each class.

Bonding in organic systems: Theories of bonding-molecular orbital approaches. Huckel molecular orbital theory and its application to simple π -systems: ethylene, allyl, cyclopropyl, cyclobutadienyl, cyclopentadienyl, cyclohexatrienyl systems. Calculation of the total π -energy, and M.O. coefficients of the systems.

Aromaticity: Concept of aromaticity, Huckel's rule, Polygon rule, annulenes, heteroannulenes and polycyclic systems.

Structure and reactivity: Brief discussion on effects of hydrogen bonding, resonance, inductive and hyperconjugation on strengths of acids and bases.

Methods of determining organic reaction mechanism: Thermodynamic and kinetic requirements for reactions, kinetic and thermodynamic control. Identification of products. Determination of reaction intermediates, isotope labeling and effects of cross over experiments. Kinetic and stereochemical evidence, solvent effect. Formation, structure, stability, detection and reactions of carbocations (classical and non-classical), carbanions, free radicals, carbenes, nitrenes, arynes and ylides (Sulphur, nitrogen and phosphorous).

UNIT-III

[16 HOURS]

Aliphatic Nucleophilic Substitution reactions: Kinetics, mechanism and stereochemical factor affecting the rate of S_N^1 , S_N^2 , S_{RN}^i , S_N^i , S_N^1 , S_N^2 , S_N^{1i} and S_{RN}^1 reactions, Neighbouring group participation.

Electrophilic substitution reactions: Kinetics, mechanism and stereochemical factor affecting the rate of S_E^1 & S_E^2

Aromatic electrophilic substitution reactions: Mechanism of nitration, halogenation, sulphonation, Friedel-Crafts alkylation and acylation, Mannich reaction, chloromethylation, Vilsmeier Haack reaction, Diazonium coupling, Gattermann-Koch reaction, Mercuration reaction.

Aromatic nucleophilic substitution reactions: S_N^1 , S_N^2 and benzyne mechanism, Bucherer reaction, von Richter reaction.

Mechanism of Addition reactions: Addition to C=C multiple bonds involving electrophiles, nucleophiles. Markownikoff's rule and anti-Markownikoff's rule.

Additions to carbonyl compounds: Addition of water, alcohol, bisulphate, HCN and amino compounds. Hydrolysis of esters.

Elimination reactions: Mechanism and stereochemistry of eliminations - E_1 , E_2 , E_{1cB} . *cis* elimination, Hofmann and Saytzeff eliminations, competition between elimination and substitution reactions, decarboxylation reactions. Chugaev reaction.

References

1. Stereochemistry of carbon compounds, Ernest L. Eliel.
2. Stereochemistry: P. S. Kalsi.
3. Organic Chemistry, VI edition, Robert T. Morrison, Robert N. Boyd.
4. Organic Chemistry, Vol-I by I. L. Finar.
5. Advance Organic Chemistry, IV edition, Jerry March.
6. Advance Organic Chemistry, III edition, Part-A and Part-B, Francis A. Carey and Rechar J. Sundberg.
7. Organic Chemistry, III edition, V. K. Ahluwalia and Rakesh Kumar Parashar.
8. Reactive intermediates in Organic Chemistry, N. S. Isaacs.

CHP HCT: 1.3. BASIC PHYSICAL CHEMISTRY

Objectives

- To understand thermal properties of chemical compounds.
- To study the rate of chemical reactions including fast reactions and factors influencing the reaction rate.
- To understand the theory of electrochemistry in solution.

Course Outcome

- The completion of this course will enable the students to gain the knowledge on fundamentals and theoretical background on the concepts of chemical thermodynamics, chemical kinetics and electrochemistry of solutions.
- This helps in understanding the stability and energetics of reaction.

Pedagogy

- Teaching through conventional method such as black board and chalk, and modern methods like power point presentation.
- To teach electrochemical aspects through animations.

Course content

UNIT-I

[16 HOURS]

Chemical Thermodynamics: Entropy: Physical significance, entropy changes in an ideal gas. Variation of entropy with temperature, pressure and volume. Entropy changes in reversible and irreversible processes.

Free energy: Helmholtz and Gibbs free energies, Gibbs-Helmholtz equation and its applications, Maxwell's relations and its applications. Nernst heat theorem: its consequences and applications. Third law of thermodynamics: statements, applications and comparison with Nernst heat theorem.

Partial molar properties: Physical significance, determination of partial molar volumes by intercept method and from density measurements. Chemical potential and its significance. Variation of chemical potential with temperature and pressure. Formulation of the Gibbs – Duhem equation. Derivation of Duhem-Margules equation.

Fugacity: Relation between fugacity and pressure, variation of fugacity with temperature and pressure. Determination of fugacity of gases.

Activity and activity coefficient: Variation of activity with temperature and pressure. Determination of activity co-efficient by depression in freezing point and solubility measurements by electrical methods.

Thermodynamics of dilute solutions: Raoult's law, Henry's law. Ideal and non-ideal solutions.

UNIT-II

[16 HOURS]

Chemical Kinetics: Complex reactions: Kinetics of parallel, consecutive and reversible reactions. Chain reactions: Branched chain reactions, general rate expression, Auto catalytic reactions (Hydrogen-Oxygen reaction), oscillatory reactions and explosion limits.

Theories of reaction rates: Collision theory and its limitations, Activated complex theory (postulates -derivation) and its applications to reactions in solution. Energy of activation, other activation parameters - determinations and their significance. Lindemann theory, Hinshelwood's theory of unimolecular reactions.

Reactions in solution: Ionic reactions - salt effects, effect of dielectric constant (single sphere models). Effect of pressure, volume and entropy change on the rates of reactions. Cage effect with an example.

Fast reactions- Introduction, study of fast reactions by continuous and stopped flow techniques,

relaxation methods (T-jump and P-jump methods), flash photolysis, pulse and shock tube methods.

UNIT-III

[16 HOURS]

Electrochemistry of solutions: Factor effecting electrolytic conductance. Debye-Huckel theory

- Concept of ionic atmosphere. Debye-Huckel-Onsager equation of conductivity and its validity. Debye-Huckel limiting law (DHL), its modification for appreciable concentrations. A brief survey of Helmholtz-Perrin, Guoy-Chapman and Stern electrical double layer (no derivation). Transference number: True and apparent transference numbers, Abnormal transference numbers, effect of temperature on transference numbers. Liquid junction potential-determination and minimization.

Energetics of cell reactions: Effect of temperature, pressure and concentration on energetics of cell reactions (calculation of ΔG , ΔH and ΔS).

Irreversible electrode process: Introduction, reversible and irreversible electrodes, reversible and irreversible cells. Polarization, over voltage - concentration over voltage, activation over voltage and ohmic over voltage. Experimental determination of over voltage. Equations for concentration over potential, stationary and non-stationary surface. Butler-Volmer equation, Tafel equation. Hydrogen oxygen over voltage. Effect of temperature, current density and pH on over voltage.

References

1. Thermodynamics for Chemists by S. Glasstone, Affiliated East-West Press, New Delhi, (1965).
2. Physical Chemistry by P.W. Atkins, ELBS, 5th edition, Oxford University Press (1995).
3. Text Book of Physical Chemistry by Samuel Glasstone, MacMillan Indian Ltd., 2nd edition (1974).
4. Elements of Physical Chemistry by Lewis and Glasstone, 2nd Edn. Macmillan & Co Ltd., New York.
5. Chemical Kinetics by K.J. Laidler, Tata McGraw-Hill Pub, Co Ltd, New Delhi.
6. Chemical Kinetics by Frost and Pearson.
7. Kinetics and Mechanism of Chemical Transformation by J. Rajaram and J.C. Kuriacose, Macmillan, New Delhi.
8. Chemical Kinetics by L.K. Jain.
9. Introduction to Electrochemistry by S. Glasstone, Affiliated East-West Press, New Delhi,
10. Electrochemistry –Principles and Applications by E.G. Potter, Cleaver-Hume press Ltd, London.
11. Modern Electrochemistry Vol. I and II by J.O.M. Bockris and A.K.N. Reddy, Pentium Press, New York (1970).

CHA HCT: 1.4. ANALYTICAL DATA ASSESSMENT AND SEPARATION TECHNIQUES

Objectives:

- To familiarize statistical methods to validate analytical methods.
- To learn sampling techniques and conventional volumetric methods.

Course outcome:

- To enhance the skills on sampling, purification, characterizations and data analysis using instrumental techniques.
- Build a foundation of chemical principles for understanding the chemical constituents in samples.
- To understand the basic Principle of Instrumentation and analytical applications.

Pedagogy:

- Teaching through conventional method such as black board and chalk, and modern methods like power point presentation.
- To evaluate validation parameters, MS-Office tools viz., MS-Excel sheets can be used.

Course content

UNIT-I

[16 HOURS]

Analytical chemistry: Its functions and applications; analytical problems and procedures, analytical techniques and methods, method validation.

Calibration and standards: Calibration, chemical standard and reference material.

Quality in analytical laboratories: quality control, quality assurance and accreditation system.

Errors in analytical measurements: measurement errors, absolute and relative errors, determinate and indeterminate errors and accumulated errors-sources, effects on results and control.

Assessment of accuracy and precision: Accuracy and precision, standard deviation, relative standard deviation, pooled standard deviation, variance, overall precision, and confidence interval.

Significance testing: Significance tests- Outlier, Q-test, F-test, t-test, and analysis of variance (ANOVA). Significant numbers.

Calibration and linear regression: Calibration, linear regression, standard addition, internal standardisation, internal normalization, external standardisation.

Figures of merit of Analytical methods: sensitivity and detection limit, linear dynamic range.

Quality control and chemometrics: Control charts, collaborative testing and multivariate statistics.

UNIT-II

[16 HOURS]

Principles of chromatography- Chromatographic separations and classification of principal chromatographic separations. Chromatographic mechanisms-sorption isotherms; adsorption systems-stationary and mobile phases, partition systems-stationary and mobile phases. Characterization of solutes-distribution ratio, retention factor, retention time and retardation factor.

Sorption processes- adsorption, partition, ion- exchange and size exclusion.

Chromatographic performance- Efficiency and resolution. Peak asymmetry- kinetic and temperature effects. Isolation of separated components.

Quantitative and qualitative analyses.

Thin layer chromatography (TLC) - Principles and procedures, stationary and mobile phases, solute- detection, alternative TLC procedures and applications of TLC.

Gas chromatography (GC) - Principles and types. Mobile phases, Sample injections, columns and stationary phases. Temperature control and solute detection; thermal conductivity detector (TCD), flame ionization detector (FID), nitrogen-phosphorus detector (NPD) and electron capture detector (ECD). Instrument control and data processing. GC-procedures- temperature programming and special procedures used in GC. Quantitative and qualitative analyses.

High performance liquid chromatography(HPLC): Principles, mobile phases, solvent delivery systems, sample injection system, column and stationary phases. Solute detection -UV-visible, fluorescence, refractive index and electrochemical detectors. Instrument control and data processing. Modes of HPLC. Optimisation of separations, qualitative and quantitative analyses.

UNIT-III

[16 HOURS]

Ion-exchange chromatography (IEC): Principles, apparatus and instrumentation, and applications.

Size-exclusion chromatography (SEC): Principles, apparatus and instrumentation, and applications.

Affinity chromatography (AFC): Principles, methodology and applications.

Supercritical fluid chromatography (SFC): Properties of supercritical fluids, instrumentation and operating variables, comparison of SFC with other chromatographic techniques, applications.

Supercritical fluid extraction (SFE): Advantages, instrumentation, choice of supercritical fluids, off-line and on-line extraction, applications.

Electrophoresis (EP) and electrochromatography(EC): Principles- high performance capillary electrophoresis and capillary electrochromatography, running buffers, supporting medium, sample injection, solutes- detection, instrument control and data processing. Modes of EP and EC- capillary zone electrophoresis (CZE), micellar electrokineticchromatography (MEKC), capillary gel electrophoresis (CZE), capillary isoelectric focusing (CIEF). Capillary electrochromatography (CEC), features, basis of separations. Qualitative analysis by CE and CEC and applications.

Solvent and solid phase extraction: Extraction techniques, extraction efficiency and selectivity. Solvent extraction (SE) - Extraction of organic acids and bases, extraction of metals. Methods of extraction and applications. Solvent phase sorbents, solid phase extraction (SPE) formats. Automated solid phase extraction. Solid phase micro extraction (SPME). Applications of SPE and SPME.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch, 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001, John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003, Pearson Education Pvt. Ltd., New Delhi.
5. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993 prenticeHall, Inc. New Delhi.
6. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
7. Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
8. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.

SOFT CORE PRACTICALS

CHA SCP: 1.1/2.1. ANALYTICAL CHEMISTRY PRACTICALS-I

[128 HOURS]

Course Objective

- To understand basic concepts by carrying out analytical experiments.
- The experimental results are subjected to validation of analytical parameters

Course Outcomes

- After studying this course the student to:
- Analyze various samples with different classical and simple instrumental skills.
- Obtain knowledge for selection of analytical methods with suitable technique being adopted for the analysis different samples like, water, laboratory chemicals and reagents, body fluids such as urine etc.
- Distinguish classical and instrumental methods.
- Propose and conduct experiment for quantification of individual analytes

Pedagogy

- Computer aided applications for the evaluation of experimental results.
- Each student performs experiments as per the protocol in practical classes.

Course experiments

Part-A

1. Determination of total acidity of vinegar and wines by acid-base titration.
2. Determination of purity of a commercial boric acid sample, and Na₂CO₃ content of washing soda.
3. Analysis of chromate-dichromate mixture by acid-base titration.
4. Determination of replaceable hydrogen and relative molecular mass of a weak organic acid by titration with NaOH.
5. Determination of ephedrine and aspirin in their tablet preparations by residual acid-base titrimetry.
6. Determination of purity of aniline and assay of chlorpromazine tablets by non-aqueous

- acid-base titration.
7. Periodate determination of ethylene glycol and glycerol (Malprade reaction).
 8. Determination of carbonate and bicarbonate in a mixture by *pH*-metric titration and comparison with visual acid-base titration.
 9. Determination of purity of a commercial sample of mercuric oxide by acid-base titration.
 10. Determination of benzoic acid in food products by titration with methanolic KOH in chloroform medium using thymol blue as indicator.
 11. Determination of the *pH* of hair shampoos and *pH* determination of an unknown soda ash.
 12. Analysis of water/waste water for acidity by visual, *pH* metric and conductometric titrations.
 13. Analysis of water/waste water for alkalinity by visual, *pH* metric and conductometric titrations.
 14. Determination of carbonate and hydroxide-analysis of a commercial washing soda by visual and *pH*-titrimetry.
 15. Determination of ammonia in house-hold cleaners by visual and conductometric titration.
 16. Potentiometric determination of the equivalent weight and K_a for a pure unknown weak acid.
 17. Spectrophotometric determination of creatinine and phosphorus in urine.
 18. Flame emission spectrometric determination of sodium and potassium in river/lake water.
 19. Spectrophotometric determination of pK_a of an acid-base indicator.

PART-B

1. Determination of percentage of chloride in a sample by precipitation titration-Mohr, Volhard and Fajan's methods.
2. Determination of silver in an alloy and Na_2CO_3 in soda ash by Volhard method.
3. Mercurimetric determination of blood or urinary chloride.
4. Determination of total hardness, calcium and magnesium hardness and carbonate and bicarbonate hardness of water by complexation titration using EDTA.
5. Determination of calcium in calcium gluconate/calcium carbonate tablets/injections and of calcium in milk powder by EDTA titration.
6. Analysis of commercial hypochlorite and peroxide solution by iodometric titration.
7. Determination of copper in an ore/an alloy by iodometry and tin in stibnite by iodimetry.
8. Determination of ascorbic acid in vitamin C tablets by titrations with $KBrO_3$ and of vitamin C in citrus fruit juice by iodimetric titration.
9. Determination of iron in razor blade by visual and potentiometric titration using sodium metavanadate.
10. Determination of iron in pharmaceuticals by visual and potentiometric titration using cerium(IV) sulphate.
11. Determination of nickel in steel by synergic extraction and boron in river water/sewage using ferroin.
12. Determination of total cation concentration of tap water by ion-exchange chromatography.
13. Determination of magnesium in milk of magnesium tablets by ion-exchange chromatography.
14. Cation exchange chromatographic separation of cadmium and zinc and their estimation by EDTA titration.
15. Gas chromatographic determination of ethanol in beverages.

16. Determination of aspirin, phenacetin and caffeine in a mixture by HPLC.
17. Solvent extraction of zinc and its spectrophotometric determination.
18. Anion exchange chromatographic separation of zinc and magnesium followed by EDTA titration of the metals.
19. Separation and determination of chloride and bromide on an anion exchanger.
20. Thin layer chromatographic separation of amino acids.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003, Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Practical Clinical biochemistry methods and interpretations, R. Chawla, J.P. Bothers Medical Publishers (P) Ltd., 1995.
7. Laboratory manual in biochemistry, J. Jayaraman, New Age International Publishers, New Delhi, 1981.
8. Practical Clinical Biochemistry by Harold Varley and Arnold.Heinmann, 4th edition.

CHI SCP: 1.2/2.2. INORGANIC CHEMISTRY PRACTICALS-I

Objectives:

[128 HOURS]

- To understand basic concepts by carrying out different experiments.
- To develop the skill for the qualitative and quantitative analysis of various samples.

Course outcome:

- Determination of various analytes presents in different ore samples by volumetric, gravimetric and spectrophotometric methods.
- The chemistry of redox, complexometric and indirect methods
- The principle in the semi-micro analysis of an inorganic salt mixture

Pedagogy:

- Each student performs experiments as per the protocol in practical classes.
- Handling the instrument and pyrolysis for quantitative determination of analyte.

Course experiments

PART – A

1. Determination of iron in haematite using cerium (IV) solution (0.02M) as the titrant, and gravimetric estimation of insoluble residue.
2. Estimation of calcium and magnesium carbonates in dolomite using EDTA titration, and gravimetric analysis of insoluble residue.
3. Determination of manganese dioxide in pyrolusite using permanganate titration.
4. Quantitative analysis of copper-nickel in alloy/mixture:
 - i. Copper volumetrically using KIO_3 .

- ii. Nickel gravimetrically using DMG
5. Determination of lead and tin in a mixture: Analysis of solder using EDTA titration.
6. Quantitative analysis of chloride and iodide in a mixture:
 - i. Iodide volumetrically using KIO_3
 - ii. Total halide gravimetrically
7. Gravimetric analysis of molybdenum with 8-hydroxyquinoline.
8. Quantitative analysis of copper(II) and iron(II) in a mixture:
 - i. Copper gravimetrically as CuSCN and
 - ii. Iron volumetrically using cerium(IV) solution
9. Spectrophotometric determinations of:
 - a. Titanium using hydrogen peroxide
 - b. Chromium using diphenyl carbazide in industrial effluents
 - c. Iron using thiocyanate/1,10-phenanthroline method in commercial samples
 - d. Nickel using dimethylglyoxime in steel solution
10. Micro-titrimetric estimation of :
 - a) Iron using cerium(IV)
 - b) Calcium and magnesium using EDTA
11. Quantitative estimation of copper (II), calcium (II) and chloride in a mixture.
12. Circular paper chromatographic separation of: (Demonstration)
 - a. Iron and nickel
 - b. Copper and nickel

PART – B

Semimicro qualitative analysis of inorganic mixtures containing **TWO** anions and **TWO** cations (excluding sodium, potassium and ammonium cations) and **ONE** of the following less common cations: W, Mo, Ce, Ti, Zr, V and Li.

References

1. Vogel's Text Book of Quantitative Chemical Analysis – 5th edition, J. Basset, R.C. Denney, G.H. Jeffery and J. Mendhom.
2. A Text Book of Quantitative Inorganic Analysis by A.I. Vogel, 3rd edition.
3. Spectrophotometric Determination of Elements by Z. Marczenko.
4. Vogel's Qualitative Inorganic Analysis – Svelha.
5. Macro and Semimicro Inorganic Qualitative Analysis by A.I. Vogel.
6. Semimicro Qualitative Analysis by F.J. Welcher and R.B. Halin.
7. Quantitative Chemical Analysis by Daniel C. Harris, 7th edition, (2006).

CHO SCP: 1.3/2.3. ORGANIC CHEMISTRY PRACTICALS-I

[128 HOURS]

Objectives:

- To understand synthetic methods by carrying out different experiments.
- To develop the skill for the separation and qualitative analysis of binary mixtures of organic compounds.

Course outcome:

- Students are involved in the multi-step synthesis of different organic compounds.

- Understand the qualitative analysis of binary mixture of organic compounds through separation, identification of functional groups and preparation of solid derivatives.

Pedagogy:

- Each student performs experiments as per the protocol in practical classes.
- Experimental setup for the synthesis of organic compounds by every individual.

Course experiments

PART-A

Multistep synthesis

1. Preparation *p*-bromoaniline from acetanilide.
2. Preparation of *n*-nitroaniline from acetanilide.
3. Oxidation of cyclohexanol to adipic acid.
4. Esterification: Preparation of benzocaine from *p*-nitrotoluene.
5. Diazotization (Sandmeyer's reaction): Preparation of *p*-chlorobenzoic acid from *p*-toluidine.
6. Preparation benzilic acid from benzoin.
7. Preparation of *o*-hydroxy benzophenone from phenyl benzoate *via* Fries rearrangement.
8. Preparation of benzanilide from benzophenone oxime *via* Beckmann rearrangement.
9. Preparation of benzoic acid from benzaldehyde (Cannizzaro Reaction).
10. Preparation of 2,4-dinitrophenylhydrazine from 2,4-dinitrochlorobenzene.
11. Preparation of *m*-nitrobenzoic acid from methylbenzoate.
12. Preparation of chalcone.

PART-B

Qualitative analysis: Separation of binary mixtures, identification of functional groups and preparation of suitable solid derivatives.

References:

1. Vogel' text book of practical organic chemistry, V edition, B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatehell.
2. Elementary practical organic chemistry, Part-I: Small scale preparations, Part-II: Qualitative organic analysis, By Arthur I, Vogel.
3. Hand book of organic analysis, H. T. Clarke and Norman Collie.
4. Experiments in Organic Chemistry, Louis F. Fieser.
5. Laboratory manual of Organic Chemistry by B. B. Dey and M. V. Sitaraman.
6. Practical Organic Chemistry by Mann F. G. and Saunders.

CHP SCP: 1.4/2.4. PHYSICAL CHEMISTRY PRACTICALS-I

[128 HOURS]

Objectives:

- To understand the rate of chemical reactions and factors influencing the reaction rate by carrying out kinetic experiments.
- To understand basic concepts of electrochemistry by carrying out experiments.

Course outcome:

- After the completion of this course, the students can able to develop the experimental skill and theoretical interpretation of experimental results of many physical chemistry

experiments of chemical kinetics in solution phase, thermodynamics, electrochemistry and spectrophotometry.

- This helps in academics, research and industries.

Pedagogy:

- Each student performs experiments as per the protocol in practical classes.
- To optimize the reaction conditions for understanding the rate of chemical reactions.

Course experiments

PART - A

1. Study of kinetics of hydrolysis of methyl acetate in presence of two different concentrations of HCl/H₂SO₄ and report the relative catalytic strength.
2. Study of kinetics of reaction between K₂S₂O₈ and KI, first order, determination of rate constants at two different temperatures and E_a .
3. To study the kinetics of saponification of ethyl acetate by conductivity method at two different concentrations of NaOH and report the relative catalytic strength.
4. Determination of partial molar volume of salt-water system (NaCl-H₂O/KCl-H₂O/KNO₃-H₂O) systems.
5. To study the kinetics of reaction between acetone and iodine - determination of order of reaction with respect to iodine and acetone.
6. Study the kinetics of decomposition of diacetone alcohol by NaOH, determine the catalytic coefficient of the reaction and comparison of strength of alkali.
7. Determination of energy of activation for the bromide-bromate reaction.
8. Kinetics of reaction between sodium formate and iodine and determination of energy of activation.
9. Determination of heat of solution of organic acid (benzoic acid/salicylic acid) by variable temperature method (graphical method).
10. Determination of degree of association of benzoic acid in benzene by distribution method.
11. To determine the eutectic point of a two component system (Naphthalene-*m*-dinitrobenzene system).
12. Analysis of a binary mixture (Glycerol & Water) by measurement of refractive index.
13. Determination of the molecular weight of a polymer material by viscosity measurements (cellulose acetate/methyl acrylate).

PART - B

1. Conductometric titration of a mixture of HCl and CH₃COOH against NaOH.
2. Conductometric titration of sodium sulphate against barium chloride.
3. pH titration of (a) HCl against NaOH (b) Copper sulphate against NaOH and (c) CH₃COOH/HCOOH against NaOH - determination of K_a .
4. Determination of equivalent conductance of weak electrolyte (CH₃COOH) at infinite dilution following Kohlrausch law.
5. Determination of dissociation constant and mean ionic activity coefficient of weak acids (CH₃COOH/HCOOH/ClCH₂COOH) by conductivity method.
6. Potentiometric titration of KI vs KMnO₄ solution.
7. Determination of dissociation constant of a weak acid (CH₃COOH/HCOOH/ClCH₂COOH) by potentiometric method.
8. Potentiometric titration of a mixture of halides (KCl+KI/KCl+KBr/KBr+KI) against AgNO₃.

9. To obtain the absorption spectra of coloured complexes, verification of Beer's law and estimation of metal ions in solution using a spectrophotometer.
10. Potentiometric titration of $K_2Cr_2O_7$ against FAS determination of redox potential and concentration of Fe^{2+} ions.
11. Conductometric titration of oxalic acid against NaOH and NH_4OH .
12. Coulometric titration I_2 vs $Na_2S_2O_3$.
13. Determination of acidic and basic dissociation constant and isoelectric point of an amino acid by pH metric method.
14. Kinetics of photodegradation of indigocarmine (IC) using ZnO/TiO_2 as photocatalyst and study the effect of $[ZnO/TiO_2]$ and $[IC]$ on the rate of photodegradation.

References:

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry – F. Daniels *et al.*
3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments – J. Rose.
7. Practical Physical Chemistry – S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry – D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry – R.C. Das and B. Behera, Tata Mc Graw Hill.

SOFT CORE PAPERS

CHA SCT: 1.1/2.1. TITRIMETRIC ANALYSIS

Objective:

- To familiarize statistical methods to validate analytical methods.
- To learn sampling techniques and conventional volumetric methods.

Course Outcome:

After studying this course the student able to:

- Understand on quantitative and qualitative methods of analysis with relevant equilibrium chemistry.
- Develop the ideas with the fundamental aspects in analytical chemistry.
- Build the interest in students in developing good experimental protocols, and in interpreting experimental results.
- Gain analytical knowledge for the quantitative analysis of various samples of different origin under titrimetric aspects.
- Learn statistical aspects from which the spirit of assessing the results will be enhanced.
- Learn method development and validation features so that they will become outstanding basement for their career in various industries.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room

teaching.

Course content

UNIT-I

[16 HOURS]

Titrimetric analysis: An overview of titrimetry. Principles of titrimetric analysis. Titration curves. Titrations based on acid-base reactions - titration curves for strong acid and strong base, weak acid and strong base and weak base and strong acid titrations. Selecting and evaluating the end point. Finding the end point by visual indicators, monitoring *pH* and temperature.

Quantitative applications – selecting and standardizing a titrant, inorganic analysis - alkalinity, acidity and free CO₂ in water and waste waters, nitrogen, sulphur ammonium salts, nitrates and nitrites, carbonates and bicarbonates. Organic analysis - functional groups like carboxylic acid, sulphonic acid, amine, ester, hydroxyl, carbonyl. Air pollutants like SO₂. Quantitative calculations. Characterization applications - equivalent weights and equilibrium constants.

Acid-base titrations in non-aqueous media: Role of solvent in acid-base titrations, solvent systems, differentiating ability of a solvent, some selected solvents, titrants and standards, titration curves, effect of water, determining the equivalence point, typical applications - determination of carboxylic acids, phenols and amines.

UNIT-II

[16 HOURS]

Precipitation titrations: Titration curves, feasibility of precipitation titrations, factors affecting shape - titrant and analyte concentration, completeness of the reaction, titrants and standards, indicators for precipitation titrations involving silver nitrate, Volhard, Mohr and Fajan's methods, typical applications.

Complexometric titrations: Complex formation reactions, stability of complexes, stepwise formation constants, chelating agents, EDTA - acidic properties, complexes with metal ions, equilibrium calculations involving EDTA, conditional formation constants, derivation of EDTA titration curves, effect of other complexing agents, factors affecting the shape of titration curves - completeness of reaction, indicators for EDTA titrations - theory of common indicators, titration methods employing EDTA - direct, back and displacement titrations, indirect determinations, titration of mixtures.

Redox titrations: Balancing redox equations, calculation of the equilibrium constant of redox reactions, calculating titration curves, detection of end point, visual indicators and potentiometric end point detection. Quantitative applications-adjusting the analyte's oxidation state, selecting and standardizing a titrant. Inorganic analysis- chlorine residuals, dissolved oxygen in water, water in non-aqueous solvents. Organic analysis-chemical oxygen demand (COD) in natural and waste waters, titrations of mercaptans and ascorbic acid with I₃⁻ and titration of organic compounds using periodate.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch, 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001, John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, Prentice Hall, Inc. New Delhi.

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- Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993 prenticeHall, Inc. New Delhi.
- Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
- Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
- Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.

CHI SCT: 1.2/2.2. CHEMISTRY OF SELECTED ELEMENTS

Objectives:

- To learn basic chemistry of some selected group elements from periodic table.
- To understand properties of metal-metal bonding and cluster compounds.

Course outcome:

- Understand the chemistry of hydrogen and group 2 elements.
- The chemistry of pseudohalogens, interhalogens and their halogen compounds.
- The chemistry of xenon and other noble gas compounds.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching. Course content

UNIT-I

[16 HOURS]

Compounds of hydrogen: The hydrogen and hydride ions, Dihydrogen and hydrogen bonding. Classes of binary hydrides: Molecular hydrides, saline hydrides and metallic hydrides.

The Group 1 elements: Occurrence, extraction and uses. Simple compounds: Hydrides, halides, oxides, hydroxides, oxoacids, nitrides, solubility and hydration and solutions in liquid ammonia. Coordination and organometallic compounds. Applications.

The Group 2 elements: Occurrence, extraction and uses. General properties. Halides, hydrides and salts of oxo acids. Complex ion in aqueous solution and complexes with amido and alkoxy ligands.

The Group 15 elements: Introduction, oxides and oxoacids of nitrogen and phosphorus.

UNIT-II

[16 HOURS]

The Group 17 elements: Occurrence, recovery and uses. Trends in properties and pseudohalogens. **Interhalogens:** Physical properties and structures, chemical properties, cationic interhalogens. **Compounds with oxygen:** Halogen oxides, oxoacids and oxoanions. Trends in rates of redox reactions and redox properties of individual oxidation states.

Chemistry of astatine.

The Group 18 elements: Occurrence, recovery and uses. Synthesis and structure of xenon

fluorides, Reaction of xenon fluorides, xenon-oxygen compounds, Organoxenon compounds, other compounds of noble gases.

M-M bonds: Multiple metal-metal bonds.

Cluster compounds: carbonyl and carbide clusters.

References

1. Basic Inorganic Chemistry – 3rd edition. F.A. Cotton, G. Wilkinson and P.L. Gaus, John Wiley and Sons (2002).
2. Inorganic Chemistry, 3rd edition. James E. Huheey, Harper and Row Publishers (1983).
3. Inorganic Chemistry, 3rd edition. G.L. Miessler and D.A. Tarr, Pearson Education (2004).
4. Inorganic Chemistry, 4th edition. C.E. Housecroft and A.G. Sharpe, Pearson Education Ltd. (2012).
5. Chemistry of the Elements – N.N. Greenwood and A. Earnshaw, Pergamon Press (1985).
6. Inorganic Chemistry, 6th edition. D.F. Shriver, M. Weller. T. Overton, J. Rourke and F.

CHO SCT: 1.3/2.3. CHEMISTRY OF NATURAL PRODUCTS-I

Objectives:

- To learn the nomenclature, classification, purification, structure and synthesis of some natural products.
- To understand the biological functions of biomolecules.

Course outcome:

- Acquire the knowledge of chemistry of lipids, prostaglandins and terpenoids.
- Understand the biological importance of chlorophyll and porphyrins.
- Chemistry of flavonoids and isoflavonoids.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern method like power point presentation is used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Lipids: Nomenclature, classification, purification, structure and synthesis of fatty acids, phospholipids, sphingolipids. Biological importance of lipids (Lecithin, sphingolipids, oils and fats).

Prostaglandins: Introduction, classification and biological importance of PG's. Constitution of PGE1. Synthesis of PGE & F series.

Terpenoids: Introduction, classification and general methods of structural elucidation. Chemistry of pinene, camphor, caryophyllene, santonin. Biosynthesis of terpenoids.

UNIT-II

[16 HOURS]

Porphyrins: Introduction, structure and biological functions of haemin. Vitamin B12: structure and as coenzyme in molecular rearrangement reactions; Chlorophyll: structure and biological importance.

Flavonoids and Isoflavonoids: Occurrence, nomenclature and general methods of structure determination. Isolation and synthesis of Apigenin, Luteolin, Kaempferol, Quercetin, wedelolactone, Butein, Daidzein. Biosynthesis of flavonoids and isoflavonoids: Acetate Pathway and Shikimic acid Pathway. Biological importance of flavonoids and isoflavonoid

References

1. Organic Chemistry, VI edition, Robert T. Morrison, Robert N. Boyd.
2. Organic Chemistry, Vol-II by I. L. Finar.
3. Schaum's outline of theory and problems of Organic Chemistry, Harbert Meislich, Howard Nechamkin and Jacob Sharefkin.
4. Natural products: Their chemistry and biological significance, J. Mann, R. S. Davidson, J. B. Banthorpe and J. B. Harborne.
5. Synthetic drugs, Gurdeep R. Chatwal.
6. Heterocyclic chemistry by Achison.
7. Heterocyclic chemistry by Smith and Joule.
8. Heterocyclic chemistry by Pacquete.

CHP SCT: 1.4/2.4. BIOPHYSICAL CHEMISTRY

Objectives:

- To understand the physico-chemical principles of biological fluids.
- To learn the pharmacokinetics, pharmacodynamics, toxicokinetics of biological systems.

Course outcome:

- After the completion of this course, the students gain the knowledge on theory and principles of biophysical chemistry and pharmacokinetics.
- This course helps to understanding the bio-availability and different pharmacokinetic parameters of drugs in the living system.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Biophysical Chemistry: Electrophoresis - Principles of free electrophoresis, zone electrophoresis, gel electrophoresis and its applications in qualitative and quantitative study of proteins. Determination of isoelectric point of a protein. Electro-osmosis and streaming potential and its biological significance. Biological significance of Donnan membrane phenomenon. Micelles and its involvement during digestion and absorption of dietary lipids. Diffusion of solutes across bio-membranes and its application in the mechanism of respiratory exchange. -Salting In and -Salting Out of proteins. Osmotic behaviour of cells and osmo-regulation and its application in the evolution of excretory systems of organisms. Effect of temperature and pH on the viscosity of bio-molecules (albumin solution). Significance of viscosity in biological systems - mechanism of muscle contraction, polymerization of DNA and nature of blood flow through different vessels. Effect of temperature, solute concentration (amino acids) on surface tension. Biological significance of surface tension - stability of Alveoli in lungs, interfacial tension in living cells (Danielli and Davson model). Application of sedimentation velocity and

sedimentation equilibrium method for molecular weight determination of proteins.

UNIT-II

[16 HOURS]

Pharmacokinetics: Introduction, biopharmaceutics, pharmacokinetics, clinical pharmacokinetics, pharmacodynamics, toxicokinetics and clinical toxicology. Measurement of drug concentration in blood, plasma or serum. Plasma level-time curve, significance of measuring plasma drug concentrations.

One compartment open model: Intravenous route of administration of drug, elimination rate constant, apparent volume of distribution and significance. Calculation of elimination rate constant from urinary excretion data, clinical application.

Two compartment model: Plasma level-time curve, relationship between tissue and plasma drug concentrations, Apparent volumes of distribution. Drug clearance, clinical example. Plasma level-time curve for a three compartment open model.

Drug absorption: Factors affecting the rate of drug absorption - nature of the cell membrane, Route of drug administration - Oral drug absorption, Intravenous infusion and intravenous solutions, Effect of food on gastrointestinal drug absorption rate.

References

1. Introduction to Physical Organic Chemistry, R.D. Gilliom, Madison – Wesley, USA (1970).
2. Physical Organic Chemistry- Reaction Rate and Equilibrium Mechanism – L.P. Hammett, McGraw HillBook, Co., (1970).
3. Biophysical Chemistry- Principle and Technique – A. Upadhyay, K. Upadhyay and N. Nath, Himalaya Publishing House, Bombay, (1998).
4. Essentials of Physical Chemistry and Pharmacy – H. J. Arnikaar, S. S. Kadam, K.N. Gujan, Orient Longman, Bombay, (1992).
5. Applied Biopharmacokinetics and Pharmacokinetics - Leon Shargel, Andrew YuPrentice-Hall International, Inc (4th edition).
6. Essentials of Physical Chemistry and Pharmacy – H.J. Arnikaar, S.S. Kadam, K.N. Gujan, Orient Longman, Bombay, (1992).

SECOND SEMESTER HARD CORE PAPERS

CHI HCT: 2.1. COORDINATION CHEMISTRY

Objectives:

- To understand the preparation, properties, electronic configuration and structural elucidation of coordination compounds.
- To learn the reaction mechanism, stereochemistry and photochemistry of coordination compounds.

Course outcome:

- Gain the knowledge of preparative methods of coordination compounds and geometries of different coordination numbers.
- Understand the CFT and MOT bonding theories of metal complexes.
- Electronic spectra, magnetic properties and infrared spectroscopy of coordination compounds. In addition, understand the reaction mechanism and photochemistry of coordination compounds.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Preparation of coordination compounds: Introduction, Preparative methods- simple addition reactions, substitution reactions, oxidation-reduction reactions, thermal dissociation reactions. Geometries of metal complexes of higher coordination numbers (2-8).

Stability of coordination compounds: Introduction, trends in stepwise stability constants, factors influencing the stability of metal complexes with reference to the nature of metal ion and ligands, the Irving-William series, chelate effect.

Determination of stability constants: Theoretical aspects of determination of stability constants of metal complexes by spectrophotometric methods.

Crystal field theory: Salient features of CFT, d-orbital splitting in octahedral, tetrahedral, square planar and tetragonal complexes, Jahn-Teller distortions, measurement of $10 Dq$ and factors affecting it. Evidences for metal-ligand covalency.

Molecular Orbital Theory: MOT to octahedral, tetrahedral and square planar complexes without and with pi-bonding.

UNIT-II

[16 HOURS]

Electronic spectra: Introduction, selection rules and intensities, electronic spectra of octahedral and tetrahedral complexes, Term symbols for d^n ions, Orgel and Tanabe-Sugano diagrams, charge-transfer spectra. Ligand-field transition. Charge transfer and energy applications. Optical rotatory dispersion and Circular dichroism. Magnetic circular dichroism.

Magnetic properties: Introduction, magnetic susceptibility and its measurements, spin and orbital contributions to the magnetic moment, the effects of temperature on μ_{eff} , spin-cross

over, ferromagnetism, anti-ferromagnetism and ferrimagnetism.

Applications of infrared spectroscopy of coordination compounds: Metal complexes of ammine, nitro, nitrito, hydroxo, carbonato, sulphato, cyano, cyanato and thiocyanato complexes.

UNIT-III

[16 HOURS]

Reactions and Mechanisms: Introduction. Substitution reactions- Inert and labile compounds, mechanisms of substitution. Kinetic consequences of Reaction pathways- Dissociation, interchange and association. Experimental evidence in octahedral substitution- Dissociation, associative mechanisms, the conjugate base mechanism, the kinetic chelate effect.

Stereochemistry of reactions- Substitution in *trans* and its complexes, isomerization of chelate rings. Substitution reactions of square-planar complexes-kinetics and stereochemistry of square-planar substitutions, evidence for associative reactions, explanations of the *trans* effect.

Electron-transfer processes: Inner-sphere mechanism and outer-sphere mechanism, conditions for high and low oxidation numbers.

Photochemistry of coordination compounds: Photochemistry of chromium(III) ammine compounds, Light-induced excited state spin trapping in iron(II) compounds and MLCT photochemistry in pentammineruthenium(II) compounds.

References

1. Physical Inorganic Chemistry- A Coordination Chemistry Approach- S.F.A. Kettle, Spektrum, Oxford, (1996).
2. Inorganic Chemistry-4th edition. C.E. Housecroft and A.G. Sharpe, Pearson Education Ltd. (2012).
3. Inorganic Chemistry-5th edition. G.L. Miessler, P. J. Fischer and D.A. Tarr, Pearson (2014).
4. Inorganic Chemistry-6th edition. D.F. Shriver, M. Weller. T. Overton, J. Rourke and F. Armstrong, Oxford University Press (2014).
5. Inorganic Chemistry- 3rd edition, James E. Huheey, Harper and Row Publishers, (1983).
6. Basic Inorganic Chemistry- 3rd edition, F.A. Cotton, G. Wilkinson and P.L. Gaus, John Wiley and Sons, (2002).
7. Infrared and Raman Spectra of Coordination Compounds, Part-B- 6th edition, K. Nakamoto, John Wiley and Sons (2009).

CHO HCT: 2.2. SYNTHETIC ORGANIC CHEMISTRY

Objectives:

- To understand the reactions of organic compounds involving various reagents.
- To learn the synthesis and retro-synthesis of different organic compounds.

Course outcome:

- Students are familiar about chemistry of oxidants, reductants and their applications in the organic synthesis.
- Understand the various catalysts in organic synthesis by known naming reactions.
- Retro-synthesis and molecular rearrangement.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern method like power point presentation is used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Oxidation: Oxidation with chromium and manganese reagents (CrO_3 , $\text{K}_2\text{Cr}_2\text{O}_7$, PCC, PDC, Sarret reagent, MnO_2 , KMnO_4), peroxides and peracids, periodic acid, OsO_4 , SeO_2 , NBS, Oppenauer oxidation, Sharpless epoxidation.

Reduction: Catalytic hydrogenation (homogeneous and heterogeneous) – catalysts (Pt, Pd, Ra-C, Ni, Ru, Rh), solvents and reduction of functional groups, catalytic hydrogen transfer reactions. Wilkinson catalyst, LiAlH_4 , NaBH_4 , DIBAL-H, Sodium cyanoborohydride, Birch reduction, Leukart reaction (reductive amination), diborane as reducing agent, Meerwein-Ponndorf-Verley reduction, Wolff-Kishner reduction, Clemensen reduction, stannous chloride, Organoboron compounds: Introduction and preparations; Hydroboration and its applications; Reactions of organoboranes: isomerization reactions, oxidation, protonolysis, carbonylation, cyanidation. Reactions with aldehydes or ketones (*E* and *Z*-alkenes).

UNIT-II

[16 HOURS]

Reagents and reactions in organic synthesis: Use of following reagents in organic synthesis and functional group transformations: Lithium diisopropylamide (LDA), Gilman reagent, dicyclohexyl carbodimide (DCC), dichlorodicyanoquinone (DDQ), Silane reagents-trialkylsilyl halides, trimethylsilyl cyanide, trimethyl silane; phase transfer catalyst, crown ethers, cyclodextrins, Ziegler-Natta catalyst, diazomethane, Woodward and Prevost hydroxylation, Stark enamine reaction, phosphorous ylides - Wittig and related reactions, Sulphur ylides – reactions with aldehydes and ketones, 1,3-dithiane anions - Umpolung reaction, Peterson reaction. Palladium reagents: Suzuki coupling, Heck reaction, Negishi reaction. Green Chemistry: Definition and principles.

UNIT-III

[16 HOURS]

Molecular rearrangements: Introduction Carbon to carbon migration: Pinacol-pinacolone, Wagner-Meerwein, Benzidine, benzylic acid, Favorskii, Fries rearrangement, dienophile rearrangement. Carbon to nitrogen migration: Hofmann, Curtius, Lossen, Schmidt and Beckmann rearrangements. Miscellaneous rearrangements: Wittig, Smiles, Bayer-Villegier rearrangement and Barton reaction.

Retrosynthesis: Introduction to disconnection approach: Basic principles and terminologies used in disconnection approach. One group C-X and two group C-X disconnections. Synthons and synthetic equivalents. Retrosynthesis and synthesis of benzofurans, *p*-methoxy acetophenone, saccharine, α -bisabolene, nuciferal, tetralone, ibuprofen; Functional group transformations in organic synthesis: nitro to keto, nitro to amine, acid to alcohol etc.

References

1. Organic Chemistry, VI edition, Robert T. Morrison, Robert N. Boyd.
2. Organic Chemistry, Vol-I & II by I. L. Finar.
3. Advance Organic Chemistry, IV edition, Jerry March.
4. Advance Organic Chemistry, III edition, Part-A and Part-B, Francis A. Carey and Rechar J. Sundberg.
5. Organic Chemistry, III edition, V. K. Ahluwalia and Rakesh Kumar Parashar.
6. Organic named reactions and molecular rearrangements, Gudeep Raj.
7. Modern synthetic reactions, II edition, H. O. House.
8. Organic synthesis, Jagadamba Singh and L. D. S. Yadav.
9. Green Chemistry, K. R. Desai.
10. Principles of Organic synthesis, R. O. C. Norman and J. M. Coxon.
11. Organic synthesis II edition, V. K. Aluwalia and Renu Agarwal.
12. Organic synthesis, Robert E. Ireland.
13. Schaum's outline of theory and problems of Organic Chemistry, Harbert Meislich, Howard Nechamkin and Jacob Sharefkin.
14. Organic chemistry by Clayden, Greeves, Warren and Wothers.

CHP HCT: 2.3. PRINCIPLES OF PHYSICAL CHEMISTRY

Objectives:

- To understand the theoretical calculations of energies of simple molecules.
- To learn the calculation of different energies by statistical thermodynamics.
- To understand the basics of polymers, their kinetics and applications.

Course outcome:

- Principles of Quantum chemistry and theoretical calculations of energies of molecules and chemical reactions.
- Apply solutions of the Schrödinger equation for simple systems (particle in a box, rigid rotor, harmonic oscillator) to real systems (vibrational, rotational, and electronic energy states) in determining the energy of stationary states.
- Explain angular momentum as possessed by atomic or molecular systems, various descriptions of how angular momentum can be coupled, and how conservation of angular momentum is important to spectroscopy.
- Concepts and applicability of statistical thermodynamics in the calculations of different energies in the reacting system. Applications of phase rule for separation of the metals from ore.
- Fundamentals of polymers and their applications in controlling the quality and waste management of polymer product.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern method like power point presentation is used in class room teaching.
- Assigning the students to solve the problems to understand the concepts.

Course content

UNIT-I

[16 HOURS]

Quantum Chemistry: Introduction to quantum mechanics: Schrödinger wave equation, time-independent and time dependent Schrödinger wave equation and the relation between their solutions. Eigen functions and Eigen values. Physical interpretation of wave function. Concept of operators – Laplacian, Hamiltonian, Linear and Hermitian operators. Angular momentum operators and their properties. Commutative and non-commutative operators. Normalization, orthogonality and orthonormality of wave functions. Postulates of quantum mechanics. Solutions of Schrödinger wave equation for free particles, particle in a ring, particle in three dimensional box. Quantum mechanical degeneracy, tunnelling (no derivation). Wave equation for H-atom, separation and solution of R, ϕ and θ equations. Application of Schrodinger equation to rigid rotator and harmonic oscillator. Eigen functions and Eigen values of angular momentum. Ladder operator method for angular momentum.

UNIT-II

[16 HOURS]

Statistical thermodynamics: Objectives of statistical thermodynamics, concept of distribution, types of ensembles. Thermodynamic probability and most probable distribution law. Partition functions – definition, evaluation of translational, rotational and vibrational and electronic partition functions for monoatomic, diatomic and polyatomic gaseous molecules. Sackur-Tetrode equation for entropy of translation function. Calculation of thermodynamic functions and equilibrium constants in terms of partition functions. Different distribution laws (Types of statistics): Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics (derivation of the three distribution laws). Comparison of Bose-Einstein and Fermi-Dirac Statistics with Maxwell-Boltzmann statistics. Problems and their solutions.

Phase rule studies: Thermodynamic derivation of phase rule. Application of phase rule to the two component systems - compound formation with congruent melting point and incongruent melting points, Roozeboom's classification. Application of phase rule to three component systems- systems of three liquids and systems of two salts and water.

UNIT-III

[16 HOURS]

Polymers: Fundamentals of polymers - monomers, repeat units, degree of polymerization. Linear, branched and network polymers. Classification of polymers, Polymerization - condensation, addition, free radical, ionic, co-ordination polymerization and ring opening polymerization. Molecular weight and size, polydispersion. Average molecular weight concepts – number, weight and viscosity average molecular weight. Determination of molecular weights - viscosity method, osmotic pressure method, sedimentation and light scattering methods.

Kinetics of Polymerization - Condensation, addition, free radical, ionic, co-ordination polymerization.

Phase transitions in polymers and thermal characterization: Glass transition, crystallinity and melting- correlation with the polymer structure.

Polymers in solution: Criteria of polymer solubility, thermodynamics of polymer solutions.

Colloids: Types and classification, Micelles: Surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactants, micellar catalysis.

References

1. Text Book of Physical Chemistry by Samuel Glasstone, MacMillan Indian Ltd., 2nd edition (1974).
2. Quantum Chemistry – A.K. Chandra. 2nd edition, Tata McGraw Hill Publishing Co. Ltd., (1983).
3. Quantum Chemistry – Eyring, Walter and Kimball. John Wiley and Sons, Inc., New York.
4. Quantum Chemistry – I.N. Levine. Pearson Education, New Delhi, (2000).
5. Theoretical Chemistry – S. Glasstone. East West Press, New Delhi, (1973).
6. Quantum Chemistry – R.K. Prasad, New Age International Publishers, (1996).
7. Text Book of Polymer Science, F.W. Billmeyer, Jr., John Wiley, London (1994).
8. Polymer Science. V. R. Gowrikar, N.V. Vishwanathan and J. Sreedhar, Wiley Eastern, New Delhi (1990).
9. Fundamentals of Polymer Science and Engineering. A. Kumar and S.K. Gupta, Tata – McGraw Hill New Delhi (1978).
10. Polymer Characterization, D. Campbell and J.R. White, Chapman and Hall, New York.
11. Fundamental Principles of Polymer Materials, R.L. Rosen, John Wiley and Sons, New York.

CHG HCT: 2.4. MOLECULAR SYMMETRY AND SPECTROSCOPY

Objectives:

- To understand the concepts of symmetry and symmetry operations and their application to CFT, hybridization, MOT and vibrational spectroscopy.
- To learn the theory and applications of microwave, vibration and Raman spectroscopy.
- To understand the principles and applications of UV-Visible and resonance Raman spectroscopy.

Course outcome:

- Molecular symmetry and applications of group theory to CFT, hybridization, MOT and vibrational spectroscopy.
- Theory and principles of Rotation, Vibration and Raman Spectroscopy.
- Theory and principles Electronic and Resonance Raman spectroscopy.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Molecular models are used to teach symmetry aspects of molecules
- Modern methods like power point presentation and animations are used in class room teaching.
- Students will be assigned to solve the numerical problems.

Course content

UNIT-I

[16 HOURS]

Molecular symmetry and group theory: Symmetry elements and symmetry operations.

The Point Groups Used with Molecules: Concept of a group, definition of a point group. Classification of molecules into point groups. Subgroups.

Hermann-Mauguin symbols for point groups. Multiplication tables (C_{2v} , C_{2h} and C_{3v}). Matrix notation for the symmetry elements. Classes and similarity transformation.

Representation of groups: The Great Orthogonality theorem and its consequences.

Character tables (C_s , C_i , C_2 , C_{2v} , C_{2h} and C_{3v}). Symmetry and dipole moment.

Applications of group theory: Group theory and hybrid orbitals.

Symmetry in Chemical bonding: Group theory to Crystal field theory and Molecular orbital theory (octahedral and tetrahedral complexes).

Symmetry in Vibrational Spectroscopy: Determining the symmetry groups of normal modes for non-linear molecules (H_2O , NH_3 , CH_4 , $trans-N_2F_2$) and linear molecules (CO , HCl , HCN and CO_2) (Integration method).

UNIT-II

[16 HOURS]

Microwave spectroscopy: Moment of inertia expression for linear di-atomic molecules. Rotation spectra of diatomic Molecules - rigid and non rigid rotator model. Rotational quantum number and the selection rule. Effect of isotopic substitution on rotation spectra. Classification of polyatomic molecules based on moment of inertia. Rotation spectra of polyatomic molecules (OCS , CH_3F and BCl_3). Applications - Principles of determination of Bond length and moment

of inertia from rotational spectra. Stark effect in rotation spectra and determination of dipole moments.

Vibration spectroscopy: Vibration of diatomic molecules, vibrational energy curves for simple harmonic oscillator. Effects of anharmonic oscillation, expressions for fundamental and overtone frequencies. Vibration - rotation spectra of carbon monoxide. Vibration of polyatomic molecules – The number of degrees of freedom of vibration. Parallel and perpendicular vibrations (CO_2 and H_2O). Combination, difference and hot bands. Fermi resonance. Force constant and its significance. Theory of infrared absorption and theoretical group frequency. Intensity of absorption band and types of absorptions. Applications: Structures of small molecules: XY_2 – linear or bent, XY_3 – planar or pyramidal.

Raman spectroscopy: Introduction, Raman and Rayleigh scattering, Stokes and anti-Stokes lines, polarization of Raman lines, depolarization factor, polarizability ellipsoid. Theories of Raman spectra - classical and quantum theory. Rotation-Raman and vibration-Raman spectra. Raman activity of vibrations, rule of mutual exclusion principle. Vibration modes of some simple molecules and their activity.

UNIT-III

[16 HOURS]

UV Visible spectroscopy: Quantitative aspects of absorption – Beer's law, Technology associated with absorption measurements. Limitations – real, chemical, instrumental and personal. Theory of molecular absorption. Vibration-rotation fine structure of electronic spectra. Types of absorption bands: n to π^* , π to π^* , n to σ^* and σ to σ^* , C-T and ligand field. Instrumentation.

Applications: Qualitative and quantitative analysis of binary mixtures, measurements of dissociation constants of acids and bases, determination of molecular weight. Woodward's empirical rules for predicting the wavelength of maximum absorption for olefins, conjugated dienes, cyclic trienes and polyenes, α,β -unsaturated aldehydes and ketones, benzene and substituted benzene rings.

Resonance Raman Spectroscopy: Resonance Raman Effect and its applications. Non-linear Raman effects: Hyper, stimulated and inverse Raman effects. Coherent Anti-Stokes Raman Scattering and its applications.

References

1. Chemical Applications of Group Theory, 3rd edition, F.A. Cotton, John Wiley and Sons (2006).
2. Molecular Symmetry and Group Theory – Robert L Carter, John Wiley and Sons (2005).
3. Symmetry in Chemistry - H. Jaffe and M. Orchin, John Wiley, New York (1965).
4. Molecular Symmetry – David J. Willock, John Wiley and Sons Ltd., (2009).
5. Group Theory and its Chemical Applications - P.K. Bhattacharya, Himalaya Publications, New Delhi (1998).
6. Fundamentals of Molecular Spectroscopy, C.N. Banwell and E.M. McCash. 4th edition, Tata McGraw Hill, New Delhi.
7. Fundamentals of molecular spectroscopy, G. M. Barrow, McGraw Hill, New York (International students Edition), 1974.

8. Theoretical chemistry, S. Glasstone, affiliated East-West Press Pvt. Ltd, New Delhi, 1973.
9. Spectroscopy, B.P. Straughan and S. Walker, John Wiley & Sons Inc., New York, Vol. 1 and 2, 1976.
10. Vibration Spectroscopy Theory and Applications, D.N. Satyanarayana, New Age International, New Delhi (2004).
11. Spectroscopy, B.P. Straughan and S. Salker, John Wiley and Sons Inc., New York, Vol.2, 1976.
12. Organic Spectroscopy, William Kemp, English Language Book society, Macmillan, 1987.
13. Instrumental methods of analysis, H. H. Willard, L. L. Merritt and J. A. Dean, 7th Edition, 1988.
14. Physical methods in inorganic chemistry, R. S. Drago, affiliated East-West press Pvt. Ltd., (Student Edition) 1978.

OPEN ELECTIVE (FOR NON-CHEMISTRY STUDENTS ONLY)
CH OET:2.1/3.1- GENERAL CHEMISTRY

Objectives:

- To understand the basic concepts of chemistry including periodic properties of elements, structure and bonding.
- To learn the applications of synthetic products and biological importance of natural products. .
- To understand the basic concepts of thermodynamics, chemical kinetics, ionic equilibria and electrochemistry.
- To learn the statistical evaluation of experimental data. Applications of titrimetric methods and separation techniques.

Course outcome:

- Periodic properties of elements, structure and bonding of ionic compounds as well as various concepts of acids and bases.
- Hybridization, bonding and molecular structure of simple organic molecules. And also, biological importance of natural products.
- Basic concepts of thermodynamics, chemical kinetics, electrochemistry and ionic equilibria and their applications.
- Statistical evaluation of experimental data, concept of titrimetric and chromatographic methods.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.
- Students will be assigned to solve the numerical problems to understand the concepts.

Course content

UNIT-I

[16 HOURS]

Periodic table and chemical periodicity: Periodic properties of elements, State of Matter, their resources. Important periodic properties of the elements, covalent radii, ionic radii, ionization potential, electron affinity and electronegativity.

Structure and Bonding: Properties of ionic compounds, structure of crystal lattices (NaCl, CsCl, ZnS, Wurtzite and rutile), Lattice energy, Born-Haber Cycle, radius ratio rules and their limitations. MO treatment for homo- and heteronuclear diatomic molecules. VSEPR model to simple molecules. Factors affecting the radii of ions, covalent character in ionic bonds, hydration energy and solubility of ionic compounds.

Concepts of Acids and Bases: Review of acid base concepts. Lux-Flood and solvent system concepts. Hard-soft acids and bases. Applications.

UNIT-II

[16 HOURS]

Bonding and molecular structure: Introduction to organic chemistry, atomic orbitals, sigma and pi bond formation-molecular orbital (MO) method, sp, sp² and sp³ hybridization, bond length, bond dissociation energies and bond angles (open chain and cyclic compounds). Electronegativity and polarity of the bonds. Classifications and reactions of organic compounds (with examples).

Acids and bases: Hydrogen bonding, resonance and inductive effect on strengths of acids and bases.

Biological importance of natural products: Amino acids, proteins, carbohydrates (cellulose, starch, glycogen), lipids (fats and oils, phospholipids), prostaglandins, nucleic acids, steroids, alkaloids, vitamins, flavonoids.

Applications of synthetic products: Dyes, drugs, polymers (plastics), soaps and detergents, pesticides and pheromones.

UNIT-III

[16 HOURS]

Thermodynamics: First and second laws of thermodynamics. Concept of entropy and free energy, entropy as a measure of unavailable energy. Entropy and free energy changes and spontaneity of process.

Chemical kinetics: Rate and order of reaction. Factor affecting the rate of reaction. and determination Order of reaction. Energy of activation and its determination. Brief account of collision and activated complex theories.

Ionic equilibria: pH scale, buffer solutions, calculation of pH of buffer solutions, buffer capacity and buffer index, buffer mixtures.

Solutions: Concentration units, solutions of liquids in liquids, Raoult's law, ideal and non-ideal solutions.

Electrochemistry: Electrolytic conductance, specific, equivalent and molar conductance, ionic mobility and transference number, factors affecting the electrolytic conductance, Arrhenius theory of strong and weak electrolytes, assumptions of Debye-Huckel theory of strong electrolytes. Single electrode potential, reference electrodes, galvanic cells, emf of galvanic cells and construction of electrochemical cells.

UNIT-IV

[16 HOURS]

Basic Statistics and Data Handling: Significant figures, accuracy and precision. Types of errors: Determinate error and indeterminate error. Definitions for statistics. Quantifying random

error: Confidence limits, variance. Rejection of results.

Applications of titrimetric methods: Introduction, theory and applications of acid base titrimetry, complexometric titrations and redox titrimetry

Separation techniques: Purification-Crystallization, sublimation, fractional crystallization, distillation techniques (simple distillation, steam distillation, distillation under reduced pressure, and fractional distillation), solvent extraction.

Chromatography: Thin layer chromatography and ion-exchange chromatography and their applications in the separation of the components from the mixture.

References

1. Text Book of Physical Chem., by Samuel Glasstone, MacMillan Indian Ltd., 2ndEd. (1974)
2. Elements of Physical Chem., by Lewis and Glasstone, 2nd Edn. Macmillan & Co Ltd.
3. Organic Chemistry, VI edition, Robert T. Morrison, Robert N. Boyd.
4. Organic Chemistry, Vol-I by I. L. Finar.
5. Vogel' text book of practical organic chemistry, V edition, B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatehell.
6. Laboratory manual of Organic Chemistry by B. B. Dey and M. V. Sitaraman.
7. Practical Organic Chemistry by Mann F. G. and Saunders.
8. Fundamentals of analytical Chem., 8th Edition, D. A. Skoog, West, Holler and Crouch.
9. Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
10. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000

THIRD SEMESTER HARD CORE PAPERS

CHI HCT: 3.1. ADVANCED INORGANIC CHEMISTRY

Objectives:

- To understand the fundamental concepts of organometallic chemistry and general principles of homogeneous and heterogeneous catalysis.
- To learn the concepts of metal clusters, silicates and silicones.

Course outcome:

- Fundamental concepts of organometallic chemistry and synthesis, structure and bonding in different organometallics and their applications.
- Homogeneous and heterogeneous catalysts and their applications in the synthesis of organic compounds in industries.
- Chemistry of main group elements, metal clusters, silicates and silicones and their applications in day to day life.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Fundamental concepts: Introduction, Classification of organometallic compounds by bond type, nomenclature, the effective atomic number rule, complexes that disobey the EAN rule, common reactions used in complex formation.

Organometallics of transition metals: Preparation, bonding and structures of nickel, cobalt, iron and manganese carbonyls. Preparation and structures of metal nitrosyls.

Ferrocene: Preparation, structure and bonding. **Metal-carbene and metal-carbyne complexes.**

Complexes containing alkene, alkyne, arene and allyl ligands: Preparation, structure and bonding.

UNIT-II

[16 HOURS]

General principles of Catalysis: Language of catalysis. Homogeneous and heterogeneous catalysts.

Homogeneous catalysis - Industrial Applications: Alkene hydrogenation and hydroformylation, The Wacker's process, Monsanto acetic acid process and L-DOPA synthesis, alkene oligomerizations, water-gas shift reactions. The Reppe reaction.

Heterogeneous catalysis –The nature of heterogeneous catalysts. Alkene polymerization: Ziegler-Natta catalysis, Fischer-Tropsch carbon chain growth.

Zeolites as catalysts for organic transformation: Uses of ZSM – 5.

Alkene metathesis, hydroboration, arylation or vinylation of olefins (Heck reaction).

Biological and Medicinal Applications: Organomercury, organoboron, organosilicon and organoarsenic compounds.

UNIT-III

[16 HOURS]

Chemistry of main group elements: Diborane and its reactions, polyhedral boranes (preparation, properties, structure and bonding). Wade's rules, carboranes and metallocarboranes. Borazines. Phosphazenes, S-N compounds.

Metal clusters: Evidences and factors favoring of M-M bonding, Wade's-Mingo's-Lauher rules, bi, tri, tetra, penta and hexa nuclear metal carbonyl clusters.

Low and high nuclearity carbonyl clusters. Electron counting schemes in carbonyl clusters. The isolobal analogy.

Silicates: Structure, classification - silicates with discrete anions, silicates containing chain anion, silicates with layer structure, silicones with three dimensional net-work and applications.

Silicones: General methods of preparation, properties. Silicone polymers - silicone fluids, silicone greases, silicone resins, silicone rubbers and their applications.

References

1. Organometallic Chemistry, 2nd edition, R.C. Mehrotra and A. Singh, New Age International Publications (2006).
2. Fundamental Transition Metal Organometallic Chemistry - Charles M. Lukehart, Brooks, Cole Publishing Company (1985).
3. The Organometallic Chemistry of the Transition Metals, 4th edition, Robert H. Crabtree, Wiley Interscience, (2005).
4. Organometallics - A Concise Introduction, 2nd edition, Christoph Elschenbroich and Albert Salzer VCH, (1992).
5. Inorganic Chemistry, 2nd edition, C.E. Housecroft and A.G. Sharpe, Pearson Education Ltd., (2005).
6. Inorganic Chemistry- 3rd edition, G.L. Miessler and D.A. Tarr, Pearson Education, (2004).
7. Basic Organometallic Chemistry - B.D. Gupta and A.J. Elias, Universities Press (2010).
8. Inorganic Chemistry Principles of Structure and Reactivity: James E. Huheey, Ellen A.
9. Keiter, Richard L. Keiter, Okhil K. Medhi, Delhi University, New Delhi (2006)
10. Chemistry of the Elements - N.N. Greenwood and A. Earnshaw, Pergamon Press (1985).
11. Inorganic Chemistry, 6th edition. D.F. Shriver, M. Weller. T. Overton, J. Rourke and F. Armstrong, Oxford University Press (2014).
12. Organometallic Chemistry and Catalysis, Didier Astruc, Springer (2007).
13. Transition Metal Organometallic Chemistry, Francois Mathey, Springer (2013).

CHO HCT: 3.2. ORGANOMETALLIC AND PHOTOCHEMISTRY

Objectives:

- To understand the fundamental concepts of photochemistry and pericyclic reactions.
- To learn the synthesis and reactions of organometallic compounds.
- To learn the asymmetric synthesis of organic compounds.

Course outcome:

- Basic concepts of photochemistry and pericyclic reactions and their usefulness in the synthesis of many organic compounds.
- Synthesis of organic compounds using different organometallic compounds as catalysts.
- Asymmetric synthesis of organic compounds using chiral compounds.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation is used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Photochemistry: Light absorption and electronic transitions, Jablonski diagram, intersystem crossing, energy transfer, sensitizers, quenchers. Photochemistry of olefins, conjugated dienes, aromatic compounds, ketones-Norrish type-I and Norrish type-II reactions, enones, Paterno-Buchi reaction, di-pi methane rearrangement, photooxidation, photoreduction.

Pericyclic reactions: Electrocyclic reactions: Stereochemistry, symmetry and Woodward-Hofmann rules for electrocyclic reactions, FMO theory of electrocyclic reactions, correlation diagram for butadiene to cyclobutene and hexatriene to cyclohexadiene systems. Cycloaddition reactions: Classification, analysis by FMO and correlation diagram method. Cycloaddition reactions: [2+2] and [4+2] cycloadditions-FMO and correlation diagram method, Diels-Alder reaction, hetero Diels-Alder reaction and their applications. Intra and intermolecular 1,3-dipolar cycloadditions: involving nitrile oxide, nitrile imine, nitrile ylide and their application in organic synthesis. Sigmatropic reactions: Classification, stereochemistry and mechanisms. suprafacial and antarafacial shifts of H and carbon moieties. [3,3] and [5,5]-sigmatropic rearrangement, Claisen, Cope and aza-Cope rearrangement.

UNIT-II

[16 HOURS]

Chemistry of organometallic compounds: Synthesis and reactions of organolithium (n-BuLi, PhLi), organocadmium, organomagnesium (Grignard reagent), organoselenium, Organozinc and organotellurium. Organoaluminium reagents: Preparation, site selective and stereoselective additions of nucleophiles mediated by organoaluminum reagents, reaction with acid chlorides, allyl vinyl ethers, 1,2-addition to imines and application in the synthesis of natural products. Organocopper reagents: Gilman reagent, preparation, reactions with aldehydes, ketones and imines. Organosamarium reagents: Reactions promoted by samarium diiodide and dicyclopentadienyl samarium – Barbier type reaction, Reformatsky type reactions, ketyl-alkene coupling reactions, pinacolic coupling reactions, Organotin reagents: tributyltin hydride, Barton decarboxylation reaction, Barton deoxygenation reaction, Stille coupling, Stille-Kelley coupling reactions, Barton McCombie reaction, Keck stereoselective allylation and other applications.

UNIT-III

[16 HOURS]

Asymmetric synthesis: Definition, importance, mechanism, energy consideration, advantages and limitations, methods of determination of enantiomeric excess. Methods of asymmetric induction:

Topocity-Prochirality: Substrate selectivity - Diastereoselectivity and enantioselectivity- Substrate controlled methods-use of chiral substrates - examples

Auxiliary controlled methods: Use of chiral auxiliaries - Chiral enolates-alkylation of chiral imines - Asymmetric Diels - Alder reaction

Reagent controlled methods: Use of chiral reagents - Asymmetric oxidation – Sharpless epoxidation - Asymmetric reduction - Use of lithium aluminium hydride and borate reagents. Synthesis and applications of oxazaborolidines, IPC-BBN, IPC2BH, (*S*)-BINAP-DIAMINE and (*R*)-BINAL-H. Use of (*R,R*)-DIPAMP, (*S,S*)-CHIRAPHOS, (*R,R*)-DIOP, SAMP, RAMP, *S*-Proline, *S*-PBMgCl, (-)-BOAlCl₂, (+) and (-)-DET.

References

1. Organic Chemistry, VI edition, Robert T. Morrison, Robert N. Boyd.
2. Advance Organic Chemistry, IV edition, Jerry March.
3. Advance Organic Chemistry, III edition, Part-A and Part-B, Francis A. Carey and Rechar J. Sundberg.
4. Organic Chemistry, III edition, V. K. Ahluwalia and Rakesh Kumar Parashar.
5. Schaum's outline of theory and problems of Organic Chemistry, Harbert Meislich, Howard Nechamkin and Jacob Sharefkin.
6. Asymmetric synthesis, Garry Procter.
7. Mechanism in Organic Chemistry, VI edition, Peter Sykes.
8. Molecular reactions and photochemistry, Charles H. Depuy, Orville L. Chopman.
9. Modern methods of Organic synthesis, III edition, W. Carruthers.
10. Organometallics in Organic synthesis, J. M. Swan and D. Stc Black.
11. Organic chemistry by Clayden, Greeves, Warren and Wothers.

CHP HCT: 3.3. ADVANCED PHYSICAL CHEMISTRY

Objectives:

- To understand the concepts of enzyme kinetics, industrial catalysis and linear free energy relationship.
- To learn the electrochemical aspects of batteries and electroplating.
- To understand the mechanism of corrosion prevention of metals by different methods.
- To understand the fundamentals of X-ray crystallography.

Course outcome:

- Applications of reaction kinetics help in correlating the rates of biological and chemical reactions.
- Theory and applications of electrochemical systems helps in the field of e-waste management and protection of metals.
- Fundamentals of X-ray crystallography and structural interpretation by various X-ray diffraction techniques.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animation are used in class room teaching.
- Students will be assigned to solve the numerical problems to understand the concepts.

Course content

UNIT-I

[16 HOURS]

Homogeneous Catalysis: Electronic and structural effects on acidity and basicity. Hard and soft acids and bases. Acidity functions: Hammett acidity function, Zuckerman-Hammett hypothesis, Bonnett hypothesis. Industrial catalysis: Catalyst carrier, promoter, inhibitor and catalyst poison.

Enzyme kinetics: Effect of substrate concentration (Michaelis - Menton equation), Effect of pH, effect of catalysts and inhibitors (substrate, zeolite, Cr^{3+} , Fe^{2+} , ZnO, U.V light), effect of temperature. A brief kinetic and mechanistic applications of glucose oxidase in the oxidation of glucose.

Linear Free Energy Relationship: Hammett equation, Taft equation, Okamoto Brown equation and its application to oxidation of amino acids and aromatic amines. Swain-Scott and Edward equation. Winstein - Grunwald relationship. Isokinetic relationship and significance of isokinetic temperature, Exner criterion.

Kinetic Isotope Effect: Theory of kinetic isotope effect - normal and inverse isotope effect, primary isotope effect, secondary isotope effect, solvent isotope effect.

UNIT-II

[16 HOURS]

Electrochemical cells and batteries: Introduction, galvanic and electrolytic cells, schematic representation of cells. Faraday's law, mass transfer in cells. Batteries: Classification, characteristics, primary, secondary and lithium batteries, fuel cells.

Electroplating: Definition, theory and mechanism of electroplating, effect of plating variables on the properties of electro deposits, comparative account of complexing and non-complexing baths (general treatment), additives on plating baths and their significance.

Metallic coating: Preparation of substrate surface, electroplating of Cu and Cr. Application of Au and Ag plating.

Corrosion: Types of corrosion, basis of electrochemical corrosion, theories and mechanism of wet corrosion. Thermodynamic aspects of corrosion. Current – potential relations (Evan diagram) in corrosion cells. Factors influencing the rate of corrosion: Metal and environmental factors. Kinetic aspects corrosion: Corrosion rate measurement by different methods – chemical and electrochemical methods. General aspects of corrosion prevention and control – designing aspects, effect of alloying and surface modification. Corrosion prevention by painting, phosphating and anodic (passivation) and cathodic protection. Corrosion inhibitors: Introduction, classification, Characteristics and requirements of efficient corrosion inhibitors, Green inhibitors and their significance, Corrosion inhibition mechanism.

UNIT-III

[16 HOURS]

Fundamentals of X-ray crystallography: Law of interfacial angles, laws of symmetry, Miller indices, Bragg equation (No derivation), Experimental methods – powder and rotating crystal methods, indexing of powder and rotating crystal photographs. Atomic scattering factor, structure factor, Fourier synthesis and electron density diagrams. Electron diffraction of gases, experimental technique, Scattering-Intensity curves, Wierl equation (no derivation), Radial distribution method determination of bond lengths and bond angles.

Imperfections in atomic packing: Types of imperfections, classification of imperfections, point defects, Schottky defects, Frenkel defects, disordered crystals, line defects, dislocation types, plane defects, small-angle and large-angle boundaries, stacking faults, crystal growth and twinning, non-stoichiometry.

Imperfections and physical properties: electrical, optical, magnetic, thermal and mechanical properties.

References

1. Chemical Kinetics by K.J. Laidler, Tata McGraw-Hill Pub, Co Ltd, New Delhi.
2. Fundamentals of Chemical Kinetics, M. R. Wright, Harwood publishing, Chichesrer, 1999.
3. Kinetics and Mechanism of Chemical Transformation by J. Rajaram and J.C. Kuriacose, Macmillan, New Delhi.
4. Electrochemistry –Principles and Applications by E.G. Potter, Cleaver-Hume press Ltd, London.
5. Chemical and Electrochemical energy systems, R. Narayan and B. Viswanathan (University Press), 1998.
6. Industrial Electrochemistry, D. Pletcher and F. C. Walsh, Chapman and Hall, 2nd Edn, 1984.
7. An Introduction to Metallic Corrosion and its Prevention, Raj Narayan (Oxford –IBH, New Delhi), 1983.
8. Fundamentals of metallic corrosion, Philips A. Schweitzer, CRC press Taylor and Francis group, New York.
9. Corrosion prevention and control, Baldev Raj, U Kamachi Mudali & S. Rangarajan, Narora Publishing House, India.
10. Solid State Chemistry and its applications – A.R. West, John Wiley & Sons.
11. New Directions in Solid State Chemistry – CNR Rao and J. Gopalakrishna, Cambridge University Press.
12. Solid state chemistry, N. B. Hannay, PHI, New Delhi.
13. Principles of the Solid State – H.V. Keer, Wiley Eastern.

CHG HCT: 3.4. CHEMICAL SPECTROSCOPY

Objectives:

- To understand the basic concepts of spectroscopic techniques such as NMR, ESR, NQR, Mossbauer and photoelectron spectroscopy.
- To familiarize with the IR and mass spectroscopy.

Course Outcome:

- Understand the spectroscopic techniques such as NMR, IR, UV, and MS for recording and interpretation of spectra.
- Understand the characterization of chemical compounds.
- To learn electric and magnetic properties of radiation, molecules and bulk matter and solve the problems related to these properties.
- Understanding various fragmentation reactions of organic molecules.
- Predict the NMR, IR, UV, and MS spectra from a given molecular structure, including fragment-ions in MS.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animation are used in class room teaching.
- Students will be assigned to solve the spectroscopic problems to understand the interpretation of spectra.

Course content

UNIT-I

[16 HOURS]

NMR Spectroscopy: Magnetic properties of nuclei (magnetic moment, g factor, nuclear spin), effect of external magnetic field on spinning nuclei, Larmor precession frequency, resonance conditions, population of nuclear magnetic energy levels, relaxation processes, relaxation time, line width and other factors affecting line width. Chemical Shift: Standards employed in NMR, factors influencing chemical shift: electronegativity, shielding and deshielding, van der Waals deshielding magnetic anisotropy, H-bonding, diamagnetic and paramagnetic anisotropies, spin-spin coupling, chemical shift values and correlation for protons bonded to carbon and other nuclei, Instrumentation. Chemical shift equivalence and magnetic equivalence, effects of chiral centre, Karplus curve-variation of coupling constants with dihedral angle. Complex NMR Spectra: Simplification of complex spectra-isotopic substitution, increased magnetic field strength, double resonance and lanthanide shift reagents, Nuclear Overhauser Effect (NOE), FT-NMR Spectroscopy and advantages. ¹³C-NMR Spectroscopy: multiplicity-Proton decoupling-Off resonance decoupling; Chemical shift, application of ¹³C, ¹⁹F, ³¹P, ¹¹B and ¹⁵N. Applications of NMR: Structural diagnosis, conformational analysis, keto-enol tautomerism, H-bonding. Solid state NMR and its applications.

Multiple resonance spectroscopy: Introduction to 2D-techniques: DEPT, COSY and NOESY.

UNIT-II

[16 HOURS]

Electron Spin Resonance Spectroscopy: Basic principles, hyperfine couplings, the 'g' values, factors affecting g values, isotropic and anisotropic hyperfine coupling constants, Zero Field splitting and Kramer's degeneracy. Measurement techniques and applications to simple inorganic and organic free radicals and to inorganic complexes.

NQR Spectroscopy: Introduction, Principles, Quadrupolar nuclei, electric field gradient, nuclear quadrupole coupling constants, energies of quadrupolar transitions, effect of magnetic field. Applications.

Mössbauer spectroscopy: The Mössbauer effect, chemical isomer shifts, quadrupole interactions, magnetic splitting, measurement techniques and spectrum display, application to the study of Fe^{2+} and Fe^{3+} compounds; iron in very high oxidation states-Fe(V) and Fe(VI) nitride complexes; Sn^{2+} and Sn^{4+} compounds, nature of M-L bond, coordination number and structure, detection of oxidation states and an inter halogen compound $\text{I}_2\text{Br}_2\text{Cl}_4$.

Photoelectron Spectroscopy: Introduction, principles, chemical shifts, photoelectron spectra of simple molecules. X-ray photoelectron and Auger electron spectroscopy- Principles and applications.

UNIT-III

[16 HOURS]

IR spectroscopy: Introduction, instrumentation, sample handling, Characteristic group frequencies and skeletal frequencies. Finger print region, Correlation chart. Identification of functional groups-alkanes, alkenes, alkynes, aromatics, carbonyl compounds (aldehydes, ketones, esters and lactones), halogen compounds, sulphur and phosphorous compounds, alcohols, amides, lactams, amino acids and amines, Factors affecting group frequencies and band shapes: conjugation, resonance and inductance, hydrogen bonding and ring strain. tautomerism, *Cis-trans* isomerism. Applications of IR spectroscopy.

Mass Spectrometry: Basic principles, Instrumentation-Mass spectrometer, interpretation of mass spectra, resolution, molecular ions, meta-stable ions, Nitrogen rule and isotope ions. Different methods of ionization (chemical ionization, electron impact, field ionization-FAB and MALDI). Fragmentation processes-representation of fragmentation, basic fragmentation types and rules. Factors influencing fragmentations and reaction pathways. McLafferty rearrangement. Fragmentations (fragmentation of organic compounds with respect to their structure determination) associated with functional groups-alkanes, alkenes, cycloalkanes, aromatic hydrocarbons, halides, alcohols, phenols, ethers, acetals, ketals, aldehydes, ketones, quinines, carboxylic acids, esters, amides, acid chlorides, nitro compounds, amines & nitrogen heterocycles. Fragmentation patterns of glucose, myrcene, nicotine, retro Diels-Alder fragmentation. Composite problems involving the applications of UV, IR, ^1H and ^{13}C -NMR and mass spectroscopic techniques for the structural elucidation of organic compounds.

References

1. Organic Spectroscopy-3rd Ed.-W. Kemp (Pgrave Publishers, New York), 1991.
2. Spectrometric Identification of Organic Compounds - Silverstein, Bassler & Monnill (Wiley) 1981.
3. Spectroscopy of Organic Compounds-3rd Ed.-P.S. Kalsi (New Age, New Delhi) 2000.
4. E.A.V. Ebsworth, D.W.H. Ranklin and S. Cradock: Structural Methods in Inorganic Chemistry, Blackwell Scientific, 1991.
5. J. A. Iggo: NMR Spectroscopy in Inorganic Chemistry, Oxford University Press, 1999.
6. C. N. R. Rao and J. R. Ferraro: Spectroscopy in Inorganic Chemistry, Vol I & II (Academic) 1970.
7. Spectroscopy, B. P. Straughan and S. Salker, John Wiley and Sons Inc., New York, Vol.2, 1976.
8. Application of Absorption Spectroscopy of Organic Compounds, John R. Dyer, Prentice/Hall of India Private Limited, New Delhi, 1974.
9. Organic Spectroscopy, V. R. Dani, Tata McGraw-Hall Publishing Company Limited, New Delhi. 1995.
10. Interpretation of Carbon-13 NMR Spectra, F.W. Wehrli and T. Wirthin, Heyden, London, 1976.
11. NMR spectroscopy-Powai

SOFT CORE PRACTICALS

CHA SCP: 3.1/4.1. ANALYTICAL CHEMISTRY PRACTICALS-II

[64 HOURS]

Objectives:

- To familiarize with the handling of instruments in the quantitative analysis of various samples.
- To understand the analysis of real samples like waste water, soil samples and biological samples and mixtures

Course Outcomes:

After studying this course, the student to:

- Get experience on analysis of various complex mixtures by following multistep reactions.
- Acquire the knowledge on handling instruments and to overcome the general problems arises during the analysis.
- Acquire industrial skills required for sampling, analytical and interpretation and presentation of results.
- Possess adequate knowledge on literature search for developed analytical methods.

Pedagogy:

- Each student performs experiments as per the protocol in practical classes.
- Computer aided applications are used for the evaluation of experimental results.

Course experiments

PART – A

1. Determination of calcium in limestone by redox, acid-base and complexation titrations.
2. Determination of vitamin C in orange juice by titration with cerium(IV) and with 2,6-dichlorophenol indophenol.
3. Determination of aluminium and magnesium in antacids by EDTA titration.
4. Analysis of a copper-nickel alloy sample for copper and nickel by EDTA titration using masking and selective demasking reactions.
5. Determination of saccharin in tablets by precipitation titration.
6. Determination of ascorbic acid in goose berry/bitter gourd by titrimetry and spectrophotometry using *N*-bromosuccinimide (NBS).
7. Analysis of a mixture of iron(II) and iron(III) by EDTA titration using *pH* control.
8. Determination of sulphur drugs by potentiometry using NaNO_2 and iodometric assay of penicillin.
9. Polarographic determination of copper and zinc in brass.
10. Determination of sodium, potassium and calcium in mineral waters by atomic emission spectrometry.
11. Determination of iron in mustard seeds and phosphorus in peas by spectrophotometry.
12. Determination of ethanol in wine by titrimetric and spectrophotometric dichromate methods.

PART –B

1. Analysis of waste waters for DO and COD by titrimetry.
2. Analysis of a ground water sample for sulphate by titrimetry (EDTA) and turbidimetry.
3. Potentiometric determination of formula and stability constant of a silver-ammonia complex ion.
4. Determination of aspirin, phenacetin and caffeine in mixture and APC tablets by solvent extraction and UV spectrophotometry.
5. Kinetic determination of urinary creatinine and purity of a commercial H₂O₂ sample.
6. Determination of chromium(III) and iron(III) in a mixture by kinetic masking methods.
7. Photometric and potentiometric titration of iron(III) with EDTA.
8. Photometric and potentiometric titration of copper with EDTA.
9. Analysis of brackish water for chloride content by a) spectrophotometry (mercuric thiocyanate method), b) conductometry (silver nitrate) and c) potentiometry (silver nitrate).
10. Conductometric titration of sodium acetate with HCl and NH₄Cl with NaOH.
11. Ascorbic acid determination in natural orange juice by coulometry.
12. Analysis of waste water for
 - a) Phosphate by molybdenum blue method
 - b) ammonia-nitrogen by Nessler's method
 - c) nitrite-nitrogen by NEDA method
15. Analysis of a soil sample for
 - a) Calcium carbonate and organic carbon by titrimetry.
 - b) Calcium and magnesium by EDTA titration.
16. Analysis of a soil sample for
 - a) Nitrogen content by Kjeldahl method
 - b) Available phosphorus by spectrophotometry.
 - c) Nitrate-nitrogen/nitrite nitrogen/ammonia nitrogen by spectrophotometry.
 - d) Sodium and potassium by flame photometry.
17. Analysis of urine for
 - a) Urea and uric acid by titrimetry and spectrophotometry.
 - b) Sulphate by precipitation titration after ion-exchange separation.
 - c) Sugar by Benedict's reagent.
18. Analysis of blood for
 - a) Cholesterol by spectrophotometry
 - b) Bicarbonate by acid-base titration.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson Education Pvt. Ltd., New Delhi.

5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Quantitative Analysis of Drugs in Pharmaceutical Formulations, P. D. Sethi, 3rd edition, CBS Publishers & Distributors, New Delhi, 1997.
7. Practical Clinical biochemistry methods and interpretations, R. Chawla, J.P. Bothers Medical Publishers (P) Ltd., 1995.
8. Laboratory Manual in Biochemistry, J. Jayaraman, New Age International Publishers, New Delhi, 1981.
9. Experiments on Water Pollution, D.I. Williams and D. Anglesia, Wayland Publishers Ltd., England, 1978.
10. Experiments on Land Pollution, D.I. Williams and D. Anglesia, Wayland Publishers Ltd., England, 1978.
15. Experiments in Environmental Chemistry, P.D. Vowler and D.W. Counel, Pergamon Press, Oxford 1980.
16. Manual Soil Laboratory Testing, vol.I, K.H. Head, Pentech Press, London 1980.

CHI SCP: 3.2/4.2. INORGANIC CHEMISTRY PRACTICALS -II

[64 HOURS]

Objectives:

- To familiarize with the instrumental methods of analysis for determining metals present in the different samples.
- To familiarize with the preparation and characterization of different inorganic complexes.

Course outcome:

- Determination of alloy samples and understanding the electrochemical deposition of metals.
- Preparation and characterization of coordination compounds.
- Determination of composition, stability constant and magnetic susceptibility of metal complexes.

Pedagogy:

- Each student performs experiments as per the protocol in practical classes.
- Spectroscopic tools are applied for the characterization of the synthesized complexes.

Course experiments

PART-A

1. Determination of bismuth, cadmium and lead in a mixture: Analysis of a low melting alloy (Wood's alloy).
2. Simultaneous spectrophotometric determination of chromium and manganese in a steel solution.
3. Determination of chromium(III) and iron(III) in a mixture: Kinetic masking method.
4. Electrogravimetric determination of:
 - a) Copper in copper sulphate
 - b) Nickel in nickel sulphate

- c) Copper and nickel in alloy solution
- d) Lead in lead nitrate.
- 5. Flame photometric determination of the following metal ions from different samples:
 - a) Sodium b) potassium and c) sodium and potassium in a mixture.
- 6. Polarographic estimation of cadmium and zinc.
- 7. Determination of iron as the 8-hydroxyquinolate by solvent extraction method.
- 8. Quantitative determination of nickel using dithizone and 1,10-phenanthroline by synergistic extraction.
- 9. Spectrophotometric determination of the pK_a value of methyl red.
- 10. Semimicro gravimetric determination of aluminium.

PART-B

1. Preparation and characterization of:
 - a) Chloropentammine cobalt(III) chloride
 - b) Estimation of chloride in a complex by potentiometric or ion-exchange method
 - c) Record the electronic absorption spectrum of a complex and verify TanabeSugano diagram.
2. Preparation of *cis*- and *trans*- dichlorobis(ethylenediammine) cobalt(III)chloride. Record the UV-Vis spectra and compare it with *cis*-form. Measure the molar conductance.
3. Preparation of hexammine cobalt(III) chloride and estimate cobalt ion.
4. Determination of magnetic susceptibility of any two compounds/complexes by Gouy method.
5. Determination of the composition of iron-phenanthroline complex by:
 - (a) Job's method
 - (b) mole-ratio method and
 - (c) Slope-ratio method.
6. Determine the stability constant of iron-tiron/iron-phenanthroline by Turner-Anderson method.
7. Preparation of potassium tris(oxalato)ferrate(III) and estimate the metal ion.
8. Preparation of acetyl acetonatomanganese(III) complex.
9. Preparation of tris(en)nickel(II) chloride and hexamine nickel(II) chloride complexes. Record electronic spectra and evaluate spectrochemical series.
10. Using chloropentammine cobalt(III) chloride, prepare nitro and nitritopentammine cobalt(III) chloride. Record the IR spectra of the isomers and interpret.
11. Estimate the chloride ion in a given complex by silver nitrate titration after ion-exchange separation.
12. Demonstration Experiments:
 - (a) Recording and interpretation of IR and NMR spectra of complexes.
 - (b) Spectrochemical series- Evaluation of Dq value.
 - (c) DNA interaction with metal complexes by UV-visible absorption and viscosity methods.

References

1. Advanced Physico-Chemical Experiments – J. Rose.
2. Instrumental Analysis Manual - Modern Experiments for Laboratory – G.G. Guilbault and L.G. Hargis.
3. A Text Book of Quantitative Inorganic Analysis – A.I. Vogel, 5th edition.
4. Experimental Inorganic Chemistry – G. Palmer.
5. Inorganic Synthesis – O. Glemser.
6. Experimental Inorganic/Physical Chemistry- Mounir A. Malati.
7. Quantitative Chemical Analysis – Daniel C. Harris, (2006) 7th edition.
8. Spectrophotometric Determination of Elements – Z. Marzenko.

CHO SCP: 3.3/4.3. ORGANIC CHEMISTRY PRACTICALS- II

[64 HOURS]

Objectives:

- To understand the concepts of isolation and purification of natural products.
- To familiarize with the estimation of different functional groups in organic compounds.

Course outcome:

- The isolation of caffeine, carotene, lycopene, cincole, azelaic acid and piperine from respective natural sources.
- Estimation of ketones, sugars, nitro and amino groups in natural products.
- Interpret UV, IR, NMR and MS data of different organic compounds.

Pedagogy:

- Each student performs experiments as per the protocol in practical classes.
- Spectroscopic tools are applied for the characterization of isolated natural products.

Course experiments

PART-A

1. Fractional crystallization: separation of mixture of naphthalene and biphenyl.
2. Thin layer chromatography: Separation of plant pigments.
3. Column chromatography: Separation of *o*- and *p*-nitro aniline
4. Isolation of piperine from pepper.
5. Isolation of caffeine from tea.
6. Isolation of azelaic acid from castor oil.
7. Isolation of carotene from carrot.
8. Isolation of lycopene from tomato.
9. Isolation of cincole from eucalyptus leaves.

PART-B

Isolation of natural products & estimations:

1. Estimation of ketones by haloform reaction.
2. Estimation of sugars by Bertrand's method.
3. Estimation of nitro groups.
4. Estimation of amino group.
5. Determination of enol content by Meyer's method.
6. Determination of iodine value of an oil or fat.
7. Determination of saponification value of oil.
8. Determination of equivalent weight of carboxylic acid by silver salt method

Interpretation of Spectra: Structural elucidation of some simple organic compounds by UV, IR, NMR and mass. Spectra have to be provided by the Teachers/ Examiners.

References

1. Vogel' text book of practical organic chemistry, V edition, B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatehell.
2. Elementary practical organic chemistry, Part-III: Quantitative organic analysis, By Arthur I, Vogel.
3. Laboratory manual of Organic Chemistry by B. B. Dey and M. V. Sitaraman.
4. Practical Organic Chemistry by Mann F. G. and Saunders.
5. Natural products: A laboratory guide by Raphael Ikhan.

CHP SCP: 3.4/4.4. PHYSICAL CHEMISTRY PRACTICALS-II

Objectives:

[64 HOURS]

- To understand the significance of various factors influencing the reaction rate in proposing the reaction mechanism.
- To understand electrochemical and spectrophotometric methods of quantification of samples, and also determination of physico-chemical parameters of some important samples.

Course outcome:

- Students can able to develop experimental skill and interpretation of plausible mechanisms of reactions.
- Gain practical knowledge on the theoretical basis of electrochemistry, thermodynamics, and spectrophotometry experiments.
- This helps in academics, research and industries.

Pedagogy:

- Each student performs experiments as per the protocol in practical classes.
- Electrochemical and spectrophotometric tools are used to conduct the experiments.

Course experiments

PART-A

1. Determination of order of reaction for the acid hydrolysis of methyl acetate and evaluation of activation parameters.
2. Evaluation of Arrhenius parameters for the reaction between $K_2S_2O_8$ and KI (First order reaction).
3. Study of kinetics of autocatalytic reaction between oxalic acid and $KMnO_4$ and determine the order of reaction with respect to $KMnO_4$.
4. Kinetics of saponification of ethyl acetate by conductivity method and study the effect of dielectric constant of the medium (using CH_3OH).
5. Study of effect of salt (ionic strength) on the kinetics of reaction between potassium persulphate and potassium iodide (second order reaction).
6. Spectrophotometric kinetics of oxidation of indigocarmine (IC) by chloramine-T (CAT) – Determination of order of reaction with respect to [CAT] and [IC].
7. To study the acid catalysed kinetics of oxidation of glycine by chloramine-T (CAT) - determination of order of reaction with respect to [CAT] and [glycine].
8. Study the phase diagram of three component system (Glacial acetic acid-Chloroform-water system / Glacial acetic acid-Acetone-Water system).
9. Study the rate of corrosion and inhibition efficiency of an inhibitor (thiourea) on mild steel/Al/Cu by weight loss method.

PART-B

1. Conductometric titration of orthophosphoric acid against NaOH.
2. Conductometric titration of a mixture of HCl, CH_3COOH and $CuSO_4$ against NaOH.
3. Conductometric titration of thorium nitrate with potassium tartarate.
4. Potentiometric titration of mixture of weak acids (acetic acid and monochloroacetic acid) against NaOH.
5. Determination of pK_a values of phosphoric acid by potentiometric / pH metric method.
6. Potentiometric titration of mixture of $KCl+KBr+KI$ against $AgNO_3$.

7. Potentiometric titration of FAS against ceric sulphate and sodium metavanadate, determine the concentration of FAS and redox potential.
8. Potentiometric titration of lead nitrate against EDTA and determine the concentration of lead nitrate solution.
9. Determination of pK value of an indicator (methyl orange/methyl red).
10. Spectrophotometric analysis of a mixture of (a) $KMnO_4$ and $K_2Cr_2O_7$.
11. Study of complex formation between ferric salt and salicylic acid.

References

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry – F. Daniels *et al.*
3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments – J. Rose.
7. Practical Physical Chemistry – S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry – D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry – R.C. Das and B. Behera, Tata Mc Graw Hill.

SOFT CORE PAPERS

CHA SCT: 3.1. ELECTROCHEMICAL METHODS OF CHEMICAL ANALYSIS

Objectives:

- To learn aspects of kinetic and radiochemical methods for analysis
- To understand the knowledge of applied aspects of recent needs by simple techniques

Course Outcome:

- To understand the reaction kinetics
- To gain the principles of radiochemical methods
- To understand the applicability of radiometric assays

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and information and communications technology are used in class room teaching.
- Students will be assigned to solve the numerical problems to understand electrochemical concepts.

Course content

UNIT-I

[16HOURS]

Introduction to electrochemical methods and types: Definitions-electrochemical, galvanic and electrolytic cells, half-cell reactions, anode and cathode, reversible cell, standard hydrogen electrode (SHE), electrode potential (E), standard electrode potential (E^0), theoretical cell potential, liquid junction potential, ohmic drop, IR, overvoltage, concentration over potential. Activity-dependence of electrode potentials- the Nernst equation, reference electrode-calomel and Ag-AgCl electrodes.

Potentiometry: Electrode systems, metallic indicator electrodes. Membrane electrodes, Ion-selective electrodes-electrode response and selectivity of glass electrode for pH measurement, errors in the use of glass electrode. Glass electrodes for the measurement of cations other than hydrogen -Solid state electrodes, liquid membrane electrodes. Ion-selective field effect transistors(ISFETS).Gassensingelectrodes.Directpotentiometry:Chemicalandenvironmental applications. Potentiometric biosensors. Potentiometric titrations- acid-base, precipitation and redox titrations. Null-point potentiometry.

Coulometric methods of analysis: Basis, Faraday's law and current efficiency. Characterizing coulometric methods. Controlled-potential coulometry- selecting a constant potential, minimising electrolysis time. Instrumentation and applications. Characterisation applications: determining the number of electrons involved (n) in a reaction. Controlled-current coulometry- minimising current efficiency, detecting the end point.

Instrumentation: current sources and cells. Comparing conductometric and conventional titrations. Applications. Automated coulometric titrations.

UNIT-II

[16HOURS]

Electrogravimetric analysis: Theory, applications, cell processes, deposition and separation, electrolytic separation of metals, applications

Voltammetry and polarography: Introduction. Electrodes. Polarographic principles- polarographic current, polarographic potential, polarographic maxima, oxygen removal. Qualitative and quantitative analyses. AC polarography. Pulse polarography. Differential pulse polarography and square wave polarography. Trace analysis by pulse polarography. Inorganic, organic, clinical and environmental applications. Characterisation applications- electrochemical reversibility and determination of n' . Determination of equilibrium constants for coupled chemical reactions. Voltammetric principles- Voltammetry at solid electrodes- hydrodynamic voltammetry, triangular voltammetry or cyclic voltammetry. Modified electrodes. Amperometry, amperometric titration. Biamperometry.

Stripping methods- anodic and cathodic stripping methods. Electrodeposition step and voltammetric deposition step. Applications of stripping methods. Voltammetry with micro electrodes.

Chemical sensors and biosensors: Sensors, electrochemical sensors, optical sensors, thermal and mass-sensitive sensors, sensor arrays.

References

- 1 Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
- 2 Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
- 3 Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993 Prentice Hall, Inc. New Delhi.
- 4 Vogel's Text book of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson Education Pvt. Ltd., New Delhi.
- 6 Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
- 7 Instrumental Methods of Analysis by H.H. Willard, L.L. Merritt and J.A. Dean, 7th Edition, CBS Publishers, New Delhi, 1988.
- 8 Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
- 9 Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
- 10 Introduction to Instrumental Analysis, Braun, Pharm. Med. Press. India.
- 11 Instant Notes of Analytical Chemistry, Kealey and Haines, Viva Books Pvt. Ltd., New Delhi, 2002.

CHI SCT: 3.2. FRONTIERS IN INORGANIC CHEMISTRY

Objectives:

- To understand the basic concepts, synthesis and applications of materials.
- To learn the properties, fabrication and characterization of nanomaterials.

Course Outcome:

- Gain knowledge on design and synthesis of new inorganic materials.
- Fabrication and characterization of nanomaterials.
- Applications of ceramics, pigments, silicates and biomaterials.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Materials chemistry: Historical Perspectives. Design of new materials through a Critical Thinking Approach. Materials sustainability.

Synthesis of materials: The formation of bulk material by different methods.

Defects and ion transport: Extended defects. Atom and ion diffusion. Solid electrolytes.

Metal oxides, nitrides and fluorides: Monoxides of the 3d metals, higher oxides and complex oxides, oxide glasses, nitrides and fluorides.

Sulfides, intercalation compounds and metal rich phases: Layered MS₂ compounds and intercalation, Chevrel phases.

Ceramic materials: Sol-gel process and applications of biomaterials of ceramics.

Inorganic pigments: Coloured pigments, white and black inorganic materials.

Molecular materials and fullerenes: Fullerenes, Molecular material chemistry.

Silicates: Structure, classification - silicates with discrete anions, silicates containing chain anion, silicates with layer structure, silicones with three dimensional net work and applications.

UNIT-II

[16 HOURS]

Nanomaterials- Introduction.

Fundamentals- Terminology and history.

Characterization and fabrication: Top-down and bottom-up fabrication. Solution based synthesis of nanoparticles. Vapour-phase synthesis of nanoparticles. Templated synthesis of nanomaterials using frameworks, supports and substrates. Sonochemical microwave methods for the synthesis of nanoparticles.

Structural study of nanocomposites by different methods.

Nanostructures and properties

One-dimensional control: carbon nanotubes and inorganic nanowires.

Two-dimensional control: graphene, quantum wells and solid-state super lattices.

Three-dimensional control: mesoporous materials and composites.

Some applications of inorganic/organic/polymeric materials: Optical, electrical, magnetic, and chemical and biosensors.

References

1. Inorganic Chemistry, 4th edition. P. Atkins, T. Overton, J. Rourke, M. Weller and F. Armstrong, Oxford University Press (2006).
2. Inorganic Chemistry Principles of Structure and Reactivity: James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Okhil K. Medhi, Delhi University, New Delhi (2006).
3. Chemistry of the Elements – N.N. Greenwood and A. Earnshaw, Pergamon Press (1985).
4. Industrial Inorganic Chemistry – 2nd edition. K.H. Buchel, H.H. Moretto and P. Woditsh, Wiley - VCH (2000).
5. Basic Inorganic Chemistry – 3rd edition. F.A. Cotton, G. Wilkinson and P.L. Gaus, John Wiley and Sons (2002).
6. Inorganic Chemistry, 3rd edition. James E. Huheey, Harper and Row Publishers (1983).
7. Inorganic Chemistry, 3rd edition. G.L. Miessler and D.A. Tarr, Pearson Education (2004).
8. Inorganic Chemistry, 2nd edition. C.E. Housecroft and A.G. Sharpe, Pearson Education.

CHO SCT: 3.3. CHEMISTRY OF NATURAL PRODUCTS-II

Objectives:

- To familiarize with the chemical concepts of alkaloids and steroids.
- To learn the structural elucidation and biological importance of alkaloids and steroids.

Course outcome:

- Chemistry of alkaloids and their biological significances.
- Synthesis and characterization of several alkaloids and steroids.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Alkaloids: Introduction, classification, isolation and general methods of structural elucidation of alkaloids. Classification of alkaloids. Biological importance of alkaloids. Structural elucidation of nicotin, papavarine, quinine, reserpine and morphine. Biosynthesis of alkaloids (nicotin, conine and cocaine).

UNIT-II

[16 HOURS]

Steroids: Introduction, Structural elucidation of cholesterol, bile acids, Ergosterol and its irradiation products. Sex hormones and corticosteroids: Synthesis of estrone, progesterone, androsterone, testosterone. Barton reaction for the synthesis of aldosterone. Brief discussion of homosteroids, norsteroids and oral contraceptives. Biological significance of anabolic steroids.

References

1. Organic Chemistry, VI edition, Robert T. Morrison, Robert N. Boyd.
2. Organic Chemistry, Vol-II by I. L. Finar.
3. Schaum's outline of theory and problems of Organic Chemistry, Harbert Meislich, Howard Nechamkin and Jacob Sharefkin.
4. Natural products: Their chemistry and biological significance, J. Mann, R. S. Davidson, J. B. Banthorpe and J. B. Harborne.

CHP SCT: 3.4. MATERIALS CHEMISTRY

Objectives:

- To familiarize with the preparation and characterization of different types of nanomaterials.
- To learn the properties and applications of semiconductors and superconductors.

Course outcome:

- Understand the fundamentals and importance of different types of nanomaterials, their methods of preparation and characterization by different techniques.
- Basic aspects of semiconductors and superconductors, their properties and applications.

Pedagogy

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Chemistry of nanomaterials: Fundamentals and importance, metal nanoclusters, magic numbers, theoretical modelling of nanoparticles, geometric structure, electronic structure, reactivity, fluctuations, magnetic clusters, bulk to nano transitions. Semiconducting nanoparticles: optical properties, photo fragmentation, Coulombic explosion.

Carbon nanoparticles: Introduction, carbon molecules, nature of carbon bond, new carbon structure. Carbon clusters: Small carbon clusters, C₆₀: Discovery, structure, alkali doping, super conductivity. Fullerenes and other bulky balls. Carbon nano-tubes: Fabrication structure, electrical properties, vibrational properties, mechanical properties. Quantum dots, Graphene, and applications of nanomaterials.

Methods of preparation: Plasma arc, Chemical vapour deposition (CVD), sol-gel, silica-gel, hydrolysis, condensation, polymerization of monomers to form nanoparticles, solvothermal, and hydrothermal methods, electrochemical, ball milling and pulsed laser methods. Characterization of nanomaterials (X-ray, IR, UV and SEM).

UNIT-II

[16 HOURS]

Semiconductors: Metals, insulators and semiconductors. Band theory, energy bands, intrinsic and extrinsic semiconductors. Conductivity: electrons and holes, temperature dependence on conductivity, Optical properties: absorption spectrum, photoconductivity, photovoltaic effect and luminescence. Junction properties: metal-metal junctions, metal-semiconductor junctions, p-n junctions, transistors, industrial applications of semiconductors: Mixed oxides, spinels and other magnetic materials.

Superconductors: Introduction, critical temperature and zero resistivity, Meissner effect, critical magnetic field and its variation with temperature. Type - I and II super conductors, specific heat, isotope effect, basic concepts of BCS theory. High temperature (T_c) superconductors and its applications.

References

1. Introduction to Nanotechnology, Charles P. Poole. Jr. and Frank J. Owens, Wiley-Interscience, Joh Wiley and Sons Inc, 2006.
2. Nanotechnology, Richard Booker and Earl Boysen, Wiley.
3. Nanomaterials, A.K. Bandopadhyay, New Age International, 2nd edition.
4. Nanotechnology - Importance and Applications, M. H. Fulekar, Ink International publishing.
5. Solid State Chemistry – N.B. Hannay.
6. Introduction to Solids – Azaroff.
7. Solid State Chemistry and its applications – A.R. West.
8. Principles of the Solid State – H.V. Keer.
9. Basic Solid State Chemistry, 2nd edition, Anthony R. West.
10. Solid State Chemistry: An Introduction, 3rd edition, Lesley E. Smart and Elaine A. Moore.
11. Introduction to Solid state Physics-C. Kittel, 5th edition, Wiley Eastern, Limited.
12. C.N.R. Rao and J. Gopalakrishna –New Directions in solid state chemistry| Cambridge University Press, Cambridge (1999).

FOURTH SEMESTER HARD CORE PAPERS

CHI HCT: 4.1. BIOINORGANIC CHEMISTRY

Objectives:

- To understand the structural parameters of metallo-proteins and their biological role.
- To learn the biological properties of metal complexes in chemo and radio therapeutics.

Course outcome:

- Structural building blocks of proteins, nucleic acids and their metal ion interactions. Biological role of Na/K channel, Ca, Vit B12, and coenzymes.
- Biochemical reactions of several metallo-enzymes and oxygen transport proteins.
- Medicinal applications of metals and metal complexes, and also treatment of toxicity due to heavy metal ions.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Structural and molecular biology: Introduction, The structural building blocks of proteins, the structural building block of nucleic acids. Metal ion interactions with nucleosides and nucleotides. General features of DNA - metal complex interaction.

Bioenergetics: Introduction, Redox reactions in metabolism, the central role of ATP in metabolism. Kinetic stability of ATP, Mitochondrial flow of electrons from NADH to O₂. Phosphorylation and respiratory chain. Oxidative phosphorylation.

Sodium and potassium-channels and pumps: Introduction, transport across membranes. Potassium and sodium channels, The sodium-potassium ATPase, Macrocyclic crown ether compounds, cryptands and ionophores.

Biochemistry of calcium: Introduction - comparison of Ca²⁺ and Mg²⁺. Biological roles of calcium, binding sites of calcium and proteins, storage of calcium, calcium in muscle contraction, calcium in blood clotting process.

Vitamin B12 and Coenzymes: Structural feature, names of different forms, chemistry of cobalamin, biochemical functions of cobalamins, model compounds. Special characteristics of B12 co-enzyme. Photosystems.

UNIT-II

[16 HOURS]

Metal ion transport and storage: Iron storage and transport: Transferrin, ferritin, phosvitin and gastroferrin. Iron transport in microbes: siderophores, *in vivo* microbial transport of iron.

Oxygen transport and oxygen uptake proteins: Properties of dioxygen (O₂): thermodynamic and kinetic aspects of dioxygen as an oxidant, activation of dioxygen through complexation with metal ions. Haemoglobin (Hb) and Myoglobin (Mb) in oxygen transport mechanism: Introduction to porphyrin system, substituent effects on porphyrin rings, functions of Hb and Mb. Characteristics of O₂⁻-binding interaction with Hb and Mb. Model compounds for oxygen

carriers (Vaska's complex and cobalt(III) – Schiff base complexes). Hemerythrin and hemocyanin.

Electron transport proteins and redox enzymes: Iron – sulfur proteins (rubredoxins and ferredoxins) and cytochromes including cytochrome P450. Catalase and peroxidase: Structure and reactivity. **Superoxide dismutase:** Structure and reactivity.

Molybdenum containing enzymes: Aspects of molybdenum chemistry, Xanthine oxidase, aldehyde oxidase, sulfite oxidase, nitrogenase and nitrite reductase.

Non-redox metalloenzymes - Structure and reactivity: Carboxypeptidase-A, alcohol dehydrogenase, leucineaminopeptidase and carbonic anhydrase.

UNIT-III

[16 HOURS]

Medicinal Inorganic Chemistry: State of the Art, New Trends, and a Vision of the Future:

Introduction, metals and human biochemistry, general requirements.

Disease due to metal deficiency and treatment: Iron, zinc, copper, sodium, potassium, magnesium, calcium and selenium.

Metal complexes as drugs and therapeutic agents: Introduction, Antibacterial agents, Antiviral agents, **Cancer Therapy:** Current Status and Mechanism of Action of Platinum-Based Anticancer Drugs. Non-platinum anticancer agents.

Gold-Based Therapeutic Agents: A New Perspective: Uses for the treatment of rheumatoid arthritis, **Diabetes:** Vanadium and diabetes,

Metal-Based Radiopharmaceuticals: Metal complexes as radio diagnostic agents.

Treatment of toxicity due to inorganics: General aspects of mechanism of metal ion toxicity,

- (i) Mechanism of antidote complex with poison, rendering it inert: arsenic, lead, mercury, iron and copper.
- (ii) Antidote accelerated metabolic conversion of poison to non-toxic product: cyanide and carbon monoxide.

References

1. The Inorganic Chemistry of Biological Process- 2nd edition, M. N. Hughes, John Wiley and Sons, (1988).
2. Bioinorganic Chemistry - R.W. Hay, Ellis Horwood Ltd., (1984).
3. Biological Inorganic Chemistry – An Introduction, R.R. Crichton, Elsevier, (2008).
4. Bioinorganic Chemistry - A.K. Das, Books and Allied (P) Ltd, (2007).
5. Bioinorganic Chemistry - K. Hussain Reddy, New Age International Ltd. (2003).
6. Bioinorganic Chemistry: A Survey - EiichiroOchiai, Academic Press, (2008).
7. Bioinorganic Chemistry: A Short Course - 2nd edition, R.M. Roat-Malone, Wiley Interscience, (2007).
8. Medicinal Applications of Coordination Chemistry - Chris Jones and John Thornback, RSC Publishing, (2007).
9. Transition Metal Complexes as Drugs and Chemotherapeutic Agents - N. Farrell, Kluwer Academic Publishers (1989).
10. The Biological Chemistry of the Elements: The Inorganic Chemistry of Life - 2nd edition, J.J.R. Frausto da Silva and R.J.P. Williams, Oxford University Press, (2001).
11. Essentials of Inorganic Chemistry, K. A. Strohfeldt, John Wiley and Sons Ltd.,(2015).
12. Bioinorganic Medicinal Chemistry (Ed) EnzoAlessio, Wiley-VCH Verlag and Co., (2011).

CHO HCT: 4.2. HETEROCYCLIC AND BIOORGANIC CHEMISTRY

Objectives:

- To familiarize with the chemistry of heterocyclic compounds.
- To learn the synthesis and biological importance of carbohydrates, proteins and nucleic acid.

Course Outcome:

- Structure, reactivity and synthesis of several heterocyclic compounds.
- Synthesis, industrial and biological importance of carbohydrates.
- General synthesis of amino acids, peptides, nucleic acids and their biological significance.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Heterocyclic compounds: Nomenclature; Structure, reactivity, synthesis and reactions of furan, pyrrole, thiophene, indole, pyridine, quinoline, isoquinoline, pyrazole, imidazole, pyrone, coumarin, chromones, pyrimidines, purines. Synthesis and synthetic applications of azirines & aziridines, oxazolines, isoxazole, triazole and azepines.

UNIT-II

[16 HOURS]

Carbohydrates: Introduction, Ring size determination of monosaccharides, configuration and conformations of monosaccharides, anomeric effect, Hudson's rules, epimerization and mutarotation. Synthesis, industrial and biological importance of glycosides, amino sugars, sucrose, maltose and lactose. Polysaccharides: General methods of structure elucidation. Industrial importance and biological importance of cellulose, starch, glycogen, dextran, hemicellulose, pectin, agar- agar. Photosynthesis and biosynthesis of carbohydrates.

UNIT-III

[16 HOURS]

Amino Acids: General structure, physiological properties, protection of functional groups.

Peptides: Structure and conformation of peptide bond, peptide synthesis: Solution phase and Merrifield's solid phase synthesis, Racemization and use of HOBT, Synthesis of oxytocin and vasopressin, biological importance of insulin, selective cleavage of polypeptide bonds (chemical and enzymatic). **Proteins:** Structure determination: C and N terminal residue determination, primary, secondary, tertiary and quaternary structure determination, denaturing and renaturing of proteins.

Nucleic acids: Introduction, structure and synthesis of nucleosides and nucleotides, protecting groups for hydroxy group in sugar, amino group in the base and phosphate functions. Methods of formation of internucleotide bonds: DCC, phosphodiester approach and phosphoramidite methods. Solid phase synthesis of oligonucleotides. Structure of RNA and DNA, Crick-Watson model, role of nucleic acids in the biosynthesis of proteins.

Protecting groups: Protection of hydroxyl, carboxyl, carbonyl, thiol and amino groups. Illustration of protection and deprotection in synthesis.

References

1. Organic Chemistry, VI edition, Robert T. Morrison, Robert N. Boyd.
2. Organic Chemistry, Vol-II by I. L. Finar.
3. Schaum's outline of theory and problems of Organic Chemistry, Harbert Meislich, Howard Nechamkin and Jacob Sharefkin.
4. Natural products: Their chemistry and biological significance, J. Mann, R. S. Davidson, J. B. Banthorpe and J. B. Harborne.
5. A text book of synthetic drugs, O. D. Tyagi and M. Yadav.
6. Synthetic drugs, Gurdeep R. Chatwal.
7. Carbohydrate Chemistry and applications of carbohydrates, K. M. Lokanatha Rai.
8. Heterocyclic chemistry by Achison.
9. Heterocyclic chemistry by Smith and Joule.
10. Heterocyclic chemistry by Pacquete.

CHP HCT: 4.3. NUCLEAR, RADIATION AND PHOTOCHEMISTRY

Objectives:

- To understand the theory and applications of photochemistry.
- To learn the fundamentals and physico-chemical applications of radiation chemistry.
- To familiarize with the concepts of nuclear chemistry including radiochemical separation techniques and nuclear power reactors.

Course outcome:

- Understand the principles of photochemistry, its experimental techniques and applications.
- Fundamentals of radiation chemistry, experimental methods of detection of radiation and applications of radioisotopes.
- General aspects of nuclear chemistry, different types of nuclear reactions, production and separation of radioisotopes and also basic features of different types of nuclear reactors.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Nuclear chemistry: Nuclear stability – nuclear forces, packing fraction, binding energy, liquid drop, shell and collective models. Radioactive decay – General characteristics, decay kinetics, parent –daughter decay growth relationships, determination of half-lives. Brief survey of alpha, beta and gamma decays. Nuclear reactions – Bethe's notation, types of nuclear reactions – specific nuclear reactions, photonuclear reactions, Oppenheimer – Phillips process, spallation reactions, Szilard-Chalmers process. Definition of Curie and related calculations. Production of radioisotopes and labelled compounds by bombardment.

Radiochemical separation techniques: carriers, solvent extraction and ion ion-exchange methods.

Nuclear power reactors: Types of nuclear power reactors, basic features and components of nuclear power reactors. An introduction to breeder reactors.

UNIT-II

[16 HOURS]

Radiation chemistry: Introduction, units, interaction of electromagnetic radiation with matter, G-value, LET of radiation. Chemical dosimetry - Fricke and ceric sulphate dosimeters. Radiolysis - cysteine, water and biphenyl. Radioisotopes as tracers, use of isotopic tracers in the elucidation of reaction mechanism, structure determination and solubility of sparingly soluble substances. ^{14}C dating, medical applications of isotopic tracers. Physico-chemical applications – isotope dilution method, activation analysis and radiometric titrations. Hazards in radiochemical work and radiation protection.

Radiation detection and measurement: Experimental techniques in the assay of radioisotopes. Radiation detectors – ionization chambers, proportional and Geiger-Muller counters – G.M. Plateau, dead time, coincidence loss, determination of dead time. Scintillation and semiconductor radiation detectors.

UNIT-III

[16 HOURS]

Photochemistry: Introduction to photochemistry, laws of photochemistry, laws of light absorption, quantum yield and its determination, factors affecting quantum yield, Actinometry - Uranyl oxalate and potassium ferrioxalate actinometers, acetone and diethylketone actinometers. Term symbols for atoms and its significance. Photochemical properties of electronically excited molecules, nature of changes on electronic excitation, shapes of absorption band and Frank Condon principle. Experimental techniques to determine the intermediates in photochemical reactions. Photosensitization: by mercury, dissociation of H_2 . Photochemical kinetics of: Decomposition of CH_3CHO , dissociation of HI and formation of HCl . Fluorescence and phosphorescence – theory and applications. Resonance fluorescence and quenching of fluorescence, Kinetics of collisional quenching (Stern-Volmer equation).

Photocatalyst – Principle, application of ZnO/TiO_2 photocatalysts in the photo cleavage of dyes, environmentally hazardous waste and industrial effluents. Effect of photo degradation on COD value.

References

1. Photochemistry, Calvert and Pitts, Wiley, New York (1996).
2. Fundamentals of Photochemistry, Gohatgi-Mukherjee, New Age International Ltd., 1986.
3. Principles and Applications of Photochemistry, R. P. Wayne, Elsevier, New York (1970).
4. Photochemistry, Paul Suppan, RSC, London (1994).
5. Introduction to Semiconductor Materials and devices, M. S. Tyagi, John Wiley & Sons, 1991.
6. Nuclear Chemistry by Friedlander and Kennedy, John Wiley and Sons (1987).
7. Essentials of Nuclear Chemistry by H.J. Arnikar, Eastern Wiley (1990).
8. Nuclear Chemistry by U.N. Dash, Sultan Chand and Sons (1991).
9. Fundamentals of Radiochemistry by D.D. Sood, A.V.R. Reddy and N. Ramamoorthy.
10. Nuclear Radiation Detectors by S.S. Kapoor and Ramamoorthy, Wiley Eastern (1986).

CHA HCT: 4.4. OPTICAL, THERMAL AND KINETIC METHODS OF ANALYSIS

Objectives:

- To understand the theory, instrumentation and applications of atomic emission spectroscopy.
- To learn the principles, instrumentation and applications of thermal methods of analysis.
- To familiarize with the concepts of kinetic methods of analysis.

Course outcome:

- Learnt the theory, instrumentation and applications of different types of atomic emission spectroscopy.
- To study the stages of thermal degradation patterns of materials using TGA and DTA techniques.
- To describe the general form of a (differential) rate law and describe how the rate of a chemical reaction depends on the concentrations of species that appear in the rate law.
- To describe the relationship between the order of a reactant and the stoichiometric coefficient for the reactant in the overall balanced chemical equation.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.
- Students will be assigned numerical problems to understand the concepts.

Course content

UNIT-I

[16 HOURS]

Atomic and molecular spectrometry-Electromagnetic radiation, atomic energy levels, molecular energy levels, transitions, quantitative spectrometry, Beer-Lambert's law.

Atomic spectrometry-Atomic structure and spectra, intensity of spectral lines.

Arc/spark atomic (optical) emission spectrometry- Principles, instrumentation, sample preparation, qualitative and quantitative analysis, applications

Glow discharge atomic emission spectrometry-principles, instrumentation, applications.

Plasma emission spectrometry-Principles, instrumentation, sample introduction, analytical measurements and applications.

Inductively coupled plasma-mass spectrometry (ICP-MS)-Principles, instrumentation and applications.

Flame emission spectrometry-principles, instrumentation, flame characteristics, flame processes, emission spectra. Quantitative measurements and interferences. Applications of flame photometry and flame atomic emission spectrometry.

Atomic absorption spectrometry- Principles, absorption of characteristic radiation. Instrumentation-sharp line sources- hollow cathode lamps, electrodeless discharge tubes. Sample vaporization- flame vaporization, flameless vaporization, vaporization by reduction and hydride generation. Quantitative measurements and interferences. Applications of AAS.

Atomic fluorescence spectrometry -Principles, instrumentation and applications.

X-ray emission spectrometry- Principles, instrumentation and applications.

Molecular fluorescence spectrometry- Theory- relaxation processes, excitation and fluorescence spectra, fluorescent species, factors affecting fluorescence, effect of concentration

on intensity, fluorescence instruments, applications of fluorescence methods. Molecular phosphorescence- phosphorometry, chemiluminescence methods.

UNIT-II

[16 HOURS]

Thermal methods of analysis: Introduction, **Thermogravimetric analysis (TGA):** Introduction, types of thermogravimetric analysis, principles. Factors affecting the results - heating rate, furnace, instrument control/data handling. Applications - purity and thermal stability, evaluation of correct drying temperature, analysis of complex mixture and determination of kinetic parameters of thermal degradation.

Differential thermal analysis (DTA): Theory - variables affecting the DTA curves. Differences between TGA and DTA. General principles. Instrumentation. Applications - analysis of the physical mixtures and thermal behaviour study. Determination of melting point, boiling point and decomposition point.

Differential scanning calorimetry (DSC): Basic principle. Differences between DTA and DSC. Instrumentation - power compensated DSC, Heat flux DSC. Applications - studies of thermal transitions and isothermal crystallization. Pharmaceutical industry for testing the purity of the samples.

Microcalorimetry: Micro-DSC instrumentation, Applications of Micro-DSC, Isothermal titration calorimetry, Microliter-flow calorimetry.

UNIT – III

[16 HOURS]

Kinetic methods of analysis: Analytical uses of reaction rates relative, basis of reaction rate methods, rate laws-first and second order reactions relative rates of reactions, analytical utility of first or pseudo first order reactions, determination of reaction rates, types of kinetic methods– differential methods, integral methods, multicomponent analysis-neglect of reaction of slow-reacting component, logarithmic extrapolation method, reaction rate method, applications- catalyzed reactions, measurement methods for catalyzed reactions, micro determination of inorganic species like iodide, selenium, cobalt & mercury in complex materials, determination of organic species, non-catalytic reactions. Applications of enzyme-catalysed reactions for the analysis of substrates stoichiometric and rate methods, determination of urea, uric acid, blood glucose, galactose and blood alcohol, determination of enzymes-LDH, GOT and GPT. A brief outline of IR, UV, NMR, Mass spectroscopy as tools for kinetic study.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993 Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Instrumental Methods of Analysis by H.H. Willard, L.L. Merritt and J.A. Dean, 7th Edition, CBS Publishers, New Delhi, 1988.
7. Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
8. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.

9. Introduction to Instrumental Analysis, Braun, Pharm. Med. Press. India.
10. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva Books Pvt. Ltd., New Delhi, 2002.
11. Analytical Transmission Electron Microscopy, An Introduction for Operators Thomas, Jürgen, Gemming, Thomas, Springer, 2014.
12. Scanning Transmission Electron Microscopy, Imaging and Analysis. Pennycook, Stephen J., Nellist, Peter D. (Eds.), Springer, 2011.

SOFT CORE PAPERS

CHA SCT: 4.1. AUTOMATED AND METHODS OF CHEMICAL ANALYSIS

Objectives:

- To understand the instrumentation and applications of automated methods of analysis.
- To familiarize with analysis of real samples and clinical analysis.

Course outcome:

- Understand various types of automated methods of analysis.
- Identify activities that can be fully or partially automated.
- Automated chemical analysis will be very helpful in the clinical as well as pharmaceutical field to perform the purity analysis of the sample, although the sample size is very small, expensive and fast analysis.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.
- Students will be assigned numerical problems to understand the concepts.

Course content

UNIT-I

[16 HOURS]

Automated methods of analysis: An overview, definition, distinction between automatic and automated systems, advantages and disadvantages by automation, types of automated techniques. Nondiscrete techniques, segmented flow methods and basic equipment, special techniques and devices, theoretical considerations and problems, applications. Single channel and multi channel auto analysers, BUN analyzers, automatic glucose analyzers and ammonia in water analyzers, COD analyzers, CFA in industry. Non-segmented flow methods: Flow injection analysis. Principles, types of dispersion, factors affecting dispersion, applications of small, medium and large dispersions. Stopped flow methods, flow injection titrations. Discrete methods: Centrifugal fast scan analyzer, automatic multipurpose analyzers, Automatic elemental analyzer, automated analyzer based on multilayer film-principles, film structure, instrumentation applications. Comparison of discrete and non-discrete methods. Advantages of flow injection measurements over continuous flow measurements.

UNIT-II

[16 HOURS]

Analysis of real samples-real sample, choice of analytical method-defining the problem, investigating the literature, choosing or devising a method, testing the procedure, analysis of standard samples, using other methods, standard addition to the sample. Accuracy in the analysis of complex materials.

Decomposing and dissolving the sample- sources of error in decomposing and dissolution. Decomposing samples with inorganic acids. Microwave decomposition. Combustion methods for decomposing organic samples. Decomposition of inorganic materials with fluxes.

Clinical Analysis- Introduction, features of clinical analysis. Composition of blood, collection and preservation of samples. Common determinations - serum electrolytes, blood glucose and blood urea nitrogen, uric acid, albumin and globulins, acid and alkaline phosphates, barbiturates, chloride, sodium and potassium, bicarbonate, serum creatinine and cholesterol. Urine analysis- Principle components. Sample collection and preservation. Determination of creatinine, chloride, uric acid, ammonia, ascorbic acid, bilirubin and calcium.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, NewYork.
2. Analytical Chemistry, G.D. Christian, 5th ed., 2001 John Wiley & Sons, Inc,India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993 prentice Hall, Inc. NewDelhi.
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5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California,1990.
6. Principles and practice of analytical chemistry. Fifield andKealey.
7. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva Books Pvt.Ltd.,2002.

CHI SCT: 4.2. BIOINORGANIC PHOTOCHEMISTRY

Objectives:

- To understand the photochemistry of inorganic compounds.
- To familiarize with the applications of fluorescents and chromogenic sensing and labeling.
- To learn photodynamic inactivation of microorganisms.

Course outcome:

- Basic concepts of photochemistry and photochemical reactions.
- Understand many organometallic compounds as fluorescent agents in the detection of cations, anions and toxic ions in the living system.
- Theory of photodynamics, and photocatalysis.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.

Course content

UNIT-I

[16HOURS]

Introduction, Philosophy of bioinorganic photochemistry

Fundamentals: Light and matter. Nature of light, Accessible light sources and Interaction between light and matter.

Formation and properties of electronic excited states: Wave mechanics and quantum numbers and Electronic excitation.

Photophysical deactivation of electronic excited states: Spontaneous deactivation, Quenching and Coordination and organometallic compounds.

Photochemical reactions: Photochemical reaction channels, Intramolecular photoreactions, Photodissociation and photoionization, Photoisomerization, Intermolecular photoreactions, the coordination compound specificity. Ligand field photochemistry, Photochemistry from LC or LLCT states, Inner-sphere charge transfer photochemistry, Outer-sphere charge transfer photochemistry, Photosensitized reactions, Homogeneous photocatalysis.

Natural photo-processes involving inorganic compounds

From interstellar space to planetary atmospheres: Homogeneous systems: from interstellar space to planetary atmospheres and primitive soup models. Heterogeneous photochemistry in ice phases.

UNIT-II

[16HOURS]

Applications: Fluorescent and chromogenic sensing and labeling: Cations as targets in biochemical sensing Cations common in biological systems, Fluorescent detection of toxic cations, Fluorescent and chromogenic sensing of anions, Common anions and Toxic anions. Optical detection of neutral molecules. Nanoparticles in biochemical sensing and labeling.

Therapeutic strategies; Photobio-stimulation, Photo-activation of drugs, Photodynamic therapy, Mechanisms of PDT and PTT. Photosensitizers, Inorganic photosensitizers, Supporting role of metal ions in photodynamic therapy, and Combination of polypyrrolic photosensitizers and metallo-pharmaceuticals, Recent PDT development and Nanomedical methods.

Photodynamic inactivation of microorganisms: Bacteria, Viruses, Fungi and Parasites.

Phototoxicity and photoprotection: Chemical and physical photoprotection. Inorganic sunscreens.

Photocatalysis in environmental protection: Development of homo- and heterogeneous methods. Homogeneous photocatalysis and heterogeneous photocatalysis. Water and air detoxification. Other applications of photocatalysis.

References

1. Bioinorganic Photochemistry- Grazyna Stochel, Malgorzata Brindell, Wojciech Macyk, Zofia Stasicka, Konrad Szacilowski. Wiley Publishers (2009).
2. Photochemistry and Photophysics of Coordination Compounds I-Volume Editors: Balzani, V., Campagna, Springer Publications. Vol.280, 2007.
3. Photochemistry and Photophysics of Coordination Compounds II - Volume Editors: Balzani, V., Campagna, Springer Publications. Vol.281, 2007.

CHO SCT: 4.3. MEDICINAL CHEMISTRY

Objectives:

- To familiarize with the methods of isolation, structural elucidation and synthesis of carotenoids and vitamins.
- To learn the basics of medicinal chemistry.
- To understand the synthesis and applications of synthetic drugs.

Course outcome:

- To acquire the knowledge of biological significances of Carotenoids and vitamins.
- Understand the pharmacodynamics, pharmacokinetics and chemotherapy of several drugs.

- Synthesis and mechanism of drug actions of antimalarial, anticancer agents and cardiovascular drugs.

Pedagogy:

- Conventional method such as black board and chalk is used.
- Modern methods like power point presentation and animations are used in class room teaching.

Course content

UNIT-I

[16 HOURS]

Carotenoids: Methods of isolation. Structure elucidation and synthesis of β -carotene. Structural relationship of α -, β - and γ -carotenes.

Vitamins: Introduction, constitution, synthesis and biological significance of thiamine, riboflavin, pyridoxine, biotin, ascorbic acid, vitamin A1 & A2, E1 and E2, B12 and K groups.

UNIT-II

[16 HOURS]

Medicinal chemistry: Introduction, pharmacodynamics, pharmacokinetics, chemotherapy, metabolites antimetabolites, agonists and antagonists. Classification of drugs on the basis of therapeutic action. Concept of pro drug and soft drug. Theories of drug activity: Occupancy theory, rate theory, induced fit theory, concept of drug receptors. Evaluation methods: Free-Wilson analysis, Hansch-analysis, ID_{50} and IC_{50} (mathematical derivation of equation excluded).

Antipyretics: Aspirin, paracetamol, phenacetin, novalgin and their mechanism of action.

Antimalarials: Structure, synthesis and mechanism of action of quinine and chloroquine.

Hypnotics: Analgesics and sedatives: phenobarbitol, chlordiazepoxide, meprobamate.

Stimulants: Structure, action and synthesis of caffeine.

Antineoplastics: Structure, pharmacological action and synthesis of 5-fluorouracil, chlorambucil, cyclophosphamide and podophyllotoxin.

Cardiovascular drugs: Introduction, synthesis of diltiazem, verapamil, methyl dopa, atenolol and oxprenolol.

References

1. Organic Chemistry, VI edition, Robert T. Morrison, Robert N. Boyd.
2. Organic Chemistry, Vol-II by I. L. Finar.
3. A text book of synthetic drugs, O. D. Tyagi and M. Yadav.
4. Synthetic drugs, Gurdeep R. Chatwal.
5. Medicinal chemistry by Graham Patrick.

CHP SCT: 4.4. QUANTUM CHEMISTRY AND BIOSENSORS

Objectives:

- To understand the applications of quantum mechanics to HMO theory.
- To learn the basics of biosensors and their applications.

Course outcome:

- Applications of quantum chemical methods in the theoretical evaluation of energies of molecules and reactions.
- Development of chemical and biochemical sensors and their applications in the determination of biomolecules.

Pedagogy:

- Conventional method such as black board and chalk is used.

- Modern methods like power point presentation and animations are also used in class room teaching.
- Students will be assigned to solve the numerical problems.

Course content

UNIT-I

16 HOURS]

Applications of quantum mechanics: Variation theorem: Statement and proof, application of variation theorem to a particle in one dimensional box, linear oscillator, H and He-atoms. Molecular orbital theory, LCAO-MO approximation, application to hydrogen molecule ion (H_2^+), energy levels of H_2^+ , bonding and antibonding molecular orbitals, energy distribution, potential energy diagrams. Valence bond theory (VB), theory of H_2 molecule, Heitler-London method, energy levels, various modifications of Heitler-London wave function. Comparison of MO and VB theories. SCF method for many electron atom. Slater Orbitals –Effective nuclear charge (ENC), expressions for slater orbitals for 1s, 2s, 3s, 2p and 3d electrons (no derivation), Slater's rules for calculation of ENC. Theories of valence – Introduction, linear and non-linear variation functions, secular equations, coulombic, exchange, normalization and overlap integrals, secular determinants.

Huckel molecular orbital theory: Outline of method, assumptions. Application to ethylene, allyl radical, cyclopropenyl radical, butadiene, cyclobutadiene, bicyclobutadiene and benzene. Calculation of delocalization energy, charge density, π -mobile bond order and free valence.

UNIT-II

[16 HOURS]

Biosensors: Introduction, electrochemical biosensors: Amperometric, potentiometric and conductometric biosensors. Optical based biosensors: Surface plasma resonance, chemiluminescence, fibre optic biosensors, piezoelectronic sensors, mass selective and thermal sensors. Bio-recognition elements in biosensors, immobilization methods, principles of biorecognition, natural, semi-synthetic and synthetic biorecognition elements. Metabolism sensors: Glucose sensors, galactose sensors. Determination alcohol, ascorbic acid, D-isocitrate, oxalate, oxaloacetate, nitrite, nitrate, carbon monoxide, glycerol, triglycerides and sucrose. Biosensors using coupled enzyme reactions.

Applications of biosensors: Determination of glucose in blood, survey of biosensor methods for the determination of glucose. Determination of copper (I) in water using anodic stripping voltammetry.

References

1. Introductory Quantum Chemistry – A.K. Chandra. Second Edition, Tata McGraw Hill Publishing Co. Ltd., (1983).
2. Quantum Chemistry – Eyring, Walter and Kimball. John Wiley and Sons, Inc.
3. Quantum Chemistry –I.N. Levine. Pearson Education, New Delhi, (2000).
4. Theoretical Chemistry – S. Glasstone. East West Press, New Delhi, (1973).
5. Quantum Chemistry – R.K. Prasad, New Age International Publishers, (1996).
6. Valence Theory – Tedder, Murel and Kettle.
7. Surface chemistry: Theory and applications, J. J. Bikertman, Academic press, (1972).
8. Chemical Kinetics, K. J. Laidler 3rd Edn., Harper International Edn., (1987).
9. Test Bok of Physical Chemistry, S. Glasston, McMillan India Ltd., 2nd Edn. (1986).
10. Physics at Surfaces, A. Zangwill, Combridge University Press (1988).
11. Surface Crystallography, L. J. Clarke, Wiley-Interscience (1985).
12. Biosensors: Fundamentals and Applications, Banshi Dhar Malhotra and Chandra Mouli Pandey, Smither Group Co., 2017, UK.

13. Biosensors: Techniques and Instrumentations in Analytical Chemistry, Frieder Scheller and Florian Schubert, Vol. 11, Elsevier Sci. Publishers, 1992.
14. Chemical Sensors and Biosensors, Brian R. Eggins, John Wiley & Sons Ltd, UK, 2004.