

Education to Excel

SBRR MAHAJANA FIRST GRADE COLLEGE (Autonomous)

Jayalakshmipuram, Mysuru – 570 012 Karnataka, INDIA

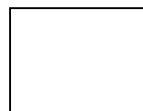
Affiliated to University of Mysore

Re-accredited by NAAC with 'A' Grade, College with Potential for Excellence

UG



PG



Syllabi of I and II Semester

B.Sc. – Biotechnology

Choice Based Credit System - 2019

Credit Pattern for Courses

L: Lecture; T: Tutorial; P: Practicals

Sem	Type	Course	L + T + P = Tot.
1	DSC	Biomolecules and Microbiology	4 + 0 + 0 = 4
1	DSC	Practical 1	0 + 0 + 2 = 2
2	DSC	Enzymology and Cellular Metabolism	4 + 0 + 0 = 4
2	DSC	Practical 2	0 + 0 + 2 = 2
3	DSC	Cell Biology and Genetics	4 + 0 + 0 = 4
3	DSC	Practical 3	0 + 0 + 2 = 2
4	DSC	Plant Cell and Tissue Culture and Animal Cell Culture	4 + 0 + 0 = 4
4	DSC	Practical 4	0 + 0 + 2 = 2
Any One of the following			
5	DSE	Molecular Biology and Genetic Engineering	4 + 0 + 0 = 4
5	DSE	Practical 5	0 + 0 + 2 = 2
5	DSE	Practical 6	0 + 0 + 2 = 2
5	DSE	Immunology and Medical Biotechnology	4 + 0 + 0 = 4
Any One of the following			
5	SEC	Intellectual Property Rights.	2 + 0 + 0 = 2
5	SEC	Biophysics and Biochemical Techniques	2 + 0 + 0 = 2
Any One of the following			
6	DSE	Microbial Technology and Agricultural Biotechnology	4 + 0 + 0 = 4
6	DSE	Practical 7	0 + 0 + 2 = 2
6	DSE	Practical 8	0 + 0 + 2 = 2
6	DSE	Environmental Biotechnology and Bioinformatics.	4 + 0 + 0 = 4
Any One of the following			
6	SEC	Molecular Biology Techniques.	2 + 0 + 0 = 2
6	SEC	Fermentation Technology	2 + 0 + 0 = 2

Credit means the unit by which the course work is measured. One hour session of Lecture or Tutorial per week for 16 weeks amounts to 1 credit. Two hours session of practical's per week for 16 weeks amounts to 1 credit per semester.

I Semester

(DSC) Biomolecules and Microbiology

Course duration: 16 weeks with 4 hours of instruction per week.

BIOMOLECULES:

32 hours

Unit I Carbohydrates: Definition, classification, Fischer and Haworth structure of monosaccharides - ribose, glucose, galactose and fructose. Reducing and non reducing sugars. Stereochemistry - Definition with examples. epimers, enantiomers, anomers, isomers concept. Fischer and Haworth structure of Disaccharides - sucrose, maltose, lactose. Polysaccharides- classification: homo and hetero polysaccharides, Structure of starch and glycogen. Biological importance of carbohydrates. 10hr

Unit II

Proteins: Amino acids- generalized structure, essential and non essential amino acids, classification of aminoacids based on polarity, nutrition, zwitter ionic structure, pKa value. D-and L- amino acids, optical activity. Peptide bond, Structure and importance of glutathione, oxytocin and insulin. Classification of proteins with example. Primary, secondary, tertiary and quaternary structural organization of proteins. Structure of hemoglobin, myoglobin, keratin and collagen. Protein stability-covalent and noncovalent interactions, Biological importance of proteins. **10hr**

Unit-III

Lipids :Definition , Biological role. Classification & Properties.

Fatty acids- Unsaturated and saturated fatty acids and their nomenclature.Essential fatty acids and their biological importance, Biological role of different types of lipids- glycolipids, phospholipids, cholesterol.

Nucleic Acids: Nucleosides & Nucleotides - structure & nomenclature. DNA-Types, secondary structure of DNA (Watson and Crick model), RNA- Types and biological functions, structure of t-RNA (Clover leaf model) **12 hr**

MICROBIOLOGY:

32 hours

Unit I

General Introduction:Scope and relevance of microbiology, important contributions by Robert Koch, Leeuwenhoek, Jenner, Pasteur, Flemming, Ivanowsky. Concept of prokaryotes and eukaryotes. General account on structure, classification and reproduction of bacteria, virus and fungi Microscopy

Light microscopy: Bright, Dark field, Phase contrast Electron microscopy- SEM, TEM **10hr**

Unit II

Microbial nutrition: Nutritional classes of micro organisms, pure culture-types of pure culture techniques, methods of maintenance and preservation of culture- over layering with mineral oil and lyophilization.

Microbial growth pattern and methods of growth measurements- Growth curve,Counting by Plate counting, Coulter counter counting and Turbidometry.

Sterilization and Disinfection : a) Physical methods – Auto clave, Hot air oven, Laminar air flow, Seitz filter, sintered filter and membrane filter. Radiation-UV and Gamma Rays b) Chemical methods – Alcohol, Aldehydes, Phenols, Halogens and gaseous agents.

Biological methods- Antimicrobial agents -penicillin, streptomycin.**12 hr**

Unit III

Role of microbes in bio-geo cycles(N,C,S,and P cycle), Biological nitrogen fixation. **Microbial diseases**: Important plant diseases-downy mildew, ergot, rust, bacterial leaf blight, TMV and Human diseases-Tuberculosis, rabies, dengue and candidiasis, symptoms causative agents and control.

Food spoilage, food preservation, food poisoning **10 hr**

Suggested Reading

- J.L Jain, Fundamentals of Biochemistry, S.Chand & company ltd. New Delhi ,India
- John A Timbell, Principles of Biochemical Toxicology
- Lehninger A.L., Principles of Biochemistry (1982), Worth Publishers, Inc. New York.
- Voet, D and Voet, J.G. (2004). Biochemistry, 3rd Edition, JohnWiley & Sons, Inc.USA.
- U. Satyanarayana., Biochemistry, Books and Allied (P) Ltd. Kolkata, India
- A.C.Deb- TextBook of Biochemistry, New Central Book Agency (P) Ltd, Kochi, India
- David T. Plummer, An Introduction to practical biochemistry, McGraw-Hill Book Company (U.K.) Ltd., London
- Sadasivam S., Manickam A, Biochemical Methods 2nd ed, New Age International, Bengaluru, India
- Biochemistry 2nd ed Keshav Trehan, New Age International, Bengaluru, India
- Murray,K.Robert;Granner,K.Daryl;Mayes,A.Peter;Rodwell,W.Victor. Harper's Illustrated Biochemistry 26th ed, McGraw-Hill Companies, USA
- Jayaraman.J, Laboratory Manual in Biochemistry. New Age International, Bengaluru, India
- G.R.Agarwal, Text Book OF Biochemistry Krishna Prakashan Media (P) Ltd, Meerut, India
- Jasra O.P, Text book of biochemistry vol 1 Sarup Books Publishers Pvt Ltd, New Delhi, India
- Denise R.Ferrier, Lippincott's illustrated reviews: Biochemistry, Lippincott Williams & Wilkin, Philadelphia, USA

Microbiology

- Chandrakanth Kelmani, A Text book of Microbiology vol-iv
- S.Sundara Rajan, College Microbiology, Himalaya Publishing House, Maharashtra, India
- Power C B, General Micro biology, Himalaya Publishing House, Maharashtra, India
- Pelczar J.Michael, Chan E.C.S, Krieg R. Noel, Microbiology 5th ed, Tata McGraw-Hill Education Pvt. Ltd, New York, USA
- Prescott,M.Lansing;Harley,P.John;Klein,A.Donald, Microbiology 5th ed, McGraw-Hill Book Company (U.K.) Ltd., London
- Dubey R.C., Maheshwari D.K, A text book of microbiology, S.Chand Publishing
- John L.Ingraham & Cathrerine A.Ingraham, Introduction to Microbiology 3rd ed
- Harvey. A. Richard. Champe. C. Pamela. & Fisher. D. Bruce, Lippincott's Illustrated reviews: Microbiology 2nd ed, Lippincott Williams & Wilkin, Philadelphia, USA
- Black G Jacquelyn, Micobiology - Principles and Explorations .
- Purohit S.S, Microbiology - Fundamentals and Applications
- Ananthanarayan R & Jayaram Paniker C.K, Text book of Microbiology 7th ed

BIOMOLECULES

Quantitative Analysis:

1. Analysis of Sugars- Glucose, fructose, starch, lactose.
2. Analysis of aminoacids
3. Estimation of reducing sugars by DNS method.
4. Estimation of Protein by Biuret and Lowry's method.
5. Separation of amino acids by circular paper chromatography. (Demonstration)

MICROBIOLOGY

1. Preparation of media: Nutrient Agar, Nutrient Broth, and Potato Dextrose Agar.
2. Isolation and culture of microorganisms from soil air and water (Demonstration).
3. Inoculation techniques: stab, point, streak, pour plate and spread plate.
4. Microbial growth determination by turbidometry.
5. Bacterial staining techniques- simple and differential staining.
6. Biochemical activity of microbes: Catalase test, starch hydrolysis and gelatin hydrolysis (Demonstration)
7. Demonstration of microbial disease: plant- Downy mildew and Rust.

DSC: Enzymology and Cellular Metabolism

Course duration: 16 weeks with 4 hours of instruction per week.

ENZYMOLGY:

32 hours

Unit I

Protein as a biological catalyst, Characteristics of Enzymes, Chemical nature of enzymes, Apozyme, Holozyme, Active sites and binding sites. Mechanism of enzyme action
Enzyme- substrate complex formation, lock and key and induced fit theory Nomenclature of Enzymes- IUBMB and trivial, classification of enzymes with enzyme commission code **10 hr**

Unit II

Cofactors and coenzymes Factors affecting enzyme activity- substrate concentration, pH, temperature, metal ions, inhibitors, allosteric inhibitors, activators, Enzyme inhibition-competitive and non-competitive, energy of activation Enzyme kinetics-Michaeli's and Menten equation. **11 hr**

Unit III

Localization of enzymes- membrane bound and soluble enzymes, isolation and purification of enzymes. Special enzymes: Isoenzymes ,multienzyme complexes, abzymes Ribozyme with example Applications of enzymes: clinical analytical and biotechnological **11hr**

CELLULAR METABOLISM

32 hours

Unit I.

Metabolism – Definition, catabolism and anabolism, overview of metabolic pathways.

Carbohydrate Metabolism: Glycolysis- schemation and Reactions of pathway, Energetics and Stoichiometry. Fates of Pyruvate under aerobic and anaerobic conditions. **TCA Cycle:** Reactions, regulation and energetics.

Gluconeogenesis: Reactions and its significance. **10 hr**

Unit II

Bioenergetics: Biological oxidation, types of phosphorylation. Electron transport chain- mechanism of oxidative phosphorylation, P:O ratio, uncouplers-definition and example. Photosynthesis: efficiency of utilization of sunlight, photophosphorylation-cyclic and noncyclic photophosphorylation, Schemation of C3, C4 pathway CAM plants. Amino Acid Metabolism: Glucogenic and ketogenic amino acids, general pathways of synthesis and degradation-: Transamination, deamination and decarboxylation. Urea cycle. **12hr**

Unit III

Lipid Metabolism: activation of fatty acids, β - oxidation and stoichiometry of β - oxidation. biosynthesis of even chain fatty acids, stoichiometry of fatty acid synthesis. Metabolism of Nucleotides: Synthesis and degradation of purines and pyrimidine nucleotides. **10hr**

Suggested Reading:

- Jasra O.P, Text book of biochemistry vol 1 Sarup Books Publishers Pvt Ltd, New Delhi, India
- J.L Jain, Fundamentals of Biochemistry, S.Chand & company ltd.
- Jayaraman.J ., Laboratory Manual in Biochemistry, New Age International, Bengaluru, India
- Singh S.P., A Text book of Biochemistry 3rd ed, CBS Publishers & Distributors, Bengaluru, India
- U. Satyanarayana., Biochemistry, Books and Allied (P) Ltd. Kolkata, India
- Rastogi S.C., Biochemistry 2nd ed, McGraw-Hill Education, India
- Voet, D and Voet, J.G. (2004). Biochemistry, 3rd Edition, JohnWiley & Sons, Inc.USA.
- A.C. Deb- Text Book of Biochemistry, New Central Book Agency (P) Ltd, Kochi, India
- Plummer. T. David., An introduction to practical biochemistry, McGraw-Hill Publications, USA
- Denise R.Ferrier, Lippincott's illustrated reviews: Biochemistry, Lippincott Williams & Wilkin, Philadelphia, USA
- Nicholas C.Price & Lewis Stevens., Fundamentals of Enzymology 3rd ed, Oxford science publications New York
- Travor Palmer., Enzymes - Biochemistry, Biotechnology and Clinical Chemistry., Oxford Woodhead Publishing, England
- Alan Wiseman., Handbook of Enzyme Biotechnology, Ellis Horwood Ltd., Chichester, U.K
- Bhatt S M., Enzymology and Enzyme Techonology, S. Chand Publishing, New Delhi, India
- Shanmugam S, Sathish Kumar T, Shanmuga prakash M., Enzyme Technology 2nd ed, Ik International Pvt Ltd, New Delhi, India
- Khan M Y, Farha Khan., Principles of Enzyme technology, PHI Learning, New Delhi, India

(DSC) Practical 2

Course duration: 16 weeks with 4 hours of lab work per week.

ENZYMOMOLOGY

Assay of salivary amylase by DNS method, determination of specific activity.

Effect of pH on enzyme activity

Effect of temperature on enzyme activity

Effect of metal ions.

METABOLISM

Qualitative analysis of some metabolites in urine samples-urea, urea acid, creatinine, albumin, glucose, sterols, ketone bodies.

Serum analysis-SGPT and SGOT.

Scheme of Valuation for Practicals

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 skill, comprehension and recording the results.

The students has to compulsorily submit the practical record during C1 and C2. For C3, the record has to be certified by the Head of the Department.

- The student is evaluated for 10 marks in C1 and C2 as per the following scheme:

Experiment: 10.

The marks scored is then normalised for 5.

- The student is evaluated for 40 marks in C3 as per the following scheme:

Heading	Marks
Experiment	35
Record	05
Total	40

B.Sc.(Biotechnology)CBCS Syllabus 2019-2020
I Sem Practical Examination Scheme

Time: 03 hours

Max Marks: 40

Q1) Estimation of glucose by DNS method **12 M**

(Procedure writing 03 M, Conducting experiment 05M Result 01 M, Graph 2M, Report 01M)

Or

Estimation of Protein by Biuret method/Lowry's Method.

Q2) Identify the given Biomolecule sugar/amino acid **5M**

(Identification 1M, minimum 2 tests has to be conducted $2 \times 1.5 = 3M$, Report 1M)

Q3) Determine Gram's reaction for the given sample and report **6M**

(Procedure writing 2M, Report with microscopic field diagram, labeled 4M)

Q4) Demonstrate any one of the inoculation technique **4M**

(Point, stab, zig zag, spread plate, Conducting 2M, Procedure 2M)

Q5) Comment on A, B, C and D **4×2=8**

Identification 1M, Comment 1M

(iodine value, chromatography photo, DNA, tRNA- photo, Culture media, Microbial growth curve, Downy mildew and Rust)

Record **05 M**

(Valued by external examiner)

II Sem Practical Examination Scheme

Time: 03 hours

Max Marks: 40

Q1. You are given two tubes A and B. Estimate the activity of Salivary amylase and report which tube contains activity.

Or

You are given tubes A B and C containing buffers of different pH. Estimate the activity of salivary amylase and report in which tube maximum activity is observed. **10 M**

(Procedure 2M, graph 2M, result 5M, Report 1M)

Q2. Carry out the qualitative analysis of any three components **4×3=12**

(Glucose, Creatinine, albumin, ketone bodies, sterol)

(Conduction of experiment 02 M, Report with Procedure 02 M)

Q3. Comment on A, B, C and D **4×2=8**

(Graph of effect of temperature, effect of metal ions, photos of Lock and Key model, Multienzyme complex. SGOT and SGPT Values, sugar concentration in urine sample, photos of Urea cycle, CAM pathway)

Q4. Record (Valued by External examiner) **5M**

Question Paper Pattern

DSC Courses: 101, 201, 301, 401, and similar courses

Time: 3 hours

Max Marks: 80

1. Answer any six of the following

1 to 8

6×2=12

2. Write short notes on any six of the following

9 to 16

6×3=18

3. Answer any four of the following

17-22

4×5=20

4. Answer any three of the following

23 to 26

3×10=30