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. – Mathematics

Choice Based Credit System - 2019

Credit Pattern for Courses

L: Lecture; T: Tutorial; P: Practicals

Semester	Sl. No	Code	Title of the paper	Teaching/ instructional class hrs/week	Credit Pattern L:T:P
I	1	DSC – MATH-01	Algebra-I and Calculus-I	4 hrs	4:0:2
			Practicals-1	4 hrs	
II	2	DSC – MATH-02	Calculus-II and Theory of Numbers	4 hrs	4:0:2
			Practicals-2	4 hrs	
III	3	DSC – MATH-03	Algebra-II and Differential Equations	4 hrs	4:0:2
			Practicals-3	4 hrs	
IV	4	DSC – MATH-04	Differential Equations-II and Real Analysis-I	4 hrs	4:0:2
			Practicals-4	4 hrs	
V	5	DSE – MATH-01	Real Analysis-II and Algebra-III	4 hrs	4:0:2
			Practicals-5	4 hrs	
	6	SEC – MATH - 01	Applied Mathematics	2hrs	2:0:0
	7	SEC – MATH - 02	Numerical Analysis	2hrs	2:0:0
VI	8	DSE – MATH-02	Algebra-IV and Complex Analysis-I	4 hrs	4:0:2
			Practicals-6	4 hrs	
	9	SEC – MATH - 03	Complex Analysis-II and Improper Integrals	2hrs	2:0:0
	10	SEC – MATH - 04	Graph Theory	2hrs	2:0:0

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.

SYLLABI FOR B.Sc. MATHEMATICS

I SEMESTER
DSC – MATH – 01 : ALGEBRA - I AND CALCULUS - I
(4 lecture hours/ week: 16 x 4 = 64 HOURS)

UNIT – I: Matrices (16 hrs)

Rank of a matrix – Elementary row/column operations – Invariance of rank under elementary operations – Inverse of a non-singular matrix by elementary operations.

System of m linear equations in n unknowns – Matrices associated with linear equations – trivial and non trivial solutions – Criterion for existence of non-trivial solution of homogeneous and non-homogeneous systems – Criterion for uniqueness of solutions. Eigen values and Eigen vectors of a square matrix – Properties – Diagonalization of a real symmetric matrix – Cayley - Hamilton theorem – Applications to determine the powers of square matrices and inverses of non-singular matrices.

UNIT – II: Theory of Equations (16 hrs)

Theory of equations – Euclid's algorithm – Polynomials with integral coefficients – Remainder theorem – Factor theorem – Fundamental theorem of algebra(statement only) – Irrational and complex roots occurring in conjugate pairs – Relation between roots and coefficients of a polynomial equation – Symmetric functions – Transformation – Reciprocal equations – Descartes' rule of signs – Multiple roots – Solving cubic equations by Cardon's method – Solving quartic equations by Descarte's Method.

UNIT III: Differential Calculus -I and Integral Calculus - I (16 hrs)

Derivative of a function - Derivatives of higher order – nth derivatives of the functions: e^{ax} , $(ax + b)^n$, $\log(ax + b)$, $\sin(ax + b)$, $\cos(ax + b)$, $e^{ax}\sin(bx+ c)$, $e^{ax}\cos(bx + c)$ – Problems, Leibnitz theorem – Monotonic functions – Maxima and Minima – Concavity , Convexity and points of inflection.

Reduction formulae for $\int\sin^n x\,dx$, $\int\cos^n x\,dx$, $\int\sin^n x\cos^m x\,dx$, $\int\tan^n x\,dx$, $\int\cot^n x\,dx$, $\int\sec^n x\,dx$, $\int\operatorname{cosec}^n x\,dx$, $\int x^n \sin x\,dx$, , $\int x^n \cos x\,dx$, , $\int x^n e^{ax}\,dx$ with definite integrals.

UNIT IV: Differential Calculus -II (16 hrs)

Polar coordinates – angle between the radius vector and the tangent at a point on a curve – angle of intersection between two curves – Pedal equations –

Derivative of arc length in Cartesian, Parametric and Polar form, Coordinates of center of curvature – Radius of curvature – Circle of curvature – Evolutes.

Books for References:

1. Natarajan, Manicavasagam Pillay and Ganapathy – Algebra
2. Serge Lang – First Course in Calculus
3. Lipman Bers – Calculus, Volumes 1 and 2
4. N. Piskunov – Differential and Integral Calculus
5. B S Vatssa, Theory of Matrices, New Delhi: New Age International Publishers, 2005.
6. A R Vashista, Matrices, Krishna Prakashana Mandir, 2003.
7. G B Thomas and R L Finney, Calculus and analytical geometry, Addison Wesley, 1995.
8. J Edwards, An elementary treatise on the differential calculus: with Applications and numerous example, Reprint. Charleston, USA BiblioBazaar, 2010.
9. N P Bali, Differential Calculus, India: Laxmi Publications (P) Ltd.., 2010.
10. S Narayanan & T. K. Manicavachogam Pillay, Calculus.:S. Viswanathan Pvt. Ltd., vol. I & II 1996.
11. Frank Ayres and Elliott Mendelson, Schaum's Outline of Calculus, 5th ed.USA: Mc. Graw Hill., 2008.
12. Shanti Narayan and P K Mittal, Text book of Matrices, 5th edition, New Delhi, S Chand and Co. Pvt. Ltd.,2013.
13. Shanthi Narayan and P K Mittal, Differential Calculus, Reprint. New Delhi: S Chand and Co. Pvt. Ltd., 2014.

PRACTICALS - 1

(4 hours/ week per batch of not more than 15 students)
Mathematics practical with Free and open Source Software (FOSS) tools for computer programs
Programs using Scilab/Maxima/Python:

1. Getting Started – Introduction.
2. Solving problems in Sets and Functions.
3. Solving problems in Algebra of Polynomials and Rational Functions.
4. Solving problems in Matrices – 1.
5. Solving problems in Matrices – 2.
6. Plotting 2D graphs.
7. Plotting 3D graphs.

8. n^{th} derivative using Maxima.
9. Leibnitz rule using Maxima.

II SEMESTER

DSC– MATH – 02 : CALCULUS - II AND THEORY OF NUMBERS
(4 lecture hours / week: 16 x 4 = 64 HOURS)

UNIT I: Limits, Continuity and Differentiability - (16 hrs)

Limit of a function – Properties and problems, Continuity of functions – Properties and problems – Infimum and supremum of a function – Theorems on continuity – Intermediate value theorem – Derivative of a function – properties and problems.

UNIT II: Mean Value theorems (16 hrs)

Rolle's theorem – Lagrange's Mean Value theorem – Cauchy's mean value theorem – Taylor's theorem – Maclaurin's theorem – Taylor's infinite series and power series expansion – Maclaurin's infinite series .
Indeterminate forms: $0/0$, ∞/∞, $0x\infty$, $\infty-\infty$, 0^{∞} , 1^{∞} and ∞^{0} .

UNIT III: Partial Derivatives (16 hrs)

Functions of two or more variables – Explicit and implicit functions – The neighbourhood of a point – The limit of a function – Continuity – Partial derivatives — Homogeneous functions – Euler's theorem – Chain rule – Change of variables – Directional derivative – Partial derivatives of higher order – Taylor's theorem for two variables – Derivatives of implicit functions – Jacobians – Some illustrative examples.

UNIT IV: Theory of Numbers (16 hrs)

Division Algorithm - Divisibility – Prime and composite numbers - Euclidean algorithm – fundamental theorem of Arithmetic – The greatest common divisor and least common multiple – congruences – Linear congruences –Simultaneous congruences – Wilson's, Euler's and Fermat's Theorems and their applications.

Books for References:

1. Serge Lang – First Course in Calculus
2. Lipman Bers – Calculus Volumes 1 and 2
3. N P Bali, Differential Calculus, India: Laxmi Publications (P) Ltd.., 2010.
4. S. Narayanan & T. K. Manicavachogam Pillay, Calculus, S. Viswanathan Pvt. Ltd., vol. I & II 1996.
5. G B Thomas and R L Finney, Calculus and analytical geometry, Addison Wesley, 1995.
6. David M Burton, Elementary Number Theory, 6th edition, McCraw Hill, 2007.
7. Emil Grosswald, Topics from the Theory of Numbers, Modern Birhauser, 1984.
8. Ivan Niven, Herbert S. Zuckerman and Hugh L. Montgomery, An Introduction to the Theory of Numbers, John Willey (New York), 1991.

PRACTICALS - 2
(4 hours/ week per batch of not more than 15 students)
Mathematics practical with Free and open Source Software (FOSS) tools for computer programs

Programs using Scilab/Maxima/Python:

1. Limits and continuity
2. Differentiability
3. Rolle's Theorem
4. Lagrange's Mean Value Theorem
5. Taylor's Theorem
6. Indeterminate Forms
7. Partial Derivatives
8. Number Theory

Structure of B.Sc Mathematics papers

Semester	Sl. No	Code	Title of the paper	Teaching/ instructional class hrs/week	Credit Pattern L:T:P	Credit Value	Marks		
							C1	C2	C3
I	1	DSC – MATH-01	Algebra-I and Calculus-I	4 hrs	4:0:2	6	10	10	80
			Practicals-1	4 hrs			05	05	40
II	2	DSC – MATH-02	Calculus-II and Theory of Numbers	4 hrs	4:0:2	6	10	10	80
			Practicals-2	4 hrs			05	05	40
III	3	DSC – MATH-03	Algebra-II and Differential Equations	4 hrs	4:0:2	6	10	10	80
			Practicals-3	4 hrs			05	05	40
IV	4	DSC – MATH-04	Differential Equations-II and Real Analysis-I	4 hrs	4:0:2	6	10	10	80
			Practicals-4	4 hrs			05	05	40
V	5	DSE – MATH-01	Real Analysis-II and Algebra-III	4 hrs	4:0:2	6	10	10	80
			Practicals-5	4 hrs			05	05	40
	6	SEC – MATH - 01	Applied Mathematics	2hrs	2:0:0	2	5	5	40
	7	SEC – MATH - 02	Numerical Analysis	2hrs	2:0:0	2	5	5	40
VI	8	DSE – MATH-02	Algebra-IV and Complex Analysis-I	4 hrs	4:0:2	6	10	10	80
			Practicals-6	4 hrs			05	05	40
	9	SEC – MATH - 03	Complex Analysis-II and Improper Integrals	2hrs	2:0:0	2	5	5	40
	10	SEC – MATH - 04	Graph Theory	2hrs	2:0:0	2	5	5	40

Evaluation Pattern:

For Discipline Specific Course (DSC) and Discipline Specific Elective (DSE) papers):

For Theory:

(i) Internal assessment

C1 Component: 10 Marks. This will be based on a theory test. This should be completed by the 8th week of the semester.
C2 Component: 10 Marks. This will be based on an assignment .This should be completed by the 15th week of the semester.

(ii) C3 Component:

Main Examination of 3 hours duration: Max. Marks : 80

The pattern of the question paper will be as follows:
There will be 5 questions, First question carries 20 marks and remaining 4 questions carries 15 marks each. All questions must be answered.

Question 1. This question covers all the four units of the syllabus. There are 12 questions (Three questions shall be chosen from each unit) each carrying 2 marks. The candidate has to answer any 10 questions.
Question 2. This question covers Unit 1 of the syllabus. There will be 5 sub-questions each carrying 5 marks. The candidate has to answer any three of the 5 sub-questions.
Question 3. This question covers Unit 2 of the syllabus. There will be 5 sub-questions each carrying 5 marks. The candidate has to answer any three of the 5 sub-questions.
Question 4. This question covers Unit 3 of the syllabus. There will be 5 sub-questions each carrying 5 marks. The candidate has to answer any three of the 5 sub-questions.
Question 5. This question covers Unit 4 of the syllabus. There will be 5 sub-questions each carrying 5 marks. The candidate has to answer any three of the 5 sub-questions.

For Practicals:

(i) Internal assessment

C1 Component: 05 Marks. This will be based on a practical test. This should be completed by the 8th week of the semester.
C2 Component: 05 Marks. This will be based on practical assignment. This should be completed by the 15th week of the semester.

(ii) C3 Component:

Main Examination of 4 hours duration: Max Marks: 40

Three experiments will be given each carrying 10 marks .

Heading	Marks
Experiment	30
Viva	05
Record	05
Total	40

The experiment portion of evaluation for each question is carried out as per the following scheme:

Heading	Marks
Problem solving manually	04
Programme writing	04
Execution	02

4. Minimum marks for Securing Credits: As per CBCS regulations.

5. Minimum credits for getting B.Sc. Degree: As per CBCS regulations.

6. Award of degree: As per CBCS regulations.

Pattern of Question Paper
(**For the semester I)**

Paper (DSC) – T1

(Duration of Exam 3 Hrs) **Max marks 80**

Part A

Answer any ten questions 10×2 =20

I. 1-3 Matrices

4-6 Theory of Equations

7-9 Differential calculus I and Integral Calculus - I

10-12 Differential calculus II

Part B

Answer any three questions from each unit(Each question carries 5 marks)
4×15 =60

II. Matrices : a, b , c, d, e
III. Theory of Equations: a, b , c, d, e.

IV. Differential calculus- I and Integral Calculus - I: a, b , c, d, e.

V. Differential calculus - II a, b , c, d, e.

(For the semester II)

Paper (DSC) – T2

(Duration of Exam 3 Hrs) **Max marks 80**

Part A

Answer any ten questions 10×2 =20

I. 1-3 Limits, Continuity and Differentiability

4-6 Mean Value theorems

7-9 Partial derivatives

10-12 Theory of Numbers

Part B

Answer any three from each of the following questions (Each question carries 5 marks) 4×15 =60

II. Limits, Continuity and Differentiability : a, b , c, d, e

III. Mean Value Theorems: a, b , c, d, e

IV. Partial derivatives : a, b , c, d, e

V. Theory of Numbers : a, b , c, d, e

BOS – Proceedings…

The first board of studies meeting in Mathematics held on 18/02/2019 at the Department of mathematics ,SBRR Mahajana First Grade college , Mysuru.

Agenda of the meeting…

1. Revision of the existing CBCS syllabus given by University of Mysore.
2. To approve and finalise the list of examiners of the UG Examination for the academic year 2019-20.
3. To finalise and suggest the subject books for reference.
4. To finalise the question paper pattern for the UG examination for the academic year 2019-20.

Decision Taken….

1. The board as resolved and approved the existing syllabus of university of Mysore with changes.
2. The board approved and suggest the changes in the units for both 1^{st} and 2^{nd} semesters.
3. The board approved the list of examiners.
4. It was resolved to retain the existing internal assessment marks.