South Konkan Education Society's

GOVINDRAM SEKSARIA SCIENCE COLLEGE (AUTONOMOUS), TILAKWADI, BELAGAVI.

(Reaccredited at 'A' grade by NAAC in 4th Cycle Affiliated to Rani Channamma University)

THE COURSE STRUCTURE & SYLLABUS OF UNDER GRADUATE

BACHELOR OF SCIENCE

MATHEMATICS

1ST & 2nd Semesters

BOS COMMITTEE (MATHEMATICS)

B.Sc. MATHEMATICS (I & II SEM) PROGRAM 2024-25

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2	Prof. Vijayalakshmi S. Shigehalli Professor, Department of Mathematics, Rani Channamma University, Belagavi	University Nominee
3	Prof. S.H. Sankanagoudar Associate Professor, Department of Mathematics, Shri. SBM. Arts, Science and Commerce College, Badami	Member (Other University)
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PREAMBLE

The subject wise expert committee to draft model curriculum contents in Mathematics constituted by the Department of Higher Education, Government of Karnataka, Bengaluru vide GO No. ED 166 UNE 2023 BENGALURU DATED 08.05.2024 is pleased to submit its partial report on the syllabus for the First Year (First & Second Semesters) B.Sc. Mathematics and detailed Course Structure for B.Sc. Mathematics Three Majer up to 4th Semester and Specialization in one subject in 5th and 6th semester

The committee discussed various models suggested by the Karnataka State Higher Education Council in its joint meetings with the Chairpersons of Board of Studies of all state universities in Karnataka and resolved to adopt a Model 3-Majors with a general degree.

The expert committee suggested to the implementation of this curriculum structure in Department of Mathematics in UG Colleges in Karnataka. Based on these recommendations, South Konkan Education Society's Govindram Seksaria Science College (Autonomous), Belagavi constituted an expert committee to review/modify the B.Sc. syllabi.

The subject expert committee designed the Course Learning Outcome (CO) to help the learners to understand the main objectives of studying the courses by keeping in mind of the Programme outcomes (PO) of the graduate degree in Mathematics or a graduate degree with Mathematics as a major subject.

As the Mathematics subject is a vast with several branches of specializations, it is difficult for every student to learn each branch of Mathematics, even though each paper has its own importance. Hence the subject expert committee suggested to consider elective papers in this course, so student can select elective paper as per her/his needs and interest.

To achieve the core objectives, it is unanimously resolved to introduce computer based practical courses by using Free and Open-Source Software's (FOSS) tools for implementation of theory-based courses as it is also suggested by the LOCF committee that the papers may be taught using various Computer Algebra System (CAS) software's such as Mathematica, MATLAB, Maxima and R to strengthen the conceptual understanding and widen up the horizon of students' self-experience. In view of these observations the subject expert committee suggested the software's Phython /R /Maxima/ Scilab/ Maple/MatLab/Mathematica for hands on experience of implementation of mathematical concepts in computer- based lab.

GOVINDRAM SEKSARIA SCIENCE COLLEGE, BELGAVI

PROGRAM OUTCOMES:

1. **Disciplinary Knowledge:** Bachelor degree in Mathematics is the culmination of in-depth knowledge of Algebra, Calculus, Geometry, differential equations and several other branches of pure and applied mathematics. This also leads to study the related areas such as computer science and other allied subjects.
2. **Communication Skills:** Ability to communicate various mathematical concepts

effectively using examples and their geometrical visualization. The skills and knowledge gained in this program will lead to the proficiency in analytical reasoning which can be used for modelling and solving of real-life problems.

3. **Critical thinking and analytical reasoning:** The students undergoing this programme acquire ability of critical thinking and logical reasoning and capability of recognizing and distinguishing the various aspects of real-life problems.
4. **Problem Solving:** The Mathematical knowledge gained by the students through this programme develop an ability to analyze the problems, identify and define appropriate computing requirements for its solutions. This programme enhances students' overall development and also equip them with mathematical modelling ability, problem solving skills.
5. **Research related skills**: The completing this programme develop the capability of inquiring about appropriate questions relating to the Mathematical concepts in different areas of Mathematics.
6. **Information/digital Literacy:** The completion of this programme will enable the learner to use appropriate software's to solve system of algebraic equation and differential equations.
7. **Self-directed learning:** The student completing this program will develop an ability of working independently and to make an in-depth study of various notions of Mathematics.
8. **Moral and ethical awareness/reasoning:** The student completing this program will develop an ability to identify unethical behavior such as fabrication, falsification or misinterpretation of data and adopting objectives, unbiased and truthful actions in all aspects of life in general and Mathematical studies in particular.
9. **Lifelong learning:** This programme provides self-directed learning and lifelong learning skills. This programme helps the learner to think independently and develop algorithms and computational skills for solving real word problems.
10. Ability to peruse advanced studies and research in pure and applied Mathematical Science

COURSE STRUCTURE FOR B.Sc. PROGRAMME

Sem	Subjects	Teaching Hours/week	Duration of Exam	Marks			Subject Credits
				IA	Exam	Total	
I	Major1 Theory	04	03	20	80	100	03
	Major1 Practical	04	04	10	40	50	02
	Major2 Theory	04	03	20	80	100	03
	Major2 Practical	04	04	10	40	50	02
	Major3 Theory	04	03	20	80	100	03
	Major3 Practical	04	04	10	40	50	02
	Language1	04	03	20	80	100	04
	Language2	04	03	20	80	100	04
	Compulsory-1	02	02	10	40	50	02
II	Major1 Theory	04	03	20	80	100	03
	Major1 Practical	04	04	10	40	50	02
	Major2 Theory	04	03	20	80	100	03
	Major2 Practical	04	04	10	40	50	02
	Major3 Theory	04	03	20	80	100	03
	Major3 Practical	04	04	10	40	50	02
	Language1	04	03	20	80	100	04
	Language2	04	03	20	80	100	04
	Compulsory-2	02	02	10	40	50	02
Total Credits							**50**

BSC I SEMESTER MATHEMATICS (Major)

Paper Code: MATMAJT 1.1 **Paper Title:** Algebra–I and Calculus–I

Teaching Hours: 4 Hrs. / Week **Marks:** Theory-80+IA-20

Teaching Hours: 60 Hrs. **Credits: 03**

UNIT-I

MATRICES:

Recapitulation of Elementary Transformations of matrices, Rank of a Matrix, Row and column reduction to Echelon form. Reduction to Normal forms, Inverse of matrix by elementary transformations, Cayley-Hamilton theorem (Without Proof), Verification of and inverse of matrices by Cayley-Hamilton theorem. Solution of System of linear equations. (15 Hours)

UNIT-II

REAL NUMBER SYSTEM: Properties of real number system, inequalities & absolute values, l.u.b, g.l.b and Archimedean properties of real numbers, Borel covering theorem (**only statement**).

LIMITS AND CONTINUITY: Recapitulation of limits and continuity. Algebra of limits (**with**

proofs). Algebra of continuous functions (**without proofs**). Properties of Continuous functions. Boundedness of continuous functions, Intermediate value theorems. (15Hours)

UNIT-III

HIGHER ORDER DERIVATIVES: The n^{th} derivative of $(ax + b)^n$, $1/(ax+b)$, $\log(ax+b)$, e^{ax+b}, $\sin(ax+b)$, $\cos(ax+b)$, $e^{ax}\sin(bx+c)$, $e^{ax}\cos(bx+c)$, Leibnitz's theorem for n^{th} derivative of product of two functions and problems on Leibnitz's theorem. (15 Hours)

UNIT-IV

MEAN VALUE THEOREMS

Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Introduction to convergence series, Taylor's Theorem (with Sclomilch and Rouche's form of reminder), Maclaurin's Series.

(15 Hours)

Reference Books:

1. Deferential Calculus – Shanti Narayan and Mittal
2. Real Analysis-N P Bali
3. First Course in Real Analysis-M. k. Singal and Asha Rani
4. Text book of B.sc Mathematics- G.K. Raganath
5. Matrices and determinants- M.L. Khanna

BSC I SEMESTER MATHEMATICS

Paper Code: MATMAJP 1.1 **Paper Title:** Practicals on Algebra–I and Calculus–I

Teaching Hours: 3 Hrs / Week **Marks:** Practical 40+IA-10

Credits: 2

Introduction to Sci Lab / Maxima and commands related to the topic.

1. Computation of Sum, Difference and Product of two Matrices.
2. Computation of trace and transpose of matrices.
3. Computation of rank of matrix and row reduced echelon form.
4. Computation of inverse of a matrix using Cayley-Hamilton theorem.
5. Solution of system of linear equations.
6. Finding n^{th} derivative of e^{ax}, trigonometric and hyperbolic functions.
7. Finding n^{th} derivative of algebraic functions and logarithmic functions.
8. Finding n^{th} derivative of $e^{ax}\sin(ax+b)$, $e^{ax}\cos(ax+b)$.
9. Examples on Rolle's theorem, Lagrange's and Cauchy's mean value theorem.
10. Taylor's and Maclaurin's series expansion of a given function.

NOTE: Use the SciLab / MAXIMA Open – source Software to execute the practical problems. Sci Lab: is an open-source software and it can be downloaded from http://www.scilab.org/download. Some materials for Sci Lab can be found on http://wiki.scilab.org/Tutorialsarchives.

MAXIMA: is an Open source Computer Algebra System for solving typical calculus problems.The latest version is available on http://maxim.source.forge,net/documentation.html

ASSESSMENT METHODS

Evaluation Scheme for Internal Assessment:

Theory:

Assessment Criteria	
1st Internal Assessment Test for 20 marks of duration 1 hr after 8 weeks (to be reduced to 04 marks)	07 marks
2nd Internal Assessment Test for 20 marks 1 hr after 12 weeks. (to be reduced to 10 marks)	07 marks
Attendance	03 marks
Assignment	03 marks
TOTAL	20 marks

Practical:

Assessment Criteria	
Internal Practical Test	10 marks

Semester End Practical Examination

Scheme for Practical Examination

Assessment Criteria		
Program 1	Writing program	08 marks
	Execution of program	07 marks
Program 2	Writing program	08 marks
	Execution of program	07 marks
Journal		05 marks
Viva Voce		05 marks
TOTAL		40 marks

BSC II SEMESTER MATHEMATICS (MAJOR) SYLLABUS FOR THE YEAR 2024-25

Paper Code: MATMAJT 1.2 **Paper Title:** practicals on Calculus-II- & 3-Dimensional geometry
Teaching Hours: 4 Hrs / Week **Marks:** Theory-80+IA-20
Teaching Hours: 60Hrs **Credits: 03**

UNIT-I

Differential Calculus

Polar coordinates. Angle between the radius vector and the tangent at a point on the curve. Angle of intersection of two curves. Introduction to polar and pedal coordinates, polar and pedal equation of the curves. Polar sub-tangent and polar sub - normal. Derivative of an arc length, curvature, radius of curvature in cartesian, parametric, polar and pedal forms.
(15 Hours)

UNIT-II

Limits, Continuity and Partial Differentiation

Limits, continuity of functions of two variables. Partial derivatives, second order partial derivatives, Euler's theorem for homogeneous functions. Total derivatives and differentiation of implicit and composite functions. Jacobian of second and third orders and its properties. (15 Hours)

UNIT-III

Integral Calculus

Reduction formulae for integration of $\sin^n x$, $\mathrm{Cos}^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\mathrm{cosec}^n x$, $\sin^m x \cos^n x$, $x^n e^{ax}$, $x^m(\log x)^n$. (15 Hours)

UNIT-IV

Sphere: Equation of a sphere, section of a sphere by a plane, Equation of a sphere through a circle, Equation of a sphere through two given points as ends of a diameter. Equation to a tangent and normal planes of a sphere, condition for tangency, orthogonality of two spheres, radical plane and coaxial system of spheres. (15 Hours)

Books of reference:

1. Differential Calculus: Shantinarayan and Dr. P.K. Mittal
2. Integral Calculus: Shantinarayan and Dr. P.K. Mittal
3. Differential Calculus and integral Calculus: N.P. Bali
4. Text Book of B.Sc. Mathematics: G. K. Ranganath
5. Differential Calculus and integral Calculus :P. N. Chatterji.
6. Analytical Solid geometry: Shantinarayan and Dr. P.K. Mittal
7. Solid Geometry: N.P. Bali
8. Real Analysis: Prof Kumaresan

BSC II SEMESTER MATHEMATICS

Paper Code: MATMAJP 1.2 **Paper Title:** Practical-2
Teaching Hours: 4 Hrs / Week **Marks:** Practical-40+IA-10
Credits: 02

1. Program to find the angle between radius vector and tangent of a polar curve
2. Finding radius of curvature of the given curves.
3. Finding the angle between the two curves.
4. Computation of arc length of cartesian, parametric curves
5. Computation of arc length of polar curve.
6. Evaluation of definite integrals and reduction formulae.
7. Program to verify Euler's theorem.
8. Program to find Jacobian of second and third orders.
9. Program to find equation of a sphere and plot the graph.
10. Program to verify the condition for orthogonality of two spheres.

NOTE: Use the SciLab / MAXIMA Open – source Software to execute the practical problems.SciLab: is an open-source software and it can be downloaded from http://www.scilab.org/download. Some materials for sciLab can be found on http://wiki.scilab.org/Tutorialsarchives.

MAXIMA: is an Open source Computer Algebra System for solving typical calculus problems.The latest version is available on http://maxim.source.forge,net/documentation.html

QUESTION PAPER PATTERN OF UG MATHEMATICS SEP SYLLABUS

TIME: 3 HOURS. MAX. MARKS: 80.

PART – A: ANSWER ANY **TEN** OUT OF **TWELVE** **10 X 2 = 20 MARKS**

Q. NO.: 1. a, b, c, d, e, f, g, h, i, j, k, l.

PART – B: ANSWER ANY **FOUR** OUT OF **SIX** **4 X 5 = 20 MARKS**

Q. NOS: 2, 3, 4, 5, 6, 7.

PART – C: ANSWER ANY **FOUR FULL** QUESTIONS OUT OF **FIVE FULL** QUESTIONS. **4 X 10 = 40 MARKS**

Q. NOS: 8 a, 8b, 9a, 9b, 10a, 10b, 11a, 11b, 12a, 12b