Guru Jambheshwar University of Science & Technology, Hisar

Scheme for Theory + Practical Based Subjects

Guidelines for Scheme of examination of UG Course Mathematics-B.A. Pass course (under semester system)

The Scheme of Examination of undergraduate (UG) Courses (**Theory-70 marks (Two Papers) + Practical-30 marks Based Subjects)** under Faculty of Humanities & Social Sciences run by affiliated degree colleges will be under (50+20) + 30 (External + Internal + Practical) for practical based courses. Pass percentage will be …

For the UG courses under Faculty of Humanities & Social Sciences, the guidelines regarding scheme and paper setting will be followed as:

For the end semester examinations regarding practical subjects, nine questions are to be set by the examiner. The candidates shall attempt five questions in all. First question will be compulsory of 05 marks based on the entire syllabus. It will comprise of five short answer type questions of one mark each. Students are required to attempt any four questions out of remaining eight questions (these eight questions may be (in) up to four units depending on the subject). All remaining questions shall carry equal marks.
Scheme: [25 Paper-I+25 Paper-II+(10+10)] + 30 [External + (Internal) + Practical]
1^{st} question=05 marks (05 short answer type questions of 1 mark each)
Rest four questions: 05 marks each i.e. 4 x 05=20
Total = (25+10+25+10) + 30 = 100 marks

Components of Internal Assessment (Breakdown of 10 marks in each Paper)
a. Class Test: 2.5 marks
b. Assignment: 2.5 marks
c. Participation in Class Discussions: 1.5 marks
d. Term Paper/written test/2^{nd} assignment: 2.5 marks
e. Attendance: 2 marks* (Paper-I+Paper-II+Practicals)

*Weightage of 2 marks for **Attendance** component out of 20 marks for Internal Assessment shall be available only to those students who attend **75% and more** of classroom lectures and practical. The break-up of marks for **attendance component** for theory + practical papers shall be as under:

(a) 75% and above up to 85%: 01 mark

(b) Above 85%: 02 marks

BA Mathematics
Semester-I
BAMH-111: ALGEBRA

Marks (External Exams) : 25
Marks (Internal Assessment): 10
Time: 3 Hours

Note. The examiner is requested to set **nine questions** in all, selecting two questions from each Unit. Candidates are required to attempt five questions in all. Question no. 1 is compulsory and is based on entire syllabus consisting of five short answer type questions each of **one mark**. Candidates are required to attempt four questions from units I to IV, selecting one question from each Unit, each question carries **five marks**.

Course Objective	Course Outcome
The course on Algebra deals with advance topics on matrices viz. rank, eigen values and homogeneous and non homogeneous systems, solution of cubic and bi-quadratic equations.	The student will be able to find the rank, eigen values of matrices and solve the homogeneous and non homogeneous systems, solution of cubic and bi-quadratic equations.

Unit-I

Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary Operations on Matrices. Rank of matrices. Inverse of a matrix. Linear dependence and independence of rows and columns of matrices. Row rank and column rank of a matrix. Eigenvalues, Eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton Theorem and its use in finding the inverse of a matrix.

Unit-II

Applications of matrices to a system of linear (both homogeneous and non–homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear and Quadratic forms. Canonical Form of a Bilinear form. Matrix notation of Bilinear and Quadratic Form. Linear Transformation of a Quadratic form. Langrange's method of Diagonalization. Factorable Quadratic Form. Sylvester's Criterion.

Unit-III

Relations between roots and coefficients of general polynomial equation in one variable. Synthetic Division. Remainder Theorem and factor Theorem. Solutions of polynomial equations having conditions on roots. Common roots and multiple roots. Transformation of equations.

Unit-IV

Nature of the roots of an equation, Solutions of cubic equations (Cardan's Method). Solution of Biquadratic equations (Descarte's Method, Ferrari's Method). Descarte's rule of signs for Polynomial. Location of roots in an interval.

Books Recommended :

1. H.S. Hall and S.R. Knight: Higher Algebra, H.M. Publications .
2. Shanti Narayan : A Text Book of Matrices. S Chand & Co Ltd.
3. Chandrika Prasad :AText Book on Algebra and Theory of Equations. Pothishala Private Ltd., Allahabad.

BA Mathematics
Semester-I
BAMH-112: CALCULUS

Marks (External Exams) : 25
Marks (Internal Assessment): 10
Time: 3 Hours

Note. The examiner is requested to set **nine questions** in all, selecting two questions from each Unit. Candidates are required to attempt five questions in all. Question no. 1 is compulsory and is based on entire syllabus consisting of five short answer type questions each of **one mark**. Candidates are required to attempt four questions from units I to IV, selecting one question from each Unit, each question carries **five marks**.

Course Objective	Course Outcome
The course on differential and Integral Calculus deals with some important concepts of limit, continuity, differentiability of functions and tracing of curves, reduction formulae, rectification, quadrature and volume of solids of revolution.	The student will be able to understand basic properties of Limit, continuity and derivability of functions, series expansion indeterminate forms, tracing of curves, reduction formulae, rectification, quadrature and volume of solids of revolution.

Unit-I

$\varepsilon - \delta$ definition of continuity of a function. Basic properties of limits, continuous functions and classification of discontinuities. Successive differentiation. Lebnitz Theorem. Maclaurin and Taylor series expansions.

Unit-II

Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes. Asymptotes in polar coordinates. Curvature , radius of curvature for Cartesian curve, parametric curves, polar curves. Newton's Method. Radius of curvature for pedal curves. Tangential polar equations. Centre of curvature. Circle of curvature. Chord of curvature, Evolutes. Test for concavity and convexity. Singular points. Points of inflexion. Multiple points. Cusps, nodes & conjugate points. Species of cusps.

Unit-III

Tracing of curves in cartesian, parametric and polar co-ordinates. Reduction formulae. Derivation of reduction formulae by connecting with other integral. Rectification, length of curves in Cartesian, parametric and polar curves, intrinsic equations of curves from cartesian, parametric and polar curves.

Unit-IV

Quadrature and Sectorial Area. Area bounded by closed curves. Area enclosed by curves in polar form. Volumes and Area of solids of revolution. Volume bounded between two solids. Volume formula for parametric curves. Theorems of Pappu's and Guilden.

Books Recommended

1. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc.
2. G.B. Thomas and R.L. Finney, Calculus, Pearson Education.
3. T.M. Apostal : Calculus, vol. 1, John Wiley and Sons (Asia).
4. Shanti Narayan, Differential and Integral Calculus.
5. Murray R. Spiegel : Theory and Problems of Advanced Calculus. Schaun's Outline series. Schaum Publishing Co., New York.
6. Gorakh Prasad : Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.

BA Mathematics
Semester-I
BAMH-113: Mathematics Lab– I

Marks for External Exams: 30
Time: 3 Hours

Course Objective	Course Outcome
The course on Practical deals with some important concepts of Programming in C.	The student will be able to solve and calculate the mathematical problems through programming.

Part A:

Introduction to Programming in C. Data types, Operators and expressions, Input / outputs functions. Decision control structure: Decision statements, Logical and conditional statements, Implementation of Loops, Switch Statement & Case control structures.

Part B:

Programs based on simple arithmetic:

1. Program to Calculate Simple Interest
2. Program to Calculate Compound Interest
3. Program to Calculate Arithmetic mean of three numbers
4. Program to calculate area of triangle by Heron's Formula
5. Program to calculate area and perimeter of a circle
6. Program to check whether the number is odd or even
7. Program to find the roots of a quadratic equation
8. Program to calculate greatest of three numbers
9. Program to reverse the digits of a positive number
10. Program to check whether a number is prime or not
11. Program to convert decimal to binary
12. Program to generate first n prime numbers.
13. Program to check a year Leap or not.
14. Program to find the sum of first n natural numbers
15. Program to find sum of first n terms of an AP
16. Program to find sum of first n terms of a GP.
17. Program to generate a pyramid
18. Program to find simple interest using switch statement.
19. Program to prepare electricity Bill
20. Program to calculate Gross Salary of an Employee

Note: Every student will have to prepare a file to maintain practical record of the problems solved and the computer program done during practical class work. Examination will be conducted through a question paper set jointly by an external and internal examiner. An examinee will be asked to write solutions in the answer books. An examinee will be asked to run (execute) two programs on a computer. Evaluation will be made on the basis of the examinees' performance in written solutions/ programs, execution of computer programs and viva-voce examination**.**

Books Recommended:

1. B.W. Kernighan and D.M. Ritchie : The C Programming Language, 2nd Edition
2. V. Rajaraman : Programming in C, Prentice Hall of India.
3. Byron S. Gottfried: Theory and Problems of Programming with C, Tata McGraw-Hill Publishing Co. Ltd.

BA Mathematics
Semester-II
BAMH-121: ORDINARY DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

Marks (External Exams) : 25
Marks (Internal Assessment): 10
Time: 3 Hours

Note. The examiner is requested to set **nine questions** in all, selecting two questions from each Unit. Candidates are required to attempt five questions in all. Question no. 1 is compulsory and is based on entire syllabus consisting of five short answer type questions each of **one mark**. Candidates are required to attempt four questions from units I to IV, selecting one question from each Unit, each question carries **five marks**.

Course Objective	Course Outcome
The course on ordinary differential equations and Laplace Transforms deals with some important concepts Exact differential equations, Orthogonal trajectories, Linear differential equations with variable & constant coefficients and solution of ordinary differential equations using Laplace Transforms.	The student will be able to understand basic properties of differential equations, Orthogonal trajectories, Linear differential equations. Apart from this the students will able to solve ODE by Transformation of the equation by changing the dependent variable/ the independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation. Method of variations of parameters. Solution of Simultaneous Differential Equations and Total Differential Equations. Also able to understand basic properties of Laplace and Inverse Laplace Transforms and solution of ordinary differential equations using Laplace Transform

Unit – I

Geometrical meaning of a differential equation. Exact differential equations, integrating factors. First order higher degree equations solvable for x,y,p Lagrange's equations, Clairaut's equations. Equation reducible to Clairaut's form. Singular solutions.

Unit – II

. Orthogonal trajectories: in Cartesian coordinates and polar coordinates. Self orthogonal family of curves. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous.

Unit – III

Linear differential equations of second order. Reduction to normal form. Transformation of the equation by changing the dependent variable/ the independent variable. Solution by operators of non-homogeneous linear differential equations.Reduction of order of a differential equation. Method of variations of parameters.Ordinary simultaneous differential equations. Solution of simultaneous differential equations.

Unit – IV

Laplace Transforms –Existence theorem for Laplace transforms, Linear property of the Laplace transform, Shifting theorems, Laplace transform of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem,

Inverse Laplace transform, convolution theorem, Inverse Laplace transform of derivatives, solution of ordinary differential equations using Laplace transform.

Books Recommended :

1. D.A. Murray : Introductory Course in Differential Equations. Orient Longaman (India) .
2. A.R.Forsyth : A Treatise on Differential Equations, Machmillan and Co. Ltd. London
3. E.A. Codington : Introduction to Differential Equations.
4. S.L.Ross : Differential Equations, John Wiley & Sons
5. B.Rai & D.P. Chaudhary : Ordinary Differential Equations; Narosa, Publishing House Pvt. Ltd.
6. M.D. Raisinghania :Ordinary and Partial Differential Equations.
7. Dyke,Phil : An introduction to Laplace Transforms and Fourier Series,Springer Undergraduate Mathematics Series.
8. Murray Spiegel: Schaum's Outline of Laplace Transform. McGraw-Hill Education.

BA Mathematics
Semester-II
BAMH-122: VECTOR CALCULAS AND GEOMETRY

Marks (External Exams) : 25
Marks (Internal Assessment): 10
Time: 3 Hours

Note. The examiner is requested to set **nine questions** in all, selecting two questions from each Unit. Candidates are required to attempt five questions in all. Question no. 1 is compulsory and is based on entire syllabus consisting of five short answer type questions each of **one mark**. Candidates are required to attempt four questions from units I to IV, selecting one question from each Unit, each question carries **five marks**.

Course Objective	**Course Outcome**
The course on Vector Calculus and Geometry deals with topics on vectors and geometry viz. directional derivatives, gradient, curl, two and three dimensional geometry.	The student will be able to find directional derivatives, gradient, curl. Laplasian operator, two and three dimensional geometry.

Unit – I

Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. Vector differentiation Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives. Gradient of a scalar point function, geometrical interpretation of grad Φ. Divergence and curl of vector point function. Gradient, divergence and curl of sums and product and their related vector identities. Laplacian operator.

Unit – II

Vector integration: Indefinite Integral, Definite Integral, Standard results of Integration. Line integral, Surface integral, Volume integral. Gauss Divergence Theorem, Divergence Theorem in Cartesian Co-ordinates, Green Theorem, Stoke's Theorem(Relation between line Integral Surface Integral). Stoke's Theorem in Cartesian form. Green's Theorem in Plane as special case of Stoke's Theorem.

Unit – III

General equation of second degree. Tracing of conics. System of conics, confocal conics. Tangent at any point to the conic, chord of contact, pole of line to the conic, director circle of conic. Polar equation of a conic, tangent and normal to the conic.

Unit -IV

Sphere: Plane section of a sphere. Sphere through a given circle. Intersection of two spheres, radical plane of two spheres. Co-axial system of spheres.

Cones: Right circular cone. Enveloping cone and reciprocal cone.

Cylinder: Right circular cylinder and enveloping cylinder.

Books Recommended:

1. Murrary R. Spiegal : Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
2. Murrary R. Spiegal : Vector Analysis, Schaum Publisghing Company, New York.
3. N. Saran and S.N. Nigam: Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.
4. Shanti Narayna : A Text Book of Vector Calculus. S. Chand & Co., New Delhi.

BA Mathematics
Semester-II

BAMH-123: Mathematics Lab– II

Marks for External Exams: 30
Time: 3 Hours

Course Objective	Course Outcome
The course on Practical deals with some important concepts of Programming in C.	The student will be able to solve and calculate the mathematical problems through programming.

Part A: Introduction to Programming in C

Introduction to Functions, Advantages of functions, Function definition and body, Nesting of Functions, Arrays, one dimensional array, two dimensional arrays, Multi-dimensional arrays, Passing arrays to functions. Strings : Character data type, Standard string handling functions, arithmetic operations on characters, Pointers: Definition, Association, Pointers and arrays. Structures: definition, declaration, arrays and structures .

Part B:

1. Program to add two matrices.
2. Program to multiply two matrices.
3. Program to find the inverse of a matrix.
4. Program to find transpose of a matrix.
5. Program to find the sum of a series. Trigonometric series: sin(x), cos(x), tan(x), etc.
6. Program to sort an entire array using bubble short.
7. Program to find trace of 3X3 Matrix.
8. Program to find largest of three numbers using function.
9. Program to find factorial of a number using recursion.
10. Program to generate n fabonacci terms using recursion.
11. Program to count number of vowels and consonants in a given sentence.
12. Program to print a salary chart for employee of a company.

Note: Every student will have to prepare a file to maintain practical record of the problems solved and the computer program done during practical class work. Examination will be conducted through a question paper set jointly by an external and internal examiner. An examinee will be asked to write solutions in the answer books. An examinee will be asked to run (execute) two programs on a computer. Evaluation will be made on the basis of the examinees' performance in written solutions/ programs, execution of computer programs and viva-voce examination

Books Recommended:

1. B.W. Kernighan and D.M. Ritchie : The C Programming Language, 2nd Edition
2. V. Rajaraman : Programming in C, Prentice Hall of India.
3. Byron S. Gottfried : Theory and Problems of Programming with C, Tata McGraw-Hill Publishing Co. Ltd.
4. E. Balagurusamy : Programming in ANSI C, , Tata McGraw-Hill Publishing Co.Ltd.