Gondwana University, Gadchiroli

Proposed B.Sc. (Mathematics) CBCS Syllabus
Semester-V & VI
2019-2020

By
Board of Studies (Mathematics)
Faculty of Science & Technology
B.SC. (MATHEMATICS)

SEMESTER WISE DISTRIBUTION OF MARKS AND CREDITS

There are two Types of Courses for B.Sc. Sem V and Sem VI
(A) Skill Enhancement Course (SEC)
(B) Discipline Specific Elective (DSE)

SKILL ENHANCEMENT COURSE (SEC)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Class</th>
<th>Semester</th>
<th>Theory paper Marks</th>
<th>Internal Assessment Marks</th>
<th>Total Marks</th>
<th>Marks for passing out of 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B.Sc. V</td>
<td>15</td>
<td>35</td>
<td>50</td>
<td>20</td>
<td>(minimum 06 marks in theory examination)</td>
</tr>
<tr>
<td>2</td>
<td>B.Sc. VI</td>
<td>15</td>
<td>35</td>
<td>50</td>
<td>20</td>
<td>(minimum 06 marks in theory examination)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td>70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester</th>
<th>Papers</th>
<th>College Examination</th>
<th>College Internal Assessment</th>
<th>Total Paper-Marks</th>
<th>Paper-Marks</th>
<th>Marks-Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sem -V</td>
<td>1 (SEC)</td>
<td>1 - 15</td>
<td>1 - 35</td>
<td>50</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Sem -VI</td>
<td>1 (SEC)</td>
<td>1 - 15</td>
<td>1 - 35</td>
<td>50</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

DISTRIBUTION OF MARKS FOR SEC INTERNAL ASSESSMENT

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Activities</th>
<th>Max Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attendance</td>
<td>05</td>
</tr>
<tr>
<td>2</td>
<td>Seminar on the respective paper</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Project on any topics in Mathematics</td>
<td>15</td>
</tr>
</tbody>
</table>

Skill Enhancement Course (SEC)

Note:  
   i) For Skill Enhancement Course (SEC), College will conduct the examination.
   ii) For each semester V & VI, SEC Examination is of 50 Marks with 2 credits.
   iii) Theory examination is of 15 marks and internal assessment is of 35 marks.
   iv) Minimum passing marks is 20 (Including minimum 06 marks in theory + internal Assessment marks).
   v) Examination Time period for SEC theory examination is of 01 hour.

Discipline Specific Elective (DSE)

For Discipline Specific Elective (DSE), University will conduct the examination.
### B.Sc. (MATHEMATICS)
**SEMESTER WISE DISTRIBUTION OF MARKS AND CREDITS FOR DISCIPLINE SPECIFIC ELECTIVE (DSE)**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Class</th>
<th>Semester</th>
<th>Theory Paper Marks</th>
<th>Internal Assessment Marks</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Paper I</td>
<td>Paper II</td>
<td>15+15</td>
</tr>
<tr>
<td>1</td>
<td>B.Sc.</td>
<td>V</td>
<td>60</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>B.Sc.</td>
<td>VI</td>
<td>60</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>120</td>
<td>120</td>
<td>60</td>
</tr>
</tbody>
</table>

#### DISTRIBUTION OF MARKS FOR DSE INTERNAL ASSESSMENT

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Activities</th>
<th>Max Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attendance</td>
<td>05</td>
</tr>
<tr>
<td></td>
<td>Any Two of the following activities</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Seminar</td>
<td>05</td>
</tr>
<tr>
<td>2</td>
<td>Unit test</td>
<td>05</td>
</tr>
<tr>
<td>3</td>
<td>Home Assignments</td>
<td>05</td>
</tr>
</tbody>
</table>

**Total Marks: 15 + 15**

**Minimum Passing Marks: 06 + 06**
Proposed Scheme for B. Sc Sem - V with Choice Based Credit System

B. Sc. Sem - V
Mathematics
2019-2020

Skill Enhancement Course (SEC)

Maximum Marks - 15+35  
Credits -2

College will conduct the Examination.

Choose any one of the following Papers

Paper: SEC - I - Probability
Paper: SEC - II - Mathematical Modeling

Discipline Specific Elective (DSE)

Time – Three Hours  
Max. Marks – 60+15

University will conduct the Theory examination

Choose any Two of the following.

Paper: DSE –I- Linear Algebra
Paper: DSE –II- Mechanics
Paper: DSE –III- Matrices and Theory of Equations
Paper: DSE-IV-Special Relativity - I
B.Sc. III SEM - V

Paper: SEC-I

Probability

Time: 1 Hour                                                      Max. Marks: 15+35

1. Introduction, Sample Space, Events , types of events, algebra of events concept of probability, axiomatic definition of probability, conditional probability, properties of conditional probability, statement of Bayes theorem and examples.

2. Addition theorem (using axiomatic definition and Venn diagram), multiplicative theorem (Statement and examples), probability mass function-definition, probability distribution, cumulative distribution function of a discrete random variable (definition and examples)

3. Expected values, variance, standard variation of discrete random variables – definition with examples.

4. Probability density function and distribution function of a continuous random variable (definition with examples)

Reference Books:


4. Mathematics Text Book for Class XII NCERT.

1. Introduction, Preliminaries, Definition of mathematical modeling formation: Identifying the relevant factors, mathematical description, examples of mathematical modeling

2. Need of mathematical modeling, Principles of mathematical modeling, (steps for mathematical modeling), examples of mathematical modeling, limitations of mathematical modeling.


4. Application of traffic flow, vibrating string, gravitational potential, conservation laws.

Reference Books:

3. Mathematics Text Book for Class XIandXII, NCERT.
B.Sc. III SEM - V

Paper: DSE-I

Linear Algebra

Time –Three Hours                                                                                     Max. Marks- 60+15

Unit- I Vector Space: Definition and example of vector spaces, subspace, linear span, Quotient space, Linear dependence and Independence and their basic properties, Basis and dimension.

Unit- II Linear transformations: The algebra of linear transformation, Rank Nullity Theorem, Matrix and linear transformation, Rank Nullity of Matrix, Isomorphism.

Unit- III Dual Space: Dual Space, Bi dual space and natural isomorphism. Adjoint of a linear transform, Eigen values and Eigen vectors of a linear transform.

Unit- IV Inner product space: Inner product, Cauchy Schwartz inequality, orthogonal vectors, orthogonal compliment, Orthogonal set, Bessel’s inequality for finite dimensional space, Gram –Schmidt Orthogonalisation process.

Reference Books:
1. I.N.Herstein – Topics in Algebra, Wiely Eastern Ltd. New Delhi, 1975
Time – Three Hours
Max. Marks: 60 + 15

Unit – I Kinematics in two dimensions and simple harmonic motion
Coordinate systems, radial and transverse components of velocity and acceleration, tangential
and normal components of velocity and acceleration, differential equation of simple harmonic
motion and its solution.

Unit – II Mechanics of a system of particles
Newton’s three laws of motion, System of particles, centre of mass, conservative system of
forces, conservation theorems: of linear momentum, angular momentum and of energy.

Unit – III Lagrangian dynamics
Generalized coordinates and velocities, constraints, relations between \( r \) and generalized
coordinates, D’Alembert principle, Lagrange’s equations of motion, generalized potential,
Rayleigh’s dissipation function.

Unit – IV Central force motion
Equivalent one body problem, central force field, motion in one dimension, potential well,
infinite motion, classification of central orbits, differential equation for the orbit, integrable
power law force field, three laws of Kepler, viral theorem

Reference Books:
   Sonu Nilu, EFI, 2001
3] Karade T M, Bendre M S and Ladke L S - Elements of Mechanics and
   Statics , Sonu Nilu, 2013
   Mechanics, Sonu Nilu, Fourteenth Edition 2017
B.Sc. III SEM- V

Paper: DSE-III

Matrices and Theory of Equations

Time – Three Hours                                                                 Max. Marks- 60+15

Unit – I Symmetric, Skew symmetric, Hermition and skew Hermition matrices, elementary operations on matrices, reduction to normal form Adjoint matrix, the inverse of a matrix, Linear independence of row and column matrix, Row rank, column rank and rank of a matrix.


Unit – III General Properties of polynomial equation in one variable, Descartes’ rule of sips, some properties of polynomial equations, Relation between roots and coefficient, transformation of equations, Roots with signs changed, roots multiplied by given number, Reciprocal roots, to increase or diminish the roots by a given quantity, removal of terms.

Unit – IV Reciprocal equations, Cubic equation, Cordon’s method, Transformation of a general cubic to the standard term, Bi-quadratic equations, Ferrari’s method, and Descartes’ method.

Reference Books:


B.Sc. III SEM V
Paper: DSE-IV
Special Relativity – I

Time – Three Hours Max. Marks- 60+15

Unit – I Review of Newtonian mechanics, Inertial system , Galilean transformation, Newtonian relativity, Conservation laws in Newtonian mechanics , Maxwell’s electromagnetic theory , Michelson – Morley experiment, Lorentz Fitzgerald contraction hypothesis, relative character of space and time

Unit – II Einstein’s special theory of relativity, postulates of special relativity theory, Lorentz transformation, Geometrical interpretation of Lorentz transformation , Group properties of Lorentz transformation , Length contraction, Time dilation.

Unit – III Relativistic Kinematics- Composition of parallel velocities , transformation equations for components of velocity, addition law for velocity, transformation of Lorentz contraction factor (1-v^2/c^2)^1/2, The transformation equation for components of acceleration of a particle.

Unit – IV Geometrical representation of space time , Four dimensional Minkowskian space time of special relativity, Time like , Light like , and Space like intervals , Lorentz transformation in index form , Proper time , world line of a particle , Four vectors and Four tensors in Minkowskin space time.

Reference Books:
1. T.M.Karade , K.S.Adhav and Maya S. Bnedre – Lectures on Special Reklativity , Sonu Nilu Pbl.Nagpur
Proposed Scheme for B. Sc. Sem VI with Choice Based Credit System

B.Sc. Sem VI
Mathematics
2019-2020

Skill Enhancement Course (SEC)

Maximum Marks- 15+35.
Credits -2

College will conduct the examination

Choose any one of the following Papers

Paper: SEC - III - Graph Theory
Paper: SEC - IV - Boolean Algebra

Discipline Specific Elective (DSE)

Time: Three Hour
Max. Marks – 60+15

University will conduct the examination of Discipline Specific Elective (DSE) Subjects.

Choose any Two of the following.

Paper: DSE –V- Numerical Methods
Paper: DSE –VI - Complex Analysis and Vector Calculus
Paper: DSE –VIII- Special Relativity - II
Basic Concepts of Graph Theory, Undirected and Directed graphs, simple graphs, multigraphs, degree of vertex, in degree and out degree, sub graphs and isomorphic graphs, weighted graphs, path and circuit, shortest path, Eulerian path and circuits, travelling salesman problems, planar graphs, Dijkstra’s algorithm, Floyd – Warshall algorithm.

Reference Books:


Lattices-Definition, examples and basic properties of ordered sets, maps between ordered sets, cover, Hasse Diagram, examples of lattices, principle of duality of lattices, sub lattices.

Properties of lattices–Isotonicity property, distributive inequalities, modular inequalities, Idempotent, commutative, associative and absorption property, some examples of lattices.

Boolean Algebra- Definition and properties of Boolean algebra, definition of sub algebras, definition of direct product, definition of Boolean Homomorphism, meaning of minterms and maxterms, Boolean expressions.

“Sum of products” canonical form with examples, minimization of Boolean functions Karnaugh diagram, switching circuits and application of switching circuits, Quinn- Mccluskey method.

Reference Books:


B.Sc. III SEM- VI

Paper: DSE- V

Numerical Methods

Time – Three Hours Max. Marks- 60+15

Unit – I Solution of nonlinear equations \( f(x) = 0 \)

Unit – II Lagrange and Newton interpolation
Finite difference operators: forward, backward, shift, central average and differential operators, Newton- Gregory forward and backward difference interpolation formula, Lagrange interpolation formula for unequal intervals, Newton divided difference interpolation formula for unequal intervals

Unit – III Numerical differentiation
Newton’s special formulae for derivatives at the end points of an interval, Newton’s general formulae for derivatives, Newton divided difference formula for derivatives, maxima and minima of a tabulated function

Unit – IV Numerical integration
Newton- Cotes quadrature formula, trapezoidal quadrature rule, Simpson’s one-third rule, Simpson’s three-eighth rule, Boole’s rule, the degree of precision and truncation error of above quadrature rules

Reference Books:


B.Sc. III SEM- VI
Paper: DSE-VI

Complex Analysis and Vector Calculus

Time –Three Hours Max. Marks- 60+15

Unit- I Analytic function, Cauchy Riemann Equation, Polar form of Cauchy Riemann Equation, Harmonic functions, Mobius Transformation, Cross Ratio.

Unit- II Complex Integration, Cauchy’s Integral Theorem, Cauchy’s Integral Formula, Singularity, Residue Theorem.

Unit- III Vector Differentiation, Gradient, Divergence, Curl and Vector Integration.

Unit- IV Green, Gauss and Stokes Theorems and Problem based on these.

Reference Books:
3. T.M.Karade- Complex Analysis SonuNiluPublication, Nagpur
Unit-I Standard Form of Linear Programming Problems: Methods of Generating Initial Feasible Solution and Standard Form of Linear Programming Problems, Linear Dependence and Independence, Graphical approach for solving some linear programs. Convex Combination, Convex sets and Extreme Points of a Convex set, Basic Feasible Solutions of Linear Programming Problems, Supporting and separating hyper planes.

Unit-II Linear Programming: The Simplex Method and Duality – Computation Procedure of the Simplex Method, Modified Simplex Method of Linear Programs with Artificial Variables: Two Phase and Big M Methods, Duality in Linear Programming Problems, Duality Theorems and Dual Solutions.

Unit-III Transportation Problems: Some Definitions and Observations, Transportation Algorithm, Mathematical Formulation of Transportation Problem, Methods for Finding an Initial Basic Feasible Solution: North West Corner Rule, Least Cost Method and Vogel’s Approximation, Test for Optimality.


Reference Books:

UNIT – I
Tensor Analysis – Coordinate transformations, Summation Convention, The Kronecker delta, Covariant, Contravariant and mixed tensor, symmetric and skew symmetric tensors, Fundamental operations on tensors, metric tensor, conjugate metric tensor.

UNIT – II

UNIT – III
Relativistic Mechanics : Variation of mass with velocity Equivalence of mass and energy, Transformation Eq\(\text{a}\) for mass, momentum and energy, Energy momentum four vectors, Relativistic force and transformation equation for its components, Relativistic Lagrangian and Hamiltonian Relativistic eq\(\text{b}\) of motion of particle.

UNIT – IV
Electromagnetism : Maxwell’s equation in vacuum, Transformation equations for density of electric charge and current, propagation of electric and magnetic field strength, Transformation equations for electromagnetic four potential vector, Lagrangian for a charged particle in an electromagnetic field, Lorentz force, The electromagnetic field tensor Maxwell’s eq\(\text{a}\) in tensor form, Lorentz force on a charged particle.

Reference Books :-
1. Prof. T. M. Karade, K. S. Adhav and Maya S. Bendre,-Lectures on Special Relativity Sonu Nilu.