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)

Sr. No.	Class	Semester	Theory paper Marks	Internal Assessment Marks	Total Marks	Marks for passing out of 50
1	B.Sc.	V	15	35	50	20(minimum 06 marks in theory examination)
2	B.Sc.	VI	15	35	50	20(minimum 06 marks in theory examination)
			30	70	100	40

Semester	Papers	College Examination	College Internal Assessment	Total
		Paper-Marks	Paper-Marks	Marks-Credits
Sem -V	1 (SEC)	1 - 15	1 - 35	50 - 2
Sem -VI	1 (SEC)	1 - 15	1 - 35	50 - 2

DISTRIBUTION OF MARKS FOR SEC INTERNAL ASSESSMENT

Sr. No.	Activities	Max Marks
1	Attendance	05
2	Seminar on the respective paper	15
3	Project on any topics in Mathematics	15

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)

Sr. No.	Class	Semester	Theory Paper Marks		Internal Assessment Marks	Total Marks
			Paper I	Paper II		
1	B.Sc.	V	60	60	15+15	150
2	B.Sc.	VI	60	60	15+15	150
			120	120	60	300

Semester	Papers	University Examination	Internal Assessment	Total
		Marks-Credits	Marks-Credits	Marks-Credits
Sem-V	2 (DSE)	2x60 - 2x2	2x15 - 2x1 = 2	150-6
Sem-VI	2 (DSE)	2x60 - 2x2	2x15 - 2x1 = 2	150-6

DISTRIBUTION OF MARKS FOR DSE INTERNAL ASSESSMENT

Sr. No.	Activities	Max Marks
1	Attendance	05
Any Two of the following activities		
1	Seminar	05
2	Unit test	05
3	Home Assignments	05

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:

1.Robert V. Hogg, Joseph W. McKean and Allen T. Craig –Introduction to Mathematical Statistics , Pearson Education,Asia,2007.

2.Irwin Miller and Marylees Miller , John E. Freund – Mathematical Statistic with Application , 7th Ed. Pearson Education , Asia, 2006

3.Sheldon Ross – Introduction to Probability Model , 9th Ed. Academic Press Indian Reprint, 2007

4.Mathematics Text Book for Class XII NCERT.

5.Mathematics and Statistics – Std. XII Maharashtra State Board of Secondary and Higher Secondary Education , Pune.

B.Sc. III SEM - V

Paper: SEC-II

Mathematical Modeling

Time: 1 Hour   Max. Marks: 15+35

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.

3. Applications of Differential equations: Vibration of mass on a spring , resonance phenomenon, mechanics of simultaneous differential equations .

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

Reference Books:

1. I. Snedon -Elements of Partial Differential Equations , McGraw Hill , International Ed. 1967
2. ShepleyL.Ross - Differential Equations ,3rd Ed. John Wiley and Sons.1984
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, orthogonalvectors,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
2. N. Jacobson – Basic Algebra, Vol I and II W.H.Freeman, 1980, Hindustan Publishing Co.
3. Shanti Narayan – A Text Book of Modern Abstract Algebra, S.Chand and Co., New Delhi
4. K.B.Datta – matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd, New Delhi, 2000
5. P.B.Bhattacharya, S.K. Jain and S.R.Nagpal – Basic Abstract Algebra, IIndEdition, Cambridge University Press Indian Edition, 1997
6. K.Hoffman and R. Kunze - Linear Algebra, IInd Edition, Prentice Hall Englewood Cliffs, New Jersey, 1971
7. S.K.Jain, A.Gunwardhana and P.B.Bhattacharya – Basic Linear Algebrawith MATLAB, Key Collage Publishing –Springer Verlag, 2001
8. S.Kumarsen - Linear Algebra, A Geometric Approach , P. Prentice Hall of India Pvt. Ltd , New Delhi, 2000
9. VivekSahai and VikasBisht – Algebra, Narosa Publishing House, 1997
10. D.S. Malik, J.N. Mordeson and M.K.Sen – Fundamentals of Abstract Algebra, McGraw Hill International Edition 1997
11. T.M.Karade, J.N. Salunke, K.S. Adhav, M.S. Bendre –Lectures on Abstract Algebra, SonuNilu Publication, Nagpur, IInd Publication

B.Sc. III SEM – V

Paper: DSE-II

Mechanics

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_i 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:
1] Goldstein H- Classical Mechanics , Addison Wesley, 1980
2] Karade T M and Bendre M S- Lectures on Classical Mechanics
   Sonu Nilu, EFI, 2001
3] Karade T M, Bendre M S and Ladke L S -Elements of Mechanics and
   Statics ,Sonu Nilu, 2013
4] Karade T M, Salunke J N and Bendre M S- Elements of Classical
    Mechanics, Sonu Nilu, Fourteenth Edition 2017
5] Landau L D and Lifshitz E M -Mechanics ,Pergamon Press, 1976
6] Synge J L and Griffith B A- Principles of Mechanics,   McGraw Hill, 1959

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 – II Linear equations – Homogeneous equations, Non – homogeneous equations, Methods of solving linear equations- solution by matrix inversion, solution by Cramer's rule, solution of Gauss – Jordan elimination method. Eigen values and Eigenvectors, some important theorems on Eigen values, Caley-Hamilton theorem.

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:

1] H.S. Hall and S.R. Knight – Higher Algebra – H.M. Publications   1994

2] K.B. Datta – Matrix and linear algebra – Prentice Hall of India Pt. Ltd. New Delhi

3] C.C. Mac Duffee – Theory of equation – John Wiley and sons Inc 1954

4] Dr. T.M. Karade and Maya S. Bendre – Algebra and Trigonometry – Sonu- Nilu Publ. Nagpur 2009

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 componets 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 inteervals , 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

2. Moller C. – The Theory of Relativity , Oxford Clarendon Press , 1932

3.Bergmann P.G. – Introduction to the Theory o0f Relativity ,Prentice Hall of India Pvt. Ltd. 1969

4.Anderson I.I.- Principle of Relativity Physics , Academic Press 1967

5.M.R. Spiegel – Theory and Problems on vector Analysis SIJ Metrics and Introduction to Tensor Theory , Schaum's out line Series McGraw Hill Book Co.

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 –VII- Linear Programming and Transportation Problems.

Paper: DSE –VIII- Special Relativity - II

Time: 1 *Hour*   Max. Marks- 15+35

Basic Concepts of Graph Theory, Undirected and Directed graphs , simple graphs, multi graphs, 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:

1.Edgar G. Goodaire and Michael M. Parmenter – Discrete Mathematics with Graph Theory , 2nd Ed. Pearson Education (Singapore)Pvt. Ltd. Indian Reprint , 2003

2.RudolfLidl and Gunter Pitz- Applied Abstract Algebra 2nd Ed. Undergraduate Text in Mathematics , Springer (SIE)Indian Reprint 2004

3.J.P.Tremblay , R. Manohar- Discrete Mathematical Structure with Application to Computer Science, Tata McGraw Hill Ed.

Paper: SEC-IV

Boolean Algebra

Time: 1 *Hour*   Max. Marks- 15+35

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:

1.B.A.Davey and H.A. Priestley-Introduction to Lattices and Order, Cambridge University Press, Cambridge, 1990

2. Rudolf Lidl and Gunter Pitz- Applied Abstract Algebra 2nd Ed. Undergraduate Text in Mathematics, Springer (SIE)Indian Reprint 2004

B.Sc. III SEM- VI

Paper: DSE- V

Numerical Methods

Time –Three Hours   Max. Marks- 60+15

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

Bisection method, Regula falsi method, secant method, Newton- Raphson method Solution of linear algebraic equations $Ax = B$ Gauss elimination method, partial pivoting, Gauss- Jordon elimination method, LU decomposition method, Gauss- Jacobi method of iteration, Gauss- Seidel method of iteration

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:

1] Atkinson Kendall E - An Introduction to Numerical Analysis ,John Wiley and sons, 1978

2] Chapra Steven C and Canale Raymond P-Numerical Methods for

   Engineers,Tata McGraw Hill Education Private Limited, Fifth Edition, 2006

3] Jain M K, Iyengar S R K and Jain R K ,Numerical Methods for Scientific and Engineering

    Computation,New Age International Publishers, Fifth Edition, 2007

4]Karade T. M.-Numerical Analysis , YashawantraoChavan Open University , Nashik 2019

5]Kreyszig Erwin –Advanced Engineering Mathematics ,John Wiley and Sons , 8th Edition , 2001

6]Mathews John H. – Numerical Methods for Mathematics , Science and Engineering –

  Prentice Hall of India 2nd Ed. 2005

7] SankarRao K.-Numerical Methods for Scientists and Engineers – PHI Learning Private Ltd. 3rd Ed. 2009

8]Sastry S.S. – Introductory Methods of Numerical Analysis – Prentice Hall of India Pvt. Ltd. 4th Ed. 2006

9]Scheid Francis - Numerical Analysis , Schaum's Outline Series, McGraw Hill Book Co., Singapore , 1998

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

Complex Analysis and Vector Calculus

Time –Three Hours   Max. Marks- 60+15

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

Unit- II ComplexIntegration, Cauchy's Integral Theorem, Cauchy's Integral   Formula, Singularity, Residue Theorem.

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

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

Reference Books:

1. J.W.Brown and R.V. Churchill- Complex Variables and Applications, 8th Ed. McGraw Hill International Edition, 2009

2. JosephBak and J. Newman- Complex Analysis 2nd Ed. Undergraduate Texts in Mathematics, Springer Verlag, New York, Inc.1997

3. T.M.Karade- Complex Analysis SonuNiluPublication, Nagpur

4. M.R.Spiegel – Theory and Problems of Advanced Calculus, Schaum Series Pub.

5. M.R.Spiegel – Vector Analysis, Schaum Series Pub.

6. N Saran and S.N. Nigam – Introduction to Vector Analysis, Pothishala Pub. Allahabad.

B.Sc. III SEM - VI

Paper: DSE - VII

Linear Programming and Transportation Problem

Time –Three Hours   Max. Marks- 60+15

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 LinearProgramming: 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.

Unit- IV Non- Linear Programming : Single Variable Optimization, Local Maximum, Local Minimum, Global Maximum, Global Minimum , Critical Points , Convex and Concave Functions, Sequential Search Techniques, Types of Sequential Search Techniques with examples , Assignment Problems and its Mathematical Formulation , Various examples of Assignment Problems , Hungarian Method for solving Assignment Problems .

Reference Books:

1. KantiSwarup , P.K. Gupta and Man Mohan – Operation Research ,14th Thoroughly Revised Edition , S. Chand and Sons Educational Publishers , New Delhi.

2. R. K. Gupta – Operation Research,Krishana Prakashan Media Ltd.

3. J. K. Sharma - Operation Research: Theory and Applications, 2nd Edition 2006, Macmillan India Ltd.

4.   R.R .Mahajan, K.D.Thengane, B.G. Ambatkar, S.D. Tade , L.S.Ladke, B. M. Roy- Linear Programming, Complex Numbers and Statics, Das Ganu Prakashan, Nagpur.

B.Sc. III SEM VI

Paper: DSE-VIII

Special Relativity – II

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
Christoffels symbols, Transformation of christoffels symbols, covariant derivatives, Absolute derivative, Geodesics, Curvature tensor, Ricci tensor, Einstein tensor, The Bianchi identity.

UNIT – III
Relativistic Mechanics : Variation of mass with velocity Equivalence of mass and energy, Transformation Eq_n for mass, momentum and energy, Energy momentum four vectors, Relativistic force and transformation equation for its components, Relativistic Lagrangian and Hamiltonian Relativistic eq_n 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_n 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.
2. C. Moller, The Theory of Relativity, Oxford Clarendon Press, 1952.

3. P. G. Bergmann, Introduction to the theory of relativity, Prentice Hall of India, Pvt. Ltd. 1969.

4. I. I. Anderson, Principle of relativity Physics, Academic Press, 1967.

5. Murray R. Spiegel, Theory and Problems on vector Analysis SIJ Metrics and Introduction to Tensor Theory, Shaum's outline Series, Mc. Gra. Hill Book Company.