SHRI JAGDISHPRASAD JHABARMAL TIBREWALA UNIVERSITY, CHUDELA (JHUNJHUNU), RAJASTHAN

SYLLABUS

B.Sc. (Mathematics)

(Bachelor of Science)

INSTITUTE OF SCIENCE
DEPARTMENT OF MATHEMATICS
EXAMINATION SCHEME AND DETAILED SYLLABUS FOR

BACHELOR OF SCIENCE
EFFECTIVE FROM ACADEMIC SESSION 2021 – 2022

Year: I   **Semester: I**

S. No.	Subject Code	Subject Name	Hrs./Week			Exam Hrs.	Maximum & Minimum Marks		
			L	T	P		Internal/ Min. Pass Marks	External/ Min. Pass Marks	Total/Min. Pass Marks
Theory									
1	PCM -107	Discrete Mathematics – I	3	0	0	3	15/06	35/14	50/20
2	PCM -108	Calculus – I	3	0	0	3	15/06	35/14	50/20
3	PCM -109	Analytic Geometry and Optimization Theory – I	3	0	0	3	15/06	35/14	50/20
4	Practical PCM-112	Optimization Techniques – I	0	0	2	2	15/06	35/14	50/20
Total			**09**		**2**				**200**
Total Teaching Load			**11**						

L: Lecture
T: Tutorial
P: Practical

YEAR: I   **SEMESTER: I**

PCM 107: Discrete Mathematics – I   **(L, T, P) = 3 (3+0+0)**

Unit	Contents of Course	Hrs.
I	Introduction to set theory, Set operations, Algebra of sets, Combination of sets, Duality, Finite and Infinite sets, Cardinality of sets, Classes of sets, Power sets, Min sets & Max sets, Cartesian product, Principles of inclusion & exclusion, Mathematical Induction, Pigeon hole principle.	9
II	Relations and Functions, Binary relations, Types of relations, Equivalence relations and partitions, Partial order relations, Lattices, Chains and Anti-chains, Sub-Lattices, Homomorphism and isomorphism, Hasse diagram.	8
III	Boolean Algebra – Lattices and Algebraic structure, Duality, Distributive and Complemented Lattices, Boolean Lattices, Boolean functions and Boolean expression.	8
IV	Logic and Propositional calculus, Simple and compound propositions, Basic logical operations, Truth tables, Tautologies and contradictions, Propositional functions, Quantifiers.	8
V	Fundamental theorem of arithmetic, Divisibility in Z, Congruence's, Chinese remainder theorem, Euler's functions, Primitive roots.	7
	Total	40

Reference Books:

1. K.H. Rosen, Discrete Mathematics and it's Applications, McGraw Hill, 1999.

2. N.L. Biggs, Discrete Mathematics, Oxford Science Publication, 1985.

3. C.L. Liu and D.P. Mohapatra, Elements of Discrete Mathematics, Tata McGraw Hill, 2008.

4. T. Koshy, Discrete Mathematics with Applications, Academic Press, 2005.

YEAR: I　　　　　　　　　　　　　　　　　　　　　　　　　　　　**SEMESTER: I**

PCM 108: Calculus – I　　　　　　　　　　　　　　　　　**(L, T, P) = 3 (3+0+0)**

Unit	Contents of Course	Hrs.
I	Series – Infinite series and Convergent series, Tests for convergence of a series – Comparison test, D' Alembert's ratio test, Cauchy's n-th root test, Rabbe's test, De-Morgan – Bertrand's test, Cauchy's condensation test, Gauss's test, (Derivation of tests is not required), Alternating series, Absolute convergence.	7
II	Taylor's theorem, Maclaurin's theorem, Power series expansion of a function, Power series expansion of sinx, cosx, e^x, $\log_e(1+x)$, $(1+x)^n$.	8
III	Derivative of the length of an arc, Pedal equations, Curvature – Various formulae, Centre of curvature and Chord of Curvature.	9
IV	Partial Differentiation, Euler's theorem on Homogeneous functions, Chain rule of partial differentiation, Total differentiation, Differentiation of implicit functions.	8
V	Envelopes and Evolutes, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.	8
	Total	40

Reference Books:

1. M. J. Strauss, G. L. Bradley and K. J. Smith, Calculus (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
2. H. Anton, I. Bivens and S. Davis, Calculus (7th Edition), John Wiley and sons (Asia), Pt Ltd., Singapore, 2002.
3. G.B. Thomas, R. L. Finney, M. D. Weir, Calculus and Analytic Geometry, Pearson Education Ltd, 2003.

YEAR: I　　　　　　　　　　　　　　　　　　　　　　　　　**SEMESTER: I**

PCM 109: Analytic Geometry and Optimization Theory – I　　　　**(L, T, P) = 3 (3+0+0)**

Unit	Contents of Course	Hrs.
I	Polar equation of conics, Polar equation of tangent, Normal and Asymptotes.	8
II	Chord of contact, Auxiliary circle, Director circle of conics.	7
III	Sphere: Section of a sphere and a plane, spheres through a given circle, intersection of a line and a sphere, tangent line, tangent plane, angle of intersection of two spheres and condition of orthogonality, power of a point with respect to a sphere, radical axis, radical centre, co-axial family of spheres.	9
IV	Cone: Cone with a vertex at the origin, cone as a surface generated by a line passing through a fixed curve and a fixed point outside the plane of the curve, right circular cone.	8
V	The linear programming problem, Basic solution, Some basic properties and theorems on convex sets, Fundamental theorem of L.P.P., Theory of simplex method only.	8
	Total	40

Reference Books:

1. R.J.T. Bell, Elementary Treatise on Co-ordinate geometry of three dimensions, Macmillan India Ltd., 1994.

2. Hamdy A. Taha, Operations Research, An Introduction (9th edition), Prentice-Hall, 2010.

3. G. Hadley, Linear Programming, Narosa Publishing House, New Delhi, 2002.

YEAR: I   **SEMESTER: I**

PCM-112: Optimization Techniques – I   **(L, T, P) =2 (0+0+2)**

	Contents of Course	Hrs.
Group A	Modelling of industrial and engineering problems into Assignment Problems and Transportation Problems and their solutions. Note: 1. Problems will be solved by using Scientific Calculators (non-Programmable). 2. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record. 3. Each Candidate has to pass in Practical and Theory examination separately.	
	Total	22
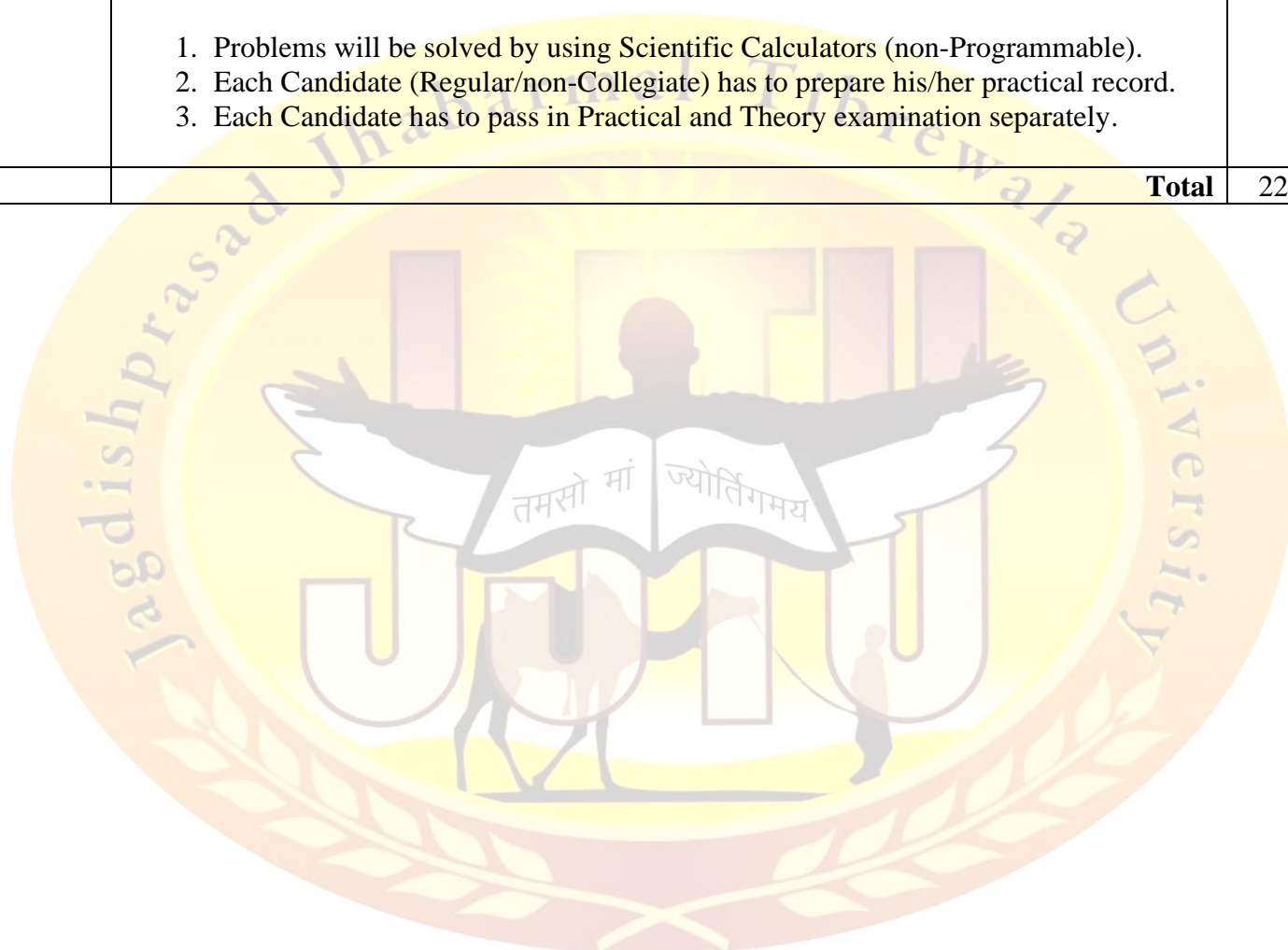
SHRI JAGDISHPRASAD JHABARMAL TIBREWALA UNIVERSITY
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BACHELOR OF SCIENCE
EFFECTIVE FROM ACADEMIC SESSION 2021 – 2022

YEAR: I   **SEMESTER: II**

S. No.	Subject Code	Subject Name	Hrs./Week			Exam Hrs.	Maximum & Minimum Marks		
			L	T	P		Internal/ Min. Pass Marks	External/ Min. Pass Marks	Total/Min. Pass Marks
Theory									
1	PCM 207	Discrete Mathematics – II	3	0	0	3	15/06	35/14	50/20
2	PCM -208	Calculus – II	3	0	0	3	15/06	35/14	50/20
3	PCM -209	Analytic Geometry and Optimization Theory – II	3	0	0	3	15/06	35/14	50/20
4	Practical PCM-212	Optimization Techniques – II	0	0	2	2	15/06	35/14	50/20
Total			**09**		**2**				**200**
Total Teaching Load			**11**						

L: Lecture
T: Tutorial
P: Practical

YEAR: I   **SEMESTER: II**

PCM 207: Discrete Mathematics – II   **(L, T, P) =3 (3+0+0)**

Unit	Contents of Course	Hrs.
I	Discrete numeric functions, Generating functions, Recurrence relations and Recurrence algorithms, Linear recurrence relation with constant coefficients and their solutions, Total solutions, Solution by the method of generating functions.	9
II	Basic concepts of graph theory, Types of graph (Connected Graphs, Regular graphs, Planar graphs).	6
III	Walk, Paths & Circuits, Shortest path problem, Operations on graphs (union, join, products), Hamiltonian and Eulerian graphs	8
IV	Matrix representation of graphs, Adjacency matrices, Incidences matrices	8
V	Trees: Introduction to trees, Difference between graphs and a tree, Rooted trees, Path length in trees, Spanning trees & cut-sets, Minimum spanning trees, Distances between vertices, Centre of tree, Binary trees and its traversal.	9
	Total	40

Reference Books:

1. K.H. Rosen, Discrete Mathematics and it's Applications, McGraw Hill, 1999.
2. N.L. Biggs, Discrete Mathematics, Oxford Science Publication, 1985.
3. C.L. Liu and D.P. Mohapatra, Elements of Discrete Mathematics, Tata McGraw Hill, 2008.
4. T. Koshy, Discrete Mathematics with Applications, Academic Press, 2005.
5. N. Deo, Graph Theory, Prentice Hall of India, New Delhi, 2004.

YEAR: I   **SEMESTER: II**

PCM 208: Calculus – II   **(L, T, P) = 3 (3+0+0)**

Unit	Contents of Course	Hrs.
I	Asymptotes, Multiple points, Curve tracing of standard curves (Cartesian and Polar curves)	8
II	Double integrals in Cartesian and Polar coordinates, Change of order of integration, Change of Variables, Triple integrals, Dirichlet's integral	9
III	Beta and Gamma functions, Reduction formulae (simple standard formulae)	8
IV	Area, Rectification	8
V	Volumes and Surfaces of solid revolution	7
	Total	40

Reference Books:

1. M. J. Strauss, G. L. Bradley and K. J. Smith, Calculus (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
2. H. Anton, I. Bivens and S. Davis, Calculus (7th Edition), John Wiley and sons (Asia), Pt Ltd., Singapore, 2002.
3. G.B. Thomas, R. L. Finney, M. D. Weir, Calculus and Analytic Geometry, Pearson Education Ltd, 2003.

YEAR: I   **SEMESTER: II**

PCM 209: Analytic Geometry and Optimization – II   **(L, T, P) = 3 (3+0+0)**

Unit	Contents of Course	Hrs.
I	Cylinder: Cylinder as a surface generated by a line moving parallel to a fixed line and through a fixed curve, different kinds of cylinders such as right circular.	8
II	Central Conicoid: Ellipsoid, Hyperboloid of one and two sheets, Tangent lines and Tangent planes, Direct sphere, Normals.	7
III	Generating lines of hyperboloid of one sheet and its properties.	8
IV	Reduction of a general equation of second degree in three dimensions to standard forms.	8
V	Duality: formulation of the dual problem, Fundamental theorem of duality, properties and elementary theorems on duality only, Economic interpretation of the primal-dual relationships.	9
	Total	40

Reference Books:

1. R.J.T. Bell, Elementary Treatise on Co-ordinate geometry of three dimensions, Macmillan India Ltd., 1994.
2. Hamdy A. Taha, Operations Research, An Introduction (9th edition), Prentice-Hall, 2010.
3. G. Hadley, Linear Programming, Narosa Publishing House, New Delhi, 2002.

YEAR: I **SEMESTER: II**

PCM-212: Optimization Techniques – II **(L, T, P) =2 (0+0+2)**

	Contents of Course	Hrs.
Group B	List of problems (with free and open-source software tool Scilab) (i) Plotting the graphs of the following functions: ax, $\sqrt{ax+b}$, $|ax+b|$, $c \pm |ax+b|$, $x^{\pm n}$, $x^{1/n}$ $(n \in Z)$, e^{ax+b}, $\log(ax+b)$, $\sin(ax+b)$, $\cos(ax+b)$, $|\sin(ax+b)|$, $|\cos(ax+b)|$. Observe and discuss the effects of change in the real constant a, b and c on the graphs. (ii) Graphs of hyperbolic functions and inverse trigonometric functions. (iii) Plotting and analyzing the graphs of polynomials and their derivatives. (iv) Complex numbers: Operations like addition, subtraction, multiplication, division, Modulus and inbuilt functions conj, imag, imult, isreal, real. (v) Matrix operations: Addition, Multiplication, Inverse, Transpose, Determinant, Rank and inbuilt functions eye, ones, zeros. Solving the system of linear equations. (vi) Solution of linear programming problems by using inbuilt functions of Scilab. Note: 1. For Group A: Problems will be solved by using Scientific Calculators (non-Programmable) 2. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record. 3. Each Candidate has to pass in Practical and Theory examination separately.	
	Total	22

INSTITUTE OF SCIENCE
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EXAMINATION SCHEME AND DETAILED SYLLABUS FOR

BACHELOR OF SCIENCE
EFFECTIVE FROM ACADEMIC SESSION 2022 – 23

YEAR: II   **SEMESTER: III**

S. No.	Subject Code	Subject Name	Hrs./Week			Exam Hrs.	Maximum & Minimum Marks		
			L	T	P		Internal/ Min. Pass Marks	External/ Min. Pass Marks	Total/Min. Pass Marks
Theory									
1	PCM 307	Real Analysis – I	3	0	0	3	15/06	35/14	50/20
2	PCM -308	Differential Equations – I	3	0	0	3	15/06	35/14	50/20
3	PCM -309	Numerical Analysis and Vector Calculus – I	3	0	0	3	15/06	35/14	50/20
4	Practical PCM-312	Practical with Computer Programming in C Language – I	0	0	2	2	15/06	35/14	50/20
Total			**09**		**2**				**200**
Total Teaching Load			**11**						

L: Lecture
T: Tutorial
P: Practical

PCM 307: Real Analysis – I   **(L, T, P) = 3 (3+0+0)**

Units	Contents of Course	Hrs.
I	Real numbers as complete ordered field, Limit point, Bolzano – Weierstrass theorem, Closed and open sets, Concept of compactness and connectedness, Heine – Borel theorem, Holder inequality & Minkowski inequality.	7
II	Metric space – Definition and examples, Open and Closed sets, Interior and Closure of a set, Limit point of a set in metric space.	9
III	Real sequences – Limit and Convergence of a sequence, Monotonic sequences, Cauchy's sequences.	7
IV	Subsequences, Cauchy's general principle of convergence, Properties of continuous functions on closed intervals.	8
V	Properties of derivable functions, Darboux's and Rolle's theorem, Notion of limit, Continuity and differentiability for functions of several variables.	9
	Total	40

Reference Books:

1. K.A. Ross, Elementary Analysis: The Theory of Calculus, Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.

2. R.G. Bartle D.R. Sherbert, Introduction to Real Analysis (3rd edition), John Wiley and Sons (Asia) Pvt. Ltd.., Singapore, 2002.

3. Charles G. Denlinger, Elements of Real Analysis, Jones and Bartlett (Student Edition),2011.

4. S. Kumaresan, Topology of Metric Spaces, Narosa Publishing House, Second Edition 2011.

5. G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill, Edition 2004.

YEAR: II   **SEMESTER: III**

PCM 308: Differential Equations – I   **(L, T, P) = 3 (3+0+0)**

Units	Contents of Course	Hrs.
I	Degree and order of a differential equation, Equations of first order and first degree, Equations in which the variables are separable, Homogeneous equations.	8
II	Equations reducible to homogeneous form, Linear equations and equations reducible to linear form. Exact differential equations and equations which can be exact.	9
III	First order but higher degree differential equations solvable for x, y and p. Clairaut's form and singular solutions with Extraneous Loci.	8
IV	Linear differential equations with constant coefficients, Complimentary function and Particular integral.	8
V	Homogeneous linear differential equations, Simultaneous differential equations.	7
	Total	40

Reference Books:

1. R.S. Senger, Ordinary Differential Equations with Integration, Prayal Publ. 2000.

2. D.A. Murray, Introductory Course in Differential Equations, Orient Longman (India), 1967.

3. E.A. Codington, An Introduction to Ordinary Differential Equations, Prentice Hall of India, 1961.

YEAR: II   **SEMESTER: III**

PCM 309: Numerical Analysis and Vector Calculus – I   (L, T, P) = 3 (3+0+0)

Units	Contents of Course	Hrs.
I	Difference, Relation between differences and derivatives, Differences of a polynomial, Newton's formulae for forward and backward interpolation.	7
II	Divided differences, Newton's divided difference, Lagrange's interpolation formula.	8
III	Central differences, Gauss's, Stirling's and Bessel's interpolation formulae. Numerical Differentiation, Derivatives from interpolation formulae.	9
IV	Numerical Integration, Derivations of general quadrature formulas, Trapezoidal rule, Simpson's one-third, Simpson's three-eight and Gauss's quadrature formulae.	7
V	Scalar and Vector point functions, Differentiation and integration of vector point functions, Directional derivative.	9
	Total	40

Reference Books:

1. B. Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, India, 2007.

2. C. F. Gerald and P. O. Wheatley, Applied Numerical Analysis, Pearson Education, India, 7th edition, 2008.

3. C.F. Gerald, P. O. Wheatley, Applied Numerical Analysis, Addison – Wesley, 1998.

YEAR: II   **SEMESTER: III**

PCM-312: Practical with Computer Programming in C Language – I   **(L, T, P) =2 (0+0+2)**

	Contents of Course	Hrs.
Group A	Practical with Computer Programming in C Language. Programming languages and problem solving on computers, Algorithm, Flow chart, Programming in C- Constants, Variables, Arithmetic and logical expressions, Input-Output, Conditional statements, implementing loops in Programs, Defining and manipulation arrays and functions. 1. Printing n terms of Fibonacci sequence. 2. Finding n! $\sum n$, $\sum n^2$ etc. 3. Defining a function and finding sum of n terms of a series/sequence whose general term is given [e.g., $a_n = (n^2+3)/(n+1)$] 4. Printing Pascal's triangle. 5. Finding gcd and lcm of two numbers by Euclid's algorithm. 6. Checking prime/composite number. 7. Finding number of primes less than n, $n \in Z$. 8. Finding mean, standard deviation and ^nP_r, ^nC_r, for different n and r. Note: 1. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record. 2. Each Candidate has to pass in Practical and Theory examinations separately.	
	Total	22

BACHELOR OF SCIENCE
EFFECTIVE FROM ACADEMIC SESSION 2022 – 23

YEAR: II   **SEMESTER: IV**

S. No.	Subject Code	Subject Name	Hrs./Week			Exam Hrs.	Maximum & Minimum Marks		
			L	T	P		Internal/ Min. Pass Marks	External/ Min. Pass Marks	Total/Min. Pass Marks
Theory									
1	PCM 407	Real Analysis – II	3	0	0	3	15/06	35/14	50/20
2	PCM -408	Differential Equations – II	3	0	0	3	15/06	35/14	50/20
3	PCM -409	Numerical Analysis and Vector Calculus – II	3	0	0	3	15/06	35/14	50/20
4	Practical PCM-412	Practical with Computer Programming in C Language – II	0	0	2	2	15/06	35/14	50/20
Total			**09**		**2**				**200**
Total Teaching Load			**11**						

L: Lecture
T: Tutorial
P: Practical

YEAR: II   **SEMESTER: IV**

PCM 407: Real Analysis – II   **(L, T, P) = 3 (3+0+0)**

Units	Contents of Course	Hrs.
I	The directional derivative, The total derivative, Expression of total derivative in terms of partial derivatives.	8
II	Riemann integration – Lower and Upper Riemann integrals, Riemann integrability, Mean value theorem of integral calculus, Fundamental theorem of integral calculus.	9
III	Functions of bounded variations – Introduction, Properties of functions bounded variations, Total variation.	8
IV	Sequence and series of functions – Pointwise and Uniform convergence, Cauchy's criterion, Weierstrass M – test, Abel's test, Dirichlet's test for uniform convergence of series of functions.	8
V	Uniform convergence and Continuity of series of functions, Term by term differentiation and integration.	7
	Total	40

Reference Books:

1. K.A. Ross, Elementary Analysis: The Theory of Calculus, Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.

2. R.G. Bartle D.R. Sherbert, Introduction to Real Analysis (3rd edition), John Wiley and Sons (Asia) Pvt. Ltd.., Singapore, 2002.

3. Charles G. Denlinger, Elements of Real Analysis, Jones and Bartlett (Student Edition),2011.

4. S. Kumaresan, Topology of Metric Spaces, Narosa Publishing House, Second Edition 2011.

5. G. F. Simmons, Introduction to Topology and Modern Analysis, Mcgraw-Hill, Edition 2004.

PCM 408: Differential Equations – II   **(L, T, P) = 3 (3+0+0)**

Units	Contents of Course	Hrs.
I	Exact linear differential equations of n-th oder, Existence and Uniqueness theorem.	8
II	Linear differential equations of second order, Linear independence of solutions, Solution by transformation of the equation by changing the dependent variable/the independent variable.	8
III	Factorization of operators, Method of variation of Parameters, Method of undetermined coefficients.	8
IV	Partial differential equations of the first order. Langrage's linear equation, Charpit's general method of solution.	7
V	Homogeneous and non-homogeneous linear partial differential equations with constant coefficients, Equations reducible to equations with constant coefficients.	9
	Total	40

Reference Books:

1. R.S. Senger, Ordinary Differential Equations with Integration, Prayal Publ. 2000.

2. D.A. Murray, Introductory Course in Differential Equations, Orient Longman (India), 1967.

3. E.A. Codington, An Introduction to Ordinary Differential Equations, Prentice Hall of India, 1961.

YEAR: II   **SEMESTER: IV**

PCM 409: Numerical Analysis and Vector Calculus – II   **(L, T, P) = 3 (3+0+0)**

Units	Contents of Course	Hrs.
I	Relation between the roots and coefficients of general polynomial equation in one variable, Transformation of equations, Descarte's rule of signs, Solution of cubic equations by Cardon's method, Biquadratic equations by Ferari's method.	8
II	Numerical solution of Algebraic and Transcendental equations, Bisection method, Secant method, Regula-Falsi method, Iteration method, Newton – Raphson Method (derivation of formulae and rate of convergence only)	7
III	Gauss elimination and Iterative methods (Jacobi and Gauss Seidal) for solving system of linear algebraic equations, Partial Pivoting method, ill conditioned systems.	9
IV	Numerical solutions of ordinary differential equations of first order with initial condition using Picard's, Euler and modified Euler's method.	9
V	Differential operators, Gradient, Divergence and Curl, Theorems of Gauss, Green, Stokes (without proof) and problems based on these theorems.	7
	Total	40

Reference Books:

1. B. Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, India, 2007.

2. C. F. Gerald and P. O. Wheatley, Applied Numerical Analysis, Pearson Education, India, 7th edition, 2008.

3. C.F. Gerald, P. O. Wheatley, Applied Numerical Analysis, Addison – Wesley, 1998.

PCM 412: Practical with Computer Programming in C Language – II   **(L, T, P) =2 (0+0+2)**

	Contents of Course	Hrs.
Group B	Practical with Computer Programming in C Language. Programming languages and problem solving on computers, Algorithm, Flow chart, Programming in C - Constants, Variables, Arithmetic and logical expressions, Input-Output, Conditional statements, implementing loops in Programs, Defining and manipulation arrays and functions. 1. Numerical integration using Trapezoidal, Simpson's 1/3, 3/8 and Waddle rules. Note: 1. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record. 2. Each Candidate has to pass in Practical and Theory examinations separately.	
	Total	22

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BACHELOR OF SCIENCE
EFFECTIVE FROM ACADEMIC SESSION 2023– 24

YEAR: III   **SEMESTER: V**

S. No.	Subject Code	Subject Name	Hrs./Week			Exam Hrs.	Maximum & Minimum Marks		
			L	T	P		Internal/ Min. Pass Marks	External/ Min. Pass Marks	Total/Min. Pass Marks
Theory									
1	PCM 507	Algebra – I	3	0	0	3	15/06	35/14	50/20
2	PCM -508	Complex Analysis – I	3	0	0	3	15/06	35/14	50/20
3	PCM -509	Mechanics – I	3	0	0	3	15/06	35/14	50/20
4	Practical PCM-512	Practical with Computer Programming in C Language – I	0	0	2	2	15/06	35/14	50/20
Total			**09**		**2**				**200**
Total Teaching Load			**11**						

L: Lecture

T: Tutorial

P: Practical

PCM 507: Algebra – I   **(L, T, P) = 3 (3+0+0)**

Units	Contents of Course	Hrs.
I	Definition and simple properties of Groups and Subgroups, Permutation group, Cyclic group.	8
II	Cosets, Lagrange's theorem on the order of subgroups of a finite order group.	9
III	Morphism of groups, Cayley's theorem, Normal subgroups.	8
IV	Quotient groups, Fundamental theorems of Isomorphism.	7
V	Definition and simple properties of Rings and Subrings.	8
	Total	40

Reference Books:

1. Joseph A. Gallian, Contemporary Abstract Algebra (4th Edition), Narosa Publishing House, New Delhi, 1999. (IX Edition 2010).

2. S Lang, Introduction to Linear Algebra (2nd edition), Springer, 2005.

3. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007.

4. S. Kumaresan, Linear Algebra- A Geometric Approach, Prentice Hall of India, 1999.

5. Kenneth Hoffman, Ray Alden Kunze, Linear Algebra 2nd Ed., Prentice-Hall Of India Pvt. Limited, 1971.

YEAR: III   **SEMESTER: V**

PCM 508: Complex Analysis - I   **(L, T, P) = 3 (3+0+0)**

Units	Contents of Course	Hrs.
I	Complex plane, Connected and Compact sets, Curves and Regions in complex plane, Jordan curve theorem (statement only), Extended complex plane, Stereographic projection.	9
II	Complex valued function – Limits, Continuity and Differentiability, Analytic functions, Cauchy – Riemann equations (Cartesian and polar form), Harmonic functions, Construction of an analytic function.	8
III	Complex integration, Complex line integrals, Cauchy integral theorem, Indefinite integral, Fundamental theorem of integral calculus for complex functions, Cauchy integral formula.	8
IV	Analyticity of the derivative of an analytic function, Morera's theorem, Poisson integral formula, Liouville's theorem.	7
V	Taylor's theorem, Laurent's theorem, Maximum modulus theorem.	8
	Total	40

Reference Books:

1. James Ward Brown and Ruel V. Churchill, Complex Variables and Applications (Eighth Edition), McGraw-Hill International Edition, 2009.

2. Joseph Bak and Donald J. Newman, Complex analysis (2nd Edition), Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.

PCM 509: Mechanics – I   **(L, T, P) = 3 (3+0+0)**

Units	Contents of Course	Hrs.
I	Velocity and acceleration – along radial and traverse directions, along tangential and normal directions.	8
II	S.H.M., Hooke's law, motion along horizontal and vertical elastic strings.	7
III	Motion in resisting medium – Resistance varies as velocity and square of velocity. Work and Energy.	8
IV	Motion on a smooth curve in a vertical plane, Motion on the inside and outside of a smooth vertical circle, Projectile.	9
V	Central orbits – p-r equations, Apses, Time in an orbit, Kepler's law of Planetary motion.	8
	Total	40

Reference Books:

1. I.H. Shames and G. Krishna Mohan Rao, Engineering Mechanics: Statics and Dynamics (4th Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2009.

2. R.C. Hibbeler and Ashok Gupta, Engineering Mechanics: Statics and Dynamics (11th Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi.

3. S.L. Loney - An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies, Kalyani Publishers, New Delhi.

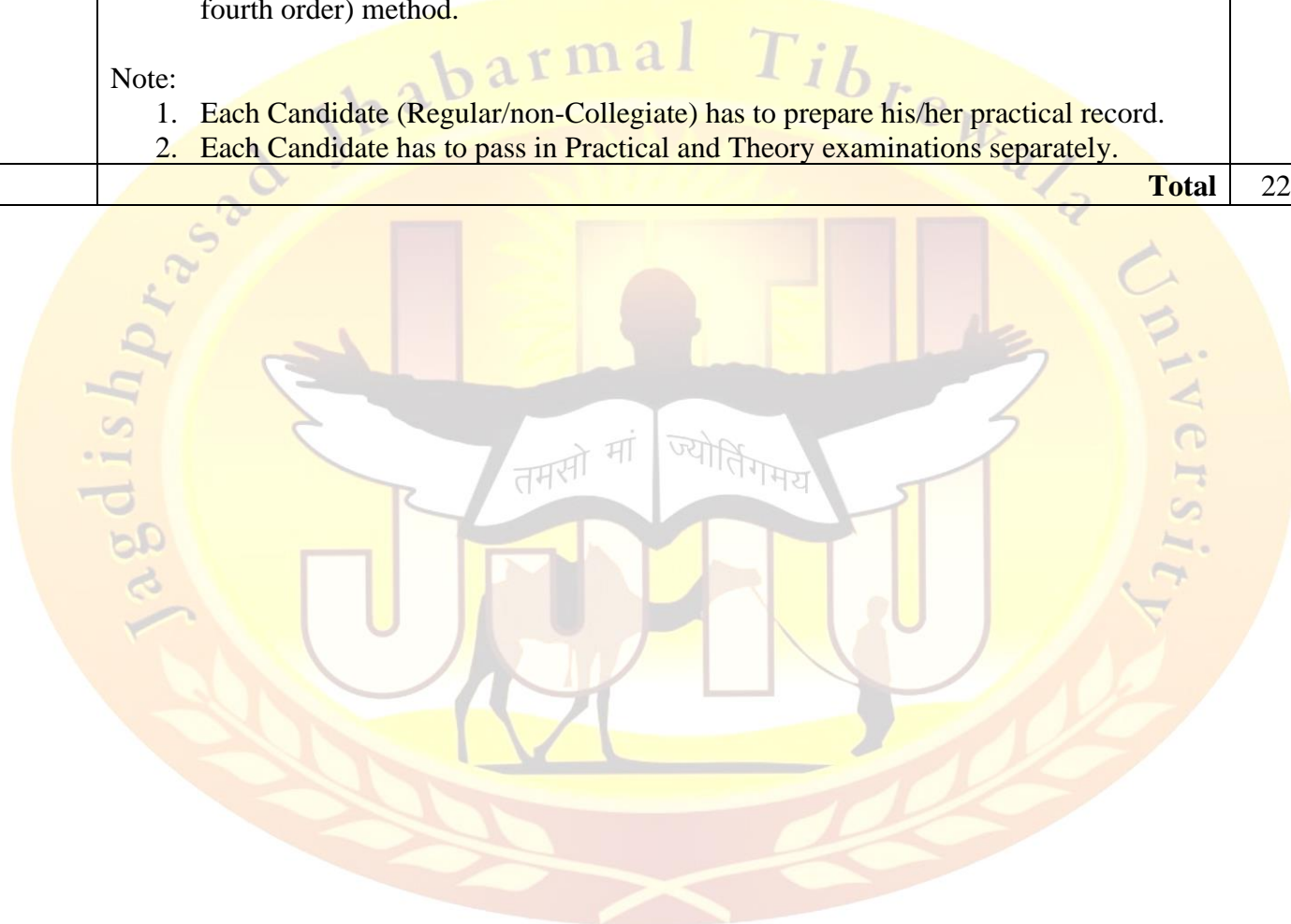4. J.L. Synge & B.A. Griffith - Principles of Mechanics, Tata McGraw-Hill, 1959.

PCM 512: Practical with Computer Programming in C Language – I   **(L, T, P) = 2 (0+0+2)**

	Contents of Course	Hrs.
Group A	Practical with Computer Programming in C Language. 1. Solution of algebraic and transcendental equations by Bisection method, Regula-falsi method and Newton-Raphson method. 2. Solution of Initial value problems by Euler's method and Runga-Kutta (third and fourth order) method. Note: 1. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record. 2. Each Candidate has to pass in Practical and Theory examinations separately.	
	Total	22

INSTITUTE OF SCIENCE
DEPARTMENT OF MATHEMATICS
EXAMINATION SCHEME AND DETAILED SYLLABUS FOR

BACHELOR OF SCIENCE
EFFECTIVE FROM ACADEMIC SESSION 2023 – 24

YEAR: III   **SEMESTER: VI**

S. No.	Subject Code	Subject Name	Hrs./Week			Exam Hrs.	Maximum & Minimum Marks		
			L	T	P		Internal/ Min. Pass Marks	External/ Min. Pass Marks	Total/Min. Pass Marks
Theory									
1	PCM 607	Algebra – II	3	0	0	3	15/06	35/14	50/20
2	PCM -608	Complex Analysis – II	3	0	0	3	15/06	35/14	50/20
3	PCM -609	Mechanics – II	3	0	0	3	15/06	35/14	50/20
4	Practical PCM-612	Practical with Computer Programming in C Language – II	0	0	2	2	15/06	35/14	50/20
Total			**09**		**2**				**200**
Total Teaching Load			**11**						

L: Lecture

T: Tutorial

P: Practical

YEAR: III   **SEMESTER: VI**

PCM 607: Algebra – II   **(L, T, P) = 3 (3+0+0)**

Units	Contents of Course	Hrs.
I	Morphism of rings, Embedded of a ring, Integral domain and field, Characteristics of a Ring and Field.	8
II	Ideals and Quotient Ring, Maximal ideal and Prime ideal, Principal Ideal domain.	7
III	Field of quotients of an integral domain, Prime fields, Definition, Examples and Simple properties of Vector spaces and Subspaces.	9
IV	Linear combination, Linear dependence and independence of vectors, Basis and Dimension.	8
V	Generation of subspaces, Sum of subspaces, Direct sum and complement of subspaces, Quotient space and its dimension.	8
	Total	40

Reference Books:

1. Joseph A. Gallian, Contemporary Abstract Algebra (4th Edition), Narosa Publishing House, New Delhi, 1999. (IX Edition 2010).

2. S Lang, Introduction to Linear Algebra (2nd edition), Springer, 2005.

3. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007.

4. S. Kumaresan, Linear Algebra- A Geometric Approach, Prentice Hall of India, 1999.

5. Kenneth Hoffman, Ray Alden Kunze, Linear Algebra 2nd Ed., Prentice-Hall Of India Pvt. Limited, 1971

PCM 608: Complex Analysis – II   **(L, T, P) = 3 (3+0+0)**

Units	Contents of Course	Hrs.
I	Power series – Absolute convergence, Abel's theorem, Cauchy – Hadamard theorem, Circle and Radius of convergence, Analyticity of the sum function of a power series.	8
II	Singularities of an analytic function, Branch point, Meromorphic and Entire functions, Riemann's theorem, Casorati – Weierstrass theorem.	9
III	Residue at a singularity, Cauchy's residue theorem, Argument principle, Rouche's theorem, Fundamental theorem of Algebra.	7
IV	Conformal mapping, Bilinear transformation and its properties, Elementary mappings: $$w(z) = \frac{1}{2}\left(z + \frac{1}{z}\right), z^2, e^z, \sin z, \cos z, \text{ and } \log z$$	8
V	Evaluation of a real definite integral by contour integration, Analytic continuation, Power series method of analytic continuation.	8
	Total	40

Reference Books:

1. James Ward Brown and Ruel V. Churchill, Complex Variables and Applications (Eighth Edition), McGraw-Hill International Edition, 2009.

2. Joseph Bak and Donald J. Newman, Complex analysis (2nd Edition), Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.

YEAR: III   **SEMESTER: VI**

PCM 609: Mechanics – II   **(L, T, P) = 3 (3+0+0)**

Units	Contents of Course	Hrs.
I	Moment of inertia – M.I. of rods, Circular rings, Circular disks, Solid and Hallow spheres, Rectangular lamina, Ellipse and Triangle, Theorem of parallel axis, Product of inertia.	8
II	Equilibrium of coplanar force	8
III	Moments and Friction	8
IV	Virtual work	7
V	Catenary	9
	Total	40

Reference Books:

1. I.H. Shames and G. Krishna Mohan Rao, Engineering Mechanics: Statics and Dynamics (4th Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2009.

2. R.C. Hibbeler and Ashok Gupta, Engineering Mechanics: Statics and Dynamics (11th Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi.

3. S.L. Loney - An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies, Kalyani Publishers, New Delhi.

4. J.L. Synge & B.A. Griffith - Principles of Mechanics, Tata McGraw-Hill, 1959.

YEAR: III   **SEMESTER: VI**

PCM: Practical with Computer Programming in C Language – II   **(L, T, P) =2 (0+0+2)**

	Contents of Course	Hrs.
Group B	Practical with Computer Programming in C Language.	
	1. Matrix operations: addition, subtraction, multiplication, Rank of a matrix, inverse of a matrix. 2. Solution of linear algebraic equations by Gauss elimination method, Matrix method, Gauss Jordan method. Note: 1. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record. 2. Each Candidate has to pass in Practical and Theory examinations separately.	
	Total	22