RAJEEV GANDHI GOVT. POST GRADUATE COLLEGE,

AMBIKAPUR, SURGUJA (CG), INDIA

Learning Outcomes based Curriculum Framework

FOR

BACHLOUR OF SCIENCE PROGRAMME

IN

MATHEMATICS

SEMESTER SYSTEM

SESSION 2023-2024

VISION

To be a global centre of excellence in mathematics for the growth of science and technology.

MISSION

To provide quality education and research in Mathematics through updated curriculum,effective teaching learning process.

To inculcate innovative skills, team-work, ethical practices among students so as to meet societal expectations.

Programme Outcome

PO-1	Basic Knowledge	Capable of delivering basic disciplinary knowledge gained during the programme.
PO-2	In-depth Knowledge	Capable of describing advanced knowledge gained during the programme.
PO-3	Critical thinking and Problem Solving abilities	Capable of analyzing the results critically and applying acquired knowledge to solve the problems.
PO-4	Creativity and innovation	Capable to identify, formulate, investigate and analyze the scientific problems and innovatively to design and create products and solutions to real life problems.
PO-5	Research aptitude and global competency	Ability to develop a research aptitude and apply knowledge to find the solution of burning research problems in the concerned and associated fields at global level.
PO-6	Holistic and multidisciplinary education	Ability to gain knowledge with the holistic and multidisciplinary approach across the fields.
PO-7	Skills enhancement	Learn specific sets of disciplinary or multidisciplinary skills and advanced techniques and apply them for betterment of mankind.
PO-8	Leadership and Teamwork abilities	Ability to learn and work in a groups and capable of leading a team even.
PO-9	Environmental and human health awareness	Learn important aspects associated with environmental and human health. Ability to develop eco-friendly technologies.
PO-10	Ethical thinking and Social awareness	Inculcate the professional and ethical attitude and ability to relate with social problems.
PO-11	lifelong learning skills and Entrepreneurship	Ability to learn lifelong learning skills which are important to provide better opportunities and improve quality of life. Capable to establish independent startup/innovation center etc.

Graduate Attributes in Mathematics

The graduate attributes in mathematics are the summation of the expected course learningoutcomes mentioned in the beginning of each course.

1. Disciplinary knowledge: Capability of demonstrating comprehensive knowledge of mathematics and understanding ofone or more disciplines which form a part of an undergraduate programme of study.

2.Communications skills:

i. Ability to communicate various concepts of mathematics effectively using examplesand their geometrical visualizations.

ii. Ability to use mathematics as a precise language of communication in other branchesof human knowledge.

iii. Ability to communicate long standing unsolved problems in mathematics.

iv. Ability to show the importance of mathematics as precursor to various scientificdevelopments since the beginning of the civilization.

v. Ability to explain the development of mathematics in the civilizational context and its role as queen of all sciences.

3. Critical thinking and analytical reasoning:

i. Ability to employ critical thinking in understanding the concepts in every area ofmathematics.

ii. Ability to analyze the results and apply them in various problem appearing indifferent branches of mathematics.

4. Problem solving:

i. Capability to solve problems in computer graphics using concepts of linear algebra.

ii. Capability to solve various models such as growth and decay models, radioactive decay model, drug assimilation, LCR circuit & population models .

iii. Ability to solve linear system of equations, linear programming problems and network flow problems.

iv. Ability to provide new solutions using the domain knowledge of mathematics

5. Research-related skills

i. Capability for inquiring about appropriate questions relating to the concepts in various fields of mathematics.

ii. To know about the advances in various branches of mathematics.

6. Self-directed learning:

Ability to work independently and do in-depth study of various notions of mathematics.

7. Moral and ethical awareness/reasoning:

Ability to identify unethical behaviour such as fabrication, falsification or misrepresentation of data and adopting objective, unbiased and truthful actions in allaspects.

8. Lifelong learning:

Ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning.

Programme Specific Outcomes

The post graduates shall be able to realise the following specific outcomes by the end of program studies: On successful completion of the M.Sc. Mathematics programme a student

PSO-1	Will have a strong foundation in both pure and applied mathematics.
PSO-2	Will be able to apply mathematical skills for solving problems and for preparing various competitive exams.
PSO-3	Will be able to communicate mathematical knowledge effectively, in writing as well as orally.
PSO-4	Will identify applications of mathematics in other disciplines, leading to enhancement of career prospects in different fields and research areas.
PSO-5	Will have basic knowledge of programming and computational techniques as required for employment.
PSO-6	Should have the knowledge of the fundamental axioms in mathematics and capability of developing ideas based on them and inculcate mathematical reasoning.
PSO-7	Will be able to locate and analyse the different mathematical texts with appropriate theoretical framework.
PSO-8	Have the knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in science, social science, engineering and technology.
PSO-9	Should be able to develop analytical skills, critical thinking, creativity, communication and presentation skills through assignments, seminar, project work.
PSO-10	Should be able to apply their skills and knowledge that translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

The B. Sc. programme is a three-year course divided into six-semesters. The syllabus and schemes of examination are detailed herewith.

The B.Sc. Mathematics Programme would make the students competent in the field of Mathematics and help them understand its role in modern day technology. Overall, the course would enable the students to understand the fundamental concepts . Knowledge gained through the open electives would be an asset in branching out in fields other than mathematics..

In I/II/III/IV/V/VI semester there shall be two theory paper each of 70 marks and 30 marks for internal assessment test. In internal assessment, there will be 10 marks for written test, 10 marks for assignment and 10 marks for a seminar in each paper.

Thus there shall be T/I=100 marks for each paper, minimum passing / qualifying marks shall be 36% in each theory/internal assessment. Candidate will be required to pass separately in each theory and internal assessment.

Courses and Course Code under Old UG Programme

Semester	code	Course Title
First	UD5-101	Calculus and Algebra I
Second	UD5-102	Calculus and Algebra II
Third	UD5-201	Advanced Calculus and Differential Equations-I
Fourth	UD5-202	Advanced Calculus and Differential Equations-II
Fifth	UD5-301	Analysis And Abstract Algebra-I
Sixth	UD5-302	Analysis And Abstract Algebra-II
Sixth(Opt.)	UD5-303	Programming in C and Numerical Analysis(Optional)

B.Sc. Semester I
Calculus and Algebra I
Course Outcome

Students are able to

1. To understand the ideas and concept of calculus and facility in solving standard examples.

2. To understand the ideas of limits and continuity and an ability to calculate with them and apply them for functions of one variable.

3. To solve problem using expansion of functions.

4. To understand the concepts of algebra and trigonometry.

5. To acquire techniques in solving equations with the help of theory of equations.

6. To understand the ideas of vector analysis and geometry in solving standard examples.

7. To be familiar with physical interpretation of divergence and curl of a vector.

PO-CO Mapping

	CO_1	CO_2	CO_3	CO_4	CO_5	CO_6	CO_7
PO_1	✓	✓	✓	✓	✓	✓	✓
PO_2	✓	✓	✓		✓	✓	✓
PO_3	✓	✓	✓	✓	✓	✓	✓
PO_4	✓	✓	✓	✓	✓	✓	✓
PO_5				✓			
PO_6	✓	✓				✓	✓
PO_7					✓		
PO_8	✓	✓	✓			✓	✓
PO_9			✓				
PO_{10}	✓	✓		✓		✓	✓
PO_{11}						✓	

B.Sc. (MATHEMATICS)		SEMESTER I	
COURSE TITLE: Calculus and Algebra I			
COURSE CODE: UD5-101		COURSE TYPE: CCC	
Credit -6		Hours-90hrs	
Theory-6	Practical-0	Theory-90	Practical-0
Marks			
Theory-(70+30)		Practical-0	

Scheme of Marks:

i. **Objective type questions: Twelve questions carrying 1 marks each to be asked 10 to be attempted.**
ii. **Short answer type questions: Five questions carrying 3 marks each to be set three to be attempted (Word limit 100 words).**
iii. **Middle answer type questions: Five questions carrying 6 marks each to be set three to be attempted (Word limit 250 words).**
iv. **Long answer type questions: Three questions carrying 11 marks each to be set three to be attempted (Word limit 750 words).**

Unit I 18 hrs	ε – δ definition of the limit of a function. Basic properties of limits, Continuity and classification of discontinuities, Differentiability, Successive differentiation, Leibnitz theorem
Unit II 18hrs	Maclaurin's &Taylor's series expansions, Asymptotes, Curvature, Test for concavity and convexity. Point of inflexion. Multiple points, Tracing of curves in Cartesian and polar co-ordinates.
Unit III 18 hrs	**De** Movier's theorem and its applications. Direct and inverse circular and hyperbolic functions. Logarithm of a complex quantity. Expansion of trigonometry functions.
Unit IV 18hrs	Relation between the roots and coefficients of general polynomial equations in one variable .Transformation of equations. Descarte's rule of signs, Solutions of cubic equation(Cardons method), Solution of biquadratic equation(Ferari method)
Unit V 18 hrs	Vector differentiation and Vector integration, Directional derivative, Gradient ,Divergence & Curl, Solenoidal and Irrotational vector, Theorems of Gauss , Green ,Stokes(without proof) and problems based on these theorems.

REFERENCES:

1. Gorakh Prasad: Differential Calculus, Pothishalas Pvt Ltd, Allahabad**.**
2. Khalil Ahmad: Text Book of Calculus, World Edu. Pub., 2012. Int.(P) Ltd. Pub.
3. I. N. Herstein: Topics in Algebra, Wiley; 2nd edition (June 20, 1975).
4. P.B. Bhattacharya, S. K. Jain and S. R. Nagpal: First course in Abstract Algebra.
5. K. B. Datta: Matrix and Linear Algebra.
6. J. Finkbecner: Matrix theory.
7. S. Singh, Modern Algebra, Vikas Publ. House, India.

B.Sc. Semester II

Calculus and Algebra II

Course Outcome

Students are able to

1. To solve problem related to definite integral.
2. To able to familiar with curve tracing
3. To make the student acquire sound knowledge of techniques in solving differential equations.
4. To understand the concepts of algebra.
5. To be familiar with group theory, ring, integral domain, field and make their fundamental strong.

PO-CO Mapping

	CO_1	CO_2	CO_3	CO_4	CO_5
PO_1	✓	✓	✓	✓	✓
PO_2	✓	✓	✓		✓
PO_3	✓	✓	✓	✓	✓
PO_4	✓	✓	✓	✓	✓
PO_5				✓	
PO_6	✓	✓	✓	✓	✓
PO_7					✓
PO_8	✓	✓	✓		
PO_9			✓		✓
PO_{10}	✓	✓		✓	
PO_{11}			✓	✓	✓

B.Sc. (MATHEMATICS)		SEMESTER II	
COURSE TITLE: Calculus and Algebra II			
COURSE CODE: UD5 -102			
Credit -6		Hours-90hrs	
Theory-6	Practical-0	Theory-90	Practical-0
Marks			
Theory-(70+30)		Practical-0	

Scheme of Marks:

i. **Objective type questions: Twelve questions carrying 1 marks each to be asked 10 to be attempted.**
ii. **Short answer type questions: Five questions carrying 3 marks each to be set three to be attempted (Word limit 100 words).**
iii. **Middle answer type questions: Five questions carrying 6 marks each to be set three to be attempted (Word limit 250 words).**
iv. **Long answer type questions: Three questions carrying 11 marks each to be set three to be attempted (Word limit 750 words).**

Unit I 18 hrs	Definite integrals. Quadrature. Rectification . Volumes and surfaces of solids of revolution.
Unit II 18hrs	Differential equations of first order and first degree. Linear differential equations. Exact differential equations. First order and higher degree equations, Geometrical meaning of differential equation. Orthogonal trajectories. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations.
Unit III 18 hrs	Linear differential equations of second order. Transformationof the equation by changing the dependent & independent variable, Method of variation of parameters. Ordinary simultaneous differential equations.
Unit IV 18hrs	Mapping , Equivalence relations and partitions, Congruence modulo n. Definition of a group with examples and simple properties, Subgroup , algebra of subgroups , Cyclic groups, Order of a group, Coset De composition, Lagrange's Theorem (only for finite group) and its consequences. Permutation groups, Even and odd permutations ,The alternating groups A_n , Cayley's theorem
Unit V 18 hrs	Homomorphism and isomorphism,Kernelof a Homomorphism, Normal Subgroup,Quotient group, Fundamental theorem of Homomorphism,Isomorphism theorem for groups,Definition with examples and properties of rings, Subring,Integral domains,characteristic of ring and field.

Reference:

1.Gorakh Prasad: Integral Calculus, Pothishalas Pvt Ltd, Allahabad.

2.Shanti Narayan: Integral Calculus, S. Chand & Co.

3. S.Balachandra Rao &H.R.Anuradha,DE with App and Programmes, Uni. Press,Hyderabad.

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

B.Sc. Semester III

Advanced Calculus and Differential Equations-I

Course Outcome

Students are able to

1. To gain proficiency in calculus computations.
2. To gain knowledge of sequences, series and their convergence.
3. To understand the ideas of limits and continuity and an ability to calculate with them and apply them for functions of two variables.
4. To acquire knowledge of techniques insolving partial differential equations.
5. To understand the ideas of Legendre, Bessel equations in solving standard differential equations and apply them.
6. To understand the ideas of differential equation and facility in solving standard equations.
7. To get knowledge about the Laplace and inverse Laplace transform.
8. To familiarize the student with the applications of Laplace transformation in solving linear differential equations.

PO-CO Mapping

	CO_1	CO_2	CO_3	CO_4	CO_5	CO_6	CO_7	CO_8
PO_1	✓	✓	✓	✓	✓	✓	✓	✓
PO_2	✓	✓	✓		✓	✓	✓	✓
PO_3	✓	✓	✓	✓	✓	✓	✓	✓
PO_4	✓	✓	✓	✓	✓	✓	✓	✓
PO_5				✓	✓	✓	✓	✓
PO_6	✓	✓						
PO_7					✓			
PO_8	✓	✓	✓					
PO_9			✓				✓	✓
PO_{10}	✓	✓		✓				✓
PO_{11}	✓	✓	✓	✓	✓	✓		

B.Sc. (MATHEMATICS)		SEMESTER III	
COURSE TITLE: Advanced Calculus And Differential Equations-I			
COURSE CODE: UD5-201			
Credit -6		**Hours-90hrs**	
Theory-6	**Practical-0**	**Theory-90**	**Practical-0**
Marks			
Theory-(70+30)		**Practical-0**	

Scheme of Marks:

i. **Objective type questions: Twelve questions carrying 1 marks each to be asked 10 to be attempted.**
ii. **Short answer type questions: Five questions carrying 3 marks each to be set three to be attempted (Word limit 100 words).**
iii. **Middle answer type questions: Five questions carrying 6 marks each to be set three to be attempted (Word limit 250 words).**
iv. **Long answer type questions: Three questions carrying 11 marks each to be set three to be attempted (Word limit 750 words).**

Unit I 18 hrs	Definition of sequence. Theorems of limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms.Comparison tests.Cauchy's integral test.Ratio tests.Raabe's, logarithmic, de-Morgan and Bertrand's tests.Alternating series.Leibnitz's theorem. Absolute and conditional convergence.
Unit II 18hrs	Continuity. Sequential continuity. Properties of continuous functions. Uniform continuity. Chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's & intermediate value theorem for derivatives. Taylor's theorem with various forms of remainders.
Unit III 18 hrs	Limit and continuity of functions of two variables.Partial differentiation change of variables.Euler's theorem on homogeneous functions.Taylor's theorem for two variables. Jacobians.
Unit IV 18hrs	Series solutions of differential equations.Power series method.Bessel and Legendre function and their properties,recurrence and generating relations. Orthogonality of functions. Sturm - Liouville problem.
Unit V 18 hrs	Laplace transformation, Linearity of the Laplace transformation. Existence theorem for Laplace transforms.Laplace transforms of derivatives & integrals.Shifting theorems.Differentation and integration of transforms.Convolution theorem.Solution ofintegral equations and systems of differential equations using the Laplaces transformation.

REFERENCES:1.Gorakh Prasad: Differential Calculus, Pothishalas Pvt Ltd, Allahabad.

2.Shanti Narayan: Differential Calculus, S. Chand & Co. New Delhi

3.Shanti Narayan: Integral Calculus, S. Chand & Co. New Delhi

B.Sc. Semester IV
Advanced Calculus and Differential Equations-II

Course Outcome

Students are able to

1. To gain proficiency in calculus computations.
2. To acquire knowledge of techniques in solving partial differential equations.
3. To understand the ideas of differential equation and facility in solving standard equations.
4. To get knowledge about the Laplace and inverse Laplace transform.
5. To familiarize the student with the applications of calculus of variation in solving differential equations.
6. To acquire knowledge of techniques in solving partial differential equations.

PO-CO Mapping

	CO_1	CO_2	CO_3	CO_4	CO_5	CO_5
PO_1	✓	✓	✓	✓	✓	✓
PO_2	✓	✓	✓		✓	✓
PO_3	✓	✓	✓	✓	✓	✓
PO_4	✓	✓	✓	✓	✓	✓
PO_5	✓	✓	✓	✓	✓	✓
PO_6	✓	✓				
PO_7					✓	✓
PO_8	✓	✓	✓			
PO_9			✓			
PO_{10}	✓	✓		✓		
PO_{11}	✓	✓	✓	✓	✓	✓

B.Sc. (MATHEMATICS)		SEMESTER IV	
COURSE TITLE: **Advanced Calculus and Differential Equations-II**			
COURSE CODE: UD5-202			
Credit -6		**Hours-90hrs**	
Theory-6	**Practical-0**	**Theory-90**	**Practical-0**
Marks			
Theory-(70+30)		**Practical-0**	

Scheme of Marks:

i. **Objective type questions: Twelve questions carrying 1 marks each to be asked 10 to be attempted.**
ii. **Short answer type questions: Five questions carrying 3 marks each to be set three to be attempted (Word limit 100 words).**
iii. **Middle answer type questions: Five questions carrying 6 marks each to be set three to be attempted (Word limit 250 words).**
iv. **Long answer type questions: Three questions carrying 11 marks each to be set three to be attempted (Word limit 750 words).**

Unit I 18 hrs	Envelopes, Evolutes, Maxima ,Minima and saddle points of functions of two variables. Lagrange's multiplier method.
Unit II 18hrs	Beta and Gamma functions, Double and triple integrals, Dirichlet's integral. Change of Order of integration in double integrals
Unit III 18 hrs	Partial differential equations of the first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than the general method. Charpit's general method of solution.
Unit IV 18hrs	Partial differential equation of second and higher orders. Classification of linear partial differential equations of second order. Homogeneous and non -homogeneous equations with constant coefficients. Partial differential equation reducible to equations with constant cofficient. Monge's methods
Unit V 18 hrs	Calculus of Variations: Variational problems with fixed boundaries, Euler's equations for functionals containing first order derivatives and one independent varialbe. Extremals. Functional dependent on higher order derivatives. Functionals dependent on more than one dependent variable. Variational problems in parametric form. Invariance of Euler's equation under coordinates transformation.Variational problems with moving boundries,functions.One sided variations.Sufficients conditions for an extremum .Jacobi and Legendre conditions.Second variational principle of least action.

Reference-

1. Zafar Ahsan: Text Book of Differential Equations and their Applications, PHI
2. Khalil Ahmad: Text Book of Differential Equations, World Education Publishers, .
3. A.S. Gupta: Calculus of variations with applications, Prentice Hall of India, 1997
4. I.N. Sneddon: Elements of Partial Differential Equations, McGraw Hill Company,

B.Sc. Semester V

Analysis And Abstract Algebra-I

Course Outcome

Students are able to

1. To gain proficiency in computation of real analysis.

2. To understand the concept of real analysis and series.

3. To understand the idea of complex analysis and ability to calculate with them.

4. To develop aspect of Linear transformation & Jordan form.

5. Distinguish the concept of Homomorphism, Automorphism & Isomorphism,

PO-CO Mapping

	CO_1	CO_2	CO_3	CO_4	CO_5
PO_1	✓	✓	✓	✓	✓
PO_2	✓	✓	✓	✓	✓
PO_3				✓	✓
PO_4	✓	✓	✓	✓	✓
PO_5	✓	✓	✓	✓	✓
PO_6	✓	✓			
PO_7					✓
PO_8	✓	✓	✓		
PO_9			✓		
PO_{10}	✓	✓		✓	
PO_{11}	✓	✓	✓	✓	✓

B.Sc. (MATHEMATICS)		SEMESTER V	
Course Title: Analysis And Abstract Algebra-I			
COURSE CODE: UD5-301			
Credit -6		**Hours-90hrs**	
Theory-6	**Practical-0**	**Theory-90**	**Practical-0**
Marks			
Theory-(70+30)		**Practical-0**	

Scheme of Marks:

i. **Objective type questions: Twelve questions carrying 1 marks each to be asked 10 to be attempted.**
ii. **Short answer type questions: Five questions carrying 3 marks each to be set three to be attempted (Word limit 100 words).**
iii. **Middle answer type questions: Five questions carrying 6 marks each to be set three to be attempted (Word limit 250 words).**
iv. **Long answer type questions: Three questions carrying 11 marks each to be set three to be attempted (Word limit 750 words).**

Unit I 18 hrs	Series of arbitrary terms. Convergence, divergence and oscillation. Abel's and Dirichlet's tests. Multiplication of series. Double series. Partial derivation and Differentiability of real valued functions of two variables. Schwartz and Young's theorem.Implicit function theorem.Fourier series.Fourier expansion of piece wise monotonic functions.
Unit II 18hrs	Riemann integral. Integrability of continuous and monotonic function.The fundamental theorem of integral calculus. Mean value theorems of integral calculus. Improper integrals and their convergence. Comparison tests, Abel's and Dirichlet's tests.
Unit III 18 hrs	Complex numbers as ordered pairs.,continuity & differentiability of complex functions. Analytic functions. Cauchy- Riemann equations. Harmonic functions. Elementary functions. Mapping by elementary functions. Mobius Transforms, Conformal mapping
Unit IV 18 hrs	Definition and examples of vector spaces. Subspaces. Sum and direct sum of subspaces. Linear span. Linear dependence, independence and their basic properties. Basis. Finite dimensional vector spaces. Existence theorem for bases. Invariance of thenumber of elements of a basis set. Dimension.
Unit V 18 hrs	Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bidual space and natural isomorphism. Adjoint of a linear transformation. Eigen values and eigen vectors of a linear transformation, Diagonalisation. Annihilator of a sub space. Bilinear, Quadratic and Hermitian forms.

Reference-

1.R. G. Bartle and D.R. Sherbert, Introduction to Real Analysis 3rd ed, John Wiley and Sons

2.S.C. Malik and Savita Arora: Mathematical Analysis, New Age (P) Ltd. Publishers,

3.Sudhir R Ghorpade and Balmohan V. Limaye, Calculus and Real Analysis, Springer

4.T.M. Apostol: Mathematical Analysis, Addison-Wesley Series in athematics,

1974.5.R.R.Goldberg: Real Analysis, Oxford IBH Publishing , New Delhi, 1970.

B.Sc. Semester VI

Analysis and Abstract Algebra-II

Course Outcome

Students are able to

1. To gain proficiency in computation of real analysis.
2. To understand the concept of real analysis and series.
3. Distinguish the concept of Homomorphism, Automorphism & Isomorphism,.
4. To introduce the concepts of metric space to the students and to make them understand various familiar concept of real analysis with the help of metric space.
5. To understand the concept of compactness and connectedness with respect to metric space and to study some useful properties of continuous function.
6. Distinguish the concept of Homomorphism, Automorphism & Isomorphism,.
7. To understand the concept of Inner Product space, orthganalization & Gram-Schmidt Process.

PO-CO Mapping

	CO_1	CO_2	CO_3	CO_4	CO_5	CO_6	CO_7
PO_1	✓	✓	✓	✓	✓	✓	✓
PO_2	✓	✓	✓		✓	✓	✓
PO_3	✓	✓	✓	✓	✓	✓	✓
PO_4	✓	✓	✓	✓	✓	✓	✓
PO_5			✓	✓		✓	✓
PO_6	✓	✓					
PO_7					✓		
PO_8	✓	✓	✓				
PO_9			✓			✓	✓
PO_{10}	✓	✓		✓			
PO_{11}	✓	✓	✓	✓	✓	✓	✓

B.Sc. (MATHEMATICS)		SEMESTER VI	
Course Title: Analysis And Abstract Algebra-II			
COURSE CODE: UD5-302			
Credit -6		**Hours-90hrs**	
Theory-6	**Practical-0**	**Theory-90**	**Practical-0**
Marks			
Theory-(70+30)		**Practical-0**	

Scheme of Marks:

i. **Objective type questions: Twelve questions carrying 1 marks each to be asked 10 to be attempted.**
ii. **Short answer type questions: Five questions carrying 3 marks each to be set three to be attempted (Word limit 100 words).**
iii. **Middle answer type questions: Five questions carrying 6 marks each to be set three to be attempted (Word limit 250 words).**
iv. **Long answer type questions: Three questions carrying 11 marks each to be set three to be attempted (Word limit 750 words).**

Unit I 18 hrs	Definition and examples of metric spaces. Neighborhoods'. Limit points. Interior points. Open and closed sets. Closure and interior. Boundary points. Sub-space of a metric space. Cauchy sequences. Completeness. Cantor's intersection theorem. Contraction principle. Construction of Real numbers and the completion of the incomplete metric space of rationals. Real numbers as a complete ordered field.
Unit II 18hrs	Dense subsets.Baire Category theorem.Separable. First countable and second countable space. Continuous functions. Equivalent metrics. Compactness. Sequential compactness. Totally bounded space. Finite intersection property. Continuous functions and compact sets. Connectedness. Components. Continuous functions and connected sets.
Unit III 18 hrs	Group:Automorphisms, inner automorphism. Automorphism groups andtheir computations. Conjugacy relation. Normaliser. Counting principle and theclass equation of a finite group. Centre for group of prime order. Abelianing of a group and its universal property. Sylow's theorems. Sylow sub-group. Structure theorem for finite Abelian groups.
Unit IV 18 hrs	Ring theory:Ring homomorphism. Ideals and Quotient Rings. Field of Quotients of an Integral Domain. Euclidean Rings. Polynomial Rings. Polynomials over the Rational Field. The Eisenstein criterion. Polynomial Rings over Commutative Rings. Unique factorization domain. R unique factorization domain implies so is $R(x_1,x_2..... x_n)$ Modules, sub-modules. Quotients modules. Homomorphism and Isomorphism Theorems.
Unit V 18 hrs	Inner Product Spaces: Cauchy Schwarz inequality.Orthogonal complements. Orthogonal sets and bases. Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process.

Reference-

1 I. N. Herstein: Topics in Algebra, Wiley; 2nd edition (June 20, 1975).

2 P.B. Bhattacharya, S. K. Jain and S. R. Nagpaul: First course in Abstract algebra Cambridge Univ. Press .3 K. B. Datta: Matrix and Linear Algebra. PHI, New Delhi.

B.Sc. (MATHEMATICS)		SEMESTER VI	
Course Title: Programming in C and Numerical Analysis(Optional)			
COURSE CODE: UD5-303			
Credit -6		**Hours-90hrs**	
Theory-6	**Practical-0**	**Theory-90**	**Practical-0**
Marks			
Theory-(70+30)		**Practical-0**	

Scheme of Marks:

i. **Objective type questions: Twelve questions carrying 1 marks each to be asked 10 to be attempted.**

ii. **Short answer type questions: Five questions carrying 3 marks each to be set three to be attempted (Word limit 100 words).**

iii. **Middle answer type questions: Five questions carrying 6 marks each to be set three to be attempted (Word limit 250 words).**

iv. **Long answer type questions: Three questions carrying 11 marks each to be set three to be attempted (Word limit 750 words).**

Unit I 18 hrs	**PROGRAMMING IN C** Programmer's model of a computer. Flow charts, Algorithm, Data types, Arithmetic and input/output instructions. Decesions control structure, Decision statements, Logical and conditional operators, Loop , Case Control Structures
Unit II 18hrs	Functions, Recursions, Preprocessors, Arrays. Puppetling of strings. Structures. Pointers. File formatting.
Unit III 18 hrs	**NUMERICAL ANALYSIS** Solution ol Equations : Bisection, Secant, Regula Falsi, Newton's Method, Roots ofPolynomials : Interpolation: Lagarange and Hermite Interpolation, Divided Differences, Difference Schemes, Interpolation Formula using Differences. Numerical Differentialion.Numerical Ouadrature : Newton-Cote's Formulas. Gauss Quadrature Formulas, Chebychev's Formulas.
Unit IV 18 hrs	Linear Equations : Direct Methods for Solving. Systems of Linear Equations (Guass Elimination, LU Decomposition, Cholesky Decomposition), Iterative Methods (Jacobi, Gauss-Seidel, Relaxation Methods). The Algebraic Eigenvalue problem: Jacobi'sMethod, Givens'Method, Householder's Method, Power Method, QR Method, Lanezos'Method.
Unit V 18 hrs	Ordinary Differential Eqution s : Euler Method, Single-step Methods, Runge-Kutta'sMethod, Multi-step Method's, Milne-Simpson Method, Methods Based on Numerical Integration, Methods Based on Numerical Differentiation, .

Reference-

1. J.B.Dixit: Programming in C and Numerical Analysis:: Laxmi Publications,New Delhi.
2. S..S..Sastry :Scope asin Introductory Methods of Numerical Analysis,, PHI (4thEd.).
3. G.. ShankarRao: Numerical Analysis , New Age International Publishers,,Hyderabad..
4. H..C.. Saxena :Finite Differences and Numerical Analysis , S..Chand and Company,,
5. Venugopal :Mastering C , Tata McGraw Hill Co. Ltd.

6. Kemigham and Ritche: The C Programming Language - [Prentice Hall].
7. M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods , New Age International, 1999.
8. S. D. Conte, C de Boor, Elementary Numerical Analysis, McGraw-Hill, 1980.
9. Melvin J. Maron, Numerical Analysis A Practical Approach, Macmillan Publishing

PAPER Opt. (II): PROGRAMMING IN C AND NUMERICAL ANALYSIS (PRACTICAL)

Max. Marks: 30

LIST OF PRACTICAL TO BE CONDUUCTED.

1. Write a program in C to flind out the largest of three integer numbers.
2. Write a program in C that reads a year and determine whether it is a leap year or not.
3. Write a program in C to calculate and print the first n terms of Fibonacci series usinglooping statement.
4. Write a program in C that reads a number in single digit. lt determines whether the Firstnumber contains the digit or not.
5. Write a program in C to generate first n prime numbers.
6. Write a program in C to computes the roots of a quadratic equation using switchstatements.
7. Write a program jn C to check whether a number is odd or even..
8. Write a program in C to find the sum of all the digits of a given number using recursion.
9. Write a program in C to calculate the factorial of a given number using recursion.
10. Write a program in C to calculate and print the multiplication of given 2D matrices.
11. Write a program in C to calculate the area of a triangle .
12. Write a C program to compute the sum of a given series.
13. Write a program in C to determine the grade of all students in the class using Structure.
14. Write a program in C to calculate the compound interest.
15. Write a program in C to sort an array of integers using a function.
16. Write a program in C to calculate and print the addition of given 2D matrices.
17. Write a program in C to generate decimal. octal, hexadecimal numbers.
18. Write a program in C to generate reverse numbers.
19. Write a program in C to generate pyramid of a number.
20. Write a program in C to sort a number.

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