GURU NANAK COLLEGE (AUTONOMOUS)

(Affiliated to the University of Madras and Accredited at 'A++' Grade by NAAC)

Guru Nanak Salai, Velachery, Chennai – 600 042

SCHOOL OF SCIENCES

B.Sc., MATHEMATICS

(SEMESTER PATTERN WITH CHOICE BASED CREDIT SYSTEM)

Syllabus

(For the UG Batch of 2024-27 and thereafter)

LOCF - LEARNING OUTCOME BASED CURRICULUM FRAMEWORK

1. PREAMBLE

The curriculum of B.Sc. Mathematics is structured in a way that the students acquire in-depth knowledge to perceive the principles of the core. Basics in Algebra, Analytical Geometry, Calculus, Differential Equations and Laplace Transforms and Mathematical Statistics are covered exclusively to prepare the students to proceed to the next level of Higher Mathematics of Algebraic Structures, Linear Algebra, Real and Complex Analysis, Mechanics. A list of varied electives namely, Numerical Analysis, Operations Research, Graph Theory, Programming Language 'C', Programming with Python are furnished to bridge between the Main and Applied Mathematics. The comprehensive curriculum design yields an excellent career opportunity in Research, Education, Public and Private Sectors, Business sectors, Banking, IT Industries and in every domain of contemporaries.

2. VISION

To create an integrated teaching-learning, research and outreach unit on par with global standards that demonstrates the enhancement achievable in all spheres of life through mathematics education.

3. MISSION

1. To facilitate an encouraging and exciting environment to develop the scientific temper in students through a curriculum based on fundamental as well as advanced scientific knowledge.
2. To provide technical skills in the respective disciplines through conducting practical training including internship as well as project, this will hone the skills necessary to become a successful mathematician, physicist, chemist, biotechnologist and visual communication professional.
3. To inculcate interdisciplinary knowledge, elective subjects in various fields are offered, thereby providing an opportunity to the students to identify their interest towards a particular field and pursue the passion.

4. PROGRAMME EDUCATIONAL OUTCOMES (PEOs)

PEO 1: Values of Life, Ethics & Social Concern

The graduates exhibit truth, loyalty, and love as integral moral principles, thereby contributing to a society characterized by enhanced well-being and fundamental goodness in behavior.

PEO 2: Employability & Entrepreneurship

The graduates apply analytical, logical, and critical problem-solving skills in professional contexts, elevating employability and cultivating entrepreneurial capabilities through upskilling.

PEO 3: Regional/National/Global Relevance & Competency

The graduates foster advanced analytical skills and a heightened appreciation for current Regional/National/Global perspectives, enabling informed and sustainable decision-making in a dynamic environment.

PEO 4: Skill Enhancement, Self-Directed & Lifelong Learning

The graduates independently engage in skill-based learning, utilizing infrastructure and opportunities for continuous upskilling, enabling self-evaluation and lifelong excellence attainment.

PEO 5: Research Skills & Innovation

The graduates proficiently apply scientific reasoning, fostering creativity, strategic thinking, and effective problem-solving skills. They demonstrate a core competency in generating innovative ideas for advancements and inventions.

5. PROGRAMME OUTCOMES (POs)

PO 1: Instill scientific and analytical reasoning to empower students towards critical thinking thereby enriching inter/multi-disciplinary knowledge.

PO 2: Encourage self-regulated learning leading to problem-solving skills and adaptability.

PO 3: Incorporate experiential learning opportunities and engage in tangible situations to develop essential life skills.

PO 4: Enhance application skills by interconnecting academia and professional realm to achieve employability.

PO 5: Foster research abilities to address everyday challenges, make impactful contributions, and participate in shaping a better future for the society.

6. PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1: A mathematics graduate demonstrates proficiency in applying mathematical concepts to address real-world issues, collaborates effectively across disciplines, and engages in ethical and responsible mathematical practices.

PSO 2: Competence of a Mathematics graduate in problem-solving and analytical thinking positions them to excel in diverse roles, fostering innovation and contributing to entrepreneurial endeavors.

PSO 3: Mathematics graduates actively contribute to community well-being through data-driven decision-making, policy advocacy, and global perspective. He/ she is equipped to understand and address challenges on an international scale.

PSO 4: Mathematics graduates possess many skills that include analytical and critical thinking, quantitative and logical reasoning, programming, adaptability, time management, ethical decision making, communication, computational and collaborative skills, which collectively make them versatile and well-prepared for a variety of careers.

PSO 5: Mathematics graduates have ability to conduct independent research, formulate hypotheses, and employ rigorous methodologies to investigate mathematical problems. A combination of research acumen and innovation prepares them to contribute significantly to academic research and industry projects.

7. PEO – PO MAPPING

	PEO 1	**PEO 2**	**PEO 3**	**PEO 4**	**PEO 5**
PO 1	3	2	3	3	2
PO 2	2	3	3	2	3
PO 3	3	3	2	2	3
PO 4	2	3	3	3	2
PO 5	3	2	2	3	3

8. PO – PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5
PSO 1	3	2	2	3	3
PSO 2	2	3	3	3	2
PSO 3	3	2	3	2	3
PSO 4	2	3	2	3	2
PSO 5	3	3	3	2	3

9. CHOICE BASED CREDIT SYSTEM (CBCS)

The College follows the CBCS with Grades under the Semester pattern. Each course is provided with a credit point based on the quantum of subject matter, complexity of the content and the hours of teaching allotted. This is done after a thorough analysis of the content of each subject paper by the members of the Board of Studies and with the approval of the Academic Council. Students are also offered a variety of Job oriented Elective, Multidisciplinary skill-based courses as part of the curriculum. Students can earn extra credits by opting for Massive Open Online Courses (MOOCs) and Certificate Courses.

The evaluation method under CBCS involves a more acceptable grading system that reflects the personality of the student. This is represented as Cumulative Grade Point Average (CGPA) and Grade Point Average (GPA) which are indicators of the Academic Performance of the student. It provides students with a scope for horizontal mobility and empowers them with the flexibility of learning at their convenience.

ELIGIBILITY FOR ADMISSION

Candidates admitted to the first year of the UG programme should have passed the higher Secondary Examinations (Academic or Vocational Stream) conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereof by the Syndicate of the University of Madras. Students applying for the PG programme should have taken the UG degree in the relevant subject from a recognized university as per the norms of the University of Madras.

For B.Com. (Hons): Candidates admitted to the first year of the B.Com. (Hons.) programme should have passed the higher secondary examinations conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereof by the Syndicate of the University of Madras with 75 % cut-off in Commerce/Business studies, Accountancy, Economics and Business Mathematics/ Mathematics.

For MBA: The basic requirement for admission to the MBA programme is a Bachelor's degree in any discipline with a minimum of 50% marks in aggregate and satisfactory test score in MAT Entrance Test conducted by AIMA, New Delhi / TANCET for MBA conducted by Government of Tamil Nadu / CAT / XAT or any other approved MBA Entrance Tests.

For MCA: Only those candidates who have passed B.C.A/B.Sc. in Computer Science or any other equivalent degree OR passed B.Sc./B.Com/BA with Mathematics at 10 + 2 level or at graduation level (with Optional bridge course in Mathematics), provided they have undergone the course under 10+2+3 pattern and obtained at least 50% of marks (45 % marks in case of candidates belonging to reserved category) in the qualifying examination shall be eligible for admission to the M.C.A. programme.

DURATION OF THE COURSE

The UG programme is of three years duration with six semesters and the PG programme is of two years duration with four semesters. The period from June to November is termed as the odd semester and the period from December to April is referred to as the even semester. Each semester must compulsorily have 90 working days before the students appear for the final End Semester Exam.

COURSE OF STUDY

The main course of study for the Bachelor's Degree shall consist of the following:

FOUNDATION COURSES

PART I: Tamil/ Hindi /Sanskrit/French

PART II: English

CORE COURSES

PART III: Consisting of (a) Main subject (b) Allied Subjects (c) Elective subjects related to the main subject of study and project work.

PART IV: Those who have not studied Tamil up to XII standard and have taken a non- Tamil language under Part – I, shall opt for Basic Tamil in the first two semesters.

Those who have studied Tamil up to XII standard, and taken a non -Tamil language under Part – I, shall opt for Advanced Tamil in the first two semesters.

Others, who do not come under either of the clauses mentioned above, can choose a Non-Major Elective (NME) in the first two semesters.

Soft Skills (I, II, III & IV Semesters)

Self-Study (Compulsory) Course (III Semester)

Environmental Studies (IV Semester)

Value Education (V Semester)

Summer Internship (After IV Semester)

PART V: Compulsory Extension Services

A Student shall be awarded one credit for compulsory extension service. A student must enroll in NSS / NCC /Sports & Games/ Citizen Consumer Club / Enviro Club or any other service organization in the College and should put in compulsory minimum attendance of 40 hours, which shall be duly certified by the Principal of the College. If a student lacks 40 hours compulsory minimum attendance in the extension services in any Semester, s/he shall have to compensate the same, during the subsequent Semesters.

COURSE STRUCTURE

The UG programme consists of 15-19 Core courses with 3-4 credits for each paper, 3 Elective courses and 4 Allied courses with 4-5 credits for each paper in addition to 4 Soft Skill courses with two credits each. Internship as a compulsory component carries 2 credits. The B.Com. (Hons) course has 31 core courses of 4 credits each and project with 8 credits.

The MBA programme has 15 core courses including project work with 4 credits, 6 elective courses with 3 credits, 2 extra disciplinary courses with 3 credits, Four Soft Skill courses with two credits each.

The MCA programme has 15 core courses of 2-4 credits, 5 Elective courses of 3 credits, 2 Extra-disciplinary courses of 3 credits and a project work of 17 credits.

Internship training is a compulsory component for all the UG & PG programmes.

10. CONSOLIDATED CREDIT STRUCTURE FOR ALL THE THREE YEARS

Subjects	No. of Paper	Credits
Languages	4	12
English	4	12
Core	15	60
Elective	3	15
Allied Subjects	2	20
Non-Major Elective	2	4
Self-Study	1	2
Soft Skills	4	8
Internship	1	2
Project	1	2
Environmental Science	-	2
Value Education	-	2
Extension activity	-	1
Total		**142**

11. CREDIT DISTRIBUTION FOR EACH SEMESTER

Sem.	Part	Course Component	Subject Name	Hours	Credits	CIA	ESE	Total
I	I	Language	Tamil - I / Hindi - I	6	3	50	50	100
	II	English	English - I	6	3	50	50	100
	III	Core Paper 1	Algebra	4	4	50	50	100
		Core Paper 2	Differential Calculus	4	4	50	50	100
		Allied - I	Chemistry - I	5	3	50	50	100
		Allied Practical	Allied Chemistry Practical - I	3	*	*	*	*
	IV	NME I	Business Mathematics I	2	2	50	50	100
		Soft Skill I	Communication and Personality Development	*	2	50	50	100
			Total	**30**	**21**	-	-	-
II	I	Language	Tamil – II/Hindi - II	6	3	50	50	100
	II	English	English - II	6	3	50	50	100
	III	Core Paper 3	Trigonometry and Number Theory	4	4	50	50	100
		Core Paper 4	Analytical Geometry	4	4	50	50	100
		Allied - II	Chemistry - II	5	3	50	50	100
		Allied Practical	Allied Chemistry Practical - II	3	4	50	50	100
	IV	NME II	Business Mathematics II	2	2	50	50	100
		Soft Skill II	Interview and Resume Writing	*	2	50	50	100
			Total	**30**	**25**			
III	I	Language	Tamil – III/Hindi - III	6	3	50	50	100
	II	English	English – III	6	3	50	50	100
	III	Core Paper 5	Differential Equations and Laplace Transforms	4	4	50	50	100
		Core Paper 6	Integral calculus and Vector Analysis.	4	4	50	50	100
		Mini Project	Mini Project	2	2			
		Allied - III	Physics - I	5	3	50	50	100
		Allied Practical	Allied Physics Practical - I	3	*	*	*	*
	IV	Soft Skill III	Digital Proficiency and Multimedia Skills	2	2	*	*	*
		Self-Study (Compulsory choose one)	Indian Heritage and Knowledge System / Contemporary world and Sustainable Development	*	2	50	50	100
			Total	**30**	**23**			
IV	I	Language	Tamil – IV/Hindi - IV	6	3	50	50	100
	II	English	English – IV	4	3	50	50	100
	III	Core Paper 7	Mathematical Statistics	4	4	50	50	100
		Core Paper 8	Real Analysis – I	4	4	50	50	100
		Allied - IV	Physics – II	5	3	50	50	100
		Allied Practical	Allied Physics Practical – II	3	4	50	50	100
	IV	Soft Skills IV	Foundations of Quantitative Aptitude	2	2	50	50	100
		EVS	Environmental Studies	2	2	50	50	100
			Total	**30**	**25**			

V	III	Core Paper 9	Algebraic Structures	6	4	50	50	100
		Core Paper 10	Real Analysis – II	6	4	50	50	100
		Core Paper 11	Mechanics	6	4	50	50	100
		Core Paper 12	Programming Language C with Practical's	6	4	50	50	100
		IDE	Numerical Analysis	5	5	50	50	100
	IV	Value Education	Value Education	1	2	50	50	100
		Internship	Internship	-	2	-	-	-
			Total	**30**	**25**			
VI	III	Core Paper 13	Linear Algebra	6	4	50	50	100
		Core Paper 14	Complex Analysis	6	4	50	50	100
		Core Paper 15	Mathematical Programming with Python and Practical's	6	4	50	50	100
		Elective - I	Operations Research	6	5	50	50	100
		Elective - II	Graph Theory	6	5	50	50	100
	V	Extension Activities	Participation in NSS/NCC/ Enviro Club, etc.	*	1	*	*	*
			Total	**30**	**23**			
			TOTAL		**142**			

EXAMINATION

Continuous Internal Assessment (CIA) will be for 50 percent and

End Semester Examination (ESE) will be for 50 percent.

CONTINUOUS INTERNAL ASSESSMENT (CIA)

Every semester will have a mid-semester examination which will be conducted on completion of 45 working days in each semester. A Model exam for three hours duration will be conducted on completion of 80 working days in each semester. For the courses coming under Part IV, ESE will be conducted in MCQ pattern. Internship credits will be given in semester V after verification of documents by the respective Heads.

The schedule for the tests is as follows:

CIA	Schedule	Syllabus Coverage
Mid Semester Examination	After **45** working days of the Semester	60%
Model Examination	After **80** working days of the Semester	95%

The components for the CIA (Theory & Practical's) are as follows:

Internal Components			
Assessment Type	**Nature**	**Maximum Marks**	**% of Weightage**
CIA	Mid Semester Examination	50	10
Model	Model Examination	100	10
	Assignment		10
	Class activities		15
	Attendance		5
Total			**50**

The class activity relates to a programme of accepted innovative techniques such as Seminar, Quiz, Portfolio creation, PowerPoint presentation, Objective tests, Role play, Group discussion, Case Study etc. The mode of evaluation of the class activity will be fixed before the commencement of the semester and an approval will be obtained from the Head of the programme/wing. The students will be informed of the various methods of evaluation once the semester begins.

A record of all such assessment procedures will be maintained by the department and is open for clarification. Students will have the right to appeal to the principal in case of glaring disparities in marking. CIA marks for practical subjects will be awarded by the respective faculty based on the performance of the student in the model practical examination, observation notebook, submission of record books, regularity and attendance for the practical classes. The attendance particulars for practical classes will be maintained by the concerned faculty. The marks for attendance will be awarded as per the following:

Percentage of General Attendance	**Marks Awarded**
90 - 100	5
75 - 89	4
60 - 74	3
< 60	0

END SEMESTER EXAMINATIONS (ESE)

After the completion of a minimum of 90 working days each semester, the End Semester Examinations will be conducted. Examinations for all UG and PG programmes will be held for all courses in November/December and April/May. Practical examinations will be conducted only during the end of the odd / even semester before, during or after the commencement of the theory exam. The schedule for ESE Practical's will be notified by the Controller of Examinations in consultation with the Dean (Academics)

12. MODE OF EVALUATION

METHODS OF EVALUATION		Marks
Internal Evaluation	Mid Sem Exam (10)	50
	Model Exam (10)	
	Assignment (10)	
	Class activity (15)	
	Attendance (5)	
External Evaluation	End Semester Examination	50
Total		**100**

13. METHOD OF ASSESSMENT

Remembering **(K1)**	The lowest level of questions requires students to recall information from the course content Knowledge questions usually require students to identify information in the textbook. Suggested Keywords: **Choose, Define, Find, How, Label, List, Match, Name, Omit, Recall, Relate, Select, Show, Spell, Tell, What, When, Where, Which, Who, Why**
Understanding **(K2)**	Understanding off acts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words. The questions go beyond simple recall and require students to combined at altogether Suggested Keywords: **Classify, Compare, Contrast, Demonstrate, Explain, Extend, Illustrate, Infer, Interpret, Outline, Relate, Rephrase, Show, Summarize, Translate**
Application **(K3)**	Students have to solve problems by using / applying a concept learned in the classroom. Students must use their knowledge to determine a exact response. Suggested Keywords: **Apply, Build, Choose, Construct, Develop, Experiment with, Identify, Interview, make use of, Model, Organize, Plan, Select, Solve, Utilize**
Analyze **(K4)**	Analyzing the question is one that asks the students to breakdown something into its component parts. Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations. Suggested Keywords: **Analyze, Assume, Categorize, Classify, Compare, Conclusion, Contrast, Discover, Dissect, Distinguish, Divide, Examine, Function, Inference, Inspect, List, Motive, Relationships, Simplify, Survey, Take part in, Test for, Theme**
Evaluate **(K5)**	Evaluation requires an individual to make judgment on something. Questions to be asked to judge the value of an idea, a character, a work of art, or a solution to a problem. Students are engaged in decision-making and problem–solving. Evaluation questions do not have single right answers. Suggested Keywords: **Agree, Appraise, Assess, Award, Choose, compare, Conclude, Criteria, Criticize, Decide, Deduct, Defend, Determine, Disprove, Estimate, Evaluate, Explain, Importance, Influence, Interpret, Judge, Justify, Mark, Measure, Opinion, Perceive, Prioritize, Prove, Rate, Recommend, Rule on, Select, Support, Value**
Create **(K6)**	The questions of this category challenge students to get engaged in creative and original thinking. Developing original ideas and problem-solving skills Suggested Keywords: **Adapt, Build, Change, Choose, Combine, Compile, Compose, Construct, Create, Delete, Design, Develop, Discuss, Elaborate, Estimate, Formulate, Happen, Imagine, Improve, Invent, make up, Maximize, Minimize, Modify, Original, Originate, Plan, Predict, Propose, Solution, Solve, Suppose, Test, Theory**

SEMESTER I

PROGRAMME: B.Sc., MATHEMATICS	BATCH: 2024 - 27
PART: III	COURSE COMPONENT: CORE 1
COURSE NAME: ALGEBRA	COURSE CODE:
SEMESTER: I	MARKS: 100
CREDITS: 4	TOTAL HOURS: 60
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To develop the knowledge on linear, polynomial, exponential, and logarithmic functions, matrices and systems of equations with an emphasis on problem solving and multiple representations.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Remember the matrix fundamentals, series manipulation, and roots of polynomial equations.
2. Attain a thorough understanding of matrix fundamentals, series manipulation, and techniques for root determination in equations.
3. Apply acquired knowledge to effectively determine matrix rank, solve linear equations, and address algebraic problems using established methods.
4. Demonstrate proficiency in analyzing reciprocal equations and categorizing series based on their characteristics.
5. Evaluate eigenvectors, approximate the sums of infinite series, and investigate the occurrence and estimation of roots.

UNIT I **(12 Hours)**

Matrices: Symmetric; Skew Symmetric; Hermitian; Skew Hermitian; Orthogonal and Unitary Matrices; Rank of a matrix; Consistency and solutions of Linear Equations.

Chapter 2: Sections 6.1, 6.2, 6.3, 9.1, 11, 16.

UNIT II **(12 Hours)**

Matrices: Cayley - Hamilton theorem; Eigen values; Eigen Vectors; Similar matrices; Diagonalization of a matrix.

Chapter 2: Sections 16, 16.1, 16.2, 16.3.

UNIT III **(12 Hours)**

Theory of Equations: Polynomial equations; Imaginary and irrational roots; Symmetric functions of roots in terms of coefficients; Reciprocal equations, Transformations of equations, Increasing and Decreasing of the roots of an equation.

Chapter 6: Sections 9 to 12, 15, 15.1, 15.2, 15.3, 16, 16.1, 16.2.

UNIT IV **(12 Hours)**

Theory of Equations: Descartes' rule of signs: Approximate solutions of roots of polynomials by Newton, Raphson method, Hornet's method; Cardan's method of solution of a cubic polynomial.

Chapter 6: Sections 24, 24.1, 24.2, 24.3, 29.4, 30, 34.1.

UNIT V **(12 Hours)**

Summation of series: Binomial, Exponential and Logarithmic series (theorems without proof); Summation of finite series using method of differences.

Chapter 3: Section 10; Chapter 4: Sections 3, 5, 6, 7.

PRESCRIBED BOOKS:

Algebra, Volume I (2018) and II (2015) by T.K. Manikavachagom Pillai and others (Viswanathan publishers).

REFERENCE BOOKS:

1. Algebra: S. Arumugam (New Gama Publishing house, Palayamkottai).
2. Higher Algebra: H.S Hall and S.R.Knight (HM Publications,1994).
3. Algebra, Analytical Geometry (2D) and Trigonometry: Dr.S.Sudha (Emerald Publishers).
4. Algebra and Trigonometry (I&II): P.R.Vittal (Margham Publishers).

E - LEARNING RESOURCES:

1. https://youtu.be/LITTastgIEM2
2. https://youtu.be/7aMdyLmDz9Y
3. https://youtu.be/hXXdCRsNYOU
4. https://youtu.be/VTQSGYnqw1Y
5. https://youtu.be/0HwGGTdrBzg

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	3	2	2
CO 2	3	3	3	3	3
CO 3	3	2	2	3	2
CO 4	2	3	3	2	2
CO 5	2	3	2	3	3
Average	2.6	2.6	2.6	2.6	2.4

PSO - CO Question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Remember the matrix fundamentals, series manipulation, and roots of polynomial equations.	1 - 5	K1
CO 2	Attain a thorough understanding of matrix fundamentals, series manipulation, and techniques for root determination in equations.	1 - 5	K1, K2
CO 3	Apply acquired knowledge to effectively determine matrix rank, solve linear equations, and address algebraic problems using established methods.	1 - 5	K3
CO 4	Demonstrate proficiency in analyzing matrices, reciprocal equations and categorizing series based on their characteristics.	1 - 5	K4
CO 5	Evaluate eigenvectors, approximate the sums of infinite series, and investigate the occurrence and estimation of roots.	1 - 5	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMME: B.Sc., MATHEMATICS	BATCH: 2024 – 27
PART: III	COURSE COMPONENT: CORE 2
COURSE NAME: DIFFERENTIAL CALCULUS	COURSE CODE:
SEMESTER: I	MARKS: 100
CREDITS: 4	TOTAL HOURS: 60
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To understand and apply the fundamental concepts in differential calculus, including derivatives, maxima, minima, curvature, and asymptotes, for solving real-world problems.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Recall the definitions of derivative, extreme values, asymptotes and formulae for radius of curvature, Jacobian.

2. Understand fundamental concepts of differential calculus including derivatives, partial differentiation, Jacobians, maxima, minima, curvature, and asymptotes.

3. Apply differential calculus techniques to solve problems related to derivatives, maxima, minima, curvature, and asymptotes in various contexts.

4. Analyze the properties and behavior of functions, curves, and surfaces using concepts like total differentials, radius of curvature, centre of curvature, and evolutes.

5. Synthesize and evaluate complex geometric concepts from calculus, including curvature and asymptotes, assessing their applicability and limitations in various contexts.

UNIT I **(12 Hours)**

Differential Calculus: n^{th} Derivative; Leibnitz's theorem (without proof) and its applications; Partial differentiations, Total differentials; Jacobians.

Chapter 3: Sections 1.1 to 1.6, 2.1, 2.2.

UNIT II **(12 Hours)**

Differential Calculus: Maxima and Minima of functions of two independent variables, Necessary and sufficient conditions (without proof); Lagrange's method (without proof).

Chapter 8: Sections 4, 5.

UNIT III **(12 Hours)**

Curvature: Curvature; radius of curvature in Cartesian and polar coordinates; p - r equations.

Chapter 10: Sections 2.1, 2.3, 2.6, 2.7.

UNIT IV **(12 Hours)**

Centre of curvature, circle of curvature, envelopes, evolutes.

Chapter 10: Sections 1.1 to 1.4, 2.2, 2.4.

UNIT V **(12 Hours)**

Asymptotes: Methods (without proof) of finding asymptotes of rational algebraic curves with special cases, Intersections of a curve with its asymptotes.

Chapter 11: Sections 1 to 4, 5.1 to 5.3, 6, 7.

PRESCRIBED BOOK:

Content and Treatment as in Calculus by S.Narayanan, T.K.Manickavachagom Pillai Volume I (2018) (Viswanathan Publishers).

REFERENCE BOOKS:

1. Calculus: Dr. S. Sudha (Emerald Publishers)

2. Calculus (I&II): P.R.Vittal (Margham Publishers)

3. Calculus (I & II): Tom M Apostol

4. Differential Calculus by Shanthi Narayan, Dr. K. Mittal

5. Differential Calculus and its Applications by Michael.

E – LEARNING RESOURCES:

1. https://www.khanacademy.org/math/differential,calculus
2. https://www.cuemath.com/calculus/differential,calculus/
3. https://www.sydney.edu.au/content/dam/students/documents/mathematics,learning,centre/introduction,to,differential,calculus.pdf

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

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B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				100

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	3	2	2
CO 2	3	3	2	3	3
CO 3	2	2	2	2	2
CO 4	3	3	3	3	3
CO 5	3	3	2	2	3
Average	2.6	2.6	2.4	2.4	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Recall the definitions of derivative, extreme values, asymptotes and formulae for radius of curvature, Jacobian.	1 - 5	K1
CO 2	Understand fundamental concepts of differential calculus including derivatives, partial differentiation, Jacobians, maxima, minima, curvature, and asymptotes.	1 - 5	K 1, K2
CO 3	Apply differential calculus techniques to solve problems related to derivatives, maxima, minima, curvature, and asymptotes in various contexts.	1 - 5	K3
CO 4	Analyze the properties and behavior of functions, curves, and surfaces using concepts like total differentials, radius of curvature, centre of curvature, and evolutes.	1 - 5	K4
CO 5	Synthesize and evaluate complex geometric concepts from calculus, including curvature and asymptotes, assessing their applicability and limitations in various contexts.	1 - 5	K5, K6

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: IV	**COURSE COMPONENT: NME I**
COURSE NAME: BUSINESS MATHEMATICS I	**COURSE CODE:**
SEMESTER: I	**MARKS: 100**
CREDITS: 2	**TOTAL HOURS: 30**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To familiarize the students with basic mathematical tools and the application of the same to business and economic situations.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Construct proofs of basic set-theoretic identities involving unions, intersections, and cartesian products.
2. Understand different types of Matrices and their types and calculate the determinant of a matrix.
3. Recognize the difference between a sequence and a series, recognize an arithmetic progression and geometric progression.
4. Explain the meaning of ratio, proportion and variations.
5. Understand what interest is

UNIT I **(6 Hours)**

Theory of Sets: Definition of a set, Elements and Types of Sets, Operations on Sets & application of Venn Diagram.

UNIT II **(6 Hours)**

Matrices: Definition of matrix; Types of matrices; Algebra of matrices.

Determinants: Definition of Determinant, Calculation of values of determinants up to third order, Cofactor and Minor, Adjoint and Inverse.

UNIT III **(6 Hours)**

Sequences and Series: Arithmetic and Geometric Progression

UNIT IV **(6 Hours)**

Ratio, Proportion and Variations: Inverse ratio, continued ratio. Direct proportion and inverse proportion. Application to partnership.

UNIT V **(6 Hours)**

Logarithms and Antilogarithms, Simple Interest, Compound Interest.

PRESCRIBED BOOK:

Business Mathematics by P.R.Vittal, Margham Publications.

REFERENCE BOOKS:

1. A test book of Business Mathematics by Dr. Padmalochan Hazarika, S Chand and Company Limited.
2. Business Mathematics by D.C. Sancheti and V.K. Kapoor, Sultan Chand & Sons, 1985.
3. Quantitative Aptitude by R. S. Aggarwal.

E - LEARNING RESOURCES:

1. https://www.geeksforgeeks.org/quantitative-aptitude/
2. https://www.toppr.com/guides/quantitative-aptitude/
3. https://byjus.com/govt-exams/quantitative-aptitude/
4. https://www.indiabix.com/aptitude/questions-and-answers/

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

SOFT SKILLS: ALL UG	**BATCH: 2024 - 27**
COURSE NAME: COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT SKILLS	**COURSE CODE: SOFT SKILL 1**
SEMESTER: I	**MARKS: 100**
CREDITS: 2	**TOTAL HOURS: 30**

COURSE OBJECTIVE:

To build communication skills for personal and professional development.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Students will demonstrate the ability to actively listen to others, understand diverse perspectives, and paraphrase key points accurately, enhancing their comprehension skills in various personal and professional contexts.

2. Students will be able to articulate thoughts, ideas, and information clearly and concisely, using appropriate language and structure to convey messages effectively in both written and verbal communication.

3. Students will develop confidence in expressing opinions, asserting boundaries, and advocating for themselves and others, leading to enhanced self-assurance and effectiveness in interpersonal and group communication.

4. Students will learn to adapt their communication style and approach based on the audience, context, and purpose of communication, fostering flexibility and versatility in interacting with diverse individuals and groups.

5. Students will acquire techniques for resolving conflicts, managing disagreements, and negotiating mutually beneficial outcomes through effective communication strategies, promoting constructive problem-solving and collaboration in personal and professional settings.

UNIT I Types of Communication (6 Hours)

Verbal Communication - Nonverbal Communication - Visual Communication - Written Communication - Interpersonal Communication - Group Communication - Mass Communication - Digital Communication- Barriers – Language- Cultural- Psychological- Semantic- Technological Barriers

UNIT II Etiquette & Ethical Practices in Communication (6 Hours)

Active Listening - Respectful Language - Clarity and Conciseness – Truthfulness-Professionalism-Tone -Timeliness - Constructive Feedback - Confidentiality - Cultural Sensitivity - - Emotional Intelligence- Social Intelligence- Social Etiquettes-Accountability.

UNIT III Self-Actualization (6 Hours)

SWOC Analysis- Self Regulation-Self Evaluation, Self-Monitoring, Self- Criticism, Self- Motivation, Self-awareness and Reflection.

UNIT IV Leadership and Teamwork (6 Hours)

Leadership Skills: Leadership styles- Goal-setting and decision-making- Motivation and influence- Team Dynamics: Team building activities- Conflict resolution- Collaborative problem-solving.

UNIT V Stress and Time Management (6 Hours)

Definition of Stress, Types of Stress, Symptoms of Stress, Stress coping ability, Stress Inoculation Training, Time Management and Work-Life Balance: Self-discipline Goal-setting.

RECOMMENDED TEXTBOOKS

1. Goleman, Daniel (2006) Emotional Intelligence, Bantam Books Linden, Wolfgang (2004) Stress Management- From Basic Science to Better Practice- University of British Columbia, Vancouver, Canada.
2. Hasson, Gill (2012) Brilliant Communication Skills. Great Britain: Pearson Education.
3. Monopoly, Madhubuti, M. Business Communication Strategies. New Delhi: Tata McGraw-Hill Publishing Company Ltd., 2001.
4. Raman, Meenakshi & Sangeetha Sharma (2011) Communication Skills, Oxford University Press.

REFERENCE BOOKS

1. N. Krishnaswamy Current English for College (1st Edition) - Trinity Press.
2. Wood, Julia T (2015) Interpersonal Communication: Everyday Encounters 8th Edition, Cengage Learning.

E-LEARNING RESOURCES

1. http://www.albion.com/netiquette/corerules.html
2. http://www.englishdaily626.com/c-errors.php
3. https://www.helpguide.org/articles/relationships-communication/nonverbal-communication.htm
4. https://www.communicationtheory.org/verbal-vs-non-verbal-communication-with-examples/
5. https://letstalkscience.ca/educational-resources/backgrounders/digital-citizenship-ethics
6. https://www.switchboard.app/learn/article/teamwork-leadership-skills

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 5 out of 7 questions (answer in 50 words)	1 - 7	2	10
B	Answer any 4 out of 6 questions (answer in 300 words)	8 - 13	5	20
C	Answer any two (Internal Choice)	14 - 15	10	20
	Internal & Viva Voce		**50**	**50**

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	----
II	2	1	1
III	1	1	1
IV	1	1	1
V	1	1	1
TOTAL	**7**	**6**	**4**

SEMESTER II

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: CORE 3**
COURSE NAME: TRIGONOMETRY AND NUMBER THEORY	**COURSE CODE:**
SEMESTER: II	**MARKS: 100**
CREDITS: 4	**TOTAL HOURS: 60**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To develop the ability to recognize and correctly manipulate trigonometric expressions, identities, equations, prime numbers, congruence's, Euler, Fermat's and Wilson's theorems to prove relations involving prime numbers.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Recall and comprehend trigonometric expansions, hyperbolic functions, and fundamental number theory concepts.

2. Understand trigonometric principles, techniques for manipulating series, and the integration of number theory concepts.

3. Demonstrate understanding and practical application of logarithmic operations on complex numbers and fundamental number theory principles.

4. Analyze and interpret number theory concepts such as prime and composite numbers, divisors, and congruence, alongside trigonometric and logarithmic operations.

5. Evaluate and assess advanced number theory topics including Euler's function, prime powers in factorials, and theorems, integrating trigonometric functions, series, and logarithmic operations.

UNIT I **(12 Hours)**

Trigonometry: Expansions of $\sin x, \cos x, \tan x$ in terms of x; Expansion of sinnx, cosnx, tannx, $\sin^n x, \cos^n x, \sin^m x \cos^n x$, hyperbolic and inverse hyperbolic functions.

Chapter 3: Sections 1, 2, 3, 4, 4.1, 5, 5.1.; Chapter 4: 1, 2, 2.1, 2.2, 2.3.

UNIT II **(12 Hours)**

Summation of series: Sums of sines and cosines of n angles which are in A.P.; Summation of trigonometric series using telescopic method, C+iS method.

Chapter 6: Sections 1, 2, 3.

UNIT III **(12 Hours)**

Logarithms of Complex numbers.

Chapter 5: Sections 5, 5.1, 5.2.

UNIT IV **(12 Hours)**

Number Theory: Prime number; Composite Number; decomposition of a composite number as a product of primes uniquely (without proof); divisors of a positive integer n; congruence modulo n.

Chapter 5: Sections 1 to 11.

UNIT V **(12 Hours)**

Number Theory: Euler function (without proof); highest power of a prime number p contained in n!; Fermat's and Wilson's theorems.

Chapter 5: Sections 12 to 17.

PRESCRIBED BOOKS:

1. Trigonometry by T.K.Manikavachagom Pillai and others (Viswanathan publishers) (2018) for units I, II, III.

2. Algebra, Volume I (2018) and II (2015) by T.K. Manikavachagom Pillai and others (Viswanathan publishers) for units IV, V.

REFERENCE BOOKS:

1. Trigonometry: P. Duraipandian (Emerald Publishers)

2. Plane Trigonometry Part 2: S.L.Loney

3. Algebra and Trigonometry (I&II): P.R.Vittal (Margham Publishers).

E - LEARNING RESOURCES:

1. https://youtu.be/6Rw-GMEjQ8shttps://youtu.be/giAjpfwC2LE
2. https://youtu.be/2VMiwNcg0ek
3. https://youtu.be/w9sjzaXEGVw
4. https://youtu.be/PtKQKc629v8
5. https://archive.nptel.ac.in/courses/111/101/111101137/

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 2	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	3	2	2
CO 2	2	3	3	3	3
CO 3	3	2	2	3	2
CO 4	2	3	2	2	2
CO 5	2	3	3	3	3
Average	2.4	2.6	2.6	2.6	2.4

PSO – CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Recall and comprehend trigonometric expansions, hyperbolic functions, and fundamental number theory concepts.	1 - 5	K1
CO 2	Understand trigonometric principles, techniques for manipulating series, and the integration of number theory concepts.	1 - 5	K 1, K2
CO 3	Demonstrate understanding and practical application of logarithmic operations on complex numbers and fundamental number theory principles.	1 - 5	K2, K3
CO 4	Analyze and interpret number theory concepts such as prime and composite numbers, divisors, and congruence, alongside trigonometric and logarithmic operations.	1 - 5	K4
CO 5	Evaluate and assess advanced number theory topics including Euler's function, prime powers in factorials, and theorems, integrating trigonometric functions, series, and logarithmic operations.	1 - 5	K5, K6

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: CORE 4**
COURSE NAME: ANALYTICAL GEOMETRY	**COURSE CODE:**
SEMESTER: II	**MARKS: 100**
CREDITS: 4	**TOTAL HOURS: 60**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To foster comprehension of conic sections, planes, straight lines and speres enhancing problem-solving abilities in geometric contexts.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Recall the equations of poles, polars, conormal points, conjugate lines, asymptotes, planes and orthogonal spheres.

2. Understand properties and equations of conic sections, planes, straight lines, and spheres, including poles, polars, and normal forms.

3. Apply geometric principles to solve problems related to conic sections, planes, straight lines, and spheres in various contexts.

4. Analyze properties and relationships between geometric elements, including intersection of planes, coplanar lines, and sections of spheres.

5. Synthesize geometric concepts to solve complex problems, while evaluating the effectiveness and limitations of geometric techniques in practical applications.

UNIT I **(12 Hours)**

Parabola: pole, polar, co-normal points, concyclic points.
Ellipse: pole, polar, conormal points, conjugate lines, conjugate diameters.

Chapter 6: Sections 4, 5, 6, 6.1, 8, 8.1, 8.2, 10, 11, 12; Chapter 7: Sections 5, 6, 7, 7.1, 7.2, 10, 10.1, 12, 12.1, 16, 16.3 (1) to (5).

UNIT II **(12 Hours)**

Hyperbola: asymptotes, conjugate diameters.
Rectangular Hyperbola: conormal points, concyclic points.

Chapter 6: Sections 8, 9, 10, 12, 13.

UNIT III **(12 Hours)**

Planes: Planes; General equation of a plane; normal form; intercept form; intersection of planes; angle between planes.

Chapter 2: Sections 1 to 7, 9.

UNIT IV **((12 Hours)**

Straight Lines: Straight Lines; symmetric form; coplanar lines; shortest distance; image of a point and a line on a plane.

Chapter 3: Sections 1 to 4, 7, 8.

UNIT V **(12 Hours)**

Sphere: Equation of a sphere; general equation; section of a sphere by a plane; tangent plane; orthogonal spheres.

Chapter 4: Sections 1 to 8.

PRESCRIBED BOOKS:

Analytical Geometry - Part I & II (2017): T.K.Manikavachagom Pillay, T.Natarajan (Viswanathan Publishers), Part 1 for units I, II; Part 2 for units III, IV, V.

REFERENCE BOOKS:

1. Analytical Geometry of 2 dimensions: P. Duraipandian

2. Coordinate Geometry: Dr. P. Balasubramanian and Others (McGraw Hill Publishers).

3. Calculus and coordinate geometry of two dimensions: P.R.Vittal (Margham Publishers).

4. Coordinate Geometry of 3 Dimensions and probability: P.R.Vittal (Margham Publishers).

E - LEARNING RESOURCES:

1. https://www.selfstudys.com/sitepdfs/OFTFqKgEjLRpH3V4DzDr
2. https://www.geeksforgeeks.org/conic-sections/
3. https://www.toppr.com/guides/maths/three-dimensional-geometry/angle-between-two-planes/
4. https://byjus.com/jee/shortest-distance-between-two-lines/
5. https://www.the-mathroom.ca/lnalg/lnalg3.1/lnalg3.1.htm

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	3	2	2
CO 2	2	3	2	2	2
CO 3	2	2	2	2	2
CO 4	2	3	3	2	2
CO 5	3	3	2	2	3
Average	2.2	2.6	2.4	2	2.2

PSO – CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Recall the equations of poles, polars, conormal points, conjugate lines, asymptotes, planes and orthogonal spheres.	1 - 5	K 1
CO 2	Understand properties and equations of conic sections, planes, straight lines, and spheres, including poles, polars, and normal forms.	1 - 5	K 2
CO 3	Apply geometric principles to solve problems related to conic sections, planes, straight lines, and spheres in various contexts.	1 - 5	K 3
CO 4	Analyze properties and relationships between geometric elements, including intersection of planes, coplanar lines, and sections of spheres.	1 - 5	K 4
CO 5	Synthesize geometric concepts to solve complex problems, while evaluating the effectiveness and limitations of geometric techniques in practical applications.	1 - 5	K 5, K6

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyse, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: IV	**COURSE COMPONENT: NME II**
COURSE NAME: BUSINESS MATHEMATICS II	**COURSE CODE:**
SEMESTER: II	**MARKS: 100**
CREDITS: 2	**TOTAL HOURS: 30**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To familiarize the students with basic mathematical tools and the application of the same to business and economic situations.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Determine the percentage of a given object(s)' presence within a group of 100 objects.
2. Understand profit and loss, components of a simple profit and loss statement, and the importance of a profit and loss statement.
3. Understand the concepts of commission, brokerage and bonus and to calculate all these under practical situations.
4. Understand the nature of discount and bank discount**.**
5. Determine the periodic payments in annuity problems.

UNIT I **(6 Hours)**

Percentage: Meaning, practical application and computation of percentages.

UNIT II **(6 Hours)**

Profit and Loss: Problems involving cost price selling price, market price trade discount and cash discount.

UNIT III **(6 Hours)**

Commission and Brokerage: Rate of commission, types of commission agents, problems.

UNIT IV **(6 Hours)**

Discounts: Factor of Discount, Depreciation.

UNIT V **(6 Hours)**

Simple Annuity: Simple annuity (time span) status of annuity, Certain annuity, Annuity Contingent, Perpetual annuity. Amount of annuity, Present value of annuity. Annuity due and immediate annuity.

PRESCRIBED BOOK:

Business Mathematics by P.R.Vittal, Margham Publications.

REFERENCE BOOKS:

1. A test book of Business Mathematics by Dr. Padmalochan Hazarika, S Chand and Company Limited.
2. Business Mathematics by D.C. Sancheti and V.K. Kapoor, Sultan Chand & Sons, 1985.
3. Quantitative Aptitude by R. S. Aggarwal.

E-LEARNING RESOURCES:

1. https://www.geeksforgeeks.org/quantitative-aptitude/
2. https://www.toppr.com/guides/quantitative-aptitude/
3. https://byjus.com/govt-exams/quantitative-aptitude/
4. https://www.indiabix.com/aptitude/questions-and-answers/

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

SOFT SKILLS: ALL UG	**BATCH: 2024 - 27**
COURSE NAME: INTERVIEW SKILLS AND RESUME WRITING	**COURSE CODE: SOFT SKILL 2**
SEMESTER: II	**MARKS: 100**
CREDITS: 2	**TOTAL HOURS: 30**

COURSE OBJECTIVE:

To equip the students to acquire the relevant skills for better employability.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Students will gain an overall understanding of the concept, the purpose, and the objectives of an interview.
2. Students will become aware of the various types of interviews and the nuances of each one of them.
3. Students will understand and equip themselves with the techniques and strategies required to ace an interview.
4. Students will be able to draft a biodata /CV/Resume in the proper format.
5. Students will embark on acquiring the relevant skills and will learn to leverage them effectively for better employability.

UNIT I Introduction to Interview Skills (6 Hours)

Definition- meaning- concept of interview –Purpose- Objectives of interview-Characteristic features of job interviews.

UNIT II Types of Interview (6 Hours)

Traditional one on one job interview- Panel interview- Behavioral Interview-Group interview- Phone Interview- Preliminary Interview-Patterned Interview Depth Interview, Stress Interview, Exit Interview-Interview through tele and video conferencing.

UNIT III Interviews: Techniques and Strategies (6 Hours)

Preparing for the Interview Process- Before the interview-During the interview-After the interview -Tips to ace an interview -Commonly asked questions in interview -Do's and Don'ts of interview -Reasons for rejections.

UNIT IV Preparing Biodata/CV/Resume (6 Hours)

Essential characteristics of a job Application-Difference between Biodata- CV-Resume-covering letter-Tips to draft an application.

UNIT V Leveraging Employability Skills (6 Hours)

Personality Development-Organizational skills-Time Management–Stress Management-Effective Communication Skills -Reasoning Ability-Verbal Ability- Group Discussion-Technical skills - Presentation skills.

RECOMMENDED TEXTBOOKS

1. Monipally, Matthukutty M. (2017) Business Communication: From Principles to Practice.

2. Peter, Francis. (2012) *Soft Skills and Professional Communication*. New Delhi: Tata McGraw Hill.

REFERENCE BOOKS

1. Higgins, Jessica JD (2018)10 Skills for Effective Business Communication: Practical Strategies from the World's Greatest Leaders.

2. Nicholas, Sonji (2023) Interviewing: Preparation, Types, Techniques, and Questions, Pressbooks.

3. Storey, James (2016) The Art of The Interview: The Perfect Answers to Every Interview Question.

E-LEARNING RESOURCES

1. https://careermobilityoffice.cs.ny.gov/cmo/documents/Resume%20&%20Interviewing%20Handout.pdf
2. https://edu.gcfglobal.org/en/interviewingskills/interview-etiquette/1/
3. https://findjobhub.com/en/types-of-interviews
4. https://egyankosh.ac.in/bitstream/123456789/23411/1/Unit-2.pdf
5. https://bharatskills.gov.in/pdf/E_Books/CTS/ES/English/ES_Part_1_62%20hour_English.pdf
6. https://bharatskills.gov.in/pdf/E_Books/CTS/ES/English/ES_Part2_58hour_English.pdf

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 5 out of 7 questions (answer in 50 words)	1 - 7	2	10
B	Answer any 4 out of 6 questions (answer in 300 words)	8 - 13	5	20
C	Answer any two (Internal Choice)	14 - 15	10	20
	Internal & Viva Voce		**50**	**50**

BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	----
II	2	1	1
III	1	1	1
IV	1	1	1
V	1	1	1
TOTAL	**12**	**6**	**4**

SEMESTER III

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: CORE 5**
COURSE NAME: DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS	**COURSE CODE:**
SEMESTER: III	**MARKS: 100**
CREDITS: 4	**TOTAL HOURS: 60**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To determine how differential equations can be used in solving many application - oriented problems and Laplace transform as a tool for solving ODEs.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Identify the dependent and independent variables in the differential equations, define and recall the properties of Laplace transform.

2. Understand the basics of ordinary and partial differential equations, analytical methods and Laplace transforms.

3. Apply methods to solve equations, use Laplace transforms for problem-solving, and model real-world scenarios.

4. Analyze method effectiveness, evaluate solutions' accuracy, and assess system stability.

5. Synthesize, evaluate, and reflect on techniques, models, and solutions, including the significance and limitations of methodologies like Laplace transforms.

UNIT I **(12 Hours)**

Ordinary Differential Equations: First order but of higher degree equations, solvable for p, solvable for x, solvable for y, Clairaut's form.

Chapter 4: Sections 1 to 4.

UNIT II **(12 Hours)**

Ordinary Differential Equations: Second order differential equations with constant coefficients with particular integrals for $e^{ax}x^m$, $e^{ax}sinmx$, $e^{ax}cosmx$. Second order differential equations with variable coefficients $x^2\frac{d^2y}{dx^2} + bx\frac{dy}{dx} + cy = q(x)$, Method of variation of parameters.

Chapter 5: Sections 1 to 6, Chapter 8: Section 4.

UNIT III **(12 Hours)**

Partial Differential Equations: Formation of PDE by eliminating arbitrary constants and arbitrary functions; Lagrange's equations Pp + Qq = R.

Chapter 12: Sections 1 to 4.

UNIT IV **(12 Hours)**

Partial Differential Equations: complete integral; singular integral; general integral; Charpit's method and standard types f(p, q) = 0, f(x, p, q) = 0, f(y, p, q) = 0, f(z, p, q) = 0, f(x, p) = f(y, q); Clairaut's form.

Chapter 12: Sections 5 and 6.

UNIT V **(12 Hours)**

Laplace transform: Laplace transform; inverse Laplace transform (usual types); applications of Laplace transform to solution of first and second order linear differential equations (constant coefficients) and simultaneous linear differential equations.

Chapter 9.

PRESCRIBED BOOK:

Differential Equations and Laplace Transforms by S.Natarajan, T.K.Manikavachagom Pillay (2017), (Viswanathan Publishers).

REFERENCE BOOKS:

1. Integral Calculus and differential equations: Dipak Chatterjee (Tata McGraw Hill Publishing Comp Ltd.)

2. Advanced Engineering Mathematics: Erwin Kreyszig (John Wiley and sons New York 1999)

3. Calculus: Narayanan and others (S.Viswanathan Publishers)

4. Differential Equations and Integral Transforms: Dr.S.Sudha (Emerald Publishers).

E - LEARNING RESOURCES:

1. https://www.youtube.com/watch?v=YHxBaOttKCU
2. https://www.youtube.com/watch?v=p_di4Zn4wz4
3. https://www.youtube.com/watch?v=ifbaAqfqpc4
4. https://www.youtube.com/watch?v=n2y7n6jw5d0
5. https://www.khanacademy.org/math/ap,calculus,ab/ab,differential,equations,new

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	3	2
CO 2	2	3	3	3	3
CO 3	3	3	3	3	3
CO 4	2	3	3	3	3
CO 5	2	3	3	3	2
Average	2.4	3	2.8	3	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Identify the dependent and independent variables in the differential equations, define and recall the properties of Laplace transform.	1 - 5	K 1
CO 2	Understand the basics of ordinary and partial differential equations, analytical methods and Laplace transforms.	1 - 5	K 2
CO 3	Apply methods to solve equations, use Laplace transforms for problem-solving, and model real-world scenarios.	1 - 5	K 3, K 4
CO 4	Analyze method effectiveness, evaluate solutions' accuracy, and assess system stability.	1 - 5	K 4
CO 5	Synthesize, evaluate, and reflect on techniques, models, and solutions, including the significance and limitations of methodologies like Laplace transforms.	1 - 5	K 5, K6

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: CORE 6**
COURSE NAME: INTEGRAL CALCULUS AND VECTOR ANALYSIS	**COURSE CODE:**
SEMESTER: III	**MARKS: 100**
CREDITS: 4	**TOTAL HOURS: 60**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To expose the students to various techniques of Integration, Vector calculus and Fourier series.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Recall definitions, formulae and concepts related to integral calculus, multiple integrals, Fourier series, vector differentiation, and vector integration.

2. Understand the properties, methods, and applications of integral calculus, multiple integrals, Fourier series, vector differentiation, and vector integration.

3. Apply integration techniques, methods of changing order of integration, Fourier series expansions, vector differentiation operations, and vector integration techniques to solve problems.

4. Analyze the behavior, convergence, and properties of integrals, Fourier series, vector fields, and vector operations.

5. Evaluate the effectiveness, accuracy, and applicability of integration methods, Fourier series expansions, vector differentiation, and vector integration techniques in solving problems.

UNIT I **(12 Hours)**

Integral calculus: Reduction Formula for $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x \, dx$, $\int_0^{\frac{\pi}{2}} \cos^m x \cos nx dx$, $\int_0^{\frac{\pi}{2}} \cos^m x \sin nx \, dx$, Beta and Gamma functions, properties.

Chapter 1: Sections 1.3, 13.1 to 13.5, 13.10.

UNIT II **(12 Hours)**

Multiple Integrals: Double integrals, change of order of integration, triple integrals, area and volume using Cartesian coordinates.

Chapter 5: Sections 2.1, 2.2, 6.3.

UNIT III **(12 Hours)**

Fourier series: Introduction, Expansions of periodic function of period 2π; expansion of even and odd functions; half range cosine and sine series.

Chapter 2: Sections 1, 2, 3,3.1,3.2,4,5.1 - 5.2.

UNIT IV **(12 Hours)**

Vector Differentiation: Gradient, divergence, curl, directional derivative, unit normal vector to a surface.

Chapter 8: Sections 17, 18, 19, 21.

UNIT V **(12 Hours)**

Vector Integration: Line, Surface and volume integrals; theorems of Gauss, Stroke's and Green (without proof) - problems.

Chapter 8: Sections 2, 5, 6, 8.2, 9, 10.

PRESCRIBED BOOKS:

1. Calculus Volume II (2018), by S.Narayanan, T.K.Manickavachagom Pillai (S.Viswanathan Publishers) for units I, II.
2. Vector Calculus by P. Kandalama, Thilagavathi for units III, IV, V.

REFERENCE BOOKS:

1. Vector Analysis: Murray Spiegel (Schaum Publishing Company, New York)
2. Integral calculus and differential equations by Dipak Chatterjee (TATA McGraw Hill Publishing company Ltd.)
3. Integral Calculus by Shanti Narayanan
4. Vector Algebra and Analysis by S.Narayanan, T.K.Manickavachagom Pillai (S. Viswanathan Publishers.

E - LEARNING RESOURCES:

1.https://www.ncl.ac.uk/webtemplate/ask,assets/external/maths,resources/core,mathematics/calculus/integration,by,reduction.html

2. https://ocw.mit.edu/ans7870/textbooks/Strang/Edited/Calculus/14.pdf

3. https://mathworld.wolfram.com/FourierSeries.html

4. https://nptel.ac.in/courses/111105122

5. https://www.youtube.com/watch?v=M0H1UJbn,V4

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	3	2
CO 2	3	2	3	3	2
CO 3	3	3	3	3	3
CO 4	3	3	3	2	3
CO 5	2	3	2	3	3
Average	2.6	2.8	2.6	2.8	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Recall definitions, formulae and concepts related to integral calculus, multiple integrals, Fourier series, vector differentiation, and vector integration.	1 - 5	K 1
CO 2	Understand the properties, methods, and applications of integral calculus, multiple integrals, Fourier series, vector differentiation, and vector integration.	1 - 5	K1, K 2
CO 3	Apply integration techniques, methods of changing order of integration, Fourier series expansions, vector differentiation operations, and vector integration techniques to solve problems.	1 - 5	K 3
CO 4	Analyze the behavior, convergence, and properties of integrals, Fourier series, vector fields, and vector operations.	1 - 5	K 4
CO 5	Evaluate the effectiveness, accuracy, and applicability of integration methods, Fourier series expansions, vector differentiation, and vector integration techniques in solving problems.	1 - 5	K 5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMME: FOR ALL NON-IT STUDENTS	BATCH: 2024 - 27
PART: IV	COURSE COMPONENT: SOFT SKILL 3
COURSE NAME: DIGITAL PROFICIENCY AND MULTIMEDIA SKILLS	COURSE CODE:
SEMESTER: III	MARKS: 100
CREDITS: 2	TOTAL HOURS: 30
PRACTICAL	

COURSE OBJECTIVES:

To equip students with essential computing skills.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Design document using salient features of MS-Word.
2. Utilize MS-Excel to manipulate data and prepare dynamic presentation using MS-Power Point.
3. Develop a static web page using HTML.
4. Exhibit proficiency in multimedia creation using GIMP.
5. Demonstrate expertise in data visualization with Raw Graphs.

UNIT I **(6 Hours)**

MS-Word: Creating, Editing, Formatting and Printing of Documents - Headers and Footers -Spell check- Insert/Draw Tables, Table Auto format – Page Borders and Shading - Mail Merge.
MS-Excel: Creating a new worksheet – Entering, editing and formatting the text, numbers – Formatting cells.

UNIT II **(6 Hours)**

Inserting Rows/Columns - Changing column widths and row heights – Freezing Titles, splitting screen - Formulae for calculation - Changing font sizes and colours, Sort.
MS-PowerPoint: Creating a Presentation - Inserting and Deleting Slides in a Presentation – Adding Text/Clip Art/Pictures - Slide Transition – Custom Animation.

UNIT III **(6 Hours)**

Web designing using HTML: Basic tags – heading tags – paragraph, bold, italic, underline tags – font tags – ordered and unordered list – inserting images – hyperlinks.

UNIT IV **(6 Hours)**

Multimedia applications using GIMP: Interface and Drawing Tools in GIMP- Applying Filters - Creating and handling multiple layers - Using Stamping and Smudging tools - Importing pictures.

UNIT V **(6 Hours)**

Data visualization using Raw Graphs: Importing and exploring data - Basic chart types - mapping - customizing visualizations - Exporting visualizations.

E-LEARNING RESOURCES:

1. https://www.javatpoint.com/ms-word-tutorial
2. https://www.w3schools.com/excel/
3. https://www.tutorialspoint.com/html/
4. https://www.gimp.org/tutorials/
5. https://www.rawgraphs.io/learning

SEMESTER IV

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: CORE 7**
COURSE NAME: MATHEMATICAL STATISTICS	**COURSE CODE:**
SEMESTER: IV	**MARKS: 100**
CREDITS: 4	**TOTAL HOURS: 60**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To understand the fundamental concept of Statistics and be able to apply appropriately in real-life scenarios.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Recall the formulae for measures of central tendency, dispersion, correlation and regression, hypothesis tests.

2. Understand statistical concepts, the significance of measures and interpret statistical results, explaining and methodologies used in data analysis.

3. Apply statistical techniques to categorize datasets, including calculating measures and performing hypothesis tests.

4. Analyze statistical data to draw conclusions, assess effectiveness of methods, and interpret outcomes of analyses.

5. Synthesize and evaluate statistical information for comprehensive analyses, while critically evaluating the reliability and validity of methodologies across different contexts.

UNIT I **(12 Hours)**

Measures of Central Tendencies, arithmetic mean, Partition values, Mode, Geometric mean and Harmonic mean, Measures of Dispersion, Range, quartile deviation, standard deviation, Mean deviation.

UNIT II **(12 Hours)**

Probability, Conditional probability, Baye's theorem, Random Variables, Discrete random variables, Continuous random variables, Mathematical expectation, Moment generating function (Cumulant generating function and characteristic function, not included), Chebychev's inequality.

UNIT III **(12 Hours)**

Correlation: scatter diagram, Karl-Pearson coefficient of correlation - Probable error of correlation coefficient, Rank correlation.

Regression: Lines of regression, Regression coefficients and its properties, angle between two lines of regression.

UNIT IV **(12 Hours)**

Tests of Hypothesis (large samples): Parameter and Statistic, Standard error of mean, Central limit theorem (without proof), Tests of hypothesis – one - tailed, two-tailed, Tests of significance for large samples.

UNIT V **(12 Hours)**

Test of Hypothesis (small samples): t - test for specified mean, F- test - ANOVA (one-way), Chi-square test - Test for independence of attributes.

PRESCRIBED BOOK:

Mathematical Statistics by Dr.P.R. Vittal, Margham publications.

REFERENCE BOOKS:

1. Hogg R.V. & Craig A.T. 1988): Introduction to Mathematical Statistics, Mcmillan.

2. Mood A.M & Graybill F.A & Boes D.G (1974) : Introduction to theory of Statistics, Mcgraw Hill.

3. S.C Gupta and V.K.Kapoor (Third Edition): Elements of Mathematical Statistics, S. Chand Publishers. (Units I, II, III).

E - LEARNING RESOURCES:

1. Khan academy

2. https://www.youtube.com/watch?v=I10q6fjPxJ0

3. https://www.youtube.com/watch?v=xTpHD5WLuoA

4. https://www.youtube.com/watch?v=dYJLUvo0Q6g

5. https://www.youtube.com/watch?v=6E6pB5JFLgM

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	3	2
CO 2	2	3	3	3	3
CO 3	2	2	3	3	2
CO 4	3	3	3	3	3
CO 5	2	3	3	3	3
Average	2.4	2.8	3	3	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Recall the formulae for measures of central tendency, dispersion, correlation and regression, hypothesis tests.	1 - 5	K 1
CO 2	Understand statistical concepts, the significance of measures and interpret statistical results, explaining and methodologies used in data analysis.	1 - 5	K 2
CO 3	Apply statistical techniques to categorize datasets, including calculating measures and performing hypothesis tests.	1 - 5	K 3
CO 4	Analyze statistical data to draw conclusions, assess effectiveness of methods, and interpret outcomes of analyses.	1 - 5	K 4
CO 5	Synthesize and evaluate statistical information for comprehensive analyses, while critically evaluating the reliability and validity of methodologies across different contexts.	1 - 5	K 5, K6

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: CORE 8**
COURSE NAME: REAL ANALYSIS I	**COURSE CODE:**
SEMESTER: IV	**MARKS: 100**
CREDITS: 4	**TOTAL HOURS: 60**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To introduce the fundamentals concepts of Mathematical analysis and to develop the mathematical concepts in advanced level.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Define and describe sets, functions, real numbers, sequences and Metric spaces.
2. Interpret concepts like equivalence, countability, convergence, divergence of sequences and continuity in real-valued functions.
3. Apply operations on sets, sequences, and functions, and apply tests for convergence and divergence of sequences.
4. Analyze the appropriate test for convergence of sequences and series, including determining limits, monotonicity and continuity.
5. Synthesize concepts from sets, sequences, and series to understand continuity in metric spaces, while evaluating convergence properties and function continuity in diverse contexts.

UNIT I **(12 Hours)**

Sets and elements; Operations on sets; functions; real valued functions; equivalence; countability; real numbers; least upper bounds.

Chapter 1: Sections 1.1 to 1.7

UNIT II **(12 Hours)**

Definition of a sequence and subsequence; limit of a sequence; convergent sequences; divergent sequences; bounded sequences; monotone sequences.

Chapter 2: Sections 2.1 to 2.6

UNIT III **(12 Hours)**

Operations on convergent sequences; operations on divergent sequences; limit superior and limit inferior; Cauchy sequences.

Chapter 2: Sections 2.7 to 2.10

UNIT IV **(12 Hours)**

Convergence and divergence; series with non-negative numbers; alternating series; conditional convergence and absolute convergence; tests for absolute convergence; series whose terms form a non-increasing sequence; the class $l^{2.}$

Chapter 3: Sections 3.1 to 3.4, 3.6, 3.7 and 3.10.

UNIT V **(12 Hours)**

Limit of a function on a real line; Metric spaces; Limits in metric spaces. Function continuous at a point on the real line, reformulation, Function continuous on a metric space.

Chapter 4: Section 4.1 to 4.3 Chapter 5 Section 5.1 - 5.3.

PRESCRIBED BOOK:

"**Methods of Real Analysis"**: Richard R. Goldberg (Oxford and IBH Publishing Co.).

REFERENCE BOOKS:

1. Principles of Mathematical Analysis by Walter Rudin.

2. Mathematical Analysis Tom M Apostol.

3. Real Analysis by Bartle and Sherbert.

E - LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ma79/preview
2. https://archive.nptel.ac.in/courses/111/101/111101134/
3. https://archive.nptel.ac.in/courses/111/106/111106142/

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	3	3	2
CO 2	2	2	3	2	3
CO 3	2	3	3	3	2
CO 4	2	3	3	2	2
CO 5	2	2	3	2	2
Average	2	2.6	3	2.4	2.2

PSO – CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Define and describe sets, functions, real numbers, sequences and Metric spaces.	1 – 5	K 1
CO 2	Interpret concepts like equivalence, countability, convergence, divergence, and continuity in real-valued functions and sequences.	1 – 5	K 2
CO 3	Apply operations on sets, sequences, and functions, and apply tests for convergence and divergence of sequences.	1 – 5	K 3
CO 4	Analyze the appropriate test for convergence of sequences and series, including determining limits, monotonicity and continuity.	1 – 5	K 4
CO 5	Synthesize concepts from sets, sequences, and series to understand continuity in metric spaces, while evaluating convergence properties and function continuity in diverse contexts.	1 – 5	K 5, K 6

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMME: ALL UG	**BATCH: 2024 - 27**
PART: IV	**COURSE COMPONENT: SOFT SKILL 4**
COURSE NAME: FOUNDATIONS OF QUANTITATIVE APTITUDE	**COURSE CODE:**
SEMESTER: IV	**MARKS: 100**
CREDITS: 2	**TOTAL HOURS: 30**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To develop learners' problem-solving skills and critical thinking abilities in the context of recruitment aptitude tests.

COURSE OUTCOMES:

The learner will be able to recognize, describe and represent patterns and relationships, as well as to solve problems using algebraic language and skills.

1. To learn about factors and multiples that numbers have in common with each other.
2. The student will analyse monthly profit and loss statements for a school store and calculate profit margin percentages.
3. Students learn what different types of interest are, where it occurs in real life and understand the concept of simple and compound interests.
4. The learner will draw, interpret and compare pie charts, bar charts and frequency diagrams.

UNIT I: Number system and Number series (6 Hours)

Numbers: Numbers and their classification, test for divisibility of numbers, General properties of divisibility, division and remainder, remainder rules.

Number Series: Number series, three steps to solve a problem on series, two-line number series, sum rules on natural numbers.

UNIT II: HCF and LCM of Numbers (6 Hours)

Factors, Multiples, Principal of Prime factorization, Highest Common Factor (HCF) and Least Common Multiple (LCM), Product of two numbers, Difference between HCF and LCM.

UNIT III: Percentage, Profit and Loss (6 Hours)

Percentage: Introduction, fraction to rate percent, rate percent to fraction, rate percent of a number, express a given quantity as a percentage of another given quantity, convert a percentage into decimals and convert a decimal into percentage.

Profit and Loss: Gain/Loss and % gain and % loss, relation among Cost price, Sale price , Gain/Loss and % gain and % loss.

UNIT IV: Simple Interest and Compound Interest (6 Hours)

Simple Interest: Definition, effect of change of *P, R and T* on Simple Interest, amount.

Compound Interest: Introduction, conversion period, basic formula, to find the Principal/Rate/Time, Difference between Simple Interest and Compound Interest.

UNIT V: Data interpretation (6 Hours)

Tabulation, Bar Graphs, Pie Charts, Line Graphs, average.

PRESCRIBED BOOK:

Quantitative Aptitude by R.S. Agarwal.

REFERENCE BOOKS:

1. Quantitative Aptitude by Abhijit Guha, Fourth Edition.
2. Quantitative Aptitude by Ramandeep Singh.

E - LEARNING RESOURCES:

1. https://byjus.com/maths/numeral-system/#:~:text=crore%20is%207.-,International%20Numeral%20System,8%20%E2%80%93%20Ones
2. https://byjus.com/maths/hcf-and-lcm/
3. https://byjus.com/maths/profit-loss-percentage/
4. https://www.vedantu.com/jee-main/maths-difference-between-simple-interest-and-compound-interest
5. https://sites.utexas.edu/sos/guided/descriptive/descriptivec/frequency/

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	**Multiple Choice Questions:** Answer 20 out of 20 questions (each question carries one mark)	1 - 20	20	20
B	Answer any 5 out of 7 questions (each question carries 6 marks)	21 - 27	6	30
TOTAL MARKS				**50**

BREAK UP OF QUESTIONS FOR PROBLEMS

UNITS	SECTION A	SECTION B
I	4	1
II	4	1
III	4	1
IV	4	1
V	4	1
Any Unit	**-**	2
TOTAL	**20**	**7**

PROGRAMME: ALL UG	**BATCH: 2024 – 27**
PART: IV	**COURSE COMPONENT: EVS**
COURSE NAME: ENVIRONMENTAL STUDIES	**COURSE CODE:**
SEMESTER: IV	**MARKS: 100**
CREDITS: 2	**TOTAL HOURS: 30**
THEORY	

COURSE OBJECTIVES:

To create awareness among the student's community about the Environmental Issues, Causes and Remedies.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Understand and realize the multidisciplinary nature of Environment & its components.
2. Know the importance of natural resources for the sustainable development of life.
3. Understand the effect of growing population on the Environment.
4. Classify the different types of pollution, their impact and measures to control pollution.
5. Learn about the Environmental issues faced globally and various steps taken globally to solve such Environmental issues

UNIT I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, scope and importance-Need for public awareness.

UNIT II: NATURAL RESOURCES

Renewable and non-renewable resources: Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT III: ECOSYSTEMS

Concept of an ecosystem.

- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem: -

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT IV: BIODIVERSITY AND ITS CONSERVATION

- Introduction – Definition: genetic, species and ecosystem diversity.
- Biogeographically classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic And option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation, Hot-sports of biodiversity.
- Threats to bio diversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT V: ENVIRONMENTAL POLLUTION

Definition: Cause, effects and control measures of

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and Industrial wastes.
- Role of an individual in prevention of pollution.

- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

UNIT 6: SOCIAL ISSUES AND THE ENVIRONMENT

- From Unsustainable to Sustainable development.
- Urban problems related to energy. - Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

UNIT 7: HUMAN POPULATION AND THE ENVIRONMENT

- Population growth, variation among nations.
- Population Explosion-Family welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of information Technology in Environment and human health.
- Case Studies. UNIT-8: Field Work (Practical).
- Visit to a local area to document environmental assets-river/forest/grassland/ hill/mountain.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

UNIT 8: FIELD WORK (PRACTICAL)

- Visit to a local area to document environmental assets-river/forest/grassland/ hill/mountain.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.

- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

PRESCRIBED BOOKS:

1. Environmental studies- Dr. D.D.Mishra – S.Chand
2. Environmental studies – Dr. J.P.Sharma – University Science Press.
3. Introduction to Environmental studies-St Joseph College Edition.
4. Environmental Studies – Dr.MahaintaK.Kalita – Asiau Books.

E - LEARNING RESOURCE:

1. https://www.collegesearch.in/articles/multidisciplinary-nature-of-environment-studies
2. https://byjus.com/chemistry/natural-resources-pdf/
3. https://en.wikipedia.org/wiki/Ecosystem
4. https://umeschandracollege.ac.in/pdf/study-material/environmental/EVS-UNIT-4-UNIT-2.pdf
5. https://www.studysmarter.co.uk/explanations/environmental-science/pollution/environmental-pollution/

SEMESTER V

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: CORE 9**
COURSE NAME: ALGEBRAIC STRUCTURES	**COURSE CODE:**
SEMESTER: V	**MARKS: 100**
CREDITS: 4	**TOTAL HOURS: 90**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To acquire knowledge about the concepts of Sets, Groups and Rings.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Recall when a binary algebraic structure forms a group, ring, field or an integral domain. of various Subgroups and its applications.

2. Understand the concepts of sub-structures, creating quotients, homomorphisms, isomorphisms and Automorphisms in various algebraic structures.

3. Apply various concepts to prove the lemmas and theorems.

4. Analyze properties of Groups, Rings, Homomorphism of Rings, Prime and Maximal ideals, Integral domain and Fields.

5. Demonstrate proficiency in applying advanced concepts across units to tackle complex problems, showcasing a deep understanding of abstract algebra principles.

UNIT I **(18 Hours)**

Introduction to groups, Subgroups, cyclic groups and properties of cyclic groups, Lagrange's Theorem, A counting principle.

Chapter 2: Section 2.4 and 2.5.

UNIT II **(18 Hours)**

Normal subgroups and Quotient group, Homomorphism, Automorphism.

Chapter 2: Section 2.6 to 2.8

UNIT III **(18 Hours)**

Cayley's Theorem, Permutation groups.

Chapter 2: Section 2.9 and 2.1

UNIT IV **(18 Hours)**

Definition and examples of ring, Some special classes of rings, homomorphism of rings, Ideals and quotient rings, More ideals and quotient rings.

Chapter 3: Section 3.1 to 3.5

UNIT V **(18 Hours)**

The field of quotients of an integral domain, Euclidean Rings, The particular Euclidean ring.

Chapter 3: Section 3.6 to 3.8

PRESCRIBED BOOK:

Contents and treatment as in "**Topics in Algebra"** , I. N. Herstein, Wiley Eastern Ltd.

REFERENCE BOOKS:

1. Modern Algebra by M.L.Santiago
2. Modern Algebra by S. Arumugam and others, New Gamma publishing House, Palayamkottai.
3. Modern Algebra by Visvanathan Nayak.

E - LEARNING RESOURCES:

1. https://nptel.ac.in

2. http://garsia.math.yorku.ca/~sdenton/algstruct

GUIDELINES TO THE UESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	3	2
CO 2	3	3	3	2	3
CO 3	2	3	2	3	2
CO 4	3	2	3	2	3
CO 5	2	3	2	3	2
Average	2.4	2.6	2.4	2.6	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Recall when a binary algebraic structure forms a group, ring, field or an integral domain. of various Subgroups and its applications.	1 - 5	K 1
CO 2	Understand the concepts of sub-structures, creating quotients, homomorphisms, isomorphisms and Automorphisms in various algebraic structures.	1 - 5	K 1, K 2
CO 3	Apply various concepts to prove the lemmas and theorems.	1 - 5	K 3
CO 4	Analyze properties of Groups, Rings, Homomorphism of Rings, Prime and Maximal ideals, Integral domain and Fields.	1 - 5	K 4
CO 5	Demonstrate proficiency in applying advanced concepts across units to tackle complex problems, showcasing a deep understanding of abstract algebra principles.	1 - 5	K 5, K 6

K1= Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., MATHEMATICS	BATCH: 2024 - 27
PART: III	COURSE COMPONENT: CORE 10
COURSE NAME: REAL ANALYSIS II	COURSE CODE:
SEMESTER: V	MARKS: 100
CREDITS: 4	TOTAL HOURS: 90
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To analyse the mathematical concepts and also to develop the mathematical concepts in advanced level.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Remember the fundamental concepts of sets, functions, limits, continuity, derivatives, integrals, and theorems.

2. Understand the properties and relationships of mathematical entities such as sets, spaces, functions, and sequences.

3. Apply concepts of continuity, convergence, derivatives, integrals, and theorems to solve problems.

4. Analyze and evaluate properties and theorems including completeness, compactness, and the Fundamental Theorems of Calculus.

5. Synthesize and design mathematical arguments and proofs regarding properties and behavior of mathematical entities.

UNIT I **(18 Hours)**

Open sets; closed sets; Discontinuous function on R^1. More about open sets; Connected sets.

Chapter 5: Sections 5.4 to 5.6, Chapter 6: Sections 6.1, 6.2

UNIT II **(18 Hours)**

Bounded sets and totally bounded sets: Complete metric spaces; compact metric spaces, continuous functions on a compact metric space, continuity of inverse functions, uniform continuity.

Chapter 6: Sections 6.3 to 6.8

UNIT III **(18 Hours)**

Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral; properties of Riemann integral.

Chapter 7: Sections 7.1 to 7.4

UNIT IV **(18 Hours)**

Derivatives; Rolle ’s Theorem, Law of mean, Fundamental theorems of calculus.

Chapter 7: Sections 7.5 to 7.8 .

UNIT V **(18 Hours)**

Taylor’s theorem; Pointwise convergence of sequences of functions, uniform convergence of sequences of functions.

Chapter 8: Section 8.5, Chapter 9: Sections 9.1 and 9.2.

PRESCRIBED BOOK:

“Methods of Real Analysis”, Richard R. Goldberg (Oxford and IBH Publishing Co).

REFERENCE BOOKS:

1. Principles of Mathematical Analysis by Walter Rudin
2. Mathematical Analysis Tom M Apostol.

E - LEARNING RESOURCES:

1. https://www.youtube.com/watch?v=X_weB_pYMV4
2. https://www.youtube.com/watch?v=DHPHlxWHe3w
3. https://www.youtube.com/watch?v=L2Mfyi74ykM
4. http://tutorial.math.lamar.edu/Classes/RealAnalysis/RealAnalysis.aspx
5. https://www.coursera.org/learn/real,analysis

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	3	2	2
CO 2	3	3	2	3	3
CO 3	2	2	2	2	2
CO 4	3	3	3	3	3
CO 5	3	3	2	2	3
Average	2.6	2.6	2.4	2.4	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Understand fundamental concepts including sets, functions, limits, continuity, derivatives, integrals, and theorems.	1 - 5	K1
CO 2	Interpret properties and relationships of mathematical entities such as sets, spaces, functions, and sequences.	1 - 5	K2
CO 3	Apply concepts of continuity, convergence, derivatives, integrals, and theorems to solve problems.	1 - 5	K3
CO 4	Analyze and evaluate properties and theorems including completeness, compactness, and the Fundamental Theorems of Calculus.	1 - 5	K4
CO 5	Synthesize and design mathematical arguments and proofs regarding properties and behavior of mathematical entities.	1 - 5	K5, K6

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: CORE 11**
COURSE NAME: MECHANICS	**COURSE CODE:**
SEMESTER: V	**MARKS: 100**
CREDITS: 4	**TOTAL HOURS: 90**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To strengthen the knowledge about equilibrium of a particle under the action of given forces, Simple Harmonic Motion, Projectiles, Moment of Inertia.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Recall and recognize different force systems, moments, couple and projectiles, Moment of Inertia. Recognizing and recalling the definitions and concepts related to moment of inertia, two-dimensional motion of rigid bodies. Remember key equations and formulas for calculating forces, moments, work, energy, and power.

2. Understand the meaning and principles behind Newton's laws of motion and equilibrium principles, the significance and applications of moment of inertia, dimensional motion of forces.

3. Applying equations and formulas related to work, energy, power, and projectile motion to solve problems. Utilizing concepts of moment of inertia to solve problems related to rigid bodies.

4. Analyze the resultant force and the motion of a particle under the influence of forces. Develop innovative problem-solving approaches to tackle complex mechanics problems.

5. Evaluate mechanical models and demonstrate its application to real life problems. Assess the accuracy and validity of solutions obtained through mathematical calculations.

UNIT I **(18 Hours)**

Force: Newton's laws of motion, Resultant of two forces on a particle. Equilibrium of a Particle: Equilibrium of a particle, Limiting equilibrium of a particle on an inclined plane.

Chapter 2: Sections:2.1 and 2.2, Chapter 3: Sections:3.1 and 3.2.

UNIT II **(18 Hours)**

Forces on a Rigid Body: Moment of a Force, General motion of a body, Equivalent systems of forces, Parallel Forces, Couples. A Specific reduction of Forces: Reduction of coplanar forcesinto a force and couple, Problems involving frictional forces.

Chapter 4: Sections 4.1 to 4.4, 4.6 (Omit Sections 4.5, 4.7 to 4.9), Chapter 5: Sections 5.1 to 5.2.

UNIT III **(18 Hours)**

Work, Energy and Power: Work, Conservative field offorce, Power. Rectilinear Motion under Varying Force: Simple Harmonic Motion, along a horizontal line, along a vertical line.

Chapter 11: Sections:11.1 and 11.2. Chapter 12: Sections, 12.1 to 12.3 (Omit Section 12.4)

UNIT IV **(18 Hours)**

Projectiles: Forces on a projectile, Projectile projected onan inclined plane.

Chapter 13: Sections, 13.1, 13.2 (Omit Section 13.3)

UNIT V **(18 Hours)**

Moment Of Inertia: Definition -Theorem of Parallel Axes - Theorem of perpendicular Axes - Moment of Inertia of some standard geometrical shapes: thin uniform rod - rectangular lamina - uniform rectangular parallelepiped - Uniform circular ring - Uniform circular disc - Uniform elliptic lamina - Solid sphere - Hollow sphere- solid right circular cone - Hollow cone.

Chapter 17: Sections 17.1: Cases 1 to 12, Book works 17.1, 17.2'
Chapter 18: Sections 18.1.1, 18.1.2, 18.2, Chapter 19: Section 19.1

PRESCRIBED BOOK:

Mechanics, by P.Duraipandian, Lakmi Duraipandian and Muthamizh Jayapragasam, S.Chand and company privatelimited Reprint 2016.

REFERENCE BOOKS:

1. Engineering Mechanics: Statics, J.L. Meriam and L. G. Kraige, Seventh Edition,Wiley and sons Pvt ltd., New York, 2012.
2. Engineering Mechanics: Dynamics, J.L. Meriam, L. G. Kraige, and J.N. Bolton, 8thedn, Wiley and sons Pvt ltd., New York, 2015.
3. Engineering Mechanics (Statics and Dynamics)A. K. Dhiman, P.Dhinam and D. Kulshreshtha, ,McGraw Hill Education(India)Private Limited, New Delhi, 2015.
4. Introduction to Statics and Dynamics , A. Ruina and R. Pratap, Oxford University Press, 2014.
5. The Elements of Statics and Dynamics, S.L. Loney, Cambridge University Press, 1904.

E - LEARNING RESOURCES:

1. https://nptel.ac.in
2. https://www.mathhelp.com/
3. https://www.udemy.com/course/mechanics,1,as,a,level,mathematics,course,unit,m1/?couponCode=NVDPRODIN35
4. https://www.uou.ac.in/sites/default/files/slm/BSCPH,101.pdf
5. https://www.teachmint.com/tfile/studymaterial/b,sc/mechanics/ch,1pdf/192496fb,59af,4bc8,bc9c,fb42275088ea

GUIDELINES TO THE QUESTION PAPER SETTERS

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

QUESTION PAPER PATTERN

BREAK UP OF QUESTIONS FOR THEORY

CTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	3	2
CO 2	3	2	3	2	3
CO 3	2	3	2	3	3
CO 4	2	2	3	2	3
CO 5	2	3	3	2	2
Average	2.4	2.6	2.6	2.4	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	To understand and recognize different force systems, moments, couple and projectiles, Moment of Inertia. Recognizing and recalling the definitions and concepts related to moment of inertia, two-dimensional motion of rigid bodies. Remember key equations and formulas for calculating forces, moments, work, energy, and power.	1 - 5	K 1
CO 2	Understand the meaning and principles behind Newton's laws of motion and equilibrium principles, the significance and applications of moment of inertia, dimensional motion of forces.	1 - 5	K 2
CO 3	Applying equations and formulas related to work, energy, power, and projectile motion to solve problems. Utilizing concepts of moment of inertia to solve problems related to rigid bodies.	1 - 5	K 3
CO 4	To analyze and evaluate the resultant force and the motion of a particle under the influence of forces. Develop innovative problem-solving approaches to tackle complex mechanics problems.	1 - 5	K 4
CO 5	To construct mechanical models and demonstrate its application to real life problems. Assess the accuracy and validity of solutions obtained through mathematical calculations. Generate new ideas or hypotheses to extend existing mechanics theories or solve unresolved problems in the field.	1 - 5	K5, K 6

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., MATHEMATICS	BATCH: 2024 - 27
PART: III	COURSE COMPONENT: CORE 12
COURSE NAME: PROGRAMMEMING LANGUAGE C WITH PRACTICAL'S	COURSE CODE:
SEMESTER: V	MARKS: 100
CREDITS: 4	TOTAL HOURS: 60
THEORY AND PROBLEMS/ PRACTICALS	

COURSE OBJECTIVE:

To learn how to write C-programmes and use them to develop the technological concepts.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Recall and fundamental programming concepts including variables, data types, operators, input/output operations, decision-making, looping, arrays, strings, functions, recursion, and pointers.
2. Understand the Interpret and programming concepts effectively in problem-solving tasks.
3. Apply and evaluate programming constructs for efficiency and correctness.
4. Synthesize programming concepts to design and develop robust programmes.
5. Create, design, and troubleshoot complex programmes using advanced techniques.

UNIT I **(12 Hours)**

Introduction. Constants, Variables, Data, types (Fundamental and user defined) Operators, Precedence of operators, Library functions.

Chapter 2 Sections 2.1, 2.8, Chapter 3 Sections 3.1, 3.12.

UNIT II **(12 Hours)**

Input, Output statements, Escape sequences. Formatted outputs, Storage classes, Compiler directives. Decision making and branching: Simple if, if else, nested if, else if ladder and switch statement, conditional operator, go to statement.

Chapter 4 Sections 4.2, 4.5, Chapter 5 Sections 5.1, 5.9.

UNIT III **(12 Hours)**

Decision making and looping: while, do while and for statement, nested for loops, continue and break statements. Arrays: One dimensional and 2 dimensional arrays, declarations, initialization of arrays.

Chapter 6 Sections 6.1, 6.5, Chapter 7 Sections 7.1, 7.5.

UNIT IV **(12 Hours)**

Operation on strings, String handling functions. **Functions:** Function definition and declaration.

Chapter 8 Sections 8.1, 8.8, Chapter 9 Sections 9.1, 9.8

UNIT V **(12 Hours)**

Function: Categories of functions, Nesting of function, Recursion.
Pointers: Introduction, Understanding pointers, declaration and initialization of pointers.

Chapter 9 Section 9.9 to 9.16, Chapter 11 Sections 11.1,11.5.

PRESCRIBED BOOK:

Programming in ANSI C 6th edition by E. Balagurusamy, Tata, McGraw Hill Publishing Company.

REFERENCE BOOKS:

1. Venugopal, programming in C
2. Gottfied, B.S: programming with C, Schum's outline series, TMH 2001
3. Yashvant Kanitkar, Let us "C" BPB Publications.

E - LEARNING RESOURCES:

1. https://www.youtube.com/watch?v=-CpG3oATGIs
2. https://www.youtube.com/watch?v=TEHA_IwNk34
3. https://www.youtube.com/watch?v=kKKvGYAX_Zs
4. https://www.learn-c.org/
5. https://www.cprogrammeming.com/

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	3	3
CO 2	3	2	3	2	3
CO 3	2	3	3	3	2
CO 4	3	3	2	2	2
CO 5	3	2	3	3	3
Ave	2.6	2.6	2.6	2.6	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Recall and understand fundamental programming concepts including variables, data types, operators, input/output operations, decision-making, looping, arrays, strings, functions, recursion, and pointers.	1 - 5	K 1
CO 2	Interpret and apply programming concepts effectively in problem-solving tasks.	1 - 5	K 2
CO 3	Analyze and evaluate programming constructs for efficiency and correctness.	1 - 5	K 3
CO 4	Synthesize programming concepts to design and develop robust programmes.	1 - 5	K 4
CO 5	Create, design, and troubleshoot complex programmes using advanced techniques.	1 - 5	K 5, K 6

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PRACTICALS **(30 Hours)**

Writing "C" programmes for the following:

1. To convert centigrade to Fahrenheit
2. To find the area, circumference of a circle
3. To convert days into months and days
4. To solve a quadratic equation
5. To find sum of n numbers
6. To find the largest and smallest numbers
7. To generate Pascal's triangle, Floyd's triangle
8. To find the trace of a matrix
9. To add and subtract two matrices
10. To multiply two matrices
11. To generate Fibonacci series using functions
12. To compute factorial of a given number, using functions
13. To add complex numbers using functions
14. To concatenate two strings using string handling functions

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: ELECTIVE 1 (IDE)**
COURSE NAME: NUMERICAL ANALYSIS	**COURSE CODE:**
SEMESTER: V	**MARKS: 100**
CREDITS: 5	**TOTAL HOURS: 90**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To equip students with skills in numerical methods for solving equations and interpolation problems, fostering efficient problem-solving abilities.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Remember the concepts of solving the linear equations.
2. Understand equation-solving method and linear equation solution techniques.
3. Apply the principles, convergence, and limitations of equation-solving and linear equation methods.
4. Analyse convergence, accuracy, error, and precision of iterative and interpolation techniques.
5. Evaluate the for complex problems and interpret their efficiency, effectiveness, reliability, and limitations in practical contexts.

UNIT I **(18 Hours)**

Solutions of algebraic and transcendental equations, Bisection method, Iteration method, Regula false method, Newton - Raphson method.

Chapter 1: Sections 1.1 - 1.4

UNIT II **(18 Hours)**

Solutions of simultaneous linear equations: Gauss, elimination method, Gauss, Jordan method, Gauss - Seidal method, Croute's method.

Chapter 2: Sections 2.1 - 2.3

UNIT III **(18 Hours)**

Operators and relation between them, Differences of a polynomial, Factorial polynomials differences of zero, summation of series.

Chapter 3: Sections 3.1- 3.7

UNIT IV **(18 Hours)**

Newton's forward and backward interpolation formulae, Central differences formulae , Gauss forward and backward formulae, Sterling's formula and Bessel's formula.

Chapter 4: Sections 4.1 - 4.3, Chapter 5: Sections 5.1 - 5.6

UNIT V **(18 Hours)**

Interpolation with unequal intervals: Divided differences and Newton's divided differences formula for interpolation and Lagrange's formula for interpolation; Inverse interpolation, Lagrange's method, Reversion of series method.

Chapter 6: Sections 6.1 - 6.8

PRESCRIBED BOOK:

Calculus of finite differences and Numerical Analysis, by P. Kandalama, Thilagavathy.K; S.Chand Publications.

REFERENCE BOOKS:

1. Numerical methods, S. Arumugam, A. Thangapandi Isaac, A. somasundaram, SciTech publications.
2. Numerical methods, E. Balagurusamy, McGraw Hill Education.
3. Numerical methods, S Kalavathy, Joice Punitha
4. Numerical methods, G. Bajaj.

E - LEARNING RESOURCES:

1. https://www.bspublications.net/downloads/0523a9f25106ff_M_III_ch_1.pdfNumerical
2. https://math.libretexts.org/Bookshelves/Applied_Mathematics/Applied_Finite_Mathematics_(Sekhon_and_Bloom)/02%3A_Matrices/2.02%3A_Systems_of_Linear_Equations_and_the_Gauss-Jordan_Method
3. https://sites.math.rutgers.edu/~sahi/Reprints/96imrn-zeros.pdf
4. https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004032250571912siddharth_bhatt_engg_Interpolation.pdf
5. https://egyankosh.ac.in/bitstream/123456789/31291/1/Unit-13.pdf

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	3	2	3
CO 2	3	3	3	3	3
CO 3	2	3	2	2	2
CO 4	3	3	3	3	3
CO 5	3	3	2	2	3
Average	2.6	2.8	2.6	2.4	2.8

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Understand equation-solving methods (e.g., bisection, iteration, Regula falsi, Newton-Raphson) and linear equation solution techniques (e.g., Gauss, elimination).	1 - 5	K 1
CO 2	Interpret principles, convergence, and limitations of equation-solving and linear equation methods.	1 - 5	K 2
CO 3	Apply mentioned methods effectively to solve equations and systems of linear equations.	1 - 5	K 3
CO 4	Analyse convergence, accuracy, error, and precision of iterative and interpolation techniques.	1 - 5	K 4
CO 5	Integrate methods to select appropriate approaches for complex problems and evaluate their efficiency, effectiveness, reliability, and limitations in practical contexts.	1 - 5	K 5, K 6

K1= Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMME: ALL UG	**BATCH: 2024 - 27**
PART: IV	**COURSE COMPONENT: VALUE EDUCATION**
COURSE NAME: VALUE EDUCATION	**COURSE CODE:**
SEMESTER: IV	**MARKS: 100**
CREDITS: 2	**TOTAL HOURS: 15**
THEORY	

UNIT 1: EDUCATION AND VALUES

Definition, Concept, Classification, Theory, Criteria and Sources of values Aims and objectives of value education Role and Need for value education in the contemporary society, Role of education in transformation of values in society Role of parents, teachers, society, peer group and mass media in fostering values

UNIT 2: VALUE EDUCATION AND PERSONAL DEVELOPMENT

Human Values: Truthfulness, Sacrifice, Sincerity, Self-Control, Altruism, Scientific Vision, relevancy of human values to good life. Character Formation towards Positive Personality
Modern challenges of adolescents: emotions and behavior Self-analysis and introspection: sensitization towards gender equality, differently abled, Respect for - age, experience, maturity, family members, neighbors, strangers, etc.

UNIT 3: HUMAN RIGHTS AND MARGINALIZED PEOPLE

Concept of Human Rights – Principles of human rights – human rights and Indian constitution – Rights of Women and children – violence against women – Rights of marginalized People – like women, children, minorities, transgender, differently abled etc. Social Issues and Communal Harmony Social issues – causes and magnitude - alcoholism, drug addiction, poverty, unemployment – communal harmony –concept –religion and its place in public domain –secular civil society.

UNIT 4: VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT

Constitutional Values :(Sovereign, Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom, Fraternity). Social Values: (Pity and Probity, Self-Control, Universal Brotherhood). Professional Values (Knowledge Thirst, Sincerity in Profession, Regularity, Punctuality, Faith). Religious and Moral Values: (Tolerance, Wisdom, character). Aesthetic Values: (Love and Appreciation of literature, fine arts). Environmental Ethical Values National Integration and international understanding. Need of Humanistic value for espousing peace in society. Conflict of cross-cultural influences, cross-border education

UNIT 5

Guru Nanak Devji's Teachings. Relevance of Guru Nanak Devji's teachings' relevance to Modern Society. The Guru Granth Sahib. The five Ks Values and beliefs Rights and freedom (Right of equality, Right to Education, Right to Justice, Rights of women, Freedom of religion, Freedom of culture, Freedom of assembly, Freedom of speech) Empowerment of women Concept of Langar
Eminent Sikh personalities

REFERENCE BOOKS:

1. Dr. Abdul Kalam. My Journey-Transforming Dreams into Actions. Rupa Publications, 2013.

2. Steven R Covey, 8th Habit of Effective People (From Effectiveness to Greatness), Free Press, New York, 2005.

3. Prem Singh, G.J. (2004). 'Towards Value Based Education', University News. Vol. 42 (45): P.11-12.

4. V.R. Krishna Iyer. Dialectics & Dynamics of Human Rights in India (Tagore Law Lectures) The Yesterday, Today and Tomorrow, Eastern Law House **(**1999, Reprint 2018) http://www.ncert.nic.in/rightside/links/pdf/framework/english/nf2005.p

SEMESTER VI

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: CORE 13**
COURSE NAME: LINEAR ALGEBRA	**COURSE CODE:**
SEMESTER: VI	**MARKS: 100**
CREDITS: 4	**TOTAL HOURS: 90**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To strengthen the knowledge on vector spaces and linear transformations.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Recall the concepts of a real (complex) vector space to an arbitrary finite-dimensional vector space and understand the concept of a vector Space**.**

2. Understand the linear independence of vectors over a field, the idea of basis, the dimension of a vector space and examining whether the given set of vectors is linearly independent or linearly dependent.

3. Analyze the product space, Orthogonal vectors, Gram Schmidth orthogonalization process etc.

4. Apply concepts of linear transformations with their matrix representation, Rank - nullity, Describe the concepts of Eigenvalue, Eigenvector and characteristic polynomial.

5. Evaluate the system of simultaneous linear equations.

UNIT I **(18 Hours)**

Vector spaces, Elementary basic concepts, linear independence and bases.

Chapter 4: Section 4.1 and 4.2

UNIT II **(18 Hours)**

Dual spaces.

Chapter 4: Section 4.3

UNIT III **(18 Hours)**

Inner product spaces.

Chapter 4: Section 4.4

UNIT IV **(18 Hours)**

Algebra of linear transformations, characteristic roots.

Chapter 6: Section 6.1 and 6.2

UNIT V **(18 Hours)**

Matrices, canonical forms, triangular forms.

Chapter 6: Section 6.3 and 6.4

PRESCRIBED BOOK:

Treatment and content as in **"Topics in Algebra"**, I. N. Herstein,Wiley Eastern Ltd.

REFERENCE BOOKS:

1. University Algebra, N. S. Gopalakrishnan, New Age International Publications, Wiley Eastern Ltd.
2. First course in Algebra, John B. Fraleigh, Addison Wesley.
3. Text Book of Algebra, R. Balakrishna and N. Ramabadran, Vikas publishing Co. Algebra, S. Arumugam, New Gamma publishing house, Palayamkottai.

E - LEARNING RESOURCES:

1. https://sites.wcsu.edu/mbxml/OER_Linear_Alg/section_bases.html.
2. https://en.wikipedia.org/wiki/Dual_basis
3. https://home.iitk.ac.in/~arlal/book/nptel/pdf/LAch5.html
4. https://gacbe.ac.in/pdf/ematerial/18BMA51C,U4.pdf
5. https://edurev.in/t/116614/Canonical,Forms,,Diagonal,Forms,,Triangular,Forms,

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	3	3	2
CO 2	3	2	3	2	3
CO 3	2	2	2	3	2
CO 4	3	3	3	2	4
CO 5	3	2	2	3	3
Average	2.6	2.4	2.6	2.6	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Acquire a detailed knowledge about vector spaces and subspaces.	1 - 5	K1
CO 2	Understand concept of dual space.	1 - 5	K 1, K 2
CO 3	Explain the significance of inner product spaces and their properties.	1 - 5	K3
CO 4	Link matrices and linear transformations. Learn to compute eigen values and eigen vectors of linear transformations. Analyze adjoint of a linear transformation.	1 - 5	K 3, K 4
CO 5	Understand concepts of canonical and triangular forms of a vector space.	1 - 5	K 5

K1= Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: CORE 14**
COURSE NAME: COMPLEX ANALYSIS	**COURSE CODE:**
SEMESTER: VI	**MARKS: 100**
CREDITS: 4	**TOTAL HOURS:90**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To enable students to build a strong intuition and support it with appropriate justification in analyzing complex numbers, operations, sequences/ functions.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Recall definitions, theorems, and concepts from complex numbers and to understand the fundamental notions of theory of complex variables and importance of complex valued functions.

2. Understand the various techniques in evaluating problems on analytic functions, integrals, power series and mappings by elementary functions.

3. Analyze the concepts of analyticity, power series, contour integrals and linear fractional Transformations.

4. Apply the problems on integration, Power series and bilinear transformation, residues and techniques in complex analysis for their validity and effectiveness.

5. Evaluate the analytic functions, contour integrals in determining improper integrals and to generate power series for analytic functions. Create new solutions, proofs, techniques, or strategies in complex analysis to solve novel problems or analyse complex functions.

UNIT I **(18 Hours)**

Functions of a complex variable , mappings, limits , theorems on limits, continuity, derivatives, differentiation formulae , Cauchy-Riemann equations , sufficient conditions for differentiability, Cauchy-Riemann equations in polar form , Analytic functions , Harmonic functions.

Chapter 2: Section 1.1, 1.2, 1.4 to 2.1 and 2 to 2.5.

UNIT II **(18 Hours)**

Linear transformations, The transformation w = 1/z , linear fractional transformations , an implicit form , exponential and logarithmic transformations , transformation w = sin z , Preservation of angles.

Chapter 8: Section 8 to 8.7, 8.9, Chapter 2: Section 1.3, Chapter 9: 9.4.

UNIT III **(18 Hours)**

Contours, contour integrals, Anti derivatives, Cauchy, Goursat theorem. Cauchy integral formula, derivatives of analytic function, Liouville's theorem and fundamental theorem of algebra, maximum moduli of functions.

Chapter 4: Sections 3.8 to 4.5, 4.7 to 5.0.

UNIT IV **(18 Hours)**

Convergence of sequences and series, Taylor's series, Laurent's series, zeros of analytic functions.

Chapter 5: Section 5.1 to 5.6.

UNIT V **(18 Hours)**

Residues, Residue theorems, Three types of isolated singular points, Residues at poles, Zeros and poles of order "m" , Evaluation of improper integrals , Improper integrals involving sines and cosines , Definite integrals involving sines and cosines , Argument principle and Rouche's theorem.

Chapter 7: Sections 7.1 to 7.4, 7.9, 8.0.

PRESCRIBED BOOK:

Complex variables and Applications (Seventh Edition) by James Ward Brown and Ruel Churchill, McGraw-Hill Inc.

REFERENCE BOOKS:

1. Theory and problems of Complex Variables, Murray R. Spiegel, Schaum outline series

2. Complex Analysis, P. Duraipandian

3. Introduction to Complex Analysis S. Ponnuswamy, Narosa Publishers 1993

4. Complex Analysis by Lars Ahlfors .

E - LEARNING RESOURCES:

1.https://archive.nptel.ac.in/courses/111/103/111103070/

2.https://www.iitg.ac.in/physics/fac/charu/courses/ph503/book.pdf

3.https://www.maths.ed.ac.uk/~jmf/Teaching/MT3/ComplexAnalysis.pdf

4.https://www.scribd.com/document/490923334/Unit,III,Complex,Integration,1

5. ttps://faculty.ksu.edu.sa/sites/default/files/2016_complex_analysis_problems_solutions.pdf

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	3	3
CO 2	3	3	3	2	3
CO 3	2	3	2	3	3
CO 4	2	2	3	3	2
CO 5	3	2	3	2	3
Average	2.4	2.6	2.6	2.6	2.8

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Recall definitions, theorems, and concepts from complex numbers and to understand the fundamental notions of theory of complex variables and importance of complex valued functions.	1 - 5	K 1, K 2
CO 2	To apply various techniques in evaluating problems on analytic functions, integrals, power series and mappings by elementary functions.	1 - 5	K 3
CO 3	To analyze the concepts of analyticity, power series, contour integrals and linear fractional transformations.	1 - 5	K 4
CO 4	To evaluate problems on integration, Power series and bilinear transformation, residues and techniques in complex analysis for their validity and effectiveness.	1 - 5	K 5
CO 5	To construct analytic functions, contour integrals in determining improper integrals and to generate power series for analytic functions. Create new solutions, proofs, techniques, or strategies in complex analysis to solve novel problems or analyse complex functions	1 - 5	K 6

K1= Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: CORE 15**
COURSE NAME: MATHEMATICAL PROGRAMMING WITH PYTHON AND PRACTICALS	**COURSE CODE:**
SEMESTER: VI	**MARKS: 100**
CREDITS: 4	**TOTAL HOURS: 90**
THEORY AND PROBLEMS/ PRACTICALS	

COURSE OBJECTIVE:

To provide Basic knowledge of Python. Python programming is intended to import various data formats for analysis.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Understand the basics of python programming.
2. Learn how to write loops and condition statements in python.
3. Learn how to write functions, passing arguments to functions and Strings.
4. Learn how to use Lists, tuples and Dictionaries in python programme.
5. Learn how to use matplotings.

UNIT I **(12 Hours)**

Basics of Python Programming: History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions.

Python Arrays: Defining and Processing Arrays.

UNIT II **(12 Hours)**

Control Statements: Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop,else suite in loop and nested loops.

Jump Statements: break, continue and pass statements**.**

UNIT III **(12 Hours)**

Functions: Function Definition – Function Call – Variable Scope and its Lifetime- Return Statement. **Function Arguments**: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion.

Python Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison.

Modules: import statement- The Python module – dir() function – Modules and Namespace.

UNIT IV **(12 Hours)**

Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists - Basic list operations-List Methods.

Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples.

Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.

UNIT V **(12 Hours)**

Visualization with Matplotlib - Importing matplotlib- Simple Line Plots- Adjusting the Plot: Line Colors and Style, Axes Limits- Labeling Plots- Simple Scatter Plots, Density and Contour Plots- Histograms, Binning's, and Density, Customizing Plot Legends, Customizing Colorbars, Multiple Subplots.

PRESCRIBED BOOKS:

1. ReemaThareja, ―Python Programming using problem solving approach, First Edition, 2017, Oxford University Press

2. Python Data Science Handbook Essential Tools for Working with Data Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North)

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

MATHEMATICAL PROGRAMMEMING WITH PYTHON LAB (30 HOURS)

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Implement basic python Programming
2. Implement loops and condition statements in python.
3. Implement functions, passing arguments to functions and Strings.
4. Implement Lists, tuples and Dictionaries in python programme.
5. Implement charts using matplot.

PRACTICALS:

1. Programme to find the sum of all elements in an array.
2. Programme to create matrix in python.
3. Programme to find the GCD of the elements in an array.
4. Programme to check given array is monotonic.
5. Programme to show else statement with a loop.
6. Programme to calculate simple interest.
7. Programme to calculate Compound interest.
8. Programme to reverse a number in python
9. Programme to find the factorial of number.
10. Implementing Function without arguments
11. Programme to accept the strings which contains all vowels
12. Programme to count the number of matching characters in pair of string.
13. Programme to print even numbers in a list.
14. Programme to remove empty list from a list.
15. Programme to swap two elements in a list.
16. Programme to Multiply all numbers in the list
17. Illustrate a programme using Line Plot.
18. Illustrate a programme using Multiline Plot.
19. Illustrate a programme using Bar Chart.
20. Illustrate a programme using Pie Chart.

PROGRAMMEME: B.SC., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: ELECTIVE 2**
COURSE NAME: OPERATIONS RESEARCH	**COURSE CODE:**
SEMESTER: VI	**MARKS: 100**
CREDITS: 5	**TOTAL HOURS: 90**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To impart knowledge on formulating mathematical models for quantitative analysis, understand and analyze managerial problems in industry so that they are able to use the resources optimally.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Understand fundamentals of linear programming, transportation, sequencing problems, game theory, queueing theory, and PERT/CPM.

2. Interpret principles and methods of graphical solution, simplex method, Big-M method, assignment problem, and game theory strategies.

3. Apply linear programming techniques, transportation algorithms, sequencing algorithms, game theory strategies, and queueing models to solve real-world problems.

4. Analyze complexity and optimality of solutions obtained from various models.

5. Develop comprehensive real-world solutions by integrating concepts, while critically assessing their effectiveness, efficiency, applicability, and limitations.

UNIT I **(18 Hours)**

Linear programming: Formulation, graphical solution, simplex method, Big-M method.

Chapter 2: Sections 2.1 to 2.7, Chapter3: Sections 3.1 to 3.3

UNIT II **(18 Hours)**

Transportation problem, Assignment problem.

Chapter6: Sections 6.1 to 6.9, Chapter 7: Sections 7.1 to 7.5

UNIT III **(18 Hours)**

Sequencing problem: n jobs through 2 machines, n jobs through 3 machines, two jobs through m machines, n jobs through m machines;

Game theory: Two person Zero-sum game with saddle point, without saddle point, dominance, solving 2 x n or m x 2 game by graphical method.

Chapter 10: Sections 10.1 to 10.5, Chapter 9: Sections 9.1 to 9.7

UNIT IV **(18 Hours)**

Queueing theory: Basic concepts, Steady state analysis of M/M/1 and M/M/S models with infinite and finite capacities.

Chapter 17: Sections 17.1 to 17.10

UNIT V **(18 Hours)**

PERT and CPM: Project network diagram, Critical path (crashing excluded), PERT computations.

Chapter 21: Sections 21.1 to 21.8

PRESCRIBED BOOK:

Operations Research by Kanti Swaroop, Gupta P K and Manmohan, Sultan Chand & Sons. (Eighth Edition).

REFERENCE BOOKS:

1. Gauss S.I., Linear programming, Mc Graw, Hill Book company.
2. Gupta P.K. and Hira D.S, Problems in Operations Research, S. Chand & Co.
3. Kanti Swaroop, Gupta P.K. and Manmohan, Problems in Operations Research, Sultan Chand & sons.
4. Ravindran A., Philips D.T. and Solberg J.J. , Operations Research, John Wiley & Sons.
5. Taha H.A., Operations Research, Macmillan publishing Company, New York.
6. Dr. Paria, Linear programming, transportation, assignment gam, Books and Allied (p) Ltd, 1999.

E - LEARNING RESOURCES:

1. NPTEL
2. Operations Research Society of America (ORSA)
3. Coursera,

4. Edx
5. Khan academy.

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	3	3
CO 2	2	3	3	3	3
CO 3	3	3	3	3	2
CO 4	2	3	3	2	3
CO 5	2	3	3	3	2
Average	2.4	3	3	2.8	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Understand fundamentals of linear programming, transportation, sequencing problems, game theory, queueing theory, and PERT/CPM.	1 - 5	K 1, K2
CO 2	Interpret principles and methods of graphical solution, simplex method, Big-M method, assignment problem, and game theory strategies.	1 - 5	K 2, K 3
CO 3	Apply linear programming techniques, transportation algorithms, sequencing algorithms, game theory strategies, and queueing models to solve real-world problems.	1 - 5	K 3
CO 4	Analyze complexity and optimality of solutions obtained from various models.	1 - 5	K 4
CO 5	Develop comprehensive real-world solutions by integrating concepts, while critically assessing their effectiveness, efficiency, applicability, and limitations.	1 - 5	K 5, K 6

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., MATHEMATICS	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: ELECTIVE 3**
COURSE NAME: GRAPH THEORY	**COURSE CODE:**
SEMESTER: VI	**MARKS: 100**
CREDITS: 5	**TOTAL HOURS: 90**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To develop a strong understanding of graph theory fundamentals and advanced concepts, enabling application in problem-solving across diverse domains.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Understand fundamental graph theory concepts such as graphs, subgraphs, degree of a vertex, isomorphism, independent sets, adjacency and incidence matrices, degree sequences, and graphic sequences.

2. Interpret properties and relationships of graphs, including connectedness, walks, trails, paths, components, bridge, block, connectivity, Eulerian and Hamiltonian graphs, and planarity.

3. Apply graph theory concepts to solve problems related to degree sequences, connectivity, Eulerian and Hamiltonian graphs, trees, and planarity in various contexts.

4. Analyze the characteristics and properties of graphs, including problems related to trees, planarity, and digraphs.

5. Apply graph theory concepts to solve complex problems, including identifying properties and formulating solutions, while critically evaluating their efficacy and practical applicability.

UNIT I **(18 Hours)**

Graphs, sub graphs, degree of a vertex, isomorphism of graphs, adjacency and incidence matrices, operations on graphs.
Chapter 2 Sections 2.0 - 2.5, 2.8, 2.9

UNIT II **(18 Hours)**

Connectedness, walks, trails, paths, components, bridge, block, connectivity – simple problems.
Chapter 4 Sections 4.0 – 4.4

UNIT III **(18 Hours)**

Eulerian and Hamiltonian graphs.
Chapter 5 Sections 5.0 – 5.2

UNIT IV **(18 Hours)**

Trees – problems.

Planarity: Definition and properties.
Chapter 6 Sections 6.0 – 6.2, Chapter 8 Sections 8.0 - 8.1

UNIT V **(18 Hours)**

Digraphs and matrices, tournaments.
Chapter 10 Sections 10.0 – 10.4

PRESCRIBED BOOK:

"Invitation to Graph Theory" by S. Arumugam and Ramachandran, New Gamma Publishing House, Palayamkottai.

REFERENCE BOOKS:

1. A first book at graph theory by John Clark and Derek Allan Holton, Allied publishers.

2. Graph Theory by S. Kumaravelu and Susheela Kumaravelu, Publishers authors C/o 182 Chidambara Nagar, Nagercoil.

E - LEARNING RESOURCES:

1. https://www.coursera.org/courses?query=graph%20theory

2. https://www.mygreatlearning.com/academy/learn,for,free/courses/basics,of,graph,theory

3. https://elearn.nptel.ac.in/shop/nptel/graph,theory/

4. https://www.udemy.com/course/graph,theory/?couponCode=ST12MT030524

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	3	2	2
CO 2	3	3	2	3	3
CO 3	2	2	2	2	2
CO 4	3	2	3	3	3
CO 5	3	3	2	2	3
Average	2.6	2.4	2.4	2.4	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Understand fundamental graph theory concepts such as graphs, subgraphs, degree of a vertex, isomorphism, independent sets, adjacency and incidence matrices, degree sequences, and graphic sequences.	1 - 5	K1, K2
CO 2	Interpret properties and relationships of graphs, including connectedness, walks, trails, paths, components, bridge, block, connectivity, Eulerian and Hamiltonian graphs, and planarity.	1 - 5	K2
CO 3	Apply graph theory concepts to solve problems related to degree sequences, connectivity, Eulerian and Hamiltonian graphs, trees, and planarity in various contexts.	1 - 5	K3
CO 4	Analyze the characteristics and properties of graphs, including problems related to trees, planarity, and digraphs.	1 - 5	K4
CO 5	Apply graph theory concepts to solve complex problems, including identifying properties and formulating solutions, while critically evaluating their efficacy and practical applicability.	1 - 5	K5, K6

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

ALLIED SUBJECTS

PROGRAMMEME: B.Sc. PHYSICS & CHEMISTRY	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: ALLIED 1**
COURSE NAME: ALLIED MATHEMATICS I	**COURSE CODE:**
SEMESTER: I/ III	**MARKS: 100**
CREDITS: 5	**TOTAL HOURS: 90**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To gain knowledge about the basic concepts of Algebra. They also gain the basic knowledge in Matrices, Trigonometry and Differential Calculus.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Understand series summation, matrix properties, numerical methods, trigonometric expansions and differential calculus.

2. Interpret applications of series, matrices, numerical methods, trigonometric expansions, and differential calculus.

3. Apply series summation, matrix operations, numerical techniques, trigonometric expansions, and differential calculus in problem-solving.

4. Analyze convergence, accuracy, and behaviour of series, matrices, numerical methods, trigonometric expansions, and differential calculus.

5. Integrate concepts to solve complex problems and evaluate the efficiency, reliability, and limitations in practical contexts.

UNIT I **(15 Hours)**

Summation of series: Binomial series -Exponential series - Logarithmic series -Simple Problems.

Chapter 2: Sections: 2.1.3, 2.2, 2.2.1, 2.3, 2.3.3.

UNIT II **(15 Hours)**

Matrices: Symmetric– Skew-Symmetric–Hermitian– Skew-Hermitian –Orthogonal and Unitary matrices– Cayley-Hamilton theorem (without proof) – Verification- Computation of inverse of matrix using Cayley - Hamilton theorem.

Chapter 4: Sections: 4.1.1 – 4.1.6, 4.5.2 and 4.5.3.

UNIT III **(30 Hours)**

Numerical Methods: Newton's method to find a root approximately.

Finite Differences: Interpolation: Operators, Δ, ∇, E, E --1 difference tables. Interpolation formulae: Newton's forward and backward interpolation formulae for equal intervals, Lagrange's interpolation formula.

Chapter 3: Sections 3.4.1. Chapter 5: Sections: 5.1 and 5.2

UNIT IV **(15 Hours)**

Trigonometry: Expansions of sinn θ, cosn θ in a series of powers of sinθ and cosθ - Expansions of sin(nθ) and cos(nθ) in a series sines and cosines of multiples of "θ" - Expansions of sinθ, cosθ and tanθ in a series of powers of "θ" – Hyperbolic and inverse hyperbolic functions.

Chapter 6: Section 6.1 – 6.3

UNIT V **(15 Hours)**

Differential Calculus: Successive differentiation, n th derivatives, Leibnitz theorem (without proof) and applications, Jacobians, maxima and minima of functions of two variables- Simple problems.

Chapter 1, Section 1.1 to 1.3.1.

PRESCRIBED BOOKS:

"Ancillary Mathematics: S.Narayanan and T.K.Manickavasagam Pillai (Viswanathan Printers)", Volume I (2015).

REFERENCE BOOKS:

1. Allied Mathematics Volume I&II: P.Kandasamy and K.Thilagavathi (S.Chand and Co.)

2. Ancillary Mathematics Volume I&II: P.Balasubramanian & K.G.Subramanian.

3. Allied Mathematics: P.R.Vittal (Margham Publications).

E - LEARNING RESOURCES:

1. https://marghampublications.com/index.php/text,books/maths/allied,mathematics,for,b,sc,and,b,c,a,for,all,indian,universities,in,single,volume,p,r,vittal

2. https://nammaponneri.com/index.php?route=product/product&product_id=1751

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	**12**	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	6	3	2
CO 2	3	2	3	2	3
CO 3	2	3	2	3	2
CO 4	3	3	3	2	3
CO 5	2	2	3	3	3
Average	2.6	2.6	2.6	2.6	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Understand series summation, matrix properties, numerical methods, trigonometric expansions and differential calculus.	1 - 5	K1
CO 2	Interpret applications of series, matrices, numerical methods, trigonometric expansions, and differential calculus.	1 - 5	K1, K2
CO 3	Apply series summation, matrix operations, numerical techniques, trigonometric expansions, and differential calculus in problem-solving.	1 - 5	K3
CO 4	Analyze convergence, accuracy, and behaviour of series, matrices, numerical methods, trigonometric expansions, and differential calculus.	1 - 5	K4
CO 5	Integrate concepts to solve complex problems and evaluate the efficiency, reliability, and limitations in practical contexts.	1 - 5	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

PROGRAMMEME: B.Sc., PHYSICS & CHEMISTRY	**BATCH: 2024 - 27**
PART: III	**COURSE COMPONENT: ALLIED 2**
COURSE NAME: ALLIED MATHEMATICS II	**COURSE CODE:**
SEMESTER: II/IV	**MARKS: 100**
CREDITS: 5	**TOTAL HOURS: 90**
THEORY AND PROBLEMS	

COURSE OBJECTIVE:

To gain some knowledge in Integral Calculus, Differential Equations, basic concepts in Laplace Transforms and Vector Calculus.

COURSE OUTCOMES:

After completing the course, the students will be equipped to

1. Understand integral calculus principles, Fourier series properties, differential equations, Laplace transforms, and vector differentiation.
2. Interpret applications of these topics in mathematical contexts.
3. Apply techniques to solve problems involving integral calculus, Fourier series, differential equations, Laplace transforms, and vector differentiation.
4. Analyze behaviour and solutions of mathematical concepts.
5. Synthesize concepts to solve complex mathematical problems.

UNIT I **(15 Hours)**

Integral calculus: Bernoulli's Formula, Reduction Formula $Sinn\theta$, $Cos\ n\theta$, $Sinm\theta\ Cos$, Simple Problems.

UNIT II **(15 Hours)**

Fourier Series: Fourier series for functions $(0, 2\pi)$, $(-\pi, \pi)$

Chapter 4: Section: 4.1, 4.1.1

UNIT III **(30 Hours)**

Differential Equations: Ordinary Differential Equations - second order non, homogeneous differential equations with constant coefficients of the form ay" +by'+ cy = X where X is of the form cos and sine,

Related problems only. **Partial Differential Equations**: Formation, complete integrals and general integrals, four standard types and solving Lagrange's linear equation P p +Q q= R

Chapter 5: Section 5.2.1, Chapter 6: Section 6.1 to 6.4

UNIT IV **(15 Hours)**

Laplace Transforms: Laplace transformations of standard functions and simple properties, inverse Laplace transforms.

UNIT V **(15 Hours)**

Vector Differentiation: Introduction, Scalar point functions, Vector point functions, vector differential operator Gradient, Divergence, Curl, Solenoidal, irrotational, identities.

Chapter 8, Section 8.1 to 8.4.4

RECOMMENDED TEXT

Allied Mathematics, Volume II by P. Duraipandian and S.Udayabaskaran, S. Chand Publications.

REFERENCE BOOKS:

1. Ancillary Mathematics by S. Narayanan and T.K. Manickavachagom Pillay, S. Viswanathan Pinters, 1986, Chennai
2. Allied Mathematics by A. Singaravelu.
3. Allied Mathematics by P.R. Vittal

E - LEARNING RESOURCES:

1. http://www.themathpaage.com
2. http://nptel.ac.in

GUIDELINES TO THE QUESTION PAPER SETTERS

QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
TOTAL MARKS				**100**

BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
TOTAL	12	**7**	**6**

PSO - CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	6	3	2
CO 2	3	2	3	2	3
CO 3	2	3	2	3	2
CO 4	3	3	3	2	3
CO 5	2	2	3	3	3
Average	2.6	2.6	2.6	2.6	2.6

PSO - CO question paper mapping

CO No.	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO 1	Understand integral calculus principles, Fourier series properties, differential equations, Laplace transforms, and vector differentiation.	1 - 5	K1
CO 2	Interpret applications of these topics in mathematical contexts.	1 - 5	K1, K2
CO 3	Apply techniques to solve problems involving integral calculus, Fourier series, differential equations, Laplace transforms, and vector differentiation.	1 - 5	K3
CO 4	Analyze behaviour and solutions of mathematical concepts.	1 - 5	K4
CO 5	Synthesize concepts to solve complex mathematical problems.	1 - 5	K5

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6 = Create

LIST OF ELECTIVES

1. Numerical Analysis
2. Operations Research
3. Graph Theory
4. Discrete Mathematics
5. Fuzzy Sets and Applications
6. Calculus of Finite Differences

INDIAN HERITAGE AND KNOWLEDGE SYSTEM

PROGRAMME:	**BATCH:** 2024-27
PART: III	**COURSE COMPONENT:** Self Study
COURSE NAME: INDIAN HERITAGE AND KNOWLEDGE SYSTEM	**COURSE CODE:**
SEMESTER: III	**MARKS:**100
CREDITS: 2	
QUESTION PATTERN: MCQ	
THEORY	

Course Objective:

To delve into Indian Heritage, this course focuses on South Indian cultures and ancient knowledge like Yoga, Ayurveda, and Siddha, shaping the Nation's identity.

Course Outcomes:

1. To develop a comprehensive understanding among students of Indian heritage, its richness and diversity, and its role in shaping the nation's cultural identity.
2. Students will gain an enhanced insight into the artistic, architectural, and literary achievements of South India and other regions, fostering a sense of pride in Indian cultural heritage.
3. To enhance students' cultural literacy by gaining insights into traditional practices preserved through folklore across India.
4. To acquire knowledge among students of ancient Indian sciences for holistic well-being, promoting physical, mental, and spiritual health.
5. Students will develop a deeper understanding of the interconnectedness of spiritual, medicinal, and artistic dimensions within Indian Heritage systems.

UNIT I: Introduction to Indian Heritage

- **Concept of Heritage:** Definition, the importance of studying heritage, and its diverse forms.
- **Cultural Landscape of India:** Overview of major cultural zones in India, with a focus on South India.

  Key Concepts: Cultural heritage, diversity, tangible heritage (e.g., monuments), intangible heritage (e.g., traditions, practices).

UNIT II: Cultural Tapestry of South India

- **Literature:** The classical Tamil literature of *Sangam poetry*, the epic Kannada works like the *"Kuvempu Ramayana,"* the Telugu compositions of *Annamacharya*, and the poetic Malayalam works of Kerala's rich literary tradition.
- **Painting:** The intricate gold leaf work of *Tanjore* painting, the intricate patterns of *Mysore* painting, hand-painting or block-printing of Kalamkari.
- **Theatre:** The ancient art form of *Koothu* and the elaborate dance-dramas of *Bhagavata Mela* in Tamil Nadu, and the colourful folk theatre of *Yakshagana* in Karnataka.
- **UNESCO Indian Heritage Sites:** *Great Living Chola Temples* artistry, *Hampi*-Virupaksha Temple and the Vijaya Vittala Temple, *Mahabalipuram*- a treasure trove of Pallava art, *Mysore*

Palace-Indo-Saracenic architecture, *Periyar National Park*- Western Ghats, *Kanchipuram*-City of Thousand Temples.

UNIT III: Tamil Nadu Folklores

- **Origins and Significance:** Historical background of Tamil Nadu folklore and its cultural significance.
- **Folk Dances:** Exploration of traditional Tamil folk dances like *Karakattam, Kolattam,* and *Kummi.*
- **Folk Music:** Overview of folk music traditions in Tamil Nadu, including *Parai Attam and Villu Paatu.*
- **Rituals and Festivals:** Understanding the role of folklore in Tamil Nadu's rituals and festivals- *Pongal and Jallikattu.*

  Key Concepts: Karakattam, Kolattam, Parai Attam, Villu Paatu, Tamil folk tales, cultural rituals.

UNIT IV: Unveiling the Knowledge Systems

- **Cultural Landscape of India:** Overview of major cultural zones in India, with a focus on South India.
- **Yoga:** Exploring the various aspects of Yoga - its philosophy, Eight Limbs, practices (e.g., Asanas, Pranayama), and benefits for physical and mental well-being.
- **Ayurveda:** Understanding the core principles of Ayurveda - its focus on holistic health, diagnosis, and treatment methods.

  Key Concepts: Yoga philosophy, Asanas, Pranayama, Tridosha theory (Ayurveda), Doshas (Vata, Pitta, Kapha), Panchakarma, herbal medicine, Ayurvedic lifestyle.

UNIT V: Siddha Tradition and Other Knowledge Systems

- **Siddha Tradition:** Origins, philosophy, medicinal practices, and spiritual aspects.
- **Other Important Knowledge Systems:** Jyotish Shastra (Indian astrology), Natya Shastra (Treatise on performing arts).

  Key Concepts: Siddha literature, alchemy, and spirituality in Siddha tradition. Pancha Boothas (Siddha), herbal remedies, Planetary influences, elements of classical Indian dance and music, and aesthetics in Natya Shastra.

CONTEMPORARY WORLD AND SUSTAINABLE DEVELOPMENT

PROGRAMME:	**BATCH:** 2024-27
PART: III	**COURSE COMPONENT:** Self Study
COURSE NAME: CONTEMPORARY WORLD AND SUSTAINABLE DEVELOPMENT	**COURSE CODE:**
SEMESTER: III	**MARKS:**100
CREDITS: 2	
QUESTION PATTERN: MCQ	
THEORY	

Course Objective:

To delve into global dynamics, this course highlights Asia and India's pivotal role in achieving global sustainability objectives.

Course Outcomes:

1. Students will gain a comprehensive understanding of the key actors, institutions, and dynamics shaping the contemporary world order.
2. Students will acquire the ability to analyze the political, economic, and security challenges within major Asian regions, fostering informed perspectives on these critical issues.
3. Through the study of recent wars, students will develop critical thinking skills to assess the root causes, human costs, and potential solutions to contemporary conflicts.
4. Students will gain a deeper understanding of the principles and challenges of sustainable development, empowering them to advocate for responsible solutions at local, national, and international levels.
5. Students will be equipped to critically evaluate India's contributions to the SDGs, particularly through specific programs implemented in Tamil Nadu, and assess their effectiveness in achieving sustainable development goals.

UNIT I: Global Governance and Institutions

- **State & Non-State Actors:** Definition, types (nation-states, failed states), functions.

  Key Actors: International states, Intergovernmental organizations (IGOs), nongovernmental organizations (NGOs), multinational corporations (MNCs).

- **United Nations (UN):** Structure, key organs (General Assembly, Security Council), functions, WB, & others.

  Key Concepts: United Nations General Assembly, United Nations Security Council.
- **Regional Organizations:** European Union (EU), African Union (AU), North Atlantic Treaty Organization (NATO).

Key Concepts: European Union Commission, African Union Commission, North Atlantic Treaty Organization.

- **International Law and Treaties:** Significance, role in addressing global challenges.

  Key Concepts: International Court of Justice, International Criminal Court, Geneva Conventions.

UNIT II: Contemporary Asia

Major Geographical Regions

- **Middle East:** Characterized by rich oil reserves, Complex political dynamics, and ongoing conflicts.

  Key countries: Iran, Iraq, Israel, Saudi Arabia, Syria, Turkey

- **Southeast Asia:** Rapid economic growth, Challenges- maritime security and environmental degradation.

  Key countries: Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam

- **Far East:** Major economic powerhouses and Potential flashpoints.

  Key countries: China, Japan, North Korea, South Korea

- **Rise of China:** Political-South China Sea, Territorial disputes and Competition for Resources. Economic- China's Belt and Road Initiative (BRI)
- **Major Economic Centers: Singapore-** Global financial hub, **Hong Kong-** Special Administrative Region of China, **United Arab Emirates (UAE)-** Diversified economy driven by oil and gas, tourism, and trade.

Regional Organizations:

- Association of Southeast Asian Nations (ASEAN)
- South Asian Association for Regional Cooperation (SAARC)
- Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)
- Asia-Pacific Economic Cooperation (APEC)
- Shanghai Cooperation Organization (SCO)

UNIT III: Recent Wars of the World

- **Syrian Civil War (2011-present):** Bashar al-Assad regime, Syrian opposition groups, ISIS.

  Key Concepts: Origins of the conflict, humanitarian crisis, foreign intervention, refugee crisis.

- **Yemeni Civil War (2015-present):** Houthi rebels, Yemeni government, Saudi-led coalition.

  Key Concepts: Proxy war dynamics, humanitarian crisis, role of Iran and Saudi Arabia, UN peace efforts.

- **Ukraine Conflict (2014-present)**: Ukrainian government, Russian-backed separatists, Russia.

Key Concepts: Annexation of Crimea, Donbas region conflict, Minsk agreements, NATO-Russia tensions.

- **Ethiopia Civil War (2020-present):** Ethiopian government, Tigray People's Liberation Front (TPLF), Eritrean forces.

  Key Concepts: Tigray conflict, humanitarian crisis, regional implications, efforts for ceasefire and peace talks.

- **Nagorno-Karabakh War (2020):** Armenia, Azerbaijan, Russia.

  Key Concepts: Conflict over Nagorno-Karabakh region, ceasefire agreement, role of Turkey, peace negotiations.

- **Myanmar Civil War (2021-present):** Myanmar military (Tatmadaw), ethnic armed groups, and Civilian resistance.

  Key Concepts: Coup aftermath, Rohingya crisis, ethnic conflicts, ASEAN mediation efforts.

UNIT IV: Sustainable Development Goals

- **Definition of Sustainable Development:** Balancing economic, social, and environmental needs.

  Key Concepts: United Nations Development Programme (UNDP), World Wildlife Fund (WWF), Sustainable Development Solutions Network (SDSN).

- **UN Sustainable Development Goals (SDGs):** Overview, targets.

  Key Concepts: United Nations, national governments, NGOs, private sector.

- **Challenges and Opportunities:** Achieving sustainability, global cooperation.

  Key Concepts: United Nations, national governments, civil society organizations, multinational corporations.

UNIT V: India's Role in Achieving Sustainable Development Goals (SDGs) with Tamil Nadu Initiatives

Addressing Basic Needs:

- **Goal 1: No Poverty**
  - National Rural Employment Guarantee Act (NREGA)
  - Kalaignar Kanchi Thalaiyalar Scheme
  - Ungal Thozhil Udhayanam (UTOY)
- **Goal 2: Zero Hunger**
  - National Food Security Act (NFSA)
  - Nutritious Noon Meal Programme
  - Annadhanam Scheme
  - Amma Unavagam

- **Goal 3: Good Health and Well-being**
    - National Health Mission (NHM)
    - Health Insurance of Tamil Nadu
    - Chief Minister's Comprehensive Health Insurance Scheme
    - Maruthuva Mitri
    - Amma Mini Clinics

Ensuring Essential Services:

- **Goal 4: Quality Education**
    - Sarva Shiksha Abhiyan (SSA)
    - Rashtriya Madhyamik Shiksha Abhiyan (RMSA)
    - Namakkal District Library Scheme
    - Pudhumai Penn Scheme under Higher Education Assurance Scheme (HEAS)
    - Free Coaching for Competitive Exams
- **Goal 6: Clean Water and Sanitation**
    - Swachh Bharat Mission (Clean India Mission)
    - National Rural Drinking Water Programme (NRDWP)
    - Jal Jeevan Mission Tamil Nadu
    - Namakku Naathey Scheme
    - Kudimaramathu Scheme
- **Goal 7: Affordable and Clean Energy**
    - National Solar Mission
    - Tamil Nadu Solar Energy Policy
    - Green House Scheme

Building Sustainable Communities:

- **Goal 11: Sustainable Cities and Communities**
    - Smart Cities Mission
    - Atal Mission for Rejuvenation and Urban Transformation (AMRUT)
    - Adi Dravidar Housing Scheme

- **Goal 13: Climate Action**

    - National Action Plan on Climate Change (NAPCC)
    - International Solar Alliance
    - Tamil Nadu Wind Energy Policy 2019
- **Goal 17: Partnerships for the Goals**
    - Development Assistance Programmes (DAPs)
    - International Development Cooperation (IDC)