

PERIYAR UNIVERSITY



DEGREE OF BACHOLAR OF MATHEMATICS WITH COMPUTER APPLICATIONS

Syllabus for

B.Sc., MATHEMATICS
(COMPUTER APPLICATIONS)

CHOICE BASED CREDIT SYSTEM
(SEMESTER PATTERN)

(For Candidates Admitted in the Colleges Affiliated to Periyar University
from 2026-2027 onwards)

REGULATIONS

Mathematics is a key to success in the field of science and engineering. Mathematics plays an important role in the context of globalization of Indian economy, modern technology, and computer science and information technology. Today, students need a thorough knowledge of basic principles, methods, results and a clear perception of the power of mathematical ideas and tools to use them effectively in modeling, interpreting and solving the real world problems. The syllabus of this program is aimed at preparing the students with the latest developments and put them on the right track to fulfill the present requirements.

ELIGIBILITY

A candidate who has passed higher secondary examination with any one of the Subjects (Maths, Statistics, Business Maths).

Duration of the course

The course for the degree of Bachelor of Mathematics(CA) shall consist of three academic years divided into six semesters.

Course of study

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

Examinations

The theory examination shall be three hours duration to each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examinations.

Maximum Duration for the completion

The maximum duration for completion of the UG Program shall not exceed twelve semesters.

Commencement of this Regulation

These regulations shall take effect from the academic year 2026-2027,i.e., for students who are to be admitted to the first year of the course during the academic year 2026-2027.

Program specific outcome (PSO) - Mathematics

Define the specialized skills, knowledge, and competencies a student acquires upon completing the program. They bridge general program outcomes with specific subject expertise.

Core PSOs for Mathematics typically include:

Analytical & Logical Thinking: Ability to formulate mathematical arguments, analyze abstract problems logically, and think critically to deduce solutions.

In-Depth Conceptual Knowledge: Solid foundational understanding of pure and applied mathematics, including algebra, real analysis, calculus, and differential equations.

Mathematical Modeling & Problem Solving: Capability to translate real-world problems into mathematical models and apply quantitative methods to solve them.

Computational Skills: Proficiency in using modern mathematical software, programming languages, and computational tools to solve complex numerical problems.

Research & Employability: Preparedness to undertake higher studies (e.g., M.Sc., Ph.D.) or careers requiring strong analytical skills, such as data analysis, finance, actuarial science, and education.

Introduction

B.Sc. Mathematics (CA): Programme Outcome, Programme Specific Outcome and Course Outcome

Mathematics is the study of quantity, structure, space and change, focusing on problem solving, with wider scope of application in science, engineering, technology, social sciences etc. The key core areas of study in Mathematics include Algebra, Analysis (Real & Complex), Differential Equations, Geometry, and Mechanics. The Bachelor's Degree B.Sc. Mathematics(CA) is awarded to the students on the basis of knowledge, understanding, skills, attitudes, values and academic achievements expected to be acquired by learners at the end of the Programme. Learning outcomes of Mathematics are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for gaining knowledge of Mathematics.

Bachelor's degree in Mathematics(CA) is the culmination of in-depth knowledge of algebra, calculus, geometry, differential equations and several other branches of Mathematics. This also leads to study of related areas like Computer science, Financial Mathematics, Statistics and many more. Thus, this programme helps learners in building a solid foundation for higher studies in Mathematics. The skills and knowledge gained have intrinsic aesthetics leading to proficiency in analytical reasoning. This can be utilised in Mathematical modelling and solving real life problems.

Students completing this programme will be able to present Mathematics clearly and precisely, make abstract ideas precise by formulating them in the language of Mathematics, describe Mathematical ideas from multiple perspectives and explain fundamental concepts of Mathematics to non-Mathematicians.

Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

Under Graduate Programme

Programme Outcomes:

PO1: Disciplinary Knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

PO2: Critical Thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO3: Problem Solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO4: Analytical Reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints.

PO5: Scientific Reasoning: Ability to analyse, interpret and draw conclusions from quantitative / qualitative data; and critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.

PO6: Self-directed & Lifelong Learning: Ability to work independently, identify and manage a project. Ability to acquire knowledge and skills, including “learning how to learn”, through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives.

B.Sc Mathematics(CA)

Programme Specific Outcomes:

PSO1: Acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics.

PSO2: Understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.

PSO3: To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids:

[illegible]

Highlights of the Revamped Curriculum:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Mathematics based problem solving skills are included as mandatory components in the ‘Training for Competitive Examinations’ course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	11	12	15	25	89
Part IV	3	5	5	6	13	3	35
Total	22	24	22	24	28	28	148

***Part I, II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree**

SEMESTER INDEX

B.Sc., MATHEMATICS(CA)CURRICULUM DESIG COURSE OF STUDY AND SCHEME OF EXAMINATION

SEMESTER – I

S.No	Semeste	Paper code	Part	Cour se Gro	Paper Type	Subject Title	Hours Week	Exam Hours	Internal Marks	Externa l Marks	Total Marks	Credit
1	SEM I		Part-I	Language	Theory	Tamil-I	6	3	25	75	100	3
2			Part-II	Language	Theory	English-I	6	3	25	75	100	3
3			Part-III	Core-I	Theory	Classical Algebra	4	3	25	75	100	4
4			Part-III	Core-II	Theory	Differential Calculus	5	3	25	75	100	5
5			Part-III	Allied	Theory	Allied Theory (Choose anyone from given Allied Papers)	4	3	25	75	100	4
6			Part-III	Allied	Practical	Allied Practical	2					
7			Part-IV	NME-I	Theory	NME-I (Choose anyone from other Departments)	2	3	25	75	100	2
8			Part-IV		Theory	Value Education	1	3	25	75	100	1
Total							30					22

SEMESTER – II

S.No	Semester	Paper code	Part	Course Group	Paper Type	Subject Title	Hours	Exam Hours	Internal Marks	External Marks	Total Marks	Credit
1	SEM-II		Part-I	Language	Theory	Tamil-II	6	3	25	75	100	3
2			PartII	Language	Theory	English-II	6	3	25	75	100	3
3			Part-III	Core-III	Theory	Integral Calculus and Trigonometry	4	3	25	75	100	4
4			Part-III	Core-IV	Practical	Office Automation	3	3	40	60	100	3
5			Part-III	Allied	Theory	Allied Theory (Choose anyone from given Allied Papers)	4	3	25	75	100	4
6			Part-III	Allied	Practical	Allied Practical	2	3	40	60	100	2
7			Part-IV	NME – II	Theory	NME – II (Choose anyone from other Departments)	2	3	25	75	100	2
8			Part-IV		Theory	Disaster Management	1	3	25	75	100	1
9			Part-IV	NMSD	Theory/ Practical	Naan Mudhalvan	2	-	-	-	-	2
Total							30					24

SEMESTER – III

S.No	Semester	Paper code	Part	Course Group	Paper Type	Subject Title	Hours Week	Exam Hours	Internal Marks	External Marks	Total Marks	Credit
1	SEM - III		Part-I	Language	Theory	Tamil-III	6	3	25	75	100	3
2			PartII	Language	Theory	English-III	6	3	25	75	100	3
3			Part-III	Core-V	Theory	Differential Equation And Laplace Tranformation	4	3	25	75	100	4
4			Part-III	Allied	Theory	Allied Theory (Choose anyone from given Allied Papers)	4	3	25	75	100	4
5			Part-III	Allied	Practical	Allied Practical	2					
6			Part-III	Elective - I	Theory	(Choose anyone from given Elective-I Papers)	3	3	25	75	100	3
7			Part-IV		Report	Health &wellness	1	3	25	75	100	1
8			Part-IV	SEC- I	Practical	Visual Basic Practical	2	3	25	75	100	2
9			Part-IV	NMSD	Theory/ Practical	Naan Mudhalvan	2					2
Total							30					22

SEMESTER – IV

S.No	Semester	Paper code	Part	Course Group	Paper Type	Subject Title	Hours Week	Exam Hours	Internal Marks	External Marks	Total Marks	Credit
1	SEM-IV		Part-I	Language	Theory	Tamil-IV	6	3	25	75	100	3
2			PartII	Language	Theory	English-IV	6	3	25	75	100	3
3			Part-III	Core-VI	Theory	Vector Calculus And fourier Series	4	3	25	75	100	4
4			Part-III	Core-VII	Practical	Latex Practical	2	3	40	60	100	2
5			Part–III	Allied	Theory	Allied Theory	4	3	25	75	100	4
6			Part–III	Allied	Practical	Allied Practical	2	3	40	60	100	2
7			Part–IV	Elective – II	Theory	Elective – II (Choose anyone from given Elective-II Papers)	2	3	25	75	100	2
8			Part-IV	SEC-II	Theory	Quantitative Aptitude And Reasoning	2	3	25	75	100	2
9			Part-IV	NMSD	Theory/ Practical	Naan Mudhalvan	2					2
Total							30					24

SEMESTER – V

S.No	Semester	Paper code	Part	Course Group	Paper Type	Subject Title	Hours Week	Exam Hours	Internal Marks	External Marks	Total Marks	Credit
1	SEM -V		Part –III	Core VIII	Theory	Abstract Algebra	6	3	25	75	100	5
2			Part –III	Core IX	Theory	Real Analysis – I	6	3	25	75	100	5
3			Part –III	Core X	Theory	Operations Research	5	3	25	75	100	5
4			Part –IV	Elective-III	Theory	Elective-III (Choose anyone from given Elective-III Papers)	5	3	25	75	100	4
5			Part –IV	SEC III	Practical	C - Programming	4	3	25	75	100	3
6			Part –IV	EVS	Theory	Environmental Studies-EVS	2	3	25	75	100	2
7			Part –IV	-	-	Internship/ Industrial Visit/Field Visit (Carried out in II year summer vacation-2 weeks)	-	-	-	-	-	2
8			Part-IV	NMSD	Theory/ Practical	Naan Mudhalvan	2	-	-	-	-	2
		Total					30					28

SEMESTER – VI

S.No	Semester	Paper code	Part	Course Group	Paper Type	Subject Title	Hours Week	Exam Hours	Internal Marks	External Marks	Total Marks	Credit
1	SEM- VI		Part-III	Core-XI	Theory	Linear Algebra	6	3	25	75	100	5
2			Part-III	Core-XII	Theory	Real Analysis –II	6	3	25	75	100	5
3			Part-III	Core-XIII	Theory	Complex Analysis	6	3	25	75	100	5
4			Part-III	Core-XIV	Practical	Basic Python	5	5	40	60	100	5
5			Part-III	Core-XV		Mini Project	5		40	60	100	5
6			Part-IV		Theory	Extension Activity	-	-	-	-	-	1
7			Part-IV	NMSD	Theory/ Practical	Naan Mudhalvan	2	-	-	-	-	2
Total							30					28

ELECTIVE PAPERS

Elective I

Mechanics

Graph Theory

Elective II

Number Theory

Numerical Methods

Elective III

Fundamentals of AI

Discrete Mathematics

ALLIED PAPERS

(I SEM / III SEM Theory Paper)

Allied Statistics – I

Allied Electronics-I

Allied Physics – I

Allied Chemistry - I

(II SEM / IV SEM Theory Paper)

Allied Statistics – II

Allied Electronics-II

Allied Physics – II

Allied Chemistry – II

Practical (II SEM / IV SEMSS)

Allied Electronics Practical

Allied Physics Practical

Allied Statistics Practical

Allied Chemistry Practical

QUESTION PAPER PATTERN FOR UG

EXAMINATION SYSTEM

There are two components in the evaluation and assessment of a student, namely Continuous. Internal Assessment (CIA) and Semester Examination (SE). The CIA will take place during the course of the semester and the semester Examination shall be conducted at the end of each semester. Each UG course consists of six semesters.

SEMESTER EXAMINATION QUESTION PAPER PATTERN FOR THE THEORY PAPERS

The Maximum Marks for Semester Examination is 75 for UG.

The question paper shall have three Parts with the maximum of 75 marks for three hours with the following break-up.

Part-A

Part-A shall contain fifteen Multiple Choice Questions drawn from all the units on the basis of three questions from each unit.

Each question shall carry one mark ($15 \times 1 = 15$ Marks). Answer all the questions.

Part-B

Part-B shall contain five questions drawn one each from the 5 units.

2 questions out of 5 are to be answered. Each question shall carry five marks ($2 \times 5 = 10$ Marks). Answer any two questions.

Part-C

Part-C shall contain five “EITHER OR” type questions drawn from all the 5 units. One “EITHER OR” type question from each unit.

Each question shall carry 10 marks ($5 \times 10 = 50$ Marks). Answer all the questions.

CONTINUOUS INTERNAL ASSESSMENT (CIA)

The break-up of the internal marks components is as follows:

(i) CIA Tests – 15 Marks (ii) Attendance – 5 Marks (iii) Problem Solving/Assignment – 5 Marks

MARKS AND QUESTION PAPER PATTERN FOR PRACTICALS

The Maximum Marks for Practical Examination is 100 for UG.

External Mark Components 60 Marks. Practical Examination 45 Marks and Record 15 Marks. Internal Mark 40 Marks.

QUESTION PATTERN FOR THE PRACTICAL EXAM PAPERS

Answer any THREE questions out of 5 questions ($3 \times 15 = 45$ Marks).

PASSING MINIMUM

The candidate shall be declared to have passed the examination if the candidates secure not less than 30 marks out of 75 marks in the semester examination in each theory course and in total (CIA mark + Theory Exam mark) not less than 40 marks.

The candidates shall be declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Practical Exam mark) with minimum of 18 marks out of 45 marks in the Practical Exam conducted by the University. There is no passing minimum for the record notebook. However, submission of the record notebook is necessary. Candidate who does not obtain the required minimum marks for a pass in a Course/Practical shall be declared Re-Appear (RA) and the candidate has to appear and pass the same at a subsequent appearance.

B. Sc Mathematics
(COMPUTER APPLICATIONS)
Syllabus with effect from the
Academic year
2026-2027

SEMESTER - I

CLASSICAL ALGEBRA

Learning Objectives:

The Course is designed to:

1. Understand and apply the Binomial theorem for positive integral and rational indices, and evaluate sums of Exponential and Logarithmic series using standard results.
2. Analyse the consistency of linear equations, determine characteristic roots and vectors, apply the Cayley–Hamilton theorem, and diagonalize matrices using similarity transformations.
3. Apply the fundamental theorem of algebra, establish relations between roots and coefficients, identify imaginary and irrational roots, and compute symmetric functions of roots.
4. Solve reciprocal equations and perform transformations such as multiplying roots by a scalar, diminishing roots, and removing terms from polynomial equations.
5. Apply Descartes' Rule of Signs to determine the nature and number of real roots, and use Horner's and Newton's methods to approximate real roots to required decimal accuracy.

UNIT I:

Binomial Series: Binomial theorem for a positive integral index – Binomial theorem for a rational index – Summation of Binomial series. Exponential series – Exponential series for all real Values of x – Standard results for the Exponential series – Logarithmic series – Problems. (Chapter-2, Chapter- 3 and Chapter-4)

UNIT II:

Matrices: Test for consistency of linear equations – Characteristic equation – Characteristic roots and characteristic vectors of a matrix – Cayley–Hamilton theorem - Similarity of matrices - Diagonalizable matrix – Problems. (Chapter-6 (Page 6.38 to Page 6.82))

UNIT III:

Theory of equations: Fundamental theorem in the theory of equations – Relation between the roots and coefficients of an equation – Imaginary and irrational roots – Symmetric functions of the roots of an equation in terms of its coefficients – Problems. (Chapter-7(Page7.1toPage7.30))

UNIT IV:

Reciprocal equations – Transformation of equations – Multiplication of roots by m – Diminishing the roots of an equation – Removal of a term of an equation – Problems. (Chapter7(page7.30 to page7.56)).

UNIT V:

Descarte's rule of signs – Descarte's rule of signs for negative roots of an equation – Horner's method for approximation of roots of a polynomial equation – Newton's Method of evaluating a real root correct to given decimal places – Problems. (Chapter– 7 (Page7.57 to Page7.67))

TEXT BOOKS:

1. Algebra, Analytical Geometry and Trigonometry by Dr.P.R. Vittal and V.Malini, Margham Publications, Chennai – 17.Third Edition 2000. Reprint 2014

REFERENCE BOOKS:

1. Algebra Volume-I T.K. Manicavachagam Pillai & others S.Viswanathan Printers and publishers Pvt. Ltd– 2003 Edition.

Website and e-Learning Source

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO 1: Classify and Solve reciprocal equations

CLO 2: Find the sum of binomial, exponential and logarithmic series

CLO 3: Find Eigen values, eigen vectors, verify Cayley – Hamilton theorem and diagonalize a given matrix

CLO 4: Expand the powers and multiples of trigonometric functions in terms of sine and cosine

CLO 5: Determine relationship between circular and hyperbolic functions and the summation of trigonometric series

Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	3	2	2	2	-	3	2	2
CLO2	3	3	3	2	2	-	3	3	2
CLO3	3	3	3	3	2	-	3	3	2
CLO4	3	2	2	2	1	-	2	2	1
CLO5	3	2	2	2	1	-	2	2	1

DIFFERENTIAL CALCULUS

Learning Objectives:

The Course is designed to:

1. The basic skills of differentiation, successive differentiation, and their applications.
2. Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.

UNIT-I:

Successive Differentiation:

Introduction (Review of basic concepts) The n th derivative Standard results Fractional expressions-Trigonometrical transformation - Formation of equations involving derivatives - Leibnitz formula for the n th derivative of a product. (Chapter3: Sections 1.1 to 1.6 and 2.1, Related problems.)

UNIT-II:

Partial Differentiation:

Partial derivatives – Successive partial derivatives - Function of a function rule - Total differential coefficient - A special case - Implicit Functions. (Chapter8: Sections 1.1 to 1.5.)

UNIT-III:

Partial Differentiation (Continued):

Homogeneous functions Partial derivatives of a function of two variables – Jacobian of two variables - Maxima and Minima of functions of two variables Lagrange's method of undetermined multipliers. (Chapter8: Sections 1.6, 1.7 and Sections 4, 5.)

UNIT-IV:

Envelope:

Method of finding the envelope – Another definition of envelope Envelope of family of curves which are quadratic in the parameter. (Chapter10: Sections 1.1 to 1.4.)

UNIT V:

Curvature:

Definition of Curvature – Radius and Centre of Curvature – Cartesian formula for the radius of curvature – The co-ordinates of the centre of curvature. Evolutes and – Radius of Curvature in Polar Co-ordinates- Pedal equation. (Chapter10: Sections 2.1 to 2.6)

TEXT BOOKS:

1. S. Narayanan and T. K. Manikavachagam Pillay, Calculus – Volume I, (2004) S, Vishwanathan Printers Pvt Ltd.

REFERENCE BOOKS:

1. Calculus - By P.R. Vittal and Malini, Margham Publications, Chennai - 17. Third edition - 2000, Reprint 2010.
2. Calculus: S. Narayanan and others, S. Viswanathan Publications
3. Calculus: Dr. S. Sudha, Emerald Publishers.

Website and e-Learning Source

<https://nptel.ac.in>

Course Learning Outcome**Students will be able to**

CLO 1: Apply techniques of successive differentiation, Leibnitz theorem, and related concepts to solve higher - order derivative problems.

CLO 2: Compute partial derivatives, total differentials, and analyze functions involving several variables.

CLO 3: Apply Jacobian, homogeneous functions, maxima and minima, and Lagrange's method of undetermined multipliers to solve optimization problems.

CLO 4: Determine envelopes of families of curves and solve related geometrical problems.

CLO 5: Analyze curvature, radius of curvature, Evolutes, and pedal equations in Cartesian and Polar coordinates.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	3	2	1	1	-	3	2	1
CLO2	3	3	2	1	1	-	3	2	1
CLO3	3	3	3	1	2	-	3	3	2
CLO4	3	2	2	1	2	-	3	2	2
CLO5	3	3	3	1	2	-	3	3	2

SEMESTER-II

INTEGRAL CALCULUS AND TRIGONOMETRY

Learning Objectives:

The Course is designed to:

1. Discuss the concepts of integrals of irrational functions and evaluate integrals by the repeated use of integration by parts
2. Use the knowledge of double and triple integrals for finding area and volumes; solve multiple integrals using change of variables
3. Acquire knowledge about Beta and Gamma functions and apply them in various problems
4. Understand and calculate expansions and develop series expansions of trigonometric functions
5. Identify the relations between trigonometric and hyperbolic functions and compute logarithm of complex quantities
6. Sharpen understanding of the overall mathematical structure of the subject.

UNIT- I

INTEGRATION:

Integration of irrational functions – Properties of definite integrals (without proof) – Integration by parts – Reduction Formulae – Bernoulli's Formula. (Book 1: Chapter 1 – Sections: 8 case(i)-case(v), 11-15.1))

UNIT - II

MULTIPLE INTEGRALS:

Definition of double integrals - Evaluation of the double integral – Change of order of integration – Triple integrals – Volume as a triple integral. (Book-I: Chapter 5 – Sections: 1 to 4, 6.3)

CHANGE OF VARIABLES:

Change of variables in the case of two variables – Change of variables in the case of three variables – Simple Problems. (Book-I: Chapter 6 – Sections: 1.1 to 2.4)

UNIT - III

IMPROPER INTEGRALS:

Beta and Gamma functions – Recurrence formula for Gamma functions – Properties of Beta functions – Relation between Beta and Gamma functions - Applications. (Book-I: Chapter 7 – Sections: 2.1, 2.3 to 5)

UNIT - IV

TRIGONOMETRY:

Expansions of $\cos n\theta$ and $\sin n\theta$ - Expansion of $\tan n\theta$ in powers of $\tan \theta$ - Expansion of $\tan (A + B + C + \dots)$ – Powers of sines and cosines of θ in terms of functions of multiples of θ - Expansions of $\cos^n \theta$ when n is a positive integer - Expansions of $\sin^n \theta$ when n is a positive integer - Expansions of $\sin \theta$ and $\cos \theta$ in a series of ascending powers of θ . (Book-II: Chapter III)

UNIT - V

TRIGONOMETRY (Contd):

Hyperbolic functions -Relations between hyperbolic functions- Relations between hyperbolic functions and circular functions - Inverse hyperbolic functions – Problems on Separation of real and imaginary parts of Hyperbolic functions - Logarithm of complex quantities. (Book-II: Chapter IV & Chapter V-Section 5)

TEXT BOOKS:

1. S.Narayanan and T.K.Manicavachagom Pillai, Calculus Volume II, S.Viswananthan printers 2024.
2. S.Narayanan and T.K.Manicavachagom Pillai, Trigonometry, S.Viswananthan (printers and publishers) 2021.

REFERENCE BOOKS:

1. Mathematics for B.Sc., Vol I and Vol II by P.Kandasamy and K.Thilagavathy S. Chand & Co, New Delhi 2004.
2. A Text Book of Calculus by Shanthi Narayan and J.N.Kapoor, S.Chand and co, 2014.
3. Mathematics for B.Sc Branch-I Vol I by P.Kandasamy K.Thilagavathi, S.Chand and co, 2015.

4. Calculus by G.B.Thomas R.L.Finney, Pearson Education, 2007.
5. Mathematics for B.Sc., Branch I Vol II by P.Kandasamy and K.Thilagavathy S. Chand &Co., 2015.
6. Mathematics for B.Sc., Branch I Vol I , II and IV by P.Kandasamy and K.Thilagavathy S. Chand & Company Ltd., New Delhi 2022, First Edition.

Website and e-Learning Source

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO 1: Discuss the concepts of integrals of irrational functions and be able to evaluate integrals by the repeated use of integration by parts.

CLO 2: Use the knowledge of double and triple integrals for finding area and volumes, Know the method of solving multiple integrals by using the concept of change of variables.

CLO 3: Acquire the information about Beta and Gamma functions and apply it in various problems.

CLO 4: Understand and calculate the expansions and could develop series expansion.

CLO 5: Identify the relations between trigonometric and hyperbolic functions and Compute Logarithm of Complex quantities.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	2	1	3	-	2	-	3
CLO2	3	3	2	2	2	-	3	1	2
CLO3	3	2	3	2	3	-	2	2	3
CLO4	2	2	-	-	-	-	1	3	1
CLO5	3	3	-	2	-	-	1	3	1

OFFICE AUTOMATION–PRACTICAL

Learning Objectives:

The Course is designed to:

1. To learn basic commands of MS Word, MS Excel and MS Access.

LIST OF PRACTICALS

MS Word

- Preparation of word document (Typing, aligning, Font Style, Font Size, Text editing, colouring, Spacing, Margins)
- Creating and Editing a table(Select no of rows, Select no of columns, row heading, column heading, column width, row width, row height, spacing text editing)
- Formatting a table(insert rows/columns, delete rows/columns, cell merging/splitting, Cell alignment)
- Preparation of letters using mail merge.
- Demonstration of Find, Replace, Cut, Copy and paste texts in a word document.

MS Excel

- Preparation of a Table using Excel.
- Creation of Charts, Graphs and Diagrams

MS Power Point

- Preparation of slides in power point.
- Creation of Animation Pictures.

MS Access

- Creation of simple reports using MS Access.

General

- Export a given graph from Excel to word.
- Sending an Email.
- Download a document from internet.

- Import a picture from internet to word document.

Create a Power point presentation when a word document is given.

TEXT BOOKS:

1. Andy Channelle, Beginning Open Office3:From Novice to Professional APressseries, Springer- Verlog, 2009.

REFERENCE BOOKS:

1. Perry M.Greg,—Sams Teach Yourself Open Office.org AllIn One, Sams Publications, 2007.

Website and e-Learning Source:

<https://nptel.ac.in>

***** Handled and Evaluated By Mathematics Staffs**

Course Learning Outcome

After completion of the course, the students will be able to

CLO1: Create, edit, and format professional documents using MS Word with appropriate text formatting , tables, and mail merge features.

CLO2: Develop and manage spreadsheets using MS Excel for the data entry, worksheet formatting, calculations, formulas, and functions.

CLO3: Analyze and present data effectively through charts, graphs, and tables, using MS Excel.

CLO4: Design and deliver effective presentations using PowerPoint with slides, animations, and organizational charts.

CLO5: Utilize MS Access and internet-based tools for database management, report generation, email communication, document handling, and integration of office applications.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	1	2	3	3	2	-	2	3	2
CLO2	2	3	3	1	2	-	3	3	2
CLO3	2	3	3	2	2	-	3	3	2
CLO4	1	2	3	3	2	-	2	3	3
CLO5	1	2	3	2	3	-	2	3	3

SEMESTER-III

DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

Learning Objectives:

The Course is designed to:

1. Knowledge about the methods of solving Ordinary and Partial Differential Equations.
2. The understanding of how Differential Equations can be used as a powerful tool in solving problems in science.

UNIT-I:

Ordinary Differential Equations – Second order Differential Equations with constant co-efficients – Particular Integrals of the form e^{xV} , where V is of the form $x, x^2, \sin ax, \cos ax, x \sin ax$ and $x \cos ax$.

UNIT-II:

Second order differential Equations with variable co – efficient – both homogeneous linear equations and homogeneous non - linear equations.

UNIT-III:

Partial Differential Equations – Definition – Complete solution, Singular solution and general solution – Solution of equations of standard types $f(p,q)=0, f(x,p,q)=0, f(y,p,q)=0, f(z,p,q)=0$ and $f_1(x,p)=f_2(y,q)$ – Clairaut's form – Lagrange's equation $Pp+Qq=R$.

UNIT-IV:

Laplace Transforms – Definition – Laplace transforms of Standard functions – Elementary theorems – Problems.

UNIT-V:

Inverse Laplace transforms – Standard formulae – Elementary Theorems – Applications to Second order linear differential equation (Problems with only one differential equation).

TEXT BOOKS:

3. T.K.ManickavasagamPillaiandS.Narayanan,Calculus,VijayNicoleImprintsPvt.Ltd.,C –7, Nelson Chambers, 115 Nelson Manickam Road, Chennai – 600 029, 2004.
4. Dr.P.R.Vittal,DifferentialEquations,FourierSeriesandAnalyticalSolidGeometry,Margham Publications, 24, Rameswaram Road, T. Nagar, Chennai – 600 017, 2000.

REFERENCE BOOKS:

7. Differential equations and its applications by S.Narayanan & T.K. Manichavasagam Pillay S. Viswanathan PVT. LTD –2001 Edition
8. Engineering Mathematics by M.K.Venkatraman, National Publishing company, Chennai.

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO 1: Determine solutions of homogeneous equations, non-homogeneous equations of degree one in two variables, solve Bernoulli's equations and exact differential equations

CLO 2: Find the solutions of equations of first order but not of higher degree and to Determine particular integrals of algebraic, exponential, trigonometric functions and their products

CLO 3: Find solutions of simultaneous linear differential equations, linear equations of second order and to find solutions using the method of variations of parameters

CLO 4: Form a PDE by eliminating arbitrary constants and arbitrary functions,
find complete, singular and general integrals, to solve Lagrange's equations

CLO 5: Explain standard forms and Solve Differential equations using Charpit's method.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	3	2	2	2	-	3	3	2
CLO2	3	3	2	2	2	-	3	3	2
CLO3	3	3	2	2	1	-	3	2	2
CLO4	3	3	3	2	2	-	3	3	2
CLO5	3	2	2	2	1	-	3	2	1

ELECTIVE SUBJECTS - I

MECHANICS

Learning Objectives:

The Course is designed to:

1. To enable the students to know about the concepts of types of forces, moments, friction, projectiles, impulsive forces, and collision of elastic bodies .

UNIT I

Forces at a point : Parallelogram law of forces - Triangular laws of forces - Perpendicular triangular forces - Converse of the triangular law of forces - The Polygon of forces - Lami's theorem.

(Book 1: Chapter II : Section 1 to 9)

UNIT II

Parallel Forces and Moments: Like and unlike parallel forces - Problems - Moments - definition –
Varignon's Theorem - Problems.

(Book 1: Chapter III: Sections 1 to 12)

UNIT III

Friction : Introduction - Experimental Results - Statistical and Dynamical limiting friction – coefficient of friction - - angle of friction - Cone of friction- Equilibrium of a particle on a rough inclined plane - Equilibrium of a particle on a rough inclined plane under a force parallel to the plane - Equilibrium of a particle on a rough inclined plane under any force - Problem.

(Book 1: Chapter VII: Section 1 to 12)

UNIT IV

Projectiles : Definitions - Two fundamental principles - The path of a projectile is a parabola - Characteristics of the motion of a projectile - Range on an inclined plane.

Chapter VI : Sections 6.1 to 6.8 , 6.12 to 6.16

UNIT V

Impulsive Forces: Impulse - Impulsive Force - Impact of two bodies - Motion of a shot and Gun
- Loss of Kinetic energy.

Collision of elastic bodies: Definitions - Fundamental Law of impact - Impact of a smooth sphere
on a fixed Smooth plane - Direct impact of two smooth spheres - Oblique impact of two smooth spheres.

Chapter VII: Sections 7.1 to 7.6, Chapter VIII: 8.1 to 8.9

TEXT BOOKS:

1. Venkataraman.M. K., Statics , Tenth Edition, Agasthiar Publications, Trichy 2002
2. Venkataraman.M. K., Dynamics Tenth Edition, Agasthiar Publications, Trichy 2002

REFERENCE BOOKS:

1. Duraipandian P, 1988, Mechanics, Emerald Publishers, Chennai. theory, K. Ireland
& M. Rosen, Springer Verlag Newyork, 1972.

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO1: Explain the concepts of forces, moments, equilibrium, and the laws of forces and apply them to solve mechanical problems.

CLO2: Analyze systems of parallel forces and moments using principles such as varignon's theorem and solve related problems.

CLO3: Apply the laws of friction and conditions of equilibrium to solve problems involving rough surfaces and inclined planes.

CLO4: Demonstrate understanding of projectile motion and determine trajectory, range, greatest, height, and time of flight.

CLO5: Apply the concepts of impulsive , impact, and collision of bodies to solve problems involving motion and loss of Kinetic energy.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	3	2	1	1	-	1	2	1
CLO2	3	3	3	1	1	-	3	3	1
CLO3	3	3	3	2	1	-	3	3	2
CLO4	3	2	3	3	1	-	2	3	3
CLO5	3	3	3	3	1	-	2	3	3

GRAPH THEORY

Learning Objectives:

The Course is designed to:

1. Master Structural Foundations: Define and manipulate basic graph types, subgraphs, isomorphism, trees, and directed networks.
2. Analyze Connectivity Metrics: Evaluate paths, components, cuts, bridges, and distances to determine overall graph stability.
3. Solve Optimization Problems: Apply structural traversal rules and algorithmic models to resolve shortest path and routing issues.

UNIT-I

Introduction-finite and infinite graphs- Definition - Examples - Incidence and Degrees - Definition - Theorem 1,2- Isolated vertex, Pendent vertex, Null Graph, Isomorphism- Problems - Subgraphs - Definition-Theorems-Operations on graphs-Definition theorem-1-Problems.

(Chapter 2 : Section 2.1 to 2.4, 2.9)

UNIT-II

Introduction-Walks, Trails and Paths - Definitions Theorem-1,2,3 - Connectedness and Disconnected graph and Components- Definitions - Theorems - Definition - Distance - Theorems - Cut point - Bridge – Blocks - Connectivity.

UNIT-III

Introduction - Eulerian Graphs - Definition - Lemmas - Theorem - Konigsberg Bridge problem – Fleury's Algorithms - Hamiltonian graphs - Definitions - Theorems - Lemma -Closure - Theorems.

UNIT-IV

Introduction - Properties and Characterization of Trees - Pendent vertices In Trees -Theorems - Distance and Centre of a tree - problems - Spanning trees - Definition-Theorem.

UNIT-V

Introduction - Definition - Basic properties definitions - Theorems - Paths and connections
-Theorems - Definition - Digraphs and matrices - Definitions - Theorems, Shortest Path problem.

TEXT BOOK

1. S.Arumugam, S.Ramachandran, Invitation to Graph theory, Scitech Publications, Chennai, 2001.

REFERENCE BOOKS

1. John clark and Derek Allan Holton,A first book at graph theory, Allied publishes.
2. S.Kumaravelu and Susheela Kumaravelu,Graph theory,Publishers Authors C/o.182, Chidambara Nagar, Nagarkoil - 629 002.
3. Introduction To Complex Analysis.S. Ponnuswamy, Narosa publishers 1993.

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO1: Explain the fundamental concepts of graph theory including graphs, subgraphs, degrees, isomorphism, and graph operations.

CLO2: Analyze graph structure using paths, trails, circuits, connectedness, components, cut vertices, bridges, and connectivity, concepts.

CLO3: Apply the properties and characterization of Eulerian and Hamiltonian graphs to solve graph-theoretic problems.

CLO4: Investigate the properties of Trees, spanning trees, centers, and distances in graphs and apply them in problem-solving.

CLO5: Analyze digraphs, graph matrices, and shortest path problems and apply graph-theoretic methods to practical situations.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	1	1	1	-	3	2	1
CLO2	3	3	2	1	1	-	3	2	2
CLO3	3	3	2	1	2	-	3	3	2
CLO4	3	3	3	1	2	-	3	3	2
CLO5	3	3	3	2	2	-	2	3	3

SKILL BASED ELECTIVE COURSE – I

VISUAL BASIC PRACTICAL

Learning Objectives:

The Course is designed to:

- 1.To familiarize students with the VB programming environment and basic controls
- 2.To develop GUI-based applications using text boxes, buttons, and combo boxes
- 3.To implement mathematical and logical programs using VB
- 4.To use advanced VB controls like Timer, Scroll bars, and Menu systems
- 5.To develop programs for sorting, statistical and trigonometric computations

1. In VB, Create a project that display the current data and time. Use VB Variable now and the format Library functions.

2. Write a program for the following List of Practicals.

- i) To enter and display text, using text box and command button.
- ii) To Convert temperature in Fahrenheit to Centigrade or Vice – Versa.
- iii) To Select any one from a list, U combo box to display choices.
- iv) To Calculate factorial of a given number.
- v) To Illustrate the use of Timer control
- vi) To Illustrate the Usage of Scroll bars.
- vii) To Illustrate the Usage of Dropdown menus
- viii) To Illustrate the Usage of Menu enhancement
- ix) To Illustrate the Usage of Pop – Up menu

- x) To Illustrate the Usage of Input boxes
- xi) To find smallest of n numbers
- xii) To find the sine of angle
- xiii) To Sort list of numbers in ascending/descending order.
- xiv) To Determine sum and average of given number

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Course Learning Outcome

Students will be able to

CLO1:Create VB projects using built-in functions, variables, and controls

CLO 2:Design GUI applications using text boxes, command buttons, and combo boxes

CLO 3:Implement logical and mathematical programs using VB

CLO 4:Use advanced controls like Timer, Scroll bars, and Menu systems

CLO 5:Develop programs for sorting, statistical calculations, and mathematical functions

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	3	2	2	1	3	2	2
CLO2	3	2	3	2	2	1	3	2	2
CLO3	3	3	3	3	2	1	3	3	2
CLO4	2	2	3	2	2	1	2	2	2
CLO5	3	3	3	3	2	1	3	3	2

SEMESTER-IV

VECTOR CALCULUS AND FOURIER SERIES

Learning Objectives:

The Course is designed to:

1. Analyze 3D Fields: Master the use of gradient, divergence, and curl to measure rates of change, fluid expansion, and rotational forces in physical space.
2. Simplify Complex Integration: Use Green's, Stokes's, and Gauss divergence theorems to convert difficult multi-dimensional integrals into simpler forms.
3. Deconstruct Periodic Waves: Break down complex engineering signals and periodic functions into basic sine and cosine components using full and half-range Fourier series.

UNIT – I

VECTOR DIFFERENTIATION:

Scalar and Vector point functions – Level surfaces - Directional derivative of a scalar point function – Gradient of a scalar point function – Summation notation for gradient – Gradient of $f(\mathbf{r})$ - Divergence and Curl of a vector point function – Solenoidal vector - Irrotational vector - Summation notation for divergence and curl- Laplacian differential operator- Problems.

UNIT – II

VECTOR INTEGRATION:

Line integrals - Surface integrals- Volume integrals -problems.

UNIT – III

VECTOR INTEGRATION:

Integral theorems (without proof) - Gauss Divergence theorem – Green's theorem in a plane - Stoke's theorem- Problems only.

UNIT – IV

FOURIER SERIES:

Periodic functions- Fourier series of function having 2π period.(Chapter I: Sections 1.1-1.3)

UNIT – V

FOURIER SERIES(Contd):

Half range Fourier Series : Half range cosine Series - Half range sine Series- Parseval's theorem

TEXT BOOKS:

1. P.R. Vittal and Malini, Vector Analysis Margham Publications, Chennai, 2000.

REFERENCE BOOKS:

1. P. Kandasamy & K. Thilagavathi, Mathematics For B.Sc Branch-I, Volume I, S. Chand and Company Ltd., New Delhi, First edition, 2022.
2. P. Duraipandian And Laxmi Duraipandian, Vector Analysis, 2005.
3. Erwin Kreyzig, Advanced Engineering Mathematics, Wiley and Sons, Tenth edition, 2016.

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO 1: Discuss the geometrical and physical significance of Vector Differentiation and to apply them.

CLO 2: Evaluate the line integrals, surface integrals and volume integrals.

CLO 3: Determine if a vector field is conservative and find the scalar potential of the conservative field.

CLO 4: Identify periodic functions and to express functions as Fourier series

CLO 5: Express functions as half range Fourier series.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	3	2	1	1	-	3	3	2
CLO2	3	3	3	1	2	-	3	2	3
CLO3	3	3	3	2	2	-	3	3	3
CLO4	3	2	2	3	2	-	2	3	3
CLO5	3	3	2	3	2	-	2	3	13

LATEX-PRACTICAL

Learning Objectives:

The Course is designed to:

1. To enable the Students to Prepare Research Articles in Latex Format.

LIST OF PRACTICALS:

1. Type a Document in different alignments (Left, Right, Center, Justify).
2. Type a Letter for applying a job.
3. Type your own Bio– Data.
4. Draw a Table structure.
5. Type a given Mathematical expression using Differentiation, Integration and Trigonometry.
6. Type a given Mathematical expression using all expression.
7. Type a given expression using all in equalities.
8. Type of given Article.
9. Draw any picture and insert in Latex file.
10. Type a given Question paper.

TEXT BOOKS:

1. David F Griffiths and Desmond J. Higham, *Learning LaTeX*, SIAM(Society for Industrial and Applied Mathematics)Publishers, Phidelphia, 1996.

REFERENCE BOOKS:

1. Nambudiripad, K.B.M., 2014. LaTeX for beginners. Narosa Publishing House private limited, New Delhi.
2. Martin J. Erickson and Donald Bindner, A student's Guide to the Study, Practice and Tools of Modern Mathematics, CRC Press, Boca Raton, FL, 2011.
3. L. Lamport, LATEX: A Document Preparation System, User's Guide and Reference Manual, Addison-Wesley, New york, Second edition, 1994.

Website and e-Learning Source:

<https://nptel.ac.in>

***** Handled and Evaluated By Mathematics Staffs**

Course Learning Outcome

After completion of the course, the students will be able to

CLO1:Make different Alignments in a document and an Application for a job

CLO2:Generate Bio-Data and Table Structures.

CLO3:Create Mathematical Statements using LaTeX.

CLO4:Prepare Articles and Inserting Pictures.

CLO5:Prepare Question paper and Power Point presentation in LaTeX format.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	2	1	1	3	3	-	1	1	3
CLO2	2	1	1	3	3	-	1	1	3
CLO3	3	2	2	3	3	-	3	2	3
CLO4	2	1	1	3	3	-	2	2	3
CLO5	2	2	1	3	3	-	2	2	3

ELECTIVE SUBJECTS - II

NUMBER THEORY

Learning Objectives:

The Course is designed to:

1. Understand the Division Algorithm, Greatest Common Divisors (GCD), the Euclidean Algorithm, and the Fundamental Theorem of Arithmetic.
2. Learn to solve linear, quadratic, and systems of linear congruences, including applications of the Chinese Remainder Theorem.
3. Solve specific polynomial equations with integer solutions

UNIT – I

The Divisibility algorithm-Prime and Composite numbers-Fibonacci and Lucas numbers-Fermat numbers. (Chapter – 2, Sections: 2.1,2.5-2.7)

UNIT – II

Greatest Common Divisor-The Euclidean algorithm-Fundamental theorem of arithmetic-Least Common Multiple-Linear Diophantine Equations. (Chapter – 3 Sections: 3.1-3.5)

UNIT - III

Congruences-Linear Congruences-The Pollard Rho Factoring method. (Chapter – 4 Sections: 4.1-4.3)

UNIT - IV

Wilson theorem-Fermat's Little theorem-Pseudoprimes -Euler's theorem. (Chapter – 7 Sections: 7.1-7.4)

UNIT - V

Finite Continued Fractions-Infinite Continued Fractions-Pythagorean theorem. (Chapter – 12 Sections:12.1,12.2,13.2-1)

TEXT BOOK:

1. Elementary number theory with applications – Thomas Koshy, Academic Press, 2007

REFERENCE BOOKS:

1. Elementary Number Theory, D.M. Burton, Universal book stall, New Delhi, 2001.

2. Introduction to the theory of number, Ivan Niven, H.S. Zuckerman, Wiley Easter New Delhi, 3rd edition, 1989.
2. A Classical Introduction to Modern Number Theory, K. Ireland & M. Rosen, Springer Verlag Newyork, 1972.

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO1: Understand the Fundamental Theorem of Arithmetic, properties of prime numbers

CLO2: Use algorithms like the Euclidean Algorithm to compute the Greatest Common Divisor (GCD)

CLO3: Apply modular arithmetic and solve linear/system congruences. This includes utilizing the Chinese Remainder Theorem to solve simultaneous linear congruences.

CLO4: Comprehend and apply fundamental theorems, such as Fermat's Little Theorem, Wilson's Theorem, and Euler's Totient Theorem.

CLO5: The learner can demonstrate that exactly one of x or y is even, explicitly prove the formula for primitive triples in terms of two integers, m and n .

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	1	1	1	-	3	2	2
CLO2	3	2	2	1	1	-	3	2	2
CLO3	3	2	3	1	2	-	3	2	2
CLO4	3	3	2	2	1	-	3	2	3
CLO5	3	3	3	1	1	-	3	3	2

NUMERICAL METHODS

Learning Objectives:

The Course is designed to:

1. Understand, quantify, and minimize floating-point, round-off, and truncation errors inherent in numerical computations.
2. Introduce numerical techniques for finding roots of non-linear algebraic/transcendental equations and solving systems of linear equations.
3. Develop methods for numerical differentiation, numerical integration (quadrature), and solving ordinary differential equations.

UNIT – I

Method of successive approximation - The Bisection method - The method of false position
_Newton Raphson Method. (Chapter – 2 Sections: 2.1 – 2.5)

UNIT – II

Finite Differences – Forward Differences – Backward Differences –Symbolic relations and separation of symbols - Detection of Errors using difference tables - Differences of a polynomial.
(Chapter – 3 Sections:3.1 – 3.3)

UNIT - III

Numerical Differentiation: Newton's forward and backward difference formulas - Numerical Integration : Trapezoidal rule - Simpson's 1/3 rule - Simpson's 3/8 rule.
chapter – 6 sections: 6.1 – 6.2, 6.4 (6.4.1, 6.4.2, 6.4.3))

UNIT - IV

Solution of Linear systems : Direct Methods - Gaussian elimination method - Gauss Jordan method, LU decomposition method . Iterative methods - Jacobian's method - Gauss Seidal Method. (Chapter – 7 Sections: 7.5, 7.5.1, 7.5.2, 7.5.3, 7.6)

UNIT - V

Solution of Ordinary Differential Equations (First Order Differential Equations only): Taylor's series (1st order only) - Euler's method - Runge-Kutta Methods – I and II order. (Chapter – 8 Sections: 8.1, 8.2, 8.4, 8.5)

TEXT BOOK:

1. Introductory Methods of Numerical analysis by S.S.Sastry,, Prentice Hall of India Pvt Ltd, New Delhi 2000

REFERENCE BOOKS:

1. Numerical Methods by. Balagurusamy, Tata Me Graw Hill Publishing Company Ltd, NewDelhi, 2002
2. Numerical Analysis by G.Shanker Rao, New Age International Publishers Fourth Edition
3. Engineering Numerical Methods by T.K.Manickavasagam and Narayanan S.Viswanathan & Co, Chennai 1998

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO1:Find roots of algebraic and transcendental equations and solve large systems of linear equations using direct and iterative methods.

CLO2:Be able to find the derivatives using Newton's forward difference formula, Newton's backward difference formula.

CLO3:Be able to derive Trapezoidal rule, Simpson's $1/3$ – rule, Simpson's $3/8$ – rule.

CLO4:Apply numerical techniques to solve initial and boundary value problems in ordinary and partial differential equations.

CLO5:Be able to find the solution of ordinary differential equation of first order by Taylor and Runge-Kutta methods

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	1	1	1	-	3	2	2
CLO2	3	2	2	1	1	-	3	2	2
CLO3	3	3	3	1	2	-	3	3	2
CLO4	3	3	2	2	1	-	3	2	3
CLO5	3	3	3	1	1	-	3	3	1

SKILL ENHANCEMENT COURSE

QUANTITATIVE APTITUDE AND REASONING

Learning Objectives:

The Course is designed to:

- Remembering the meaning of HCF and LCM of numbers.
- Understanding the concept of percentage on simple problems.
Analyzing the concepts of ratio and proportion.

UNIT– I

Numbers-H.C.F and L.C.M. of Numbers. (Chapter – 1 & 2)

UNIT– II

Decimal Fractions–Simplification. (Chapter – 3 & 4)

UNIT– III

Square Roots and Cube Roots–Average. (Chapter – 5 & 6)

UNIT– IV

Problems on Numbers-Problems on Ages. (Chapter – 7 & 8)

UNIT– V

Surds & Indices–Percentage. (Chapter – 9 & 10)

TEXT BOOKS:

1. R.S.Aggarwal, Quantitative Aptitude for Competitive Examinations, S.Chand co Ltd., 152.

Anna Salai, Chennai,2010

REFERENCE BOOKS:

1. Quantitative Aptitude“by Abhijit Guha,Tata Mc Graw Hill Publishing Company Limited,
New Delhi (2005)

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO1:Perform basic mathematics in Numbers.

CLO2:Understand Decimal Fractions and Simplification.

CLO3 :Develop basic concept of Square Roots and Cube Roots and Average.

CLO4 :Explain Problems on Numbers-Problems on Ages.

CLO5:Critique and evaluate quantitative arguments that utilize mathematics, statistical and quantitative informations.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	2	1	1	-	3	2	1
CLO2	3	2	2	1	1	-	3	2	1
CLO3	3	3	2	2	2	-	3	2	2
CLO4	3	3	2	2	2	-	3	2	2
CLO5	3	3	3	2	2	-	3	3	2

SEMESTER-V

ABSTRACT ALGEBRA

Learning Objectives:

The Course is designed to:

1. Identify the Algebraic structures like Groups and Rings.
2. Understand about Structure preserving maps.
3. Enabling to construct Quotient rings.
4. To solve congruence problems.

UNIT-I:

Group Theory: Definition of a Group -Some Examples of groups – Some Preliminary Lemmas – Subgroups- A counting principle.

Chapter - 2 (sections 2.1 - 2.5)

UNIT-II:

Group Theory: - Normal subgroups and Quotient groups - Homomorphisms – Automorphisms

Chapter - 2 (sections 2.6 - 2.8)

UNIT-III:

Group Theory: - Cayley's Theorem- Permutation groups-Another Counting Principle

Chapter - 2 (sections 2.9 - 2.11)

UNIT-IV:

Ring Theory: Definition and examples of Rings-Some special classes of Rings- Homomorphisms - Ideals and Quotient Rings-More ideals and Quotient Rings. Chapter - 3 (sections 3.1 - 3.5)

UNIT-V:

Ring Theory: The field of Quotients of an Integral Domain- Euclidean Rings–A particular Euclidean Ring. Chapter - 3 (sections 3.6 - 3.8)

TEXT BOOKS:

1. I.N. Herstein, Topics in Algebra, Second Edition, Wiley Eastern Ltd., New Delhi 2022.

REFERENCE BOOKS:

- 1.A.R. Vasishtha, &A.K Vasishtha ,A first course in Modern Algebra, Krishna PrakashanPvt.Ltd.,Meerut, 2023.
2. V.K.Khanna,S.K Bhambri,A Course in Abstract Algebra,Fifth Edition,Vikas Publishing House Pvt.Ltd.,Noida ,2016
3. K.ViswanathaNaik, Modern Algebra, Emerald Publishers,135 Anna salai, Chennai – 2, 1988 & 2001

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO1: Know the basic concepts of Groups and Subgroups.

CLO2: Understand about Homomorphisms and Isomorphisms.

CLO3: Apply permutation concepts for solving problems.

CLO4: Analyze the concepts of Rings and Ideals.

CLO5: Demonstrate the properties of Euclidean Rings.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	1	1	2	-	3	2	1
CLO2	3	3	2	2	3	-	3	3	2
CLO3	2	3	3	2	3	-	2	2	3
CLO4	3	3	2	2	3	-	3	3	2
CLO5	3	3	3	3	3	-	3	2	3

REAL ANALYSIS – I

Learning Objectives:

The Course is designed to:

1. Classify sets as countable or uncountable using bijective mappings.
2. Apply the Least Upper Bound (Supremum) property to establish the completeness of real numbers.
3. Prove sequence convergence directly using the formal ε -N definition.

UNIT-I:

Functions – Real Valued functions – Equivalence countability – Real numbers – Least upper bound (Sections 1.3 to 1.7) Sequence of real numbers – definition of sequence and subsequence – Limit of a sequence – Convergent sequences – divergent sequences. (Sections 2.1 to 2.4)

UNIT-II:

Bounded sequences – Monotone sequences – operations on convergent sequences – operations on divergent sequences – Limit superior and limit inferior – Cauchy sequences (Sections 2.5 to 2.10).

UNIT-III:

Convergent and divergent series of real numbers – series with non-negative terms – Alternating series – conditional convergence and absolute convergence – Rearrangements of series – Test for absolute convergence – series whose terms form a non increasing sequence (Sections 3.1 to 3.7)

UNIT-IV:

The Class $\mathcal{I}^2$ – Limit of a function on the real line – metric spaces – Limit in metric spaces. (Sections 3.10, 4.1 to 4.3).

UNIT-V:

Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space – open sets – closed sets – Discontinuous functions on $\mathbb{R}^1$. (Sections 5.1 to 5.6).

TEXT BOOKS:

1 Richard R. Goldberg, Methods of Real Analysis – Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. D. Somasundaram and B.Choudhary, A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, Third Reprint, 2007.

2. Tom. M. Apostel, Mathematical Analysis, Narosa Publications, New Delhi, 2002.

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO1: Define basic structural elements of the real line system including real-valued functions, bounds, suprema/infima, and distinguish between countable and uncountable sets.

CLO2: Demonstrate formal sequence behaviors by constructing proofs for convergence or divergence using ε -N limits, monotone behavior, and the Cauchy Criterion.

CLO3: Evaluate infinite series of real numbers to determine whether they converge absolutely, conditionally, or diverge, using appropriate structural tests and understanding term rearrangements.

CLO4: Apply functional limits and structural norm concepts to transition from the real line framework into abstract $\mathbb{R}^2$ and general metric spaces.

CLO5: Systematically analyze functions for continuity and classify topological properties of sets (open, closed, closure, limit points) within general metric spaces.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	2	1	-	-	3	2	2
CLO2	3	3	3	2	1	-	3	3	3
CLO3	3	3	2	2	-	-	2	2	3
CLO4	3	2	3	3	-	-	3	3	2
CLO5	3	2	3	3	-	-	3	2	2

OPERATIONS RESEARCH

Learning Objectives:

The Course is designed to:

1. Optimize Limited Resources: Formulate and solve linear programming, transportation, and assignment models to maximize profits or minimize costs under constraints.
2. Streamline Workflows and Operations: Apply sequencing and network scheduling (PERT/CPM) techniques to minimize project durations, machine idle times, and operational delays.
3. Enhance Strategic Decision-Making: Evaluate competitive business scenarios and conflict situations systematically using game theory principles.

UNIT-I

Introduction to operations Research-Meaning, scope, Importance, Applications, OR, models, Limitations, phases of OR – Linear programming problem (L.P.P) – Mathematical formulation – Illustrations on Mathematical formulations of L.P.P's - Graphical solution/Method - some exemption cases – Simplex Method-Big M- Method, (Surplus & Artificial Variable)- without algorithms

Chapter 1: sections 1.1, 1.5 & 1.6;

Chapter 2: section 2.1 to 2.4

Chapter 3: section 3.1 to 3.3

Chapter 4: 4.1 to 4.4

UNIT- II

Transportation problem: Introduction- Mathematical formulation - Initial Basic feasible solution – North West Corner Rule- Matrix Minima Method - Vogel's Approximation Method – Degeneracy in TP – MODI Method for optimal solutions- some exemption cases (Unbalanced Maximization case in TP)

Assignment problem: Introductions – Mathematical formulation - Hungarian method- special cases in AP (unbalanced AP & Maximization Case in AP).

Chapter 10 : 10.1,10.2,10.8,10.9,,10.10,10.12 ,10.13

Chapter 11 : 11.1 to 11.4

UNIT-III

Sequencing problem – Introduction – problems of sequencing - Basics in sequencing - n jobs to be operated on two Machines – n jobs to be operated on Three Machines -n jobs to be operated on M Machines. Chapter 12: Section 12.1 to 12.6

UNIT IV

Game theory - Games and strategies - Introduction - same basic terms - Two person Zero sum game
– The maxima and minima principle games - saddle point - Dominance property- Mixed strategies
- Graphic solution 2 x n and m x 2 games using algebraic Method.

Chapter 17 : section 17.1 to 17.7

UNIT V

Introduction - Basic terminologies - Rules of constructing a project Network - Network Computations
- Floats - Programme Evaluation Review Technique (PERT) - Basic difference between PERT
and CPM -Problems based on CPM and PERT

Chapter 25 : 25.1 to 25.11

TEXT BOOK:

1. P.K.Gupta, Man Mohan, Kanti Swarup ,Operations Research (9th Edition),2001-Sultan Chand & Sons Educational Publishers -New Delhi.

REFERENCE BOOKS:

1. P.K. Gupta & D.S Hira Operations Research (Second Edition)
2. S. Kalavathy , Operations Research (Fourth Edition), Vikas Publishing House , Chennai.2012
3. P.R. Vittal , V. Malini , Operations Research,Margam Publications,2012

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO1 : Explain the fundamentals of operations research and formulate Linear Programming Problems (LPPs) arising from real-life situations.

CLO2 : Solve Linear Programming Problems using graphical methods, Simplex method, Big-M method, and related optimization techniques.

CLO3 : Apply Operations Research techniques such as Transportation, Assignment, and

Sequencing models to obtain optimal solutions.

CLO4 : Analyze decision making situation using Game Theory and determine optimal strategies for competitive environments.

CLO5: Construct and analyze project networks using CPM and PERT techniques for project Planning , scheduling, and control.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	2	1	1	-	3	2	1
CLO2	3	3	3	1	2	-	3	3	2
CLO3	3	3	3	2	2	-	2	3	2
CLO4	2	3	3	2	2	-	2	3	2
CLO5	2	3	3	2	3	-	2	3	3

ELECTIVE SUBJECTS – III

INTRODUCTION TO AI

Learning Objectives:

The Course is designed to:

To know about the Database system, Database structure, Database objects and various backup recovery concepts.

UNIT I

Introduction- What is AI?- The foundations of Artificial Intelligence- The History of Artificial Intelligence- Applications of AI

UNIT II

Intelligent Agents -Agents and Environments-Good Behavior: The concept of Rationality-The Nature of Environments-The Structure of Agents

UNIT III

Solving problems by Searching-Example Problems-Problem-Solving Agents and Heuristic –Functions- Introduction to Machine Learning for Problem Solving

UNIT IV

Beyond Classical Search-Logical Search Algorithms and Optimization Problems-Local Search in Continuous spaces

UNIT V

Games – Introduction-Optimal Decision in Games-Alpha - Beta Pruning-Monte Carlo Tree Search-Reinforcement Learning

TEXT BOOK(s):

1. Stuart Russell and Peter Norvig, Artificial Intelligence, A Modern Approach, Third Edition

CHAPTERS

Unit I - Chapter 1

Unit II - Chapter 2

Unit III - Chapter 3

Unit IV - Chapter 4

Unit V - Chapter 5

REFERENCE BOOK:

1. Tutorials Point https://www.dcehvp.com/E-Content/BCA/BCA-III/artificial_intelligence_tutorial.pdf
2. Patrick Henry Winston, Artificial Intelligence, 3rd Edition

***** Handled and Evaluated By Mathematics Staffs**

COURSE OUTCOMES:

The student will be able to

CO 1: Understand the fundamental concepts involved in AI with its History and applications

CO 2: Explain the various types of Agents and Environments

CO 3: Select the appropriate search methods to solve the problem.

CO 4: Describe the concept of logical search and optimization problems.

CO 5: Outline the Optimal Decision in Games with reinforcement learning

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	1	1	1	1	1	3	3	1
CLO2	3	1	1	1	1	1	3	3	1
CLO3	3	1	1	1	1	1	2	3	1
CLO4	3	1	1	1	1	1	3	3	1
CLO5	3	1	1	1	1	1	3	3	1

DISCRETE MATHEMATICS

Learning Objectives:

The Course is designed to:

1. Understand mathematical logic, statements, connectives, truth tables, and tautologies
2. Apply normal forms and rules of inference for the statement calculus
3. Study the predicate calculus with quantifiers, free/bound variables, and inference theory
4. Understand relations, functions, partial ordering, and mathematical induction via Peano axioms
5. Explore lattices, Boolean algebra, Boolean functions, and free Boolean algebra

UNIT - I

Mathematical logic – Statements and Notations – Connectives – Negation – Conjunction – Disjunction – Statement formulas and Truth table – Conditional and Bi- conditional – well formed formulas. Tautologies. (Sections 1.1, 1.2.1 to 1.2.4, 1.2.6 to 1.2.8)

UNIT - II

Normal forms – Disjunctive Normal forms – Conjunctive Normal forms – Principal Disjunctive Normal forms – Principal conjunctive normal forms – ordering and uniqueness of normal forms – the theory of inference for the statement calculus – validity using truth tables – Rules of inference. (Sections 1.3.1 to 1.3.5., 1.4.1 to 1.4.2)

UNIT - III

The predicate calculus – Predicates – The Statements function, Variables and quantifiers – Predicate formulas – Free and bound variables – The universe of discourse – inference theory of the predicate calculus – Valid formulas and Equivalence – some valid formulas over finite Universes – Special valid formulas involving quantifiers – Theory of inference for the predicate calculus. (Sections 1.6.1 to 1.6.4).

UNIT - IV

Relations and ordering – Relations – Properties of binary relation in a set – Partial ordering – Partially ordered set: Representation and Associated terminology – Functions – Definition and introduction – Composition of functions – inverse functions – Natural numbers – Peano axioms – Mathematical Induction. (Sections 2.3.1, 2.3.2, 2.3.8, 2.3.9, 2.4.1., 2.4.3., 2.5.1)

UNIT - V

Lattices a partially ordered sets : Definition and Examples – Some properties of Lattices.

Boolean Algebra: Definition and example – Sub algebra, Direct Product and homomorphism – Boolean Functions – Boolean forms and free Boolean algebra – values of Boolean expression and Boolean functions. (Sections 4.1.1., 4.1.2., 4.2.1, 4.2.2, 4.3.1., 4.3.2.,)

TEXT BOOK

1. J.P. Trembly, R. Manohar, Discrete Mathematical Structure with Applications to Computer Science, Tata McGraw Hill, 2001.

REFERENCE BOOK

1. Dr. M.K.Sen and Dr. B.C.Charraborthy, Introduction to Discrete Mathematics, Arunabha Sen Books & Allied Pvt. Ltd., 8/1 Chintamani Das Lane, Kolkata – 700009, Reprinted in 2016.

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO 1: Construct truth tables and identify tautologies using logical connectives and statement formulas

CLO 2: Convert statements to normal forms (DNF/CNF/PDNF/PCNF) and apply rules of inference

CLO 3: Use predicate calculus with quantifiers; prove valid formulas and apply inference theory

CLO 4: Analyse binary relations, partial orderings, composition of functions, and prove results using mathematical induction

CLO 5: Define and apply lattices and Boolean algebra; evaluate Boolean expressions and functions

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	2	1	-	-	2	3	1
CLO2	3	2	2	2	1	-	3	3	2
CLO3	3	3	2	1	-	-	2	3	1
CLO4	3	2	1	1	-	-	2	3	2
CLO5	3	3	3	2	2	-	3	2	3

SKILL ENHANCEMENT COURSE II

C-PROGRAMMING

Learning Objectives:

The Course is designed to:

- ❖ Knowledge & Understanding of core subject
- ❖ Problem Solving & Logical Thinking
- ❖ Analytical & Computational Ability
- ❖ Communication & Presentation Skills

UNIT – I

Introduction – Basic structure of C – Programs – Character Set – Keywords and Identifiers – Constants – Variables – Data types – declaration of variables – Assigning value to variables – defining symbolic constants, operators and expressions.

UNIT – II

Reading and writing a character – formatted input and output – IF – IF ELSE – ELSE IF ladder – Switch statement – operator – GO TO Statement – WHILE – DO – FOR Statement.

UNIT – III

Array – Introducing one dimensional and two dimensional arrays – initializing two dimensional arrays. Handling of character string.

UNIT – IV

User defined functions – form of C functions – return values and their types – calling a function – three categories of functions – structures and unions – Introduction - Structure definition – giving values to members – Structure initialization – Unions.

UNIT – V

Pointers – Introduction – Understanding pointers accessing the address of a variable – Declaring and initializing pointers. File management – Introduction defining, Opening and closing a file – I/O Operation on files.

Text Book:

1 E. Balagurusamy, 1998, Programming in ANSI C, Tata McGraw Hill Publications Co., Ltd., ED. 2.1.

Reference Books:

1. Mullish Copper, 1998, The Spirit of C, Jaico Publication.

2. YashwantKanikar, 2002, Let Us C, BPB Publications.i.

***** Handled and Evaluated By Mathematics Staffs**

Course Learning Outcome

CLO 1:Understand the basic structure of C programs, data types, variables, constants, and operators

CLO 2;Apply control structures — if-else, switch, loops (while, do-while, for) and I/O functions

CLO 3:Implement arrays (1D & 2D) and handle character strings in C programs

CLO 4:Design and use user-defined functions, structures, and unions in C programming

CLO 5:Apply pointers and perform file management operations including I/O on files

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	2	1	2	1	2	3	2
CLO2	3	3	3	2	2	1	2	3	2
CLO3	3	3	3	2	3	2	2	3	3
CLO4	3	3	3	2	3	2	2	3	3
CLO5	3	3	3	2	3	2	2	2	3

SEMESTER-VI

LINEAR ALGEBRA

Learning Objectives:

The Course is designed to:

1. Introduce the fundamental concepts of Vector Space, Subspace, Linear Combinations and System of Linear equations.
2. To study Linear Transformations and their matrix representation, null space and its properties.
3. To provide knowledge of inner product spaces, norms, orthogonality and adjoint operators.

UNIT-I :

Introduction-Vector Spaces-Subspaces-Linear Combinations and System of linear equations.

(Chapter :1 Sections : 1.1-1.4)

UNIT-II :

Linear Dependence and Linear Independence-Bases and Dimension. (Chapter :1 Sections : 1.5-1.6)

UNIT-III :

Linear Transformations, Null spaces and Ranges. The matrix representation of a linear transformation-Composition of linear transformations and Matrix multiplication-Invertibility and Isomorphisms.

(Chapter :2 Sections : 2.1-2.4)

UNIT-IV :

Inner products and Norms-The Gram-Schmidt Orthogonalization process and Orthogonal Complements-The Adjoint of a linear operator.

(Chapter :6 Sections : 6.1-6.3)

UNIT-V :

Normal and Self adjoint operators-Unitary and Orthogonal operators and their matrices (Excluding orthogonal operators on $\mathbb{R}^2$)-Orthogonal projections and the Spectral Theorem.

(Chapter :6 Sections : 6.4-6.6)

TEXT BOOK :

Stephen H.Friedberg, Arnold J.Insel Lawrence E.Spence, “ Linear Algebra”, Prentice Hall India, 5th edition.

REFERENCE BOOKS :

1. Arumugam.S and Issac.A, 2014, “Modern Algebra”.
2. Sharma J.N and Vashistha A.R, 1981, “Abstract Algebra”.

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO1 : Explain the concept of Vector Spaces, Subspaces, Linear Combination, Linear dependence, Linear independence and Solve system of linear equations.

CLO2 : Analyze and apply linear transformations find kernel, range and represent transformations using matrices.

CLO3 : Use inner products, norms and Gram-Schmidt orthogonalization to construct orthogonal and orthonormal bases.

CLO4 : Identify and analyze adjoint, normal, self-adjoint, unitary and orthogonal operators and spectral theorem.

CLO5 : Develop mathematical thinking and apply linear algebra techniques in higher mathematics, statistics, physics, computer science and engineering applications.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	3	3	3	2	-	3	3	2
CLO2	3	3	3	3	2	-	3	3	2
CLO3	3	3	3	2	2	-	3	2	2
CLO4	3	3	3	2	2	-	3	3	2
CLO5	3	3	3	3	2	-	3	3	2

REAL ANALYSIS – II

Learning Objectives:

The Course is designed to:

1. A curated checklist of core theorems you absolutely must know how to prove for the exam.
2. A breakdown of typical errors students make when trying to meet these objectives (e.g., confusing pointwise vs. uniform convergence).
3. Sample problem sets mapped directly to these specific learning goals.

UNIT-I:

More about open sets – connected sets – bounded sets and totally bounded sets – complete metric spaces. (Sections 6.1 to 6.4)

UNIT-II:

Compact metric spaces – continuous functions on compact metric spaces – continuity of the inverse function – uniform continuity. (Sections 6.5 to 6.8)

UNIT-III:

Sets of measure zero – definition of the Riemann integral – Existence of the Riemann integral – Properties of the Riemann integral (Sections 7.1 to 7.4)

UNIT-IV:

Derivatives – Rolle's theorem – The law of the mean – Fundamental theorem of calculus. (Sections :7.5 to 7.8)

UNIT-V:

Pointwise convergence of sequences of functions – uniform convergence of sequences of functions – consequences of uniform convergence – convergence and uniform convergence of series of functions (Sections :9.1 to 9.4)

TEXT BOOKS:

1. Richard R. Goldberg, Methods of Real Analysis – Oxford and IBH Publishing co, Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. D. Somasundaram and B.Choudhary, A First Course in Mathematical Analysis, Narosa Publishing House, Third Reprint, 2007.
2. Tom. M. Apostel, Mathematical Analysis, Narosa Publications, New Delhi, 2002.

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO1 (Metric Topology): Analyze and distinguish the structural differences between bounded, totally bounded, connected, and complete metric spaces, providing rigorous proofs or counterexamples where necessary.

CLO2 (Continuity & Compactness): Evaluate the behavior of continuous functions on compact domains, and apply the principles of uniform continuity and inverse function mappings to topological problems.

CLO3 (Integration Theory): Formulate and evaluate upper and lower Riemann sums, and utilize Lebesgue's criterion to prove whether a given bounded function is Riemann integrable based on its set of discontinuities.

CLO4 (Differential Calculus): Construct and execute rigorous proofs for foundational calculus theorems (Rolle's, Mean Value Theorems, and both parts of the Fundamental Theorem of Calculus).

CLO5 (Functional Convergence): Determine and contrast pointwise vs. uniform convergence for sequences and series of functions using precision tools like the Weierstrass M-test and the M_n -test.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	3	3	2	2	-	3	3	1
CLO2	3	2	3	2	2	-	3	3	1
CLO3	3	3	3	1	2	-	3	3	2
CLO4	3	2	2	1	1	-	2	2	2
CLO5	3	3	3	2	2	-	3	3	3

COMPLEX ANALYSIS

Learning Objectives:

The Course is designed to:

1. Apply concept and consequences of analyticity and C-R equations.
2. Understand the concept of mappings and transformations.
3. Compute complex contour integrals and applying Cauchy's integral in various versions.
4. Understand zeros and singularities of an analytic function, apply their properties in the evaluation of definite integral.

UNIT-I: Analytic functions

Functions of a Complex variable – Limits – Theorem on limits – Continuity – Derivatives – Differentiation formulas – Cauchy Riemann equation – conditions for differentiability – Polar coordinates – Analytic functions – Harmonic functions.

(Chapter 2: Section-11,14,15,17,18,19,20,21,22,23,25)

UNIT-II: Conformal mapping

Mappings – Mapping by exponential function – Linear transformation – The transformation $w=1z$ – Mappings by $1z$ – Linear fractional transformations (bilinear)

(Chapter 2: Section-12,13; Chapter 8: Section- 83 to 86)

UNIT-III: Complex Integration

Contour integrals – Some examples – Simply and Multiply connected domains – Cauchy integral formula – Formula for derivatives – Liouville's theorem – Fundamental theorem of Algebra – Maximum modulus principle. (Chapter 4: 39,40,46 to 50)

UNIT-IV: Sequences and Series

Convergence of sequences – Convergence of series– Taylor’s series – Laurent series– Absolute and uniform convergence of power Series – Continuity of sums of power series–Integration & differentiation of power series(Chapter5: Section-51,52,53,55,57,58,59)

UNIT-V: Residues and Poles

Isolated singular points – Residues – Cauchy Residue theorem –Residue at infinity– The three types of isolated singular points –Residues at poles – Zeros of analytical functions – Zeros and poles – Evaluation of real improper integrals (excluding poles on the real axis). (Chapter6:Section-62,63,65,66,68,69:Chapter7: Section-71)

TEXT BOOKS:

1. Complex variables and application, Seventh Edition by James Ward Brown and Ruel V. Churchill, Mc-Graw Hill Book Co., International Edition, 2009.

REFERENCE BOOKS:

1. Theodore W. Gamelan, Complex Analysis, Springer Verlag, 2008
2. Joseph Bak and Donald J. Newman, Complex analysis, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.
3. Richard A. Silverman, Introductory Complex Analysis. Dover Publications, 1972.

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO 1: Explain about analytic functions, their differentiation and continuity and to verify the Harmonic functions using analyticity conditions

CLO 2: Explain the concept of Conformal mappings and mappings by linear transformations and linear fractional transformations

CLO 3: Explain about the integrations of functions over simply and multiply connected domains and to derive the Cauchy integral formula, Liouville's theorem, Fundamental theorem of Algebra and Maximum Module Principle

CLO 4: Find the convergence the sequences and series, to derive Taylor's and Laurent's series

CLO 5: Find the nature of singularities, to find the residue of a given function at a given singular point, to Explain about zeros and poles and to evaluate real improper integrals (Excluding poles on the real axis)

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	3	3	2	1	-	3	3	2
CLO2	3	3	3	2	1	-	3	3	2
CLO3	3	3	3	2	1	-	3	3	2
CLO4	3	3	3	2	1	-	3	3	2
CLO5	3	3	3	2	1	-	3	3	2

BASIC PYTHON PRACTICAL

Learning Objectives:

The Course is designed to:

1. Foundational Data Control: Mastery over Python's core structures (Strings, Lists, Tuples, Dictionaries) and control flows (loops and conditionals) to manipulate and process data effectively.
2. Resilient Functional Architecture: Capability to build modular code using advanced functions and safeguard applications against runtime failures through structured exception handling

LIST OF PRACTICALS:

1. Program for Systemconfiguration
2. Working with Strings
3. Workin gwith Lists
4. Working with Tuples
5. Working with Dictionary
6. Working with conditional loops–if, else, elif
7. Working with conditionalexpressions–for, while,break,continue
8. Implementing programson functions
9. Working with function–formal arguments and variable length arguments
10. Working with Detecting and HandlingException
11. Working with modules
12. Working with Built-in Functions

TEXT BOOKS:

1. Wesley J.Chun, “Core Python Programming”, 2nd Edition, Pearson Education LPE, NewDelhi,2007.

REFERENCE BOOKS:

1. Mark Summerfield, Programming in Python 3, Pearson Education LPE, New Delhi, 1996.
2. Python Programming, Brain draper, kindle unlimited pvt.ltd.
3. Core Python Programming, Dr.R.Nageswara Rao, dreamtech pvtltd. Kindle.
4. The complete reference on Python, Martin.C.Brown MAC GrawHill pvt.ltd.
5. Coding for beginners using Python .Louie Stowell, kindle publishing pvt.ltd.

Website and e-Learning Source:

1. <https://www.programiz.com/python-programming>
2. <https://www.guru99.com/python-tutorials.html>
3. https://www.w3schools.com/python/python_intro.asp

***** Handled and Evaluated By Mathematics Staffs**

Course Learning Outcome

After completion of the course, the students will be able to

CLO1: Develop and execute simple Python programs.

CLO2: Write simple Python programs using conditionals and looping for solving problems.

CLO3: Decompose a Python program into functions.

CLO4: Represent compound data using Python lists, tuples, dictionaries etc.

CLO5: Read and write data from/to files in Python programs.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	1	1	3	2	2	2	2
CLO2	3	2	1	1	3	2	2	2	2
CLO3	3	2	1	1	3	2	2	2	2
CLO4	3	2	1	1	3	2	2	2	2
CLO5	3	2	1	1	3	2	2	2	2

Naan Mudhalvan Paper - Arrear Students - Re-Exam - Skill Enhancement

Course Course Title & Syllabus

For the Academic year 2026-2027 Onwards

(Semesters - II, III, IV, V & VI)

SEMESTER - II

MATHEMATICAL APTITUDE - I

Learning Objectives:

The Course is designed to:

1. To prepare the students for competitive examinations.

UNIT - I

Simplification.

UNIT - II

Logarithms.

UNIT - III

Permutations and Combinations.

UNIT - IV

Probability.

UNIT - V

Tabulation.

TEXT BOOKS:

R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S.Chand co Ltd., 152. Anna Salai, Chennai, 2010 .

REFERENCE BOOKS:

Quantitative Aptitude ‘by Abhijit Guha, Tata McGraw Hill Publishing Company Limited, New Delhi (2005).

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO 1: Apply arithmetic shortcuts and algebraic identities to solve complex calculation problems quickly and accurately.

CLO 2: Solve exponential and logarithmic equations by applying foundational laws and properties of logarithms.

CLO 3: Differentiate between arrangement and selection problems to calculate total possibilities using permutations and combinations.

CLO 4: Determine mathematical probability of real-world events utilizing counting principles and probability theorems.

CLO 5: Analyze and interpret structured numerical data from complex tables to compute growth rates, ratios, percentages, and averages.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	-	2	2	-	3	1	2
CLO2	3	2	-	2	-	-	3	-	1
CLO3	3	3	2	2	-	1	3	2	3
CLO4	3	3	3	2	-	3	3	2	2
CLO5	2	3	3	2	2	3	3	3	2

SEMESTER - III
MATHEMATICAL APTITUDE - II

Learning Objectives:

The Course is designed to:

1. To prepare the students for competitive examinations.

UNIT - I

Bar Graphs.

UNIT - II

Stocks and Shares.

UNIT - III

Alligation or Mixture.

UNIT - IV

Boats and Streams.

UNIT - V

Calendar and Clocks.

TEXT BOOKS:

R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S.Chand co Ltd., 152. Anna Salai, Chennai, 2010 .

REFERENCE BOOKS:

Quantitative Aptitude ‘by Abhijit Guha, Tata McGraw Hill Publishing Company Limited, New Delhi (2005).

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO 1: Extract, analyze, and interpret quantitative information presented in bar graphs to make informed data-driven decisions.

CLO 2: Calculate dividends, investment returns, and market values involving stocks and shares to solve commercial arithmetic problems.

CLO 3: Apply the rule of alligation to determine the ratios and prices of components when blending two or more ingredients.

CLO 4: Resolve complex speed, distance, and time equations by factoring in upstream and downstream velocities in boats and streams.

CLO 5: Determine specific days of the week across centuries using calendar codes and calculate angles and reflections using clock mechanics.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	3	1	3	2	3	2	3
CLO2	3	3	2	1	2	2	3	3	2
CLO3	3	3	2	1	1	2	3	2	2
CLO4	3	3	1	1	1	2	3	1	1
CLO5	2	3	1	1	1	2	3	1	1

SEMESTER - IV
MATHEMATICAL APTITUDE - III

Learning Objectives:

The Course is designed to:

1. To prepare the students for competitive examinations.

UNIT - I

Problems on Ages.

UNIT - II

Ratio and Proportion.

UNIT - III

Simple Interest.

UNIT - IV

Compound Interest.

UNIT - V

Odd man out and Series.

TEXT BOOKS:

R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S.Chand co Ltd., 152. Anna Salai, Chennai, 2010 .

REFERENCE BOOKS:

Quantitative Aptitude 'by Abhijit Guha, Tata McGraw Hill Publishing Company Limited, New Delhi (2005).

Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO 1: Solve age-related algebraic problems using linear equations and ratio elimination techniques.

CLO 2: Apply principles of ratio, proportion, and variations to solve scaling, mixture, and distribution problems.

CLO 3: Compute simple interest and evaluate real-world loan or investment scenarios.

CLO 4: Analyze compound interest variations (annual, half-yearly) and calculate principal depreciation or population growth.

CLO 5: Crack logical patterns in alphanumeric series and isolate anomalies using the "Odd Man Out" rule.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	2	3	2	1	2	1	3	3	2
CLO2	3	3	2	1	2	2	3	3	3
CLO3	2	2	1	2	3	3	3	3	2
CLO4	2	3	1	2	3	3	3	3	3
CLO5	1	3	3	1	3	1	3	3	3

SEMESTER - V
MATHEMATICAL APTITUDE - IV

Learning Objectives:

The Course is designed to:

1. To prepare the students for competitive examinations.

UNIT - I

Percentage.

UNIT - II

Profit and Loss.

UNIT - III

Partnership.

UNIT - IV

True Discount.

UNIT - V

Bankers Discount.

TEXT BOOKS:

R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S.Chand co Ltd., 152. Anna Salai, Chennai, 2010 .

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Website and e-Learning Source:

<https://nptel.ac.in>

Course Learning Outcome

Students will be able to

CLO 1: Compute absolute and relative percentage variations to analyze population metrics, asset depreciation, and growth trends.

CLO 2: Evaluate retail trade metrics, including Cost Price, Selling Price, and successive discounts, to determine net profit or loss margins.

CLO 3: Formulate equitable profit and loss allocation models for simple and compound corporate partnerships based on capital and time investment.

CLO 4: Deconstruct commercial credit transactions to calculate the Present Worth and True Discount of future debts.

CLO 5: Calculate Banker's Discount, Banker's Gain, and legal grace periods for bills of exchange in commercial banking scenarios.

For Mapping with POs and PSOs

	Pos						PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	3	1	2	2	-	3	2	3
CLO2	3	3	2	-	2	-	3	3	2
CLO3	3	2	3	-	1	-	3	2	2
CLO4	3	3	2	2	1	2	3	3	3
CLO5	3	3	2	2	1	3	3	3	3

SEMESTER - VI
MATHEMATICAL APTITUDE - V

Learning Objectives:

The Course is designed to:

1. To prepare the students for competitive examinations.

UNIT - I

Area.

UNIT - II

Volume and Surface.

UNIT - III

Pie chart.

UNIT - IV

Races and Games.

UNIT - V

Heights and Distance.

TEXT BOOKS:

R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S.Chand co Ltd., 152. Anna Salai, Chennai, 2010 .

REFERENCE BOOKS:

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Course Learning Outcome

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CLO 3: Compute simple interest and evaluate real-world loan or investment scenarios.

CLO 4: Analyze compound interest variations (annual, half-yearly) and calculate principal depreciation or population growth.

CLO 5: Crack logical patterns in alphanumeric series and isolate anomalies using the "Odd Man Out" rule.

For Mapping with POs and PSOs

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CLO2	3	2	2	-	-	1	3	2	1
CLO3	2	3	-	3	2	-	3	3	3
CLO4	2	3	-	-	-	-	3	2	2
CLO5	3	2	1	-	-	-	3	1	1

