ANNAMALAI UNIVERSITY

(Affiliated Colleges)

201 - B.Sc. Mathematics

Programme Structure and Scheme of Examination (under CBCS)

(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

Part	Course Code	Study Components & Course Title	Credit	Hours/Week	Maximum Marks		
					CIA	ESE	Total
		SEMESTER – I					
I	23UTAML11/ 23UHINL11/ 23UFREL11	Language – I: பொது தமிழ்– I: **தமிழிலக்கிய வரலாறு-1/** Hindi-I/ French-I	3	6	25	75	100
II	23UENGL12	General English – I	3	6	25	75	100
III	23UMATC13	Core – I : Algebra & Trigonometry	5	5	25	75	100
	23UMATC14	Core –II : Differential Calculus	5	4	25	75	100
	23UPYPE15 23UCHEE15 23UPHYE15 23UCHEEP1 23UPHYEP1	**Elective – I** Python Programming / Chemistry for Physical Sciences–I / Physics - I Chemistry for Physical Sciences Practical –I Physics Practical - I	3/2 1	5/3 2	25 25	75 75	100 100
IV	23UTAMB16 23UTAMA16	Skill Enhancement Course – 1* NME-I/ Basic Tamil – I / Advanced Tamil - I	2	2	25	75	100
	23UMATF17	Foundation Course**:** Bridge Mathematics	2	2	25	75	100
		Total	**23**	**30**			**700/800**
		SEMESTER – II					
I	23UTAML21/ 23UHINL21/ 23UFREL21	Language – II பொது தமிழ் -II: **தமிழிலக்கிய வரலாறு**-2/ Hindi-II/ French-II	3	6	25	75	100
II	23UENGL22	General English – II	3	6	25	75	100
III	23UMATC23	Core – III: Analytical Geometry of Three Dimension	5	5	25	75	100
	23UMATC24	Core –IV: Integral Calculus	5	4	25	75	100
	23UPYPE25 23UCHEE25 23UPHYE25 23UCHEEP2 23UPHYEP2	Elective - II Python Programming Lab / Chemistry for Physical Sciences–II/ Physics - II Chemistry for Physical Sciences Practical –II / Physics Practical - II	3/2 1	5/3 2	25 25	75 75	100 100
IV	23UTAMB26 23UTAMA26	Skill Enhancement Course – 2* NME-II/ Basic Tamil – II / Advanced Tamil - II	2	2	25	75	100
	23USECG27	Skill Enhancement Course – 3 Internet and its Applications (Common Paper)	2	2	25	75	100

	23UNMSD01	Language Proficiency for employability: Overview of English Communication**	2	-	25	75	100
		Total	**25**	**30**			**800/900**

		SEMESTER – III					
23UTAML31 23UHINL31/ 23UFREL31	I	Language – III பொது தமிழ் -III: **தமிழக வரலாறும், பண்பாடும்**/ Hindi-III/ French-III	3	6	25	75	100
23UENGL32	II	English – III	3	6	25	75	100
23UMATC33	III	Core -V: Vector Calculus and its Applications	5	5	25	75	100
23UMATC34		Core- VI: Differential Equations And Applications	5	5	25	75	100
23UMATE35 23UTALE35		Elective - III: Mathematical Statistics / Accountancy- Tally	3	4	25	75	100
23UMATS36	IV	Skill Enhancement Course- 4: Computational Mathematics-I	1	1	25	75	100
23UMATS37		Skill Enhancement Course-5: PHP Programming	2	2	25	75	100
		Environmental Studies	-	1			
		Total	**22**	**30**			**700**
		SEMESTER – IV					
23UTAML41/ 23UHINL41/ 23UFREL41	I	Language – IV: பொது தமிழ் -IV: **தமிழும் அறிவியலும்**/ Hindi-IV/ French-IV	3	6	25	75	100
23UENGL42	II	English – IV	3	6	25	75	100
23UMATC43	III	Core – VII: Industrial Statistics	5	5	25	75	100
23UMATC44		Core -VIII: Elements of Mathematical Analysis	5	5	25	75	100
23UMATE45 23UTALE45		Elective - IV: Mathematical Statistics Practical using R-Programming / Accountancy-Tally Practical	3	3	25	75	100
23UMATS46	IV	Skill Enhancement Course- 6: Android App development	2	2	25	75	100
23UMATS47		Skill Enhancement Course- 7: Computational Mathematics-II	2	2	25	75	100
23UEVSG48		Environmental Studies	2	1	25	75	100
		Total	**25**	**30**			**800**
		SEMESTER – V					
23UMATC51	III	Core - IX: Abstract Algebra	4	5	25	75	100
23UMATC52		Core – X: Real Analysis	4	5	25	75	100
23UMATC53		Core – XI: Fourier Series and Fourier Transform Techniques (Laplace, Fourier)	4	5	25	75	100
23UMATD54		Core – XII: Project with viva-voce	4	5	25	75	100
23UMATE55-1/ 23UMATE55-2/ 23UMATE55-3		Elective – V: Fuzzy Sets and Fuzzy Logic/ Programming Language C / Data Structures	3	4	25	75	100
23UMATE56-1/		Elective – VI: Optimization Techniques/	3	4	25	75	100

23UMATE56-2/ 23UMATE56-3		Laplace and Z Transforms/ Neural network models					
23UVALG57	IV	Value Education	2	2	25	75	100
23UMATI58		Summer Internship[++]	2	_	25	75	100
		Total	**26**	**30**			**800**
		SEMESTER – VI					
23UMATC61	I	Core – XIII: Linear Algebra	4	6	25	75	100
23UMATC62	II	Core – XIV: Complex Analysis	4	6	25	75	100
23UMATC63	III	Core – XV: Mechanics	4	6	25	75	100
23UMATE64-1/ 23UMATE64-2/ 23UMATE64-3		Elective – VII: Graph Theory & Applications / Object Oriented Programming with C++ / Algorithms	3	5	25	75	100
23UMATE65-1/ 23UMATE65-2/ 23UMATE65-3		Elective – VIII: Discrete Mathematics / Introduction to Machine Learning / Programming Language Java	3	5	25	75	100
23UMATF66	IV	Professional Competency Skill: Mathematics for Competitive Examinations-I	2	2	25	75	100
23UMATX67	V	Extension Activity	1	_	100		100
		Total	**21**	**30**			**700**
		Grand Total	**142**				**4500/4700**

Non-major (NME) Electives offered to other Departments

IV	23UMATN16	Basic Mathematics - I	2	2	25	75	100
	23UMATN26	Basic Mathematics - II	2	2	25	75	100

* PART-IV: NME / Basic Tamil / Advanced Tamil (Any one)

Students who have not studied Tamil upto 12th Standard and have taken any Language other than Tamil in Part-I, must choose Basic Tamil-I in First Semester & Basic Tamil-II in Second Semester.

Students who have studied Tamil upto 10th & 12th Standard and have taken any Language other than Tamil in Part-I, must choose Advanced Tamil-I in First Semester and Advanced Tamil-II in Second Semester.

** The course "23UNMSD01: Overview of English Communication" is to be taught by the experts from Naan Mudhalvan Scheme team. However, the faculty members of Department of English should coordinate with the Naan Mudhalvan Scheme team for smooth conduct of this course.

[++]Students should complete two weeks of internship before the commencement of V semester.

Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System for all UG courses including Lab Hours

First Year – Semester-I

Part	List of Courses	Credit	No. of Hours
Part I	Language – Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	14
Part IV	Skill Enhancement Course SEC-1 (NME-I)	2	2
	Foundation Course	2	2
		23	**30**

Semester-II

Part	List of Courses	Credit	No. of Hours
Part I	Language – Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	14
Part IV	Skill Enhancement Course -SEC-2 (NME-II)	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific)	2	2
		23	**30**

Second Year – Semester-III

Part	List of Courses	Credit	No. of Hours
Part I	Language - Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	14
Part IV	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	E.V.S	-	1
		22	**30**

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part I	Language - Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	13
Part IV	Skill Enhancement Course -SEC-6 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -SEC-7 (Discipline / Subject Specific)	2	2
	E.V.S	2	1
		25	**30**

Third Year

Semester-V

Part	List of Courses	Credit	No. of Hours
Part III	Core Theory, Practical, Project & Elective Courses	22	28
Part IV	Value Education	2	2
	Internship / Industrial Visit / Field Visit	2	-
		26	**30**

Semester-VI

Part	List of Courses	Credit	No. of Hours
Part III	Core Theory, Practical & Elective Courses	18	28
Part IV	Professional Competency Skill	2	2
Part V	Extension Activity	1	-
		21	**30**

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	13	13	22	18	92
Part IV	4	4	3	6	4	2	23
Part V	-	-	-	-	-	1	1
Total	23	23	22	25	26	21	**140**

***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 Part IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

CREDIT DISTRIBUTION FOR U.G. PROGRAMME

Part	Course Details	No. of Courses	Credit per course	Total Credits
Part I	Tamil	4	3	12
Part II	English	4	3	12
Part III	Core Courses	15	4/5	68
	Elective Courses: Generic / Discipline Specific (3 or 2+1 Credits)	8	3	24
Part I, II and III Credits				116
Part IV	Skill Enhancement Courses / NME / Language Courses	7	1/2	15
	Professional Competency Skill Course	1	2	2
	Environmental Science (EVS)	1	2	2
	Value Education	1	2	2
	Internship	1	2	2
Part IV Credits				**23**
Part V	Extension Activity (NSS / NCC / Physical Education)	1	1	1
Total Credits for the UG Programme				**140**

Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand/Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview	
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain	
Analyze(K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge	
Evaluate(K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons	
Create(K6)	Check knowledge in specific or off beat situations, Discussion, Debating or Presentations	

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 earning 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.

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:

	POs							PSOs		
	1	2	3	4	5	6	…	1	2	…
CLO1										
CLO2										
CLO3										
CLO4										
CLO5										

<table>
<tr><td>Title of the Course</td><td colspan="7">ALGEBRA & TRIGONOMETRY</td></tr>
<tr><td>Paper Number</td><td colspan="7">CORE I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC13</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">5</td><td></td><td colspan="2">--</td><td colspan="2">5</td></tr>
<tr><td>Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="7">• Basic ideas on the Theory of Equations, Matrices and Number Theory.
• Knowledge to find expansions of trigonometry functions, solve theoretical and applied problems.</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="7">Unit I: Reciprocal Equations-Standard form–Increasing or decreasing the roots of a given equation- Removal of terms, Approximate solutions of roots of polynomials by Horner’s method – related problems.</td></tr>
<tr><td colspan="7">Unit II: Summation of Series: Binomial– Exponential –Logarithmic series (Theorems without proof) – Approximations - related problems.</td></tr>
<tr><td colspan="7">Unit III: Characteristic equation – Eigen values and Eigen Vectors-Similar matrices - Cayley – Hamilton Theorem (Statement only) - Finding powers of square matrix, Inverse of a square matrix up to order 3, Diagonalization of square matrices - related problems.</td></tr>
<tr><td colspan="7">Unit IV: Expansions of sinnθ, cosnθ in powers of sinθ, cosθ - Expansion of tannθ in terms of tan θ, Expansions of $\cos^n\theta$, $\sin^n\theta$, $\cos^m\theta\sin^n\theta$ – Expansions of $\tan(\theta_1+\theta_2+,\ldots,+\theta_n)$-Expansions of sinθ, cosθ and tanθ in terms of θ - related problems.</td></tr>
<tr><td colspan="7">Unit V: Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series - related problems.</td></tr>
<tr><td>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="7">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="7">Knowledge, problem solving, analytical ability, professional competency, professional communication and transferable skill.</td></tr>
</table>

Recommended Text	1. T. K. Manickavasagam Pillay, T. Natarajan and K. S. Ganapathy, Algebra Volume I, S. Viswanathan (Printers & Publishers) Pvt. Ltd., Reprint 2011 (Unit I). UNIT I: Chapter-VI: Sec (16-19;30) UNIT II: Chapter-III and IV 2. T. K. Manickavasagam Pillay, T. Natarajan and K. S. Ganapathy, Algebra Volume II, S. Viswanathan (Printers & Publishers) Pvt. Ltd., Reprint 2011 (Unit I). UNIT III: Chapter-II 3. S. Narayanan, T. K. Manickavasagam Pillay, Trigonometry, S. Viswanathan (Printers and Publishers) Pvt. Ltd., Reprint 2009 UNIT IV: Chapter- 3: Sec(1-5) UNIT V: Chapter- 3: Sec(2-2.3; 5-5.5) 4. S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay and Dr. P. Kandaswamy,Ancillary Mathematics, Volume-I, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2009. 5. S.Arumugam & others, Trigonometry and Fourier series, New Gamma Publications -1999
Books for Reference	1. W.S. Burnstine and A.W. Panton, Theory of equations 2. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007 3. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005 4. C. V. Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003 5. J. Stewart, L. Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012. 6. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

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

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	2	1	3	1	-	-	3	2	1
CLO3	3	1	3	1	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	-	-	3	2	1

<table>
<tr><td>Title of the Course</td><td colspan="7">DIFFERENTIAL CALCULUS</td></tr>
<tr><td>Paper Number</td><td colspan="7">CORE II</td></tr>
<tr><td>Category</td><td>Core</td><td>Year</td><td>I</td><td>Credits</td><td>5</td><td>Course Code</td><td>23UMATC14</td></tr>
<tr><td></td><td></td><td>Semester</td><td>I</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Instructional Hours per week</td><td colspan="2">Lecture
4</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice
--</td><td>Total
4</td></tr>
<tr><td>Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="7">• The basic skills of differentiation, successive differentiation, and their applications.
• Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.</td></tr>
<tr><td>Course Outline</td><td colspan="7">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
Chapter – III: Section – 1.1 to 1.6 and 2.1 to 2.2</td></tr>
<tr><td></td><td colspan="7">UNIT-II: Partial Differentiation: Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions.
Chapter – VIII : Section – 1.1 to 1.5</td></tr>
<tr><td></td><td colspan="7">UNIT-III: Partial Differentiation (Continued): Partial derivatives of a function of two variables – Maxima and Minima of functions of two variables - Lagrange’s method of undetermined multipliers.
Chapter – VIII : Section –1.7, Section 4, Section 5.</td></tr>
<tr><td></td><td colspan="7">UNIT-IV: Envelope: Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter.
Chapter – X : Section – 1.1 to 1.3</td></tr>
<tr><td></td><td colspan="7">UNIT-V: Curvature: Definition of Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutes – Radius of Curvature in Polar Co-ordinates.
Chapter – X : Section – 2.1 to 2.6</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. S.Narayanan and T.K.Manicavachagom Pillai, Calculus Volume I, S.Viswanathan (Printers&Publishers) Pvt Limited , 1987.
Reference Books	1. R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989. 2. T. Apostol, Calculus, Volumes I and II. 3. S. Goldberg, Calculus and mathematical analysis. 2. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002. 3. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010. 4. M.J. Strauss, G.L. Bradley and K. J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2007
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Find the nth derivative, form equations involving derivatives and apply Leibnitz formula

CLO 2: Find the partial derivative and total derivative coefficient

CLO 3: Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers

CLO 4: Find the envelope of a given family of curves

CLO 5: Find the evolutes and involutes and to find the radius of curvature using polar co-ordinates

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	2	1	3	-	-	-	3	2	1
CLO3	3	2	3	2	-	-	3	2	1
CLO4	3	2	3	2	1	-	3	2	1
CLO5	3	2	3	2	1	-	3	2	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">PYTHON PROGRAMMING</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">Elective - I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2"></td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UPYPE15</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">5</td><td colspan="2"></td><td>--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basic Knowledge of Programming concept</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Describe the core syntax and semantics of Python programming language.
• Discover the need for working with the strings and functions.
• Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
• Understand the usage of packages and Dictionaries</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Introduction -Python Overview - Getting Started with Python - Comments -Python Identifiers - Reserved Keywords - Variables - Standard Data Types - Operators - Statement and Expression - String Operations - Boolean Expressions
(Sec. 3.1–3.12)</td></tr>
<tr><td colspan="6">UNIT-II: Control Statements -Iteration – while Statement - Input from Keyboard (3.13 – 3.15)</td></tr>
<tr><td colspan="6">UNIT-III: Introduction - Built-in Functions - Composition of Functions - Parameters and Arguments - Function Calls - The return Statement - Python Recursive Function - The Anonymous Functions (Sec. 4.1 – 4.9)</td></tr>
<tr><td colspan="6">UNIT-IV: Text Files- Directories (Sec. 7.1 and 7.2)</td></tr>
<tr><td colspan="6">UNIT-V: Overview of OOP- Class Definition- Creating Objects- Objects as Arguments- Objects as Return Values- Built-in Class Attributes- Inheritance- Method Overriding- Data Encapsulation- Data Hiding (Sec. 8.1 – 8.10)</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	E Balagurusamy, "Introduction to Computing and Problem Solving Using Python",1st Edition, McGraw Hill India; 2016
Reference Books	1. Charles Dierbach, "Introduction to Computer Science using Python - A computational Problem solving Focus", Wiley India Edition, 2015. 2. Wesley J. Chun, "Core Python Applications Programming", 3rd Edition , Pearson Education, 2016 3. Mark Lutz, "Learning Python Powerful Object Oriented Programming", O'reilly Media 2018, 5th Edition. 4. Timothy A. Budd, "Exploring Python", Tata MCGraw Hill Education Private Limited 2011, 1 st Edition. 5. John Zelle, "Python Programming: An Introduction to Computer Science", Second edition, Course Technology Cengage Learning Publications, 2013, ISBN 978- 1590282410 6. Michel Dawson, "Python Programming for Absolute Beginers" , Third Edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-1435455009
Website and e-Learning Source	https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

Course Learning Outcome (for Mapping with POs and PSOs)

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

CLO5: Usage of Classes and Objects in python

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	2	1	3	1	-	-	3	2	1
CLO3	3	1	3	1	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	-	-	3	2	1

SEMESTER: I Part: III	23UCHEE15 Chemistry for Physical Science– I	Credit : 2 Hours : 3

Objectives of the course	This course aim state provide knowledge on the • Basics of atomic orbitals, chemical bonds, hybridization • Concepts of thermodynamics and its applications. • Concepts of nuclear chemistry • Importance of chemical industries • Qualitative and analytical methods.
Course Outline	**UNIT-I** **Chemical Bonding and Nuclear Chemistry** Chemical Bonding**:** Molecular Orbital Theory-bonding, anti – bonding
	And non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties. Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and Nuclear reactions-group displacement law. Nuclear binding energy-Mass defect-calculations. Nuclear fission and nuclear fusion-differences–Stellar energy. Applications of radioisotopes–carbon dating, rock dating and medicinal applications.
	Unit-II **Industrial Chemistry** Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted Water gas, producer gas, CNG, LPG and oil gas (manufacturing Details not required). Silicones**:** Synthesis, properties and uses of silicones. Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple super phosphate.

	UNIT-III **Fundamental Concepts in Organic Chemistry** Hybridization: Orbital overlap, hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6. Electronic effects: Inductive effect and consequences on K_a and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples. Reaction mechanisms: Types of reactions–aromaticity (Huckel'srule) – aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft'salkylationandacylation.Heterocycliccompounds:Preparation,propertiesofpyrroleandpyridine.
	UNIT-IV **Thermodynamics and Phase Equilibria** Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and second law of thermodynamics. significance. Free energy change and its importance (noderivation). Conditions for spontaneity in terms of entropy and Gibbs free energy. Relation ship between Gibbs free energy and entropy. Phase Equilibria: Phaserule – definition of termsinit. Applicationsof Phase rule to water system. Two component system-Reduced phase Rule and its application to asimple eutectic system (Pb-Ag).

	UNIT-V **Analytical Chemistry** Introductiontoqualitativeandquantitativeanalysis.Principlesofvolumetric analysis.Separationandpurificationtechniques–extraction,distillationand crystallization. Chromatography: principle and application of column, paper and thin Layer chromatography.
Extended Professional Component(isa Part of internal Component only, Not to be included In the external	Questions related to the above topics, from various competitive Examinations UPSC/JAM/TNPSC others to be solved (To be discussed during the Tutorial hours)

examination Question paper)	
Skills acquired From this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house,Chennai,firstedition,2009. 2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006. 3. S.ArunBahl,B.S.Bahl, Advanced Organic Chemistry; S.Chandand Company, NewDelhi, twentythirdedition,2012. 4. P.L.Soni,H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand&sons,NewDelhi, twentyninth edition,2007.
Reference Books	5. P.L.Soni,Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, NewDelhi, twentieth edition,2007. 6. B.R.Puri,L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co.,NewDelhi, forty seventh edition,2018. 7. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition,2014.
Website and e-learning source	**1.** https://byjus.com/jee/chemical-bonding/ 2. https://en.wikipedia.org/wiki/Fuel 3. https://www.brainkart.com/article/Fundamentals-of-Organic-Chemistry_36450/ 4. https://chem.libretexts.org/Courses/BethuneCookman_University/B-CU%3A_CH-345_Quantitative_Analysis/Book%3A_Analytical_Chemistry_2.1_(Harvey)/06%3A_Equilibrium_Chemistry/6.02%3A_Thermodynamics_and_Equilibrium_Chemistry 5. https://en.wikipedia.org/wiki/Chromatography
Course Learning Outcomes (for Mapping with Pos and PSOs) **On completion of the course the students should be able to**	

1. CO1: Gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications.
2. CO2: Evaluate the efficiencies and uses of various fuels and fertilizers
3. CO3: Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.
4. CO4: Apply various thermodynamic principles, systems and phase rule.
5. CO5:Explain various methods to identify anappropriate method for the separation of chemical components

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

SEMESTER: I **Part: III**	**23UCHEEP1** **Chemistry for Physical Science Practicals – I**	**Credit : 1** **Hours : 2**

Objectives of the course	This course aims to provide knowledge on the • basics of preparation of solutions. • principles and practical experience of volumetric analysis
Course Outline	**VOLUMETRIC ANALYSIS** 1. Estimation of sodium hydroxide using standard sodium carbonate. 2. Estimation of hydrochloric acid using standard oxalic acid. 3. Estimation of ferrous sulphate using standard Mohr's salt. 4. Estimation of oxalic acid using standard ferrous sulphate. 5. Estimation of potassium permanganate using standardsodium hydroxide. 6. Estimation of magnesium using EDTA. 7. Estimation of ferrous ion using diphenyl amine as indicator.
Reference Books	V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principles ofPractical Chemistry; Sultan Chand & sons, Second edition, 1997.
Website and E-Learning Sources	1)http://www.federica.unina.it/agraria/analytical-chemistry/volumetricanalysis 2)https://chemdictionary.org/titration-indicator/
Course Learning Outcomes (for Mapping with Pos and PSOs)On completion of the course the students should be able to CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.CO 2: design, carry out, record and interpret the results of volumetric titration. CO 3: apply their skill in the analysis of water/hardness. CO4: analyze the chemical constituents in allied chemical products	

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution toPSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

Note: Scheme for Practical Evaluation.

Volumetric Estimation – 75

Record – 10 marks
Procedure – 15marks
Results
< 2% - 50 marks
2-3% - 40 marks
3-4% - 30 marks
> 4% - 20 marks

COURSE	**ELECTIVE: I**
COURSETITLE	**PHYSICS – I**
COURSE CODE	**23UPHYE15**
CREDITS	2
HOURS	3
COURSE OBJECTIVES	To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

UNITS	**COURSE DETAILS**
UNIT-I	**WAVES, OSCILLATIONS AND ULTRASONICS:** simple harmonic motion (SHM) – composition of two SHMs at right angles (periods in the ratio 1:1) – Lissajous figures – uses – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonics: medical field – lithotripsy, ultrasonography – ultrasono imaging- ultrasonics in dentistry – physiotheraphy, 25phthalmology – advantages of noninvasive surgery – ultrasonics in green chemistry.
UNIT-II	**PROPERTIES OF MATTER:** *Elasticity*: elastic constants – bending of beam – theory of non- uniform bending – determination of Young's modulus by non-uniform bending – energy stored in a stretched wire – torsion of a wire – determination of rigidity modulus by torsional pendulum *Viscosity*: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method, *Surface tension*: definition – molecular theory – droplets formation– shape, size and lifetime – COVID transmission through droplets, saliva – drop weight method – interfacial surface tension.
UNIT-III	**HEAT AND THERMODYNAMICS:** Joule-Kelvin effect – Joule-Thomson porous plug experiment – theory – temperature of inversion – liquefaction of Oxygen– Linde's process of liquefaction of air– liquid Oxygen for medical purpose– importance of cryocoolers – thermodynamic system – thermodynamic equilibrium – laws of thermodynamics – heat engine – Carnot's cycle – efficiency – entropy – change of entropy in reversible and irreversible process.
UNIT-IV	**ELECTRICITY AND MAGNETISM:** potentiometer – principle – measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart's law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage – power factor and current values in an AC circuit – types of switches in household and factories– Smart Wi-Fi switches- fuses and circuit breakers in houses
UNIT-V	**DIGITAL ELECTRONICS AND DIGITAL INDIA:** logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan's theorem – verification – overview of Government initiatives: software technological parks under

	MeitY, NIELIT- semiconductor laboratories under Dept. of Space – an introduction to Digital India
TEXT BOOKS	1. R. Murugesan (2001), Allied Physics, S. Chand & Co, New Delhi. 2. Brijlal and N. Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi. 3. Brijlal and N. Subramaniam (1994), Properties of Matter, S. Chand & Co.,New Delhi. 4. J. B. Rajam and C. L. Arora (1976). Heat and Thermodynamics (8^{th} edition), S. Chand & Co.,New Delhi. 5. R. Murugesan(2005), Optics and Spectroscopy, S.Chand & Co, NewDelhi. 6. A. Subramaniyam, Applied Electronics 2^{nd} Edn., National Publishing Co., Chennai.
REFERENCE BOOKS	1. Resnick Halliday and Walker(2018). Fundamentals of Physics (11^{th}edition), John Willey and Sons, Asia Pvt .Ltd., Singapore. 2. V. R. Khanna and R. S. Bedi (1998), Textbook of Sound 1^{st}Edn. Kedharnaath Publish & Co, Meerut. 3. N. S. Khare and S. S. Srivastava (1983), Electricity and Magnetism 10^{th}Edn., Atma Ram & Sons, New Delhi. 4. D. R. Khanna and H.R. Gulati (1979). Optics, S. Chand &Co. Ltd., New Delhi. **5.** V. K. Metha (2004).Principles of electronics 6^{th} Edn. S. Chand and company.
WEBLINKS	1. https://youtu.be/M_5KYncYNyc 2. https://youtu.be/ljJLJgIvaHY 3. https://youtu.be/7mGqd9HQ_AU 4. https://youtu.be/h5jOAw57OXM 5. https://learningtechnologyofficial.com/category/fluid-mechanics-lab/ 6. http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://www.youtube.com/watch?v=gT8Nth9NWPMhttps://www.youtube.com/watch?v=9mXOMzUruMQ&t=1shttps://www.youtube.com/watch?v=m4u-SuaSu1s&t=3shttps://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

At the end of the course, the student will be able to:

COURSEOUTCOMES	**CO1**	Explain types of motion and extend their knowledge in the study of various dynamic motions analyze and demonstrate mathematically. Relate theory with practical applications in medical field.
	CO2	Explain their knowledge of understanding about materials and their behaviors and apply it to various situations in laboratory and real life. Connect droplet theory with Corona transmission.
	CO3	Comprehend basic concept of thermodynamics concept of entropy and associated theorems able to interpret the process of flow temperature physics in the background of growth of this technology.
	CO4	Articulate the knowledge about electric current resistance, capacitance in terms of potential electric field and electric correlatetheconnectionbetweenelectricfieldandmagneticfieldandanalyzethemmathematicallyverifycircuitsandapplytheconcepts to construct circuits and study them.
	CO5	Interpret the real life solutions using AND, OR, NOT basic logic gates and intend their ideas to universal building blocks. InferoperationsusingBooleanalgebraandacquireelementaryideasofICcircuits.Acquire information about various Govt. programs/ institutions in this field.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the3-pointscale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	S	S	S
CO2	M	S	S	S	M	S	S	S	S	M
CO3	M	S	S	S	S	M	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	M	S	S	S	S	S	S	S	S	S

COURSETITLE	**PHYSICS PRACTICALS – I**
CREDITS	1
COURSE CODE	23UPHYEP1
HOURS	2
COURSE OBJECTIVES	Apply various physics concepts to understand Properties of Matter and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

ANY Seven only

1. Young's modulus by non-uniform bending using pin and microscope
2. Young's modulus by non-uniform bending using optic lever, scale and telescope
3. Rigidity modulus by static torsion method.
4. Rigidity modulus by torsional oscillations without mass
2. Surface tension and interfacial Surface tension – drop weight method
3. Comparison of viscosities of two liquids – burette method
4. Specific heat capacity of a liquid – half time correction
5. Verification of laws of transverse vibrations using sonometer
6. Calibration of low range voltmeter using potentiometer
7. Determination of thermo emf using potentiometer
8. Verification of truth tables of basic logic gates using ICs
9. Verification of De Morgan's theorems using logic gate ICs.
10. Use of NAND as universal building block.

Note : Use of digital balance permitted

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

YEAR - I	BASIC MATHEMATICS - I	23UMATN16
SEMESTER -I		HRS – 2
NON-MAJOR ELECTIVE – 1		CREDIT – 2

Course Objectives:
Students can be given practice to solve all kinds of problems arise day today life in Science, technology and Business Using the concepts of number system, HCF and LCM, average, ratio, proportion, and partnership.

UNIT 1:
Number System
UNIT 2:
H.C.F and L.C.M of Numbers
UNIT 3:
Average
UNIT 4:
Ratio and Proportion
UNIT 5:
Partnership
Text Book:
Quantitative Aptitude – Dr.R.S.Aggarwal, S. Chand Publications, Revised and Enlarged Edition 2017
Unit-1 Pages from 3 to 50
Unit-2 Pages from 51 to 68
Unit-3 Pages from 206-239
Unit-4 Pages from 426 to 475
Unit-5 Pages from 476 to 492
Reference Books:
1. Quantitative Aptitude for Competitive Examinations- Abhijit Guha,Third Edition (2006),Tata McGraw Hill publishing Company Ltd., New Delhi.
2. Course in Quantitative Aptitude for Competitive Examinations- Agarwal P. K, First Edition (2002), Cyber-tech Publications, New Delhi.
3. Fast Track Objective Arithmetic, Rajesh Verma, Arihant Publications,2004

Course Outcomes:
On successful completion of the course, the students will be able to:

CLO1: Understand the nature of number system
CLO2: Compute the HCF an LCM of given numbers
CLO3: Calculate the average of given values.
CLO4 : Calculate Ratio and Proportion.
CLO5: Understand the concepts of Partnership

Outcome Mapping:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	1	1	2	3	3	1
CLO2	2	3	3	1	-	2	3	2	1
CLO3	3	3	3	3	-	-	3	3	1
CLO4	3	2	3	2	3	-	3	3	1
CLO5	3	2	3	2	3	-	3	3	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">Foundation course - Bridge Mathematics</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">FOUNDATION 1</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATF17</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td colspan="2">-</td><td colspan="2">--</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">To bridge the gap and facilitate transition from higher secondary to tertiary education;
To instil confidence among stakeholders and inculcate interest for Mathematics;</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Algebra: Binomial theorem, General term, middle term, problems based on these concepts
NCERT Class 11 Mathematics: Chapter 7</td></tr>
<tr><td colspan="6">Unit II: Sequences and series (Progressions).
NCERT Class 11 Mathematics: Chapter 8</td></tr>
<tr><td colspan="6">Unit III: Permutations and combinations, Fundamental principle of counting. Factorial n. Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups.
NCERT Class 11 Mathematics: chapter 6</td></tr>
<tr><td colspan="6">Unit IV: Trigonometry: Introduction to trigonometric ratios, proof of sin(A+B), cos(A+B), tan(A+B) formulae, multiple and sub multiple angles, sin(2A), cos(2A), tan(2A) etc., transformations sum into product and product into sum formulae, inverse trigonometric functions, sine rule and cosine rule
NCERT Class 11 Mathematics: Chapter 3
NCERT Class 12 Mathematics: Chapter 2</td></tr>
<tr><td colspan="6">Unit V: Calculus: Limits, standard formulae and problems, differentiation, first principle, uv rule, u/v rule, methods of differentiation, application of derivatives, integration - product rule and substitution method.
NCERT Class 11 Mathematics: Chapter 12</td></tr>
</table>

Recommended Text	NCERT class XI and XII text books.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome

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

CLO 1: Prove the binomial theorem and apply it to find the expansions of any $(x + y)^n$ and also, solve the related problems

CLO 2: Find the various sequences and series and solve the problems related to them. Explain the principle of counting.

CLO 3: Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations

CLO 4: Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and submultiple angles, etc. Also, they can solve the problems using the transformations.

CLO 5: Find the limit and derivative of a function at a point, the definite and indefinite integral of a function. Find the points of min/max of a function.

Mapping of Course Learning Outcomes (CLOs) with Programme Learning Outcomes (PLOs) and Programme Specific Outcomes (PSOs)

	POs						PSOs	
	1	2	3	4	5	6	1	2
CLO1	3	1	3	1	2	1	1	3
CLO2	2	3	1	2	2	3	2	1
CLO3	3	3	2	2	2	1	2	1
CLO4	2	3	3	2	1	3	2	1
CLO5	1	2	3	1	3	3	2	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">ANALYTICAL GEOMETRY OF THREE DIMENSION</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC23</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td></td><td colspan="2">--</td><td colspan="2">5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Necessary skills to analyze characteristics and properties of two- and three-dimensional geometric shapes.
• To present mathematical arguments about geometric relationships.
• To solve real world problems on geometry and its applications.</td></tr>
<tr><td colspan="2" rowspan="4">Course Outline</td><td colspan="6">UNIT-I: Rectangular cartesian co-ordinates:
direction cosines of a line- Angle between two lines-Projections-Direction cosines-Direction ratios- Conditions for perpendicularity and parallelism</td></tr>
<tr><td colspan="6">UNIT-II: System of Planes-Length of the perpendicular–Orthogonal projection.</td></tr>
<tr><td colspan="6">UNIT-III: Representation of line–angle between a line and a plane – co – planar lines–shortest distance between two skew lines –length of the perpendicular–intersection of three planes.</td></tr>
<tr><td colspan="6">UNIT-IV: Equation of a sphere-general equation-section of a sphere by a plane-equation of the circle- tangent plane- angle of intersection of two spheres- condition for the orthogonality-radical plane.</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-V The Central Quadrics and Cone- The equation of a surface. Cone. Right circular cone. Intersection of a straight line and a quadric cone. Tangent plane and normal. Condition that the cone has three mutually perpendicular generators. Cylinder Enveloping Cylinder.</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. T.K. Manickavachagom Pillai and T. Natarajan. A Text Book Of Analytical Geometry (Part II-Three Dimensions)Viswanathan (Printers & Publishers) Pvt. Ltd. Unit I Chapter 1 : Sec (1-12) Unit II Chapter 2: Sec (13-23) Unit III Chapter 3: Sec (24-30,33) Unit IV Chapter 4: Sec (35-42) Unit V Chapter 5: Sec (43-49)
Reference Books	1. S. L. Loney, Co-ordinate Geometry. 2. Robert J. T. Bell, Co-ordinate Geometry of Three Dimensions. 3. William F. Osgood and William C. Graustein, Plane and Solid Analytic Geometry, Macmillan Company, New York, 2016.Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010. 4. Robert C. Yates, Analytic Geometry with Calculus, Prentice Hall, Inc., New York, 1961. 5. Earl W. Swokowski and Jeffery A. Cole, Algebra and Trigonometry with Analytic Geometry, Twelfth Edition, Brooks/Cole, Cengage Learning, CA, USA, 2010. 6. William H. McCrea, Analytical Geometry of Three Dimensions, Dover Publications, Inc, New York, 2006.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Find pole, polar for conics, diameters, conjugate diameters for ellipse and hyperbola

CLO 2: Find the polar equations of straight line and circle, equations of chord, tangent and normal and to find the asymptotes of hyperbola

CLO 3: Explain in detail the system of Planes

CLO 4: Explain in detail the system of Straight lines

CLO 5: Explain in detail the system of Spheres

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	2	2	2	1	-	-	3	2	1
CLO2	2	2	2	1	-	-	3	2	1
CLO3	3	2	2	1	-	-	3	2	1
CLO4	3	2	3	1	-	-	3	2	1
CLO5	3	2	3	1	-	-	3	2	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">INTEGRAL CALCULUS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE IV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC24</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2"></td><td colspan="2">--</td><td colspan="2">4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• Knowledge on integration and its geometrical applications, double, triple integrals and improper integrals.
• Knowledge about Beta and Gamma functions and their applications.
• Skills to Determine Fourier series expansions.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="8">UNIT-I: Reduction formulae -Types, integration of product of powers of algebraic and logarithmic functions - Bernoulli’s formula,
Chapter 1: Section – 13.1 to 13.5, 13.10,15.1</td></tr>
<tr><td colspan="8">UNIT-II: Multiple Integrals - definition of double integrals - evaluation of double integrals – double integrals in polar coordinates - Change of order of integration.
Chapter 5 : Section – 1, 2.1 to 2.2, 3.1</td></tr>
<tr><td colspan="8">UNIT-III: Triple integrals –applications of multiple integrals - volumes of solids of revolution - change of variables - Jacobian.
Chapter 5: Section 4, 5.1 to 5.4
Chapter 6 : Section 1.1,1.2, 2.1 to 2.4</td></tr>
<tr><td colspan="8">UNIT-IV: Beta and Gamma functions – infinite integral - definitions–recurrence formula of Gamma functions – properties of Beta and Gamma functions- relation between Beta and Gamma functions - Applications.
Chapter 7: Section 2.1 to 2.3 ,3, 4, 5</td></tr>
<tr><td colspan="8">UNIT-V: Geometric and Physical Applications of Integral calculus.
Chapter 2 : Section 1.1 to 1.3, 2.1,2.2
Chapter 3 : Section 1.1 to 1.3</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	S.Narayanan and T.K.Manicavachagom Pillai, Calculus Volume II, S.Viswanathan (Printers&Publishers) Pvt Limited , Chennai (2013)
Reference Books	1. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002. 2. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007. 3. D. Chatterjee, Integral Calculus and Differential Equations, Tata-McGraw Hill Publishing Company Ltd. 4. P. Dyke, An Introduction to Laplace Transforms and Fourier Series, Springer Undergraduate Mathematics Series, 2001 (second edition).
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae

CLO 2: Evaluate double and triple integrals and problems using change of order of integration

CLO 3: Solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution

CLO4: Explain beta and gamma functions and to use them in solving problems of integration

CLO 5: Explain Geometric and Physical applications of integral calculus

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	3	1	3	-	-	-	3	2	1
CLO3	3	1	3	-	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	2	1	3	2	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">PYTHON PROGRAMMING LAB</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">Elective - II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2"></td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UPYPE15</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2">Instructional Hours</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">per week</td><td>--</td><td colspan="2">--</td><td colspan="2">6</td><td>6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Basic of programming skill</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Acquire programming skills in core Python.
• Acquire Object-oriented programming skills in Python.
• Develop the skill of designing graphical-user interfaces (GUI) in Python.
• Develop the ability to write database applications in Python.
• Acquire Python programming skills to move into specific branches</td></tr>
<tr><td colspan="2" rowspan="8">List of Exercises:</td><td colspan="6">1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user’s choice.</td></tr>
<tr><td colspan="6">2. Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the five subjects are to be input by user. Assign grades according to the following criteria:
Grade A: Percentage >=80
Grade B: Percentage >=70 and 80
Grade C: Percentage >=60 and <70
Grade D: Percentage >=40 and <60
Grade E: Percentage < 40</td></tr>
<tr><td colspan="6">3. Create a menu driven Python program to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.</td></tr>
<tr><td colspan="6">4. Write a Python script that prints prime numbers in between given two numbers.</td></tr>
<tr><td colspan="6">5. Program to find factorial of the given number using recursive function.</td></tr>
<tr><td colspan="6">6. Write a Python script to generate the Fibonacci series</td></tr>
<tr><td colspan="6">7. Write a Python program to count the number of even and odd numbers from array of N numbers.</td></tr>
<tr><td colspan="6">8. Write a Python class to reverse a string word by word.</td></tr>
</table>

	9. Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input : tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output : 3)
	10. Create a Savings Account class that behaves just like a BankAccount, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint:use Inheritance).
	11. Write a Python program to construct the following pattern, using a nested loop * ** *** **** ***** **** *** ** *
	12. Write a Python program to carry out Matrix Multiplication
	13. Write a Python script to generate the Pascal Triangle
	14. Read a file content and copy only the contents at odd lines into a new file.
	15. Create a Turtle graphics window with specific size.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	4. E Balagurusamy, "Introduction to Computing and Problem Solving Using Python",1st Edition, McGraw Hill India; 2016 5. Charles Dierbach, “Introduction to Computer Science using Python - A computational Problem solving Focus”, Wiley India Edition, 2015. 6. Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition , Pearson Education, 2016

Reference Books	1. Mark Lutz, "Learning Python Powerful Object Oriented Programming", O'reilly Media 2018, 5th Edition. 2. Timothy A. Budd, "Exploring Python", Tata MCGraw Hill Education Private Limited 2011, 1 st Edition. 3. John Zelle, "Python Programming: An Introduction to Computer Science", Second edition, Course Technology Cengage Learning Publications, 2013, ISBN 978- 1590282410 4. Michel Dawson, "Python Programming for Absolute Beginers" , Third Edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-1435455009
Website and e-Learning Source	https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: To understand the problem solving approaches

CLO2: To learn the basic programming constructs in Python

CLO3: To practice various computing strategies for Python-based solutions to real world problems

CLO4: To use Python data structures - lists, tuples.

CLO5: To do input/output with files in Python.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	1	1	2	3	2	1
CLO2	2	1	3	1	-	1	3	2	1
CLO3	3	1	3	1	-	-	3	2	1
CLO4	3	1	3	2	3	-	3	2	1
CLO5	3	1	3	2	3	-	3	2	1

SEMESTER: II Part: III	23UCHEE25 Chemistry for Physical Sciences– II	Credit: 2 Hours: 3

Objectives of the course	This course aims at providing knowledge on the • Co-ordination Chemistry and Water Technology • Carbohydrates and Amino acids • basics and applications of electrochemistry • basics and applications of kinetics and catalysis • Various photochemical phenomenon
Course Outline	**UNIT I** **Co-ordination Chemistry and Water Technology** Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature - Werner'stheory - EAN rule - Pauling's theory – Postulates - Applications to $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$,$[Co(CN)_6]^{3-}$ Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea) – Applications in qualitative and quantitative analysis. Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques- BOD, COD.
	Unit II **Carbohydrates and Amino acids** Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose –fructose interconversion. Properties of starch and cellulose. Amino acids: Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method. RNA and DNA (elementary idea only).

	UNIT III **Electrochemistry** Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells - fuel cells-corrosion and its prevention.
	UNIT IV **Kinetics and Catalysis** Order and molecularity. Integrated rate expression for I and II (2A □ Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction – Half-life period – Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation.
	UNIT V **Photochemistry** Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen-chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).
Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved (To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

Recommended Text	1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition,2009. 2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006. 3. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
Reference Books	1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007. 2. R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
	3. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
Website and e-learning source	

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO 1: write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology

CO 2: explain the preparation and property of carbohydrate, amino acids and nucleic acids.

CO 3: apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.

CO 4: identify the reaction rate, order for chemical reaction and explain the purpose of a catalyst.

CO 5: outline the various type of photochemical process.

CO /PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage ofCourse Contribution to PSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**

CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

SEMESTER: II Part: III	23UCHEEP2 Chemistry for Physical Science Practicals – II	Credit: 1 Hours: 2

Objectives of the course	This course aims to provide knowledge on • identification of organic functional groups • different types of organic compounds with respect to their properties. • determination of elements in organic compounds..
	SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS The analysis must be carried out as follows:
	(a) Functional group tests [phenol, acids (mono & di) aromatic primary amine, amides (mono & di), aldehyde and glucose]. (b) Detection of elements (N, S, Halogens). (c) To distinguish between aliphatic and aromatic compounds. (d) To distinguish – Saturated and unsaturated compounds.
Reference Books	V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principlesof Practical Chemistry; Sultan Chand & sons, Second edition, 1997.
Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.CO 2: design, carry out, record and interpret the results of volumetric titration. CO 3: apply their skill in the analysis of water/hardness. CO4: analyze the chemical constituents in allied chemical products	

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution toPSOs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of correlation between CO's and PO's

Scheme of Valuation:
Max.Marks:100
Int.Marks:25
Ext.Marks:75
Record:15 marks
Preliminary Tests:10 marks
Detection Of elements:10 marks
Detection of functional group:10 marks
Identification of compound:10 marks
Confirmatory Tests:5 marks
Report:5 marks
Systamatic Procedure:10 marks

COURSE	**ELECTIVE: II**
COURSE TITLE	**PHYSICS –II**
COURSE CODE	**23UPHYE25**
CREDITS	2
HOURS	3
COURSE OBJECTIVES	To understand the basic concepts of optics, modern Physics, concepts of relativity and quantum physics, semiconductor physics, and electronics.

UNITS	COURSE DETAILS
UNIT-I	**OPTICS: i**nterference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge – diffraction – diffraction of light vs sound – normal incidence – experimental determination of wavelength using diffraction grating (no theory) – polarization – polarization by double reflection – Brewster's law – optical activity – application in sugar industries
UNIT-II	**ATOMIC PHYSICS:** atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model – various quantum numbers – Pauli's exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton – Stark effect –Zeeman effect (elementary ideas only) – photo electric effect – Einstein's photoelectric equation – applications of photoelectric effect: solar cells, solar panels, optoelectric devices
UNIT-III	**NUCLEAR PHYSICS:** nuclear models – liquid drop model – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses –controlled and uncontrolled chain reaction – nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor – breeder reactor – importance of commissioning PFBR in our country – heavy water disposal, safety of reactors: seismic and floods –introduction to DAE, IAEA – nuclear fusion – thermonuclear reactions – differences between fission and fusion.
UNIT-IV	**INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES**: frame of reference – postulates of special theory of relativity – Galilean transformation equations – Lorentz transformation equations – derivation – length contraction – time dilation – twin paradox – mass-energy equivalence –introduction on gravitational waves, LIGO, ICTs opportunities at International Centre for Theoretical Sciences
UNIT-V	**SEMICONDUCTOR PHYSICS:** p-n junction diode – forward and reverse biasing – characteristic of diode – Zener diode – characteristic of Zener diode – voltage regulator – full wave bridge rectifier – construction and working – advantages (no mathematical treatment) – USB cell phone charger –introduction to e-vehicles and EV charging stations

TEXT BOOKS	1. R. Murugesan (2005), Allied Physics, S. Chand & Co, New Delhi. 2. K. Thangaraj and D. Jayaraman (2004), Allied Physics, Popular Book Depot, Chennai. 3. Brijlal and N. Subramanyam (2002), Textbook of Optics, S. Chand & Co, New Delhi. 4. R. Murugesan (2005), Modern Physics, S. Chand & Co, New Delhi. 5. A. Subramaniyam Applied Electronics, 2nd Edn., National Publishing Co., Chennai.
REFERENCE BOOKS	1. Resnick Halliday and Walker (2018), Fundamentals of Physics, 11th Edn., John Willey and Sons, Asia Pvt. Ltd., Singapore. 2. D. R. Khanna and H .R. Gulati (1979).Optics, S. Chand & Co. Ltd., New Delhi. 3. A. Beiser (1997), Concepts of Modern Physics, Tata McGraw Hill Publication, New Delhi. 4. Thomas L. Floyd (2017), Digital Fundamentals, 11th Edn., Universal Book Stall, New Delhi. 5. V. K. Metha (2004), Principles of electronics, 6th Edn. , S. Chand and Company, New Delhi.
WEBLINKS	1. https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=QrhxU47gtj4https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo 2. https://www.youtube.com/watch?v=JrRrp5F-Qu4 3. https://www.validyne.com/blog/leak-test-using-pressure-transducers/ 4. https://www.atoptics.co.uk/atoptics/blsky.htm - 5. https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

COURSE OUTCOMES:

At the end of the course the student will be able to:

COURSEOUTCOMES	**CO1**	Explain the concepts of interference diffraction using principles of superposition of waves and rephrase the concept of polarization based on wave patterns
	CO2	Outline the basic foundation of different atom models and various experiments establishing quantum concepts. Relate the importance ofinterpretingimprovingtheoreticalmodelsbasedonobservation. Appreciateinterdisciplinarynatureofscience and in solar energy related applications.
	CO3	Summarize the properties of nuclei, nuclear forces structure of atomic nucleus and nuclear models. Solve problems on delay rate half-life and mean-life. Interpret nuclear processes like fission and fusion. Understand the importance of nuclear energy, safety measures carried and get our Govt. agencies like DAE guiding the country in the nuclear field.
	CO4	To describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation. Extend their knowledge on concepts of relativity and vice-versa. Relate this with current research in this field and get an overview of research projects of National and International importance, like LIGO, ICTS, and opportunities available.
	CO5	Summarize the working of semiconductor devices like junction diode, Zener diode, transistors and practical devices we daily use like USB chargers and EV charging stations.

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG (**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	S	S	S
CO2	M	S	S	S	M	S	S	S	S	M
CO3	M	S	S	S	S	M	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	M	S	S	S	S	S	S	S	S	S

COURSE TITLE	**PHYSICS PRACTICALS – II**
COURSE CODE	**23UPHYEP2**
CREDITS	1
HOURS	2
COURSE OBJECTIVES	Apply various Physics concepts to understand concepts of Light, electricity and magnetism and waves, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

Any Seven only

1. Radius of curvature of lens by forming Newton's rings
2. Thickness of a wire using air wedge
3. Wavelength of mercury lines using spectrometer and grating
4. Refractive index of material of the lens by minimum deviation
5. Refractive index of liquid using liquid prism
6. Determination of AC frequency using sonometer
7. Specific resistance of a wire using PO box
8. Thermal conductivity of poor conductor using Lee's disc
9. Determination of figure of merit table galvanometer
10. Determination of Earth's magnetic field using field along the axis of a coil
11. Characteristics of Zener diode
12. Construction of Zener / IC regulated power supply
13. Construction of AND, OR, NOT gates using diodes and transistor
14. NOR gate as a universal building block

METHOD OF EVALUATION:

Continuous Internal Assessment	End Semester Examination	Total	Grade
25	**75**	**100**	

NON-MAJOR ELECTIVE –2

YEAR - I	BASIC MATHEMATICS - II	23UMATN26
SEMESTER –II		HRS – 2
NON-MAJOR ELECTIVE – 2		CREDIT – 2

Course Objectives:

To enhance the problem solving techniques in real life applications of mathematical concepts Time, work, distance, Boats and Stream, Alligation or Mixture , Volume and Surface area.

UNIT 1:

Time and Work

UNIT 2:

Time and Distance

UNIT 3:

Boats and Streams

UNIT 4:

Alligation or Mixture

UNIT 5:

Volume and Surface Area

Text Book:

Quantitative Aptitude – Dr.R.S.Aggarwal, S. Chand Publications, Revised and Enlarged Edition 2017

Unit-1 Pages from 526 to 561
Unit-2 Pages from 562 to 599
Unit-3 Pages from 600 to 611
Unit-4 Pages from 633 to 640
Unit-5 Pages from 766 to 813

Reference Books:

1. Quantitative Aptitude for Competitive Examinations- Abhijit Guha,Third Edition (2006),Tata McGraw Hill publishing Company Ltd., New Delhi.
2. Course in Quantitative Aptitude for Competitive Examinations- Agarwal P. K, First Edition (2002), Cyber-tech Publications, New Delhi
3. Fast Track Objective Arithmetic, Rajesh Verma, Arihant Publications,2004

Course Outcomes:

On successful completion of the course, the students will be able to:

CLO1: Solve problems on time and work.
CLO2: Calculate time and distance for real word problems.
CLO3: Compute the speed of boats and streams.
CLO4: Calculate the mixing of water in milk
CLO5: Solve problems on Volume and Surface area.

Outcome Mapping:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	1	1	2	3	2	1
CLO2	2	3	3	1	-	2	3	2	1
CLO3	3	3	1	1	-	-	3	2	1
CLO4	2	2	3	2	3	-	3	2	1
CLO5	3	1	3	2	3	-	3	2	1

SEMESTER – III

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">VECTOR CALCULUS AND ITS APPLICATIONS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE - V</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC33</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">1</td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Knowledge about differentiation of vectors and on differential operators. Knowledge about derivatives of vector functions.
• Skills in evaluating line, surface and volume integrals.
• The ability to analyze the physical applications of derivatives of vectors.</td></tr>
<tr><td colspan="2" rowspan="4">Course Outline</td><td colspan="7">UNIT-I: Differentiation of Vector Functions
Vector functions - Limit of a vector function - Derivative of a vector function - Partial derivatives of vector functions - Velocity of a particle
Differentiation Applied to Geometry
Differential Geometry - Partial differentiation applied to Geometry
Chapter 1 (Section 1.1 to 1.11)</td></tr>
<tr><td colspan="7">UNIT-II: Gradient of a Scalar Point Function and Divergence and Curl of a Vector Point Function
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 $\boldsymbol{f}(\boldsymbol{r})$ - Divergence and curl of a vector point function - Summation notation for divergence and curl - Laplacian differential operator - Other differential operators - Divergence and curl of a gradient - Divergence and curl of a curl
Chapter 2 (Section 2.1 to 2.13)</td></tr>
<tr><td colspan="7">UNIT-III: Multiple Integrals
Single, Double and triple integrals - Two dimensional regions - Regions in polar coordinates - Single Integrals - Double integrals - Order of integration when limits are constants - Transformation of coordinates - Cylindrical polar coordinates - Spherical polar coordinates - Triple integrals - Important surfaces - Coordinates of points of regions
Chapter 3</td></tr>
<tr><td colspan="7">UNIT-IV: Line, Surface, Volume Integrals
Line integrals - Independence of path of integration - Conservative field and scalar potential - Line integral of a conservative vector - Surface integrals - Volume integrals - Cylindrical and spherical polar coordinates Chapter 3 (Section 3.1 to 3.8)</td></tr>
</table>

	UNIT-V: Integral Theorems Integral theorems - Gauss' divergence theorem - Integral theorems derived from the divergence theorem - Green's theorem in plane - Stoke's theorem - Integral theorems derived from Stoke's theorem - Operational meanings of ∇, $\nabla \cdot$, $\nabla \times$ in terms of surface integrals Chapter 4 (Section 4.1 to 4.8)
Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Duraipandian P. & Pachaiyappa, Vector Analysis, (1^{st} edn., Reprint 2021), S Chand and Company Limited, New Delhi.
Reference Books	1. J.C. Susan, Vector Calculus, (4th Edn.) Pearson Education, Boston, 2012. 2. A. Gorguis, Vector Calculus for College Students, Xilbius Corporation, 2014. 3. J.E. Marsden and A. Tromba,Vector Calculus, , (5^{th}edn.) W.H. Freeman, New York, 1988.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Find the derivative of vector and sum of vectors, product of scalar and vector point function and to Determine derivatives of scalar and vector products

CLO 2: Applications of the operator 'del' and to Explain soleonidal and ir-rotational vectors

CLO 3: Solve simple line integrals

CLO 4: Solve surface integrals and volume integrals

CLO 5: Verify the theorems of Gauss, Stoke's and Green's(Two Dimension)

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	3	1	-	-	3	2	1
CLO2	3	2	3	1	2	-	3	2	1
CLO3	3	3	3	3	-	-	3	3	1
CLO4	3	3	3	3	-	-	3	3	1
CLO5	3	3	3	3	2	-	3	3	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">DIFFERENTIAL EQUATIONS AND APPLICATIONS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE -VI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC34</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td colspan="2">1</td><td>--</td><td colspan="2">5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Knowledge about the methods of solving Ordinary and Partial Differential Equations.
• The understanding of how Differential Equations can be used as a powerful tool in solving problems in science.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Equations of the First Order and Higher Degree- Equations Solvable for p- Equations Solvable for x - Equations Solvable for y – Clairaut’s Equation- Linear equations of Second and Higher Order with constant coefficients.
Chapters: ODE 1,2 (Pages: 1 – 40)</td></tr>
<tr><td colspan="6">UNIT-II: Simultaneous Equations, Euler’s Homogeneous Linear Differential Equations– Legendre’s Linear Equations
Chapters: ODE 3, 4 (Pages: 41 -56)</td></tr>
<tr><td colspan="6">UNIT-III: Method of Variation of Parameters- Method of undetermined Coefficients. Total differential Equation
Chapters: ODE 5,6 Pages 57 -105</td></tr>
<tr><td colspan="6">UNIT-IV: Formation of PDE – Complete Integral – Particular Integral – Singular Integral – Equation’s Solvable by direct Integration – Solving equations of the 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, p), Z = p x + q y + f(p, q), Equations Reducible to standard form
Chapters: PDE 1 (Pages: 117 – 150)</td></tr>
<tr><td colspan="6">UNIT-V: Lagranges Linear Equation, Charpits Method
Chapter: PDE 1, 2 (Pages: 150 – 178)</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">P.Kandasamy, K.Thilagavathy [2004], “Mathematics for B.Sc” Vol-III, S.Chand & Company Ltd., New Delhi-55.</td></tr>
</table>

Reference Books	1. D.A. Murray, Introductory course in Differential Equations, Orient and Longman 1. H.T. H.Piaggio, Elementary Treaties on Differential Equations and their applications, C.B.S Publisher & Distributors, Delhi,1985. 2. Horst R. Beyer, Calculus and Analysis, Wiley, 2010. 3. Braun, M. Differential Equations and their Applications. (3rd Edn.), Springer- Verlag, New York. 1983. 4. Boyce, W.E. and R.C.DiPrima. Elementary Differential Equations and Boundary Value Problems. (7th Edn.) John Wiley and Sons, Inc., New York. 2001. 5. Sundrapandian, V. Ordinary and Partial Differential Equations, Tata McGraw Hill Education Pvt.Ltd. New Delhi, 2013 6. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984. 7. I. Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967. 8. G.F. Simmons, Differential equations with applications and historical notes, 2nd Ed, Tata Mcgraw Hill Publications, 1991.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

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

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	1	-	3	2	1
CLO2	3	1	3	2	1	-	3	2	1
CLO3	3	1	3	2	1	-	3	3	1
CLO4	3	1	3	2	2	1	3	3	1
CLO5	3	1	3	2	2	1	3	3	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">MATHEMATICAL STATISTICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE – III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATE35</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">-</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">To Learn Statistical Methods Probability theory, Random variables, Distribution functions, Mathematical expectations, Generating functions, Correlation , Regression, and some standard Distributions. Students should be given practice on Statistical methods so that he could apply the techniques to solve real world problems in the field of Science, Technology and Business Management.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">UNIT-I: Probability Theory
Axiomatic approach to probability - Some theorems on Probability - Conditional Probability - Multiplication theorem of probability - Independent events - Baye’s Theorem - Simple Problems.
[Chapter 3, sec 3.8 (3.8.1;3.8.2;3.8.5;3.8.6), sec 3.9 (3.9.1,3.9.2), sec 3.10 - 3.13; Chapter 4, sec 4.2]</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-II: Random Variables, Distribution Functions and Mathematical Expectation
Random Variables (Discrete and Continuous) - Distribution Function – Mathematical Expectation – Expected value of function of a random variable – properties of expectation – properties of variance – covariance. [Chapter 5, sec 5.2-5.4; Chapter 6, sec 6.2-6.6]</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-III: Generating Functions
Moment generating function - Characteristic Function - Uniqueness and Inversion Theorem (Statement only) - Chebychev’s Inequality - Simple Problems. [Chapter 7, sec 7.1,7.3 - 7.5]</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-IV: Correlation and Regression
Concept of Bivariate Distribution - Correlation - Karl Pearson’s Coefficient of Correlation - Rank Correlation - Linear Regression.
[Chapter 10, sec 10.4-10.7, Chapter 11, sec 11.2]</td></tr>
<tr><td colspan="2"></td><td colspan="6">UNIT-V: Standard Distributions
Discrete distributions - Binomial, Poisson, Hyper Geometric and Negative Binomial Distributions - Continuous Distributions Normal, Uniform, Exponential.
[Chapter 8, sec 8.4(8.4.1-8.4.8), sec 8.5(8.5.1-8.5.6), sec (8.6.1; 8.6.3-8.6.5), sec 8.8; Chapter 9, sec 9.2 (9.2.1-9.2.5), sec 9.3, sec 9.8]</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan & sons , (11th edition, June 2002).
Reference Books	1. Hogg, R.V. & Craig.A.T.(1998): Introduction to Mathematical Statistics, Macmillan 2. Mood. A.M. Graybill. F.A.& Boes.D.G.(1974): Introduction to theory of Statistics, McGraw Hill. 3. Snedecor.G.W. &Cochran.W.G.(1967): Statistical Methods, Oxford and IBH 4. Hoel, P.G (1971): Introduction to Mathematical Statistics, Wiley. 5. Wilks S.S. Elementary Statistical Analysis, Oxford and IBH
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Understand the concepts of Probability theory and their usage in real world Situations

CLO 2: Solve problems on Random variables, Distribution functions and Mathematical expectations

CLO 3: Understand the Generating functions and its applications

CLO 4: Apply the standard distributions in many fields of Science, Engineering, Medicine, Nano technology and Business

CLO 5: Solve problems in Correlation and Regression Analysis

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	3	1	-	-	3	2	1
CLO2	3	2	3	1	2	-	3	2	1
CLO3	3	3	3	3	-	-	3	3	1
CLO4	3	3	3	3	-	-	3	3	1
CLO5	3	3	3	3	2	-	3	3	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">ACCOUNTANCY-TALLY (Theory)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UTALE35</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2"></td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">1) To understand about the Tally ERP 9
2) To enable the students to learn payment voucher and inventory
3) To understand the purchase order process and order voucher.
4) To know about the Goods and Services in practical.
5) To analyze the interest calculation.</td></tr>
<tr><td colspan="2" rowspan="4">Course Outline</td><td colspan="6">UNIT-I: Interface and Company Management
Introduction to Tally ERP9 - Creating a Company - Altering and Deleting Company – Data Security: Security Control Setup - User Security Control, Multi Language, Export, Import, Backup and Restore: Export and Import Formats - Data Backup and Restore</td></tr>
<tr><td colspan="6">UNIT-II: Default Vouchers
Payment Voucher - Receipt Voucher - Contra Voucher - Journal Voucher, Day Book: Day Book Reports - Altering and Deleting Transactions, Cheque Printing: CTS Cheque Printing System.</td></tr>
<tr><td colspan="6">UNIT-III: Purchase Order Processing:
Purchase Order Process - Purchase Order Voucher - Receipt Note (Inventory) - Rejection-Out Voucher, Sales Order Processing: Sales Order Process - Sales Order Voucher - Delivery Note (Inventory) - Rejection-IN Voucher , Debit and Credit Notes, Bank Reconciliation, Manufacturing Vouchers: Bills of Materials - Job Costing, Tax Deducted at Source (TDS): Understanding TDS - Creating TDS Masters - TDS Payment - Tax Reports and Tax Forms, Payroll Accounting: Understanding Payroll - Pay Heads and Categories - Employee Details and Salary Details - Attendance Entries - Salary Payment – Pay sheet and Pay Slips</td></tr>
<tr><td colspan="6">UNIT-IV: Goods and Services Tax (GST)
Activating Tally in GST - Setting Up GST (Company Level, Ledger Level or Inventory Level) - GST Taxes & Invoices - SGST, CGST & IGST - Creating GST Tamilnadu State Council for Higher Education Masters in Tally, Purchase Voucher with GST: Updating GST Number for Suppliers -Intra-State Purchase Entry in GST (SGST + CGST)</td></tr>
</table>

	UNIT-V: Interest Calculations (Auto Mode) Activating Interest Calculations, Point of Sales, Budgets and Controls: Budget Masters and Configurations - Budget Reporting and Analysis, Cost Centres and Cost Categories: Cost Centres - Profit Centres, Purchase and Sales Reporting: Analysing Purchase and Sales Register.
Recommended Text	1) Nadhani, A.K. *Implementing Tally*, BPB Publications 2) Rizwan Ahmed, P. (2016). *Tally ERP 9,* Margham Publications. 3) Mamrata Agrawal. (2010). *Financial Accounting using Tally*. New Delhi, India: DreamTech Press.
Reference Books	1) Nandhani, K.K. Computerized Accounting under Tally, Implementing Tally, BPB publication. 2) Singh, S. (2015). Tally ERP 9 (Power of Simplicity). India: V&S Publishers. 3) Dinesh Maidasani. (2010). Straight to the Point. Tally. ERP 9. India: Firewall Media.
Website and e-Learning Source	

COURSE LEARNING OUTCOMES

1.To prepare the Tally ERP 9

2.Getting experience in payment voucher and inventory

3.Know the Purchase order process and order voucher.

4. Know about the Goods and Services in practical.

5. Experience in interest calculation.

Outcome Mapping

	PO1	PO2	PO3	PO4	PO5
CLO1	**2**	**3**	**3**	**2**	**3**
CLO2	**3**	**3**	**3**	**3**	**3**
CLO3	**3**	**3**	**3**	**2**	**3**
CLO4	**3**	**3**	**3**	**3**	**3**
CLO5	**3**	**3**	**3**	**3**	**3**

PO – Programme Outcome, CO – Course outcome

1 – Low, 2.– Moderate, 3 – High

Skill Enhancement Course-4

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">COMPUTATIONAL MATHEMATICS-I</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Skill Enhancement Course</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">1</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATS36</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>2</td><td colspan="2"></td><td>--</td><td colspan="2">2</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• To learn and use computational mathematics to interpolate the values.
• To find the missed values from the data
• To learn the various techniques of finding the in between values from the given data.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT - I

Interpolation - Newton - Gregory forward & backward formulae for interpolation (no derivations of formula, problems only).</td></tr>
<tr><td colspan="6">UNIT - II

Central differences formulae: Gauss Forward and Backward formulae (no derivations of formula, problems only).</td></tr>
<tr><td colspan="6">UNIT - III

Sterling’s formula - Bessel’s formula (no derivations of formula, problems only).</td></tr>
<tr><td colspan="6">UNIT - IV

Divided differences - Newton’s divided differences formula
(no derivation of formula, problems only)</td></tr>
<tr><td colspan="6">UNIT – V
Lagrange’s interpolation formula (no derivation , problems only)</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">Recommended Text

1.M.K. Venkataraman. (1992) Numerical methods for Science and Engineering National Publishing Company, Chennai.

2. B.D. Gupta.(2001) Numerical Analysis.Konark Pub. Ltd., Delhi</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="6">Reference Books

1. S. Arumugham. (2003) Numerical Methods, New Gamma Publishing, Palamkottai.
2. H.C. Saxena. (1991) Finite differences and Numerical analysis S.Chand & Co., Delhi
3. A.Singaravelu (2004). Numerical MethodsMeenakshi Agency, Chennai
4. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite difference & Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="6">https://nptel.ac.in</td></tr>
</table>

Course Learning Outcomes

CLO1: Know the concepts of Interpolations to find the intermediate values.

CLO2: Understand the finding of intermediate values using central difference formula..

CLO3: Know the different formula for central difference.

CLO4: Understand the idea of divided differences.

CLO5: Know the interpolation for unequal intervals.

Outcome Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CLO1	**2**	**3**	**3**	**3**	**3**
CLO2	**3**	**3**	**3**	**3**	**3**
CLO3	**3**	**3**	**3**	**3**	**2**
CLO4	**2**	**3**	**2**	**3**	**3**
CLO5	**2**	**3**	**3**	**3**	**3**

<table>
<tr><td>Title of the Course</td><td colspan="6">PHP PROGRAMMING</td></tr>
<tr><td>Paper Number</td><td colspan="6">Skill Enhancement Course – 5</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATS37</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>2</td><td colspan="2"></td><td>--</td><td colspan="2">2</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• To learn and use open source database management system MySQL.
• To create dynamic web pages and websites.
• To connect web pages with database.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Basic development Concepts – Creating first PHP Scripts – Using Variable and Operators – Storing Data in variable – Understanding Data types – Setting and Checking variables Data types</td></tr>
<tr><td colspan="6">UNIT-II: Writing Simple Conditional Statements - Writing More Complex Conditional Statements – Repeating Action with Loops – Working with String and Numeric Functions</td></tr>
<tr><td colspan="6">UNIT-III: Storing Data in Arrays – Processing Arrays with Loops and Iterations – Using Arrays with Forms - Working with Array Functions</td></tr>
<tr><td colspan="6">UNIT-IV: Introducing Database and SQL- Using MySQL-Adding and modifying Data Handling Errors</td></tr>
<tr><td colspan="6">UNIT-V: Introduction XML - Simple XML and DOM Extension</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">Vikram Vaswani- PHP A Beginner’s Guide, Tata McGraw-Hill</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="6">1. The PHP Complete Reference – Steven Holzner – Tata McGraw-Hill Edition.
2. Spring into PHP5 – Steven Holzer, Tata McCraw Hill Edition</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="6">https://nptel.ac.in</td></tr>
</table>

Course Learning outcomes

CLO1 : Know the writing of PHP scripts.
CLO2: Able to write programs using control structures and looping statements.
CLO3 : Able to write PHP programs using arrays and functions.
CLO4: Able to write program using database and SQL.
CLO5: Able to write programs using XML and DOM extensions.

Outcome Mapping

	PO1	PO2	PO3	PO4	PO5
CLO1	**2**	**3**	**3**	**2**	**3**
CLO2	**2**	**3**	**3**	**3**	**3**
CLO3	**3**	**2**	**3**	**2**	**2**
CLO4	**2**	**3**	**3**	**3**	**3**
CLO5	**3**	**3**	**3**	**3**	**3**

SEMESTER - IV

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">INDUSTRIAL STATISTICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE - VII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC43</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">5</td><td colspan="2"></td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">The objective is to train students in some concepts in industrial statistics. The theory of sample moments, significant test, sampling theory and analysis of variance are introduced. Practical problems are solved.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="7">UNIT-I:
Sampling and large sample test,
Chapter: 12 Page 307- 333</td></tr>
<tr><td colspan="7">UNIT-II:
Exact sampling distribution (chi-square distribution)
Chapter:13 Page 334 - 351</td></tr>
<tr><td colspan="7">UNIT-III:
Exact sampling distribution t, F and Z distribution
Chapter:14 Page 352-370</td></tr>
<tr><td colspan="7">UNIT-IV:
Theory of estimation, testing of hypothesis
Chapter:15 and 16 Pages: S.1-S.15 and S.18-S.30</td></tr>
<tr><td colspan="7">UNIT-V:
Analysis of variance, Design of experiments
Chapter: 17 and 18 Page: S.31-S.46 and S.47-S.75</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="7">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="7">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="7">S.C. Gupta & V.K. Kapoor: Elements of Mathematical Statistics, Third extensively revised and greatly improved edition, Sultan Chand & sons.</td></tr>
</table>

Reference Books	1. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & sons. 2. Hogg, R.V. & Craig. A. T. (1998): Introduction to Mathematical Statistics, Macmillan 3. Mood.A.M.,Graybill. F.A.&Boes. D.G.(1974): Introduction to theory of Statistics, McGraw Hill. 4. Snedecor.G.W. &Cochran.W.G.(1967): Statistical Methods, Oxford and IBH 4. Hoel.P.G (1971): Introduction to Mathematical Statistics, Wiley. 5. Wilks . S. S.Elementary Statistical Analysis, Oxford and IBH 6. O. Kempthone - Design of Experiments 7. Das and Giri : Design of Experiments Wiley Eastern
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Gain working knowledge related to the problems of industrial statistics

CLO 2: Apply the fundamental concept of statistical methods to solve some real life problems

CLO 3: Gain a basic knowledge for study of advanced courses in this area

CLO 4: Solve problems on Testing of Hypothesis

CLO 5: Apply the Analysis of Variance and Design of Experiments over the collection of data for Research problems

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	3	1	-	-	3	2	1
CLO2	3	2	3	1	2	-	3	2	1
CLO3	3	3	3	3	-	-	3	3	1
CLO4	3	3	3	3	-	-	3	3	1
CLO5	3	3	3	3	2	-	3	3	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">ELEMENTS OF MATHEMATICAL ANALYSIS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE - VIII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC44</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="2">--</td><td colspan="2">5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Identify and characterize sets and functions and Understand, test and analyze the convergence and divergence of sequences, series.
• Understand metric spaces with suitable examples</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Sets and Functions: Sets and elements- Operations on sets- functions- real valued functions- equivalence – countability - real numbers- least upper bounds.
Chapter 1 (Section 1.1 - 1.7)</td></tr>
<tr><td colspan="6">UNIT-II: Sequences of Real Numbers: Definition of a sequence and subsequence - limit of a sequence – convergent sequences – divergent sequences - bounded sequences - monotone sequences
Chapter 2 (Section 2.1 – 2.6)</td></tr>
<tr><td colspan="6">UNIT-III: Operations on convergent sequences – operations on divergent sequences – limit superior and limit inferior- Cauchy sequences.
Chapter 2 (Section 2.7 – 2.10)</td></tr>
<tr><td colspan="6">UNIT-IV: Series of Real Numbers: Convergence and divergence – series with non –negative terms - alternating series - conditional convergence and absolute convergence - tests for absolute convergence.
Chapter 3 (Section 3.1 - 3.4, 3.6)</td></tr>
<tr><td colspan="6">UNIT-V: Limits and Metric Spaces: Limit of a function on a real line - Metric spaces - Limits in metric spaces
Continuous Functions on Metric Spaces: Functions continuous at a point on the real line - Functions continuous on a metric space.
Chapter 4 (Section 4.1 - 4.3)
Chapter 5 (Section 5.1, 5.3)</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">Richard R. Goldberg, Methods of Real Analysis: Oxford and IBH Publishing, 2020.</td></tr>
</table>

Reference Books	1. T. M. Apostol, Calculus (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2002. 2. R.G. Bartle and D. R Sherbert, Introduction to Real Analysis, John Wiley and Sons (Asia) P. Ltd., 2000. 3. E. Fischer, Intermediate Real Analysis, Springer Verlag, 1983. 4. K.A. Ross, Elementary Analysis- The Theory of Calculus Series- Undergraduate Texts in Mathematics, Springer Verlag, 2003.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Explain in detail about sets and functions, equivalence and countability and the LUB axiom

CLO 2: Explain Sequence and Subsequence of real numbers and to find the limit of sequence to test for convergent, divergent, bounded and monotone sequences

CLO 3: Explain the operations on convergent and divergent sequences and to Explain the concepts of limit superior and limit inferior and the notion of Cauchy sequences

CLO 4: Classify the series of real numbers and the alternating series and their convergence and divergence, the conditional convergence and absolute convergence and solve problems on convergence of the sequences

CLO 5: Explain about the metric spaces and functions continuous on a Metric space

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	2	3	2	-	3	2	1
CLO2	3	3	2	3	2	-	3	2	1
CLO3	3	3	3	3	2	-	3	2	1
CLO4	3	3	3	3	2	-	3	2	1
CLO5	3	3	2	3	2	-	3	2	1

Title of the Course		MATHEMATICAL STATISTICS PRACTICAL USING R - PROGRAMMING					
Paper Number		ELECTIVE – IV					
Category	Core	Year	II	Credits	3	Course Code	23UMATE45
		Semester	IV				

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total
	-	-	3	3

Objectives of the Course	After taking the course, students will be able to • Use R for statistical programming, computation, graphics and modelling • Write functions and use R in an efficient way • Fit some basic types of statistical models
List of exercise	Using R Programming develop the programmes in the following topics: 1. Plotting Bar chart and scatter plot 2. Plotting histogram and pie chart 3. Graphics for grouped data 4. Graphical display of distributions 5. Measures of central tendency -Mean, median, mode 6. Measures of Dispersion- std. deviation, mean deviation 7. Regression and correlation. Linear models. 8. Large sample tests 9. Small sample test t- tests 10. Small sample test F-tests 11. Small sample test Chi-square tests 12. ANOVA (one way) 13. ANOVA (Two way)
Reference Books	1. Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters Beginner's Guide to R - Springer, 2009. 2. Allerhand M. Tiny Handbook of R – Springer Briefs in Statistics, 2011 3. Baayen R. Analyzing Linguistic Data - A Practical Introduction to Statistics using R, 2008. 4. Gardener M. Beginning R - The Statistical Programming Language, 2012. 5. Jim Albert, Maria Rizzo R by Example, 2012. 6. Matloff N. Art of R Programming - A Tour of Statistical Software Design, 2011.

OUTCOME MAPPING

Course Outcome	Programme Outcome					
	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	3	3	3	3
CLO2	3	2	3	3	3	3
CLO3	3	3	3	3	2	3
CLO4	3	3	3	3	3	3
CLO5	2	3	3	3	2	3

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">ACCOUNTANCY -TALLY PRACTICAL</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Allied</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UTALE45</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">-</td><td colspan="2"></td><td colspan="2">3</td><td>3</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">1) Help the students to know the fundamental concepts of Tally.
2) Help them to understand how to use Tally software in day-to-day applications.
3) Familiarize the students to use this package for business.
4) Introduce the students to some basic tools like creation of voucher, purchase order etc.
5) Familiarize the students in the preparation of tax related sales vouchers.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Introduction: Introduction to Tally – Selecting a Company – Shutting a Company – Altering a Company – Accounting Information – Groups – Managing Groups – Single & Group – Ledgers.</td></tr>
<tr><td colspan="6">UNIT-II: Vouchers: Vouchers – Creating Vouchers – Displaying and Altering Vouchers – Control Vouchers –Purchase Vouchers – Sales Vouchers – Payment – Receipt and Journal Vouchers – Bank Reconciliation Statement.</td></tr>
<tr><td colspan="6">UNIT-III: Inventory Management: Inventory Management – Stock Groups – Stock Categories – Stock Items – Types of Inventory Vouchers – Receipt Note Vouchers.</td></tr>
<tr><td colspan="6">UNIT-IV: Purchase & Sales Order: Purchase Orders – Creation of a Purchase Order – Altering a Purchase Order – Deleting a Purchase Order – Sales Orders – Deleting a Sales Order – Invoices Reports –Trial Balance – Profit and Loss A/c Balance Sheet.</td></tr>
<tr><td colspan="6">UNIT-V: Pay Roll & Tax: Pay Roll in Tally – Collected at Source – Tax Deducted at Sources – various Financial Statements – Budget – GST.</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">1. Kumar, S. (2018). Tally ERP 9 with GST. New Delhi: TB Publications. 1st Edition.
2. Sharaddha Singh. (2018). Tally ERP 9: Power of Simplicity. New Delhi: V & S Publishers.
3. Manoj Bansal, & Ajay Sharma. (2018). Computerised Accounting System. Agra: Sahitya Bhawan Publications.
4. Asok K. Nadhani. (2018). Tally ERP 9 Training Guide. New Delhi: BPB Publications.4th Edition.
5. Parag Joshi. (2018). Tally ERP 9 with GST. New Delhi: Dnyansankul Prakashans Publications.</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="6">1) Tally Education Pvt. Ltd. (2018). Official Guide to Financial Accounting using Tally ERP 9. New Delhi: BPB Publications. 4th Edition.
2) Navneet Mehra. (2020). GST Tally ERP 9: Power of Simplicity. New Delhi: V & S Publishers.
3) Namrata Agrawal. (2019). Tally.ERP 9. New Delhi: Dreamtech Press.
4) Bimlendu Shekhar. (2021). Tally Practical Work Book-1. 2nd Edition.
5) DT Editorial Services. (2020). Tally. ERP 9 with GST in Simple Steps. New Delhi: Dream \tech Press.</td></tr>
</table>

COURSE LEARNING OUTCOMES

1) Using Tally to create personal business documents following current professional and/or industry standards
2) Create scientific and technical documents incorporating the billing procedures
3) Develop entries for creation of vouchers
4) Design bills for implementation of taxation aspects.
5) Design and construct financial statements after considering taxes and GST.

OUTCOME MAPPING

Course Outcome	Programme Outcome					
	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	3	3	3	3
CLO2	3	2	3	3	3	3
CLO3	3	3	3	3	2	3
CLO4	3	3	3	3	3	3
CLO5	2	3	3	3	2	3

<table>
<tr><td>Title of the Course</td><td colspan="6">ANDROID APP DEVELOPMENT</td></tr>
<tr><td>Paper Number</td><td colspan="6">SKILL ENHANCEMENT COURSE - 6</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATS46</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">2</td><td colspan="2"></td><td colspan="2">--</td><td>2</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">• To introduce the knowledge on the android application development.
• To study the Android activity.</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Introduction - History about Android operating system - Android program structure - User interface</td></tr>
<tr><td colspan="6">UNIT-II: Building blocks of User interface - Android Layout types - Layout attributes</td></tr>
<tr><td colspan="6">UNIT-III: Dialogs - Intent - types of intent - Explicit and Implicit intent - Intent data transfer from one activity to another - Android switch button</td></tr>
<tr><td colspan="6">UNIT-IV: Android life cycle: Android Activity life cycle - menus - menu Activity</td></tr>
<tr><td colspan="6">UNIT-V: Recycler view - Broadcast receiver and Notification. Testing Activity</td></tr>
<tr><td>Recommended Text</td><td colspan="6">Android For Beginners, Pratiyash Guleria, BPB publications</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Android programming for Beginners, John Horton, Packt
2. Android system programming, Roger Ye, Packt</td></tr>
<tr><td>Website and e-Learning Source</td><td colspan="6">https://nptel.ac.in</td></tr>
</table>

Course Learning Outcomes

CLO1: Know the basics of Android operating system.
CLO2: Know the Building blocks of User interface and Layout .
CLO3: Know the function of Android switch button.
CLO4: Know the Android life cycle and menus.
CLO5: Understand the Broadcast receiver ,Notification and Testing activity.

OUTCOME MAPPING

Course Outcome	Programme Outcome					
	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	2	3	3	3	3
CLO2	3	2	3	3	3	2
CLO3	2	3	3	2	2	3
CLO4	3	3	3	3	3	2
CLO5	2	3	3	3	3	3

Title of the Course		COMPUTATIONAL MATHEMATICS-II					
Paper Number							
Category	Skill Enhancement Course - 7	Year	II	Credits	2	Course Code	23UMATS47
		Semester	IV				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		2		--	2		
Objectives of the Course		• This course covers the techniques of Solving non-linear equations, Simultaneous linear equations and Numerical Integration. • It also deals with solution of ordinary differential equations of first order.					
Course Outline		**UNIT - I** Iteration method-Newton-Rapson Method. (No derivation of formula- problems only)					
		UNIT - II Gauss elimination method - Gauss-Jordan Method (Three unknowns only). (No derivation of formula- problems only)					
		UNIT - III Trapezoidal rule-Simpson's one third rule- Simpson's three-eight rule (No derivation of formula- problems only)					
		UNIT - IV Euler-Maclaurin Summation Formula- Euler's method (No derivation of formula- problems only)					
		UNIT - V Picard's method - Runge Kutta method (Fourth order only). (No derivation of formula- problems only)					
Recommended Text		**Recommended Text** 1.M.K. Venkataraman. (1992) *Numerical methods for Science and Engineering* National Publishing Company, Chennai. 2. B.D. Gupta.(2001) *Numerical Analysis.*Konark Pub. Ltd., Delhi					
Reference Books		**Reference Books** 1. S. Arumugham. (2003) *Numerical Methods*, New Gamma Publishing, Palamkottai. 2. H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand & Co., Delhi 3. A.Singaravelu (2004). *Numerical Methods*Meenakshi Agency, Chennai 4. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite difference & Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.					
Website and e-Learning Source		https://nptel.ac.in					

Course Learning Outcomes

CLO1: Know the methods of solving non-linear equations

CLO2: Understand the finding of solutions of simultaneous equations.

CLO3: Know the techniques of evaluation of Numerical Integration.

CLO4: Understand the Numerical solutions of differential equations.

CLO5: Introduce different methods for finding solutions of numerical differential equations

OUTCOME MAPPING

Course Outcome	Programme Outcome					
	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	3	3	3	3	3
CLO2	3	3	3	3	3	3
CLO3	3	2	3	3	3	3
CLO4	3	3	3	3	3	2
CLO5	2	3	3	2	3	3

<table>
<tr><td>Title of the Course</td><td colspan="6">ABSTRACT ALGEBRA</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE - IX</td></tr>
<tr><td rowspan="2">Category Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC51</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td>1</td><td colspan="2">--</td><td>5</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">• Concepts of Sets, Groups and Rings.
• Construction, characteristics and applications of the abstract algebraic structures</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Definition of a group- Some examples of groups – Some preliminary lemmas – Subgroups - A counting principle
Chapter 2 (Section-2.1 to 2.5)</td></tr>
<tr><td colspan="6">UNIT-II: Normal subgroups and Quotient group- Homomorphism-Automorphism
Chapter 2 (Section-2.6 to 2.8)</td></tr>
<tr><td colspan="6">UNIT-III: Cayley’s Theorem-Permutation groups
Chapter 2 (Section-2.9 and 2.10)</td></tr>
<tr><td colspan="6">UNIT-IV: 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)</td></tr>
<tr><td colspan="6">UNIT-V: The field of quotients of an integral domain-Euclidean Rings – A particular Euclidean Ring
Chapter 3 (Section-3.6 to 3.8)</td></tr>
<tr><td>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td>Recommended Text</td><td colspan="6">Topics in Algebra–I.N.Herstein, Wiley Eastern Ltd. Second Edition (1st January 2006)</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
2. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.
3. Joseph A Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1999.</td></tr>
<tr><td>Website and e-Learning Source</td><td colspan="6">https://nptel.ac.in</td></tr>
</table>

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Explain groups, subgroups and cyclic groups

CLO 2: Explain about Normal subgroup, Quotient groups, Homomorphisms and Automorphisms and verify the functions for homomorphism and automorphism properties

CLO 3: Explain Permutation groups and apply Cayley's theorem to problems

CLO 4: Explain Rings, Ideals and Quotient Rings and examine their structure

CLO 5: Discuss about the field of quotient of an integral domain and to Explain in detail about Euclidean Rings

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	2	3	1	-	3	3	1
CLO2	3	3	2	3	1	-	3	3	1
CLO3	3	3	2	3	2	-	3	3	1
CLO4	3	3	2	3	1	-	3	3	1
CLO5	3	3	2	3	2	-	3	3	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">REAL ANALYSIS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE - X</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC52</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td>1</td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Real Numbers and properties of Real–valued functions.
• Connectedness, Compactness, Completeness of Metric spaces.
• Convergence of sequences of functions, Examples and counter examples</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Continuous Functions on Metric Spaces: Open sets– closed sets – Discontinuous function on R^1.
Connectedness, Completeness and Compactness: More about open sets-Connected sets. Chapter 5 (Section 5.4 -5.6) Chapter 6 (Section 6.1, 6.2)</td></tr>
<tr><td colspan="6">UNIT-II: 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 (Section 6.3 - 6.8)</td></tr>
<tr><td colspan="6">UNIT-III: Calculus: Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral-properties of Riemann integral. Chapter 7 (Section 7.1 - 7.4)</td></tr>
<tr><td colspan="6">UNIT-IV: Derivatives-Rolle’s theorem, Law of mean, Fundamental theorems of calculus. Chapter 7 (Section 7.5 - 7.8)</td></tr>
<tr><td colspan="6">UNIT-V: Taylor’s theorem - Point wise convergence of sequences of functions, uniform convergence of sequences of functions.
Chapter 8 (Section 8.5) Chapter 9 (Section 9.1, 9.2)</td></tr>
<tr><td colspan="3">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="5">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="3">Skills acquired from this course</td><td colspan="5">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">Richard R. Goldberg, Methods of Real Analysis: Oxford and IBH Publishing, 2020.</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="6">1. Principles of Mathematical Analysis by Walter Rudin, Tata McGraw Hill Education, Third edition (1 July 2017).
2. Mathematical Analysis Tom M A postal, Narosa Publishing House, 2nd edition (1974), Addison-Wesley publishing company, New Delhi.</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="6">https://nptel.ac.in</td></tr>
</table>

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Explain the concepts of Continuous and Discontinuous functions, open and close sets, Connectedness, Completeness and Compactness

CLO 2: Explain the concepts of bounded and totally bounded sets, continuity of inverse functions and Uniform continuity

CLO 3: Define the sets of measure zero, to Explain about the existence and properties of Riemann integral

CLO 4: Explain the concept of differentiability and to Explain Rolle's theorem, Law of mean, and Fundamental theorem of calculus

CLO 5: Explain the point wise and uniform convergence of sequence of function and to derive the Taylor's theorem

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	1	3	1	-	3	1	1
CLO2	3	3	1	3	1	-	3	1	1
CLO3	3	3	1	3	1	-	3	1	1
CLO4	3	3	1	3	1	-	3	1	1
CLO5	3	3	1	3	1	-	3	1	1

<table>
<tr><td>Title of the Course</td><td colspan="6">FOURIER SERIES AND FOURIER TRANSFORM</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE - XI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC53</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">4</td><td>1</td><td>--</td><td colspan="2">5</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">Introduce the Fourier series and its application and the concepts of Half range Sine and Cosine series Dirichlet’s conditions, Fourier Integrals, Fourier Sine and Cosine Integral, and different type Fourier transforms.</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Introduction, Dirichlet conditions, Euler’s Formulae for Fourier Series, Theorem for the convergence of Fourier series, Fourier Series for functions of period 2π, Examples (Book-1)</td></tr>
<tr><td colspan="6">UNIT-II: Change of Interval -Fourier Series for functions of period 2л, Dirichlet’s conditions, Examples. Fourier Series of a function with its periodic extension. (Book-1)</td></tr>
<tr><td colspan="6">UNIT-III: Half Range Fourier Series: Construction of Half range Sine Series, Construction of Half range Cosine Series. Examples. (Book-1)</td></tr>
<tr><td colspan="6">UNIT – IV: Definition - Fourier Integrals - Fourier Since and Cosine Integral - Complex Form of Fourier Integral - Fourier Transform: Fourier Since and Cosine Transforms - Finite Fourier Sine and Cosine Transforms (without proof) (Book-2)</td></tr>
<tr><td colspan="6">UNIT-V: Properties of Fourier Transforms - Convolution Theorem for Fourier Transforms - Parseval’s Identity for Fourier Transforms - (without derivation), Inverse of Fourier Transform, Examples.
(Book-2)</td></tr>
<tr><td>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td>Recommended Text</td><td colspan="6">1.Dr. M. K. Venkataraman and Mrs. Manorama Sridhar, Content and treatment of Chapter 1 Fourier series as in the book Calculus and Fourier Series, The National Publishing company, Chennai 2001.
2.B.S. Grewal. Higher Engineering Mathematics (2002), Khanna Publishers, New Delhi.</td></tr>
</table>

Reference Books	1. S. Narayanan and T.K. Manicavachagom Pillay, Calculus Volume-III, S. Viswanathan (Printers & Publisher) Pvt. Ltd. Chennai, 2008. 2. M.K.Venkataraman, Engineering Mathematics-Part B. National Publishing Company, Chennai, 1992. 3. Dr. B. S. Grewal, Higher Engineering Mathematics Edition 43rd, Khanna Publishers, New Delhi, 2014. 4. K. Vairamanickam, Nirmala P. Ratchagar and S. Tamilselvan, Engineering Mathematics – II, Scitech Publications (India) Pvt. Ltd., Chennai, 2011. 5. K. Vairamanickam, Nirmala P. Ratchagar and S. Tamilselvan. Transforms and Partial Differential Equations, Scitech Publications (India) Pvt. Ltd., Chennai, 2012.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Find the Fourier series representation of a function of one variable.

CLO 2: Find the solution of the wave, diffusion and Laplace equations using the Fourier series.

CLO 3: Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.

CLO 4: Understand different types of Fourier Transform and its properties.

CLO 5: Solve problems on Fourier Transform and inverse Fourier Transform.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	2	3	3	3	2	2	2	3	2
CLO2	2	3	3	3	2	2	2	3	2
CLO3	2	3	3	3	2	2	2	3	2
CLO4	3	2	2	2	-	1	2	3	2
CLO5	2	3	3	3	2	2	2	3	2

Title of the Course		PROJECT WITH VIVA VOCE					
Paper Number		CORE – XII					
Category	Core	Year	III	Credits	4	Course Code	23UMATD54
		Semester	V				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
			-	--	5		

(Refer to the Regulations)

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">FUZZY SETS AND FUZZY LOGIC</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE – V</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATE55-1</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">3</td><td colspan="2">1</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">This course aims to offer fuzzy sets, Crisp sets, properties of α-Cuts, fuzzy operations and fuzzy logic</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Fuzzy sets:
Basic types-Basic Concepts-Characteristic and significant of the paradigm shift. Chapter-I: Sections 1.3 to 1.5</td></tr>
<tr><td colspan="6">UNIT-II: Fuzzy sets versus Crisp sets:
Additional properties of α-Cuts - Representation of fuzzy sets-Extensiton principle of fuzzy sets . Chapter-II: Sections 2.1 to 2.3</td></tr>
<tr><td colspan="6">UNIT-III: Operations on fuzzy sets:
Types of operations-Fuzzy complements-Fuzzy intersections :t-Norms-Fuzzy union: t-CoNorms. Chapter-III: Sections 3.1 to 3.4</td></tr>
<tr><td colspan="6">UNIT – IV: Fuzzy logic:
Classical logic-Multivalued logics-Fuzzy Propositions-Fuzzy Quantifiers . Chapter-VIII: Sections 8.1 to 8.4</td></tr>
<tr><td colspan="6">UNIT-V: Fuzzy logic contd.,:
Inference from conditional fuzzy propositions-Inference from conditional and qualified propositions- Inference from quantified propositions. Chapter-VIII: Sections 8.6 to 8.8</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">Geroge J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:
Theory and Applications, Prentice Hall P T R, New Jersey, 1995.</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="6">1. H.J. Zimmermamn, Fuzzy sets Theory and its applications, Ailled Publishers 1996.
2. A. Kaufman, Introduction to the theory of Fuzzy subsets Academic press,1975.
3. V.Novak, Fuzzy Sets and Their Applications, Adam Hilger, Bristol, 1969.</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="6">https://nptel.ac.in</td></tr>
</table>

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Fuzzy sets.

CLO 2: Representation of fuzzy sets

CLO 3: Operations on fuzzy sets.

CLO 4: Characteristics of fuzzy logic

CLO 5: Fuzzy propositions

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	2	3	3	3	2	2	2	3	2
CLO2	2	3	3	3	2	2	2	3	2
CLO3	2	3	3	3	2	2	2	3	2
CLO4	3	2	2	2	-	1	2	3	2
CLO5	2	3	3	3	2	2	2	3	2

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">PROGRAMMING LANGUAGE C</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATE55-2</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">3</td><td>1</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">To make the students abreast with the programming concepts Constants, variables, data types,operators, expressions ,formatted input-output statements, Control statements and to master them in C Language. Students can be given practice to write a complete C program to solve all kinds of problems arise day today life in Science, technology and Business.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Overview of C
Basic Structure of C Programs- Programming style- Executing a ‘C’ Programs –‘c’ Tokens- Keywords and Identifiers
Chapter-1(Sections 1.8-1.10), Chapter-2 (Sections 2.3, 2.4)</td></tr>
<tr><td colspan="6">UNIT-II: Constants, Variables & Data Type
Constants-Variables-Data Types- Declaration of Variables-Declaration of Storage Class- Assigning values to variables
Chapter-2 (Sections 2.5-2.10)</td></tr>
<tr><td colspan="6">UNIT-III: Operators and Expression
Arithmetic Operators-Relational operators- Logical operators-Assignment operators-Increment and decrement operators-Conditional operators-Evaluation of Expressions-Precedence of Arithmetic operators Chapter-3 (Sections 3.2-3.12)</td></tr>
<tr><td colspan="6">UNIT – IV: Formatted Input, Output & Decision Making and Branching
Formatted input- Formatted output- Decision making with ‘IF’ statement- Simple IF statement- The IF….ELSE statement-Nesting of IF…ELSE statement-The ELSE IF ladder-The switch statement – The ?: Operators- The GOTO statement
Chapter-4 (Sections 4.4,4.5), Chapter-5 (Sections 5.2-5.9)</td></tr>
<tr><td colspan="6">UNIT-V: Decision Making and Looping & Arrays
The WHILE statement-The DO statement-The FOR statement-Jumps in LOOPS-One dimensional array-Declaration of one dimensional arrays-Initialization of one dimensional arrays-Two dimensional arrays-Multi dimensional arrays
Chapter-6 (Sections 6.2-6.5),Chapter-7 (Sections 7.2-7.7)</td></tr>
<tr><td colspan="3">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="5">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
</table>

Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	E. Balagurusamy [1996], "Programming in ANSI C", Tata McGraw Hill.
Reference Books	4. V.Rajaraman [1995], "Computer Programming In C", Prentice Hall. New Delhi. 5. H.Schildt, Obsborne (1994), "Teach Yourself C", McGraw Hill, New York ,Mullish Cooper. 6. "The Spirit of C – An Introduction to Modern Programming",Jaico Publishing House. Delhi. 1998. 7. Yashavant Kanetkar, "Let Us C", 6th edition BPB publication.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Knowledge pertaining to C-Language Fundamentals

CLO 2: Logic using Control Statements

CLO 3: Modular Programming using Functions

CLO 4: Knowledge pertaining to arrays and structures

CLO 5: Advanced Programming techniques to solve a very complex problems

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	2	3	3	3	2	2	2	3	2
CLO2	2	3	3	3	2	2	2	3	2
CLO3	2	3	3	3	2	2	2	3	2
CLO4	3	2	2	2	-	1	2	3	2
CLO5	2	3	3	3	2	2	2	3	2

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">DATA STRUCTURES</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7"></td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATE55-3</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">3</td><td colspan="2">1</td><td>-</td><td>4</td></tr>
<tr><td colspan="3">Pre-requisite</td><td colspan="5">Basic knowledge in data and representations</td></tr>
<tr><td colspan="3">Links to other Courses</td><td colspan="5"></td></tr>
<tr><td colspan="8">Learning Objectives: (for teachers: what they have to do in the class/lab/field)
• To impart the basic concepts of data structures .
• To acquaint the student with the basics of the various data structures and make the students knowledgeable in the area of data structures.
• This course also gives insight into the various data structure techniques</td></tr>
<tr><td colspan="8">Course Learning Outcomes: (for students: To know what they are going to learn)
CLO1: To introduce the concepts of Data structures and to understand simple linear data structures.
CLO2:Learn the basics of stack data structure, its implementation and application
CLO3:Use the appropriate data structure in context of solution of given problem and demonstrate a familiarity with major data structures.
CLO4: To introduce the basic concepts Queues.
CLO5: To give clear idea on Trees and Graphs</td></tr>
<tr><td>Units</td><td colspan="6">Contents</td><td>Required Hours</td></tr>
<tr><td>I</td><td colspan="6">INTRODUCTION TO DATA STRUCTURES:
• Data Structures: Definition- Time & Space Complexity,
• Arrays: Representation of arrays, Applications of arrays, sparse matrix and its representation,
• Linear list: Singly linked list implementation, insertion, deletion and searching operations on linear list
• Circular linked list: implementation, Double linked list implementation, insertion, deletion and searching operations. Applications of linked lists- Dynamic Storage management.</td><td>8</td></tr>
<tr><td>II</td><td colspan="6">STACKS:
• Operations, array and linked representations of stack,
• stack applications, infix to postfix conversion, postfix expression evaluation, recursion implementation</td><td>8</td></tr>
<tr><td>III</td><td colspan="6">QUEUES:
• Queues: operations on queues, array and linked representations.
• Circular Queue: operations,, applications of queues.</td><td>8</td></tr>
</table>

IV	**TREES :** • **Trees:** Definitions and Concepts- Representation of binary tree, Binary tree traversals (Inorder, Postorder, preorder • Binary search trees	**8**
V	**GRAPHS:** Representation of Graphs- Types of graphs - Breadth first traversal – Depth first traversal- -Applications of graphs –	**8**

Extended Professional Component (is a part of internal component only, n ot to be included in the External Examination question paper)	Questions related to the above topics, from variouscompetitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication andTransferrable Skill

Learning Resources:

- **Recommended Texts**

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , "Fundamentals of Data in C", Universities Press

Reference Books

1.Seymour Lipschutz ,"Data Structures with C", First Edition, Schaum's outline series in computers, Tata McGraw Hill.

2.R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.

3.A.K.Sharma, Data Structures using C , Pearson Education India,2011.

Web resources: Web resources from NDL Library, E-content from open source libraries

Course Learning Outcome (for Mapping with POs and PSOs)

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	3	3	2	2	3	3	2
CLO2	3	3	3	3	2	2	3	3	3
CLO3	3	3	3	3	3	2	3	3	2
CLO4	3	2	2	2	-	1	3	3	3
CLO5	2	3	3	3	3	3	3	3	2

Title of the Course		OPTIMIZATION TECHNIQUES					
Paper Number		ELECTIVE – VI					
Category	Core	Year	II	Credits	3	Course Code	23UMATE56-1
		Semester	IV				

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total
	3	1		4

Pre-requisite	Basic knowledge in data and representations
Links to other Courses	

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To impart the basic concepts of Network diagram for different optimization techniques.
- To acquaint the student with the basics of Inventory models and its controlling process.
- This course also gives insight into the various sequencing problems and queuing Theory

Course Learning Outcomes: (for students: To know what they are going to learn)

CLO1: To introduce the construction of Network diagrams for CPM method.

CLO2: Learn the basics of Network scheduling by PERT Method.

CLO3: Use the appropriate Inventory models and its working system to maintain stock of products

CLO4: To introduce the basic concepts of Sequencing problems of Jobs with machines.

CLO5: To give clear idea on queuing systems.

Units	Contents	Required Hours
I	Network logic-Numbering the events-construction of network diagram-Critical path method (CPM) - Three floats	8
II	Three time estimates-Network scheduling by PERT Method- Cost consideration in PERT and CPM -Crashing	8
III	Inventory models - EOQ model (a) Uniform demand rate infinite production rate with no shortages (b) Uniform demand rate infinite production rate with shortages allowed (c) Uniform demand rate finite production rate with no shortages (d) Uniform demand rate finite production rate with shortages allowed - Inventory control with Price Breaks.	8
IV	Sequencing problem - n jobs through 2 machines, n jobs through 3 machines - two jobs through m machines - n jobs through m machines.	8
V	Queuing Theory - Basic concepts - Steady state analysis of M/M/1 and M/M/N systems with finite and infinite capacities - Multi-channel queuing model (M/M/C)/FCFS/∞/∞) .	8

Extended Professional Component (is a part ofinternal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication andTransferrable Skill

Learning Resources:

Recommended Text

1. Gupta P.K. and Hira D.S. (2000) *Problems in Operations Research*, S.Chand &Co. Delhi

Reference Books

1. J.K.Sharma, (2001) Operations Research: Theory and Applications, Macmillan, Delhi
2. KantiSwaroop, Gupta P.K. and Manmohan, (1999) *Problems in Operations Research*, Sultan Chand & Sons., Delhi.
3. V.K.Kapoor [1989] *Operations Research*, sultan Chand & sons.
4. Ravindran A., Philips D.T. and Solberg J.J., (1987) *Operations research*, John Wiley & Sons, New York.
5. Taha H.A. (2003) *Operations Research,* Macmillan Publishing Company, New York
6. S.J.Venkatesan, *Operations Research,* J.S. Publishers, Cheyyar-604 407.

Course Learning Outcome (for Mapping with POs and PSOs)

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	3	3	3	2	3	3	2
CLO2	3	3	3	3	2	2	3	3	3
CLO3	3	3	2	3	3	2	3	3	2
CLO4	3	2	3	2	-	3	3	3	3
CLO5	3	3	3	3	3	3	3	3	2

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">LAPLACE AND Z TRANSFORM</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE – VI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATE56-2</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>3</td><td colspan="2">1</td><td colspan="2">--</td><td>4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">To introduce Laplace transform which is a useful technique in solving many application problems and to solve differential and integral equations. To introduce Z-transforms which is a useful technique in solving difference equations and signal processing, the Z-transform converts a discrete domain signal, which is a sequence of real numbers, into a complex frequency domain representation.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Laplace Transforms
Definition-Transforms of elementary functions-properties-Transform of derivatives and integrals- Multiplication by t-Division by t
Chapter 21</td></tr>
<tr><td colspan="6">UNIT-II: Laplace Transform (Continued)
Transform of unit step function-transform of periodic functions-Initial and Final value theorem-Methods of determining inverse Laplace Transforms</td></tr>
<tr><td colspan="6">UNIT-III: Laplace Transform (Continued)
Convolution theorem-Application to differential equations-Integral Equations</td></tr>
<tr><td colspan="6">UNIT – IV: Z-transforms
Introduction-Definition-Elementary Properties of Z-transforms-Inverse Z-transforms</td></tr>
<tr><td colspan="6">UNIT-V: Z-transforms (Continued)
Convolution theorem-Formation of difference equations-Solution of difference equations using Z-transforms</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferable Skill</td></tr>
</table>

Recommended Texts	1. M.K. Venkataraman. (2009) Engineering Mathematics volume Two. National Publishing Company,Chennai. 2. Erwin Kreyszig, Advanced Engineering Mathematics, Willey India Pvt. Ltd., 3. T, Veerarajan, Engineering Mathematics [For Semester I and II], 3rd Edition, Tata McGraw Hill Education Private Limited, New Delhi
Reference Books	1. N. P. Bali and Dr. Manish Goyal A text book of Engineering Mathematics, Ninth Edition, Laxmi Publications(P) Ltd., New Delhi. 2. Dr.B. S. Grewal, Higher Engineering Mathematics, 40th Edition, Khanna Publishers, New Delhi.
Website and e-Learning Source	

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Explain the fundamental concepts and properties of Laplace transforms, transform of derivatives

CLO 2: Demonstrate accurate and efficient use of the Laplace transforms and their applications in the solution of ordinary differential equations

CLO 3: Explain the fundamental concepts and properties of Z-transforms

CLO 4: Apply problem-solving skills, concepts and techniques from ordinary differential equations and Laplace transforms relevant to diversified situation in Physics, Engineering, Signals and System and in other Mathematical contexts.

CLO 5: Solve problems on Convolution theorem, Formation of difference equations and Solution of difference equations using Z-transforms

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	2	3	3	3	2	2	2	3	2
CLO2	2	3	3	3	2	2	2	3	2
CLO3	2	3	3	3	2	2	2	3	2
CLO4	3	2	2	2	-	1	2	3	2
CLO5	2	3	3	3	2	2	2	3	2

<table>
<tr><td>Title of the Course</td><td colspan="6">NEURAL NETWORK MODELS</td></tr>
<tr><td>Paper Number</td><td colspan="6">ELECTIVE - VI</td></tr>
<tr><td rowspan="2">Category Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATE56-3</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">3</td><td colspan="2">1</td><td colspan="2">--</td><td>4</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">1. To learn the application of Fuzzy Logics and its controls
2. To understand the concept of adaptive fuzzy logic system
3. To understand the concept of artificial neural networks with its algorithm
4. To understand the concept of Mapping
5. To learn from the case studies of fuzzy logic system</td></tr>
<tr><td rowspan="5">Course Outline</td><td colspan="6">Unit I: ADAPTIVE FUZZY SYSTEMS

Teaching Hours: 8 Hrs.
Performance index-Modification of rule base()-Modification of membership functions- Simultaneous modification of rule based and membership functions-Genetic algorithms- Adaptive fuzzy system-Neurofuzzy systems.</td></tr>
<tr><td colspan="6">UNIT-II: ARTIFICIAL NEURAL NETWORKS

Teaching Hours: 8 Hrs.
Introduction-History of Neural Networks-Multilayer Perceptions.</td></tr>
<tr><td colspan="6">UNIT-III: ARTIFICIAL NEURAL NETWORKS
Back propagation algorithm and its Variations-Different types of learning, examples.</td></tr>
<tr><td colspan="6">UNIT-IV: MAPPING AND RECURRENT NETWORKS

Teaching Hours: 8 Hrs.
Counter propagation-Self organization Map-Cognitron and Neocognitron-Hopfield Net- Kohonnen Nets- Grossberg Nets-Art-I, Art-II reinforcement learning</td></tr>
<tr><td colspan="6">UNIT-V: CASE STUDIES

Teaching Hours: 7 Hrs.
Application of fuzzy logic and neural networks to Measurement-Control-Adaptive Neural Controllers-Signal Processing and Image Processing</td></tr>
<tr><td>Recommended Text</td><td colspan="6">Vallum B.R and Hayagriva V.R C++, Neural networks and Fuzzy logic, BPBPublications, New Delhi, 1996</td></tr>
</table>

Reference Books	1. Fuzzy logic and Neural Networks/Chennakesava R.Alavala/New Age International, 2008 2. Neural Networks for control, Millon W.T, Sutton R.S and Werbos P.J, MIT Press 1992 3. Fuzzy sets Fuzzy logic, Klir, G.J and Yuan B.B Prentice Hall of India Pvt. Ltd, New Delhi 4. Neural Networks and Fuzzy Systems, Kosko, Prentice hall of India Pvt Ltd, New Delhi, 1994 5. Introduction to Artificial Neural Systems, Zurada J.M.Jaico Publishing House, NewDelhi,1994

Course Learning Outcomes

1. After studied unit-1, the students are able to understand the adaptive fuzzy logics.
2. After studied unit-2, the students are able to understand the concept of neural networks
3. After studied unit-3, the students are able see different learning of neural networks
4. After studied unit-4, the students are able to understand the concept mapping
5. After studied unit-5, the students are able to understand the concept of fuzzy logic system.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	3	3	3	2	3	3	2
CLO2	3	3	3	3	2	2	3	3	3
CLO3	3	2	3	2	3	3	3	3	3
CLO4	3	2	2	3	-	3	3	3	3
CLO5	3	2	3	3	3	3	3	3	2

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">SUMMER INTERNSHIP ++</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE - XII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATI58</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td></td><td>-</td><td>--</td><td colspan="3">-</td></tr>
</table>

(Refer to the Regulations)

SEMESTER - VI

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">LINEAR ALGEBRA</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE - XIII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC61</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>6</td><td colspan="2"></td><td>--</td><td colspan="2">6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Vector Spaces, linear dependence and independence of vectors .Dual spaces, Inner product and norm – orthogonalization process.
• Linear transformations. Various operators on vector spaces</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Vector Spaces
Linear dependence and independence - Bases – Dimension - Definition and examples. Chapter 4 (Section-4.1, 4.2)</td></tr>
<tr><td colspan="6">UNIT-II: Vector Spaces [Contd.]
Dual space - Annihilator of a Subspace - inner product spaces - Schwarz Inequality - Orthonormal Vectors - Orthogonal Complement
Chapter 4 (Section-4.3, 4.4)</td></tr>
<tr><td colspan="6">UNIT-III: Linear Transformations
Algebra of linear transformations - Sub Algebra - Minimal Polynomial - Invertible - characteristics roots - Characteristic Vectors. Chapter 6 (Section-6.1, 6.2)</td></tr>
<tr><td colspan="6">UNIT – IV: Linear Transformations [Contd.]
Matrices - Matrix of a Linear Transformation and its Properties-canonical forms - triangular forms - Invariant Transformation - Triangular Matrix of ‘T’ Chapter 6 (Section-6.3, 6.4)</td></tr>
<tr><td colspan="6">UNIT-V: Linear Transformations [Contd.]
Trace and Transpose: Definition and Properties-Jacobson Lemma- Symmetric, Skew Symmetric and Adjoint of a matrix - Determinants: Definition and Properties- Solving system of Linear Equation-Secular Equation. Chapter 6 (Section-6.8, 6.9)</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">Linear Algebra - Stephen H Friedberg, Arnold J Insel and Lawrence E Spence, 5th edition (2018) Pearson</td></tr>
</table>

Reference Books	1. I.N.Herstein, Topics in Algebra, Wiley EasternLtd. Second Edition, 2006. 2. N.S.Gopalakrishnan, University Algebra, New Age International Publications, Wiley Eastern Ltd. 3. John B.Fraleigh, First course in Algebra, Addison Wesley. 4. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 4th Ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2004. 5. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007. 6. S. Lang, Introduction to Linear Algebra, 2nd Ed., Springer, 2005. 7. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Acquire a detailed knowledge about vector spaces and subspaces

CLO 2: Explain the concepts of Linear Dependence, Linear Independence, Bases and Dimension of basis

CLO 3: Explain the concept of Linear Transformations, their Matrix representation and the notion of dual spaces

CLO 4: Find the Eigen values and Eigen vectors, to apply the concepts for diagonalisation

CLO5: Explain about Inner product and norms and to apply Gram Schmidt Orthogonalization Process to problems on inner product spaces

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	2	3	-	-	3	3	1
CLO2	3	3	3	3	-	-	3	3	1
CLO3	3	3	2	3	1	-	3	3	1
CLO4	3	3	3	3	-	-	3	3	1
CLO5	3	3	3	3	1	-	3	3	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">COMPLEX ANALYSIS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE - XIV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC62</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>6</td><td colspan="2"></td><td colspan="2">--</td><td>6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Apply concept and consequences of analyticity and C-R equations.
• Understand the concept of mappings and transformations.
• Compute complex contour integrals and applying Cauchy‘s integral in various versions.
• Understand zeros and singularities of an analytic function, apply their properties in the evaluation of definite integral.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">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)</td></tr>
<tr><td colspan="6">UNIT-II: Conformal mapping: Mappings – Mapping by exponential function – Linear transformation – The transformation w= $\frac{1}{z}$– Mappings by $\frac{1}{z}$ – Linear fractional transformations (bilinear)
Chapter 2 (Section 12,13) Chapter 8 (Section 83 to 86)</td></tr>
<tr><td colspan="6">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 (Section 39,40,46 to 50)</td></tr>
<tr><td colspan="6">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
Chapter 5 (Section 51,52,53,55,57,58,59)</td></tr>
<tr><td colspan="6">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)</td></tr>
<tr><td colspan="3">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="5">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)</td></tr>
</table>

Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	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. 4. S. Ponnusamy and H. Silverman, Complex variables with applications, Birkhauser, 2006.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

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, Liouvlle'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)

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
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

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">MECHANICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">CORE – XV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATC63</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">6</td><td colspan="2"></td><td>--</td><td>6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Equilibrium of a particle under the action of given forces
• Simple Harmonic Motion
• Projectiles</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: 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 (Section 2.1, 2.2)
Chapter 3 (Section 3.1, 3.2)</td></tr>
<tr><td colspan="6">UNIT-II: Forces on a Rigid Body: Moment of a Force – General motion of a body – Equivalent systems of forces- Parallel Forces – Forces acting along the sides of a Triangle – Couples - A specific reduction of Forces: Reduction of coplanar forces into a force and couple – Problems involving frictional forces.
Chapter 4 (Section 4.1 - 4.6)
Chapter 5 (Section 5.1)</td></tr>
<tr><td colspan="6">UNIT-III: Work, Energy and Power: Work – Conservative field of force – Power -Rectilinear Motion under Varying Force: Simple Harmonic Motion - along a horizontal line – along a vertical line.
Chapter 11 (Section 11.1 – 11.3)
Chapter 12 (Section 12.1 – 12.3)</td></tr>
<tr><td colspan="6">UNIT – IV: Projectiles: Forces on a projectile – Projectile projected on an inclined plane
Chapter 13 (Section 13.1, 13.2)</td></tr>
<tr><td colspan="6">UNIT-V:Central Orbits: General orbits – Central orbit – Conic as a centered orbit
Chapter 16 (Section 16.1 - 16.3)</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
</table>

Recommended Text	P. Duraipandian, Laxmi Duraipandian and Muthamizh Jayapragasam, Mechanics, S.Chand & Company Pvt. Ltd., New Delhi, 2008.
Reference Books	1. J.L. Meriam and L. G. Kraige, Engineering Mechanics: Statics, Seventh Edition,Wiley and sons Pvt ltd., New York, 2012. 2. J.L. Meriam, L. G. Kraige, and J.N. Bolton, Engineering Mechanics: Dynamics, 8thedn, Wiley and sons Pvt ltd., New York, 2015. 3. A. K. Dhiman,P.Dhinam and D. Kulshreshtha, Engineering Mechanics (Statics and Dynamics) ,McGraw Hill Education(India) Private Limited, New Delhi, 2015.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will able to

CLO 1: Define Resultant, Component of a Force, Coplanar forces, like and unlike parallel forces, Equilibrium of a Particle, Limiting equilibrium of a particle on an inclined plane.

CLO 2: Define Moment of a force and Couple with examples. Define Parallel Forces and Forces acting along a Triangle, Solve problems on frictional forces

CLO 3: Define work, energy, power, rectilinear motions under varying forces. Define Simple Harmonic Motion and find its Geometrical representation.

CLO 4: Define Projectile, impulse, impact and laws of impact. Prove that the path of a projectile is a parabola. Find the direct and oblique impact of smooth elastic spheres

CLO 5: Define central orbits, explain conic as centered orbits and solve problems related to central orbits

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	3	2	1	1	3	3	2
CLO2	3	2	3	2	1	1	3	3	2
CLO3	3	2	3	2	1	1	3	3	2
CLO4	3	2	3	2	1	1	3	3	2
CLO5	3	2	3	2	1	1	3	3	2

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">GRAPH THEORY & APPLICATIONS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE - VII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATE64-1</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">5</td><td colspan="2"></td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">To study and develop the concepts of graphs, subgraphs, connectivity, Eulerian and Hamiltonian graphs, Trees, Colourings and Planarity. To acquire knowledge to model real world problems using graph theory.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">Unit I: Definition and Examples – Degrees – Subgraphs – Isomorphism – Independent Sets and Coverings –Intersection Graphs and Line Graphs – Matrices – Operations on Graphs.
Chapter 2 Sections 2.1 to 2.9 (except 2.5)</td></tr>
<tr><td colspan="6">Unit II: Walks, Trails and Paths – Connectedness and Components – Blocks – Connectivity – Simple Problems.
Chapter 4 Sections 4.1 to 4.4</td></tr>
<tr><td colspan="6">Unit III: Eulerian Graphs - Hamiltonian Graphs - Simple Problems.
Chapter 5 Sections 5.1 to 5.2</td></tr>
<tr><td colspan="6">Unit IV: Characterisation of Tress – Centre of a Tree – Definition of Planarity and Properties
Chapter 6 Sections 6.1 to 6.2 ; Chapter 8 Sections 8.1</td></tr>
<tr><td colspan="6">Unit V: Chromatic Number and Chromatic Index – The Five Colour Theorem – Simple Problems. Chapter 9 Sections 9.1, 9.2</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Knowledge, problem solving, analytical ability, professional competency, professional communication and transferable skill.</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">S. Arumugam and S. Ramachandran, “Invitation to Graph Theory”, SCITECH Publications India Pvt. Ltd., Chennai – 600 056.</td></tr>
<tr><td colspan="2">Books for Reference</td><td colspan="6">1. S. Kumaravelu, Susheela Kumaravelu, Graph Theory, Publishers, 182, Chidambara Nagar, Nagarcoil – 629 002.
2. S.A.Choudham, A First Course in Graph Theory, Macmillan India Ltd.
3. J.A. Bondy and U.S.R. Murthy, Graph Theory with Applications, Macmillon, London.</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="6">https://nptel.ac.in</td></tr>
</table>

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CO1: Give Examples and counter examples of Graphs and Subgraphs

CO2: Understand Proof techniques in Graph theory.

CO3: Know the Intersection Graphs and Line Graphs, Incident Matrices, Intersection Graphs and Line Graphs, Operations on Graphs.

CO4: Get Problem solving skills in Chromatic Number and Chromatic Index.

CO5: Understand the concepts of Hamiltonian Graphs, Trees, Planarity and Colouring

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	2	1	3	1	-	-	3	2	1
CLO3	3	1	3	1	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	-	-	3	2	1

Title of the Course		OBJECT ORIENTED PROGRAMMING WITH C++					
Paper Number		ELECTIVE - VII					
Category	Core	Year	III	Credits	3	Course Code	23UMATE64-2
		Semester	VI				

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total
	5		--	5

Pre-requisite	
Links to other Courses	

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To engender an appreciation for the need and characteristics of Object-orientation.
- To impart knowledge of the C++ language grammar in order to design and implement programming solutions to simple problems by applying Object-oriented thinking.

Course Learning Outcomes: (for students: To know what they are going to learn)

CLO1: Explain the various basic concepts of Object-orientation.

CLO2: Write programs to implement static binding

CLO3: Write programs to implement inheritance and dynamic binding

CLO4: Write programs to implement templates and exception handling and learn how to use STL class library.

CLO5: Write programs implementing File and Stream I/O.

Conceptualize a given simple problem in an Object-oriented way, design classes and write a program to solve the problem by applying the concepts of Object-orientation and features of C++.

Find and fix bugs in a given program snippet.

Determine the output of a given program snippet.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	**Object Oriented Programming Concepts:** Complexity in software - The need for object-orientation – Abstraction – Encapsulation – Modularity – Hierarchy. **Basic Elements of C++:** Classes – Objects – Data members and member functions – *private* and *public* access specifiers - Static members - Constructors – Singleton class - Destructors - Friend Functions and Friend Classes - Array of objects – Pointer to objects - *this* pointer – References – Dynamic memory allocation - Namespaces.	17
II	**Function Overloading:** Overloading a function - Default arguments – Overloading Constructors. **Operator Overloading:** Overloading an operator as a member function – Overloading an operator as a friend function – Overloading the operators [], (), -> and comma operators – Conversion Functions.	17

III	**Inheritance:** Types of inheritance – *protected* access specifier –Virtual Base Class – Base class and derived class constructors. **Run-time Polymorphism:** Virtual Functions – Function overriding - Pure virtual function – Abstract base class.	**17**
IV	**Templates:** Function templates – Overloading a function template – Class templates. **Standard Template Library (STL):** Containers: vector, list – Iterators: forward, backward – Algorithms: removing and replacing elements, sorting, counting, reversing a sequence. **Exception Handling:** Exceptions – *try*, *catch*, *throw* – Rethrowing an exception – Restricting exceptions - Handling exceptions in derived classes - *terminate()*, *abort()*, *unexpected()*, *set_terminate()*.	**17**
V	**I/O Streams:** Formatted I/O with *ios* class functions - Manipulators – Creating own manipulator – Overloading << and >> operators. **File I/O:** *fstream* class – Opening and closing a file – Reading from and writing to a text file - Unformatted and Binary I/O – Random access I/O.	**17**

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from variouscompetitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication andTransferrable Skill

Learning Resources:

Recommended Texts

1. Herbert Schildt, *C++ - The Complete Reference*, Third Edition, TMH, 1999.
2. Grady Booch, *Object Oriented Analysis and Design*, Pearson Education, 2008. (For Unit I)

Reference Books

1. Bjarne Strousstrup, *The C++ Programming Language*, Addison Wesley, 2000.
2. J. P. Cohoon and J. W. Davidson, *C++ Program Design – An Introduction to Programming and Object-Oriented Design*, Second Edition, McGraw Hill, 1999.
3. C. J. Lippman, *C++ Primer*, Third Edition, Addison Wesley, 2000.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	3	3	2	2	3	3	3
CLO2	3	3	3	3	3	3	2	3	2
CLO3	3	3	3	3	2	3	3	3	3
CLO4	3	3	3	2	-	1	3	3	3
CLO5	2	3	3	3	3	2	2	3	2

Title of the Course		ALGORITHMS					
Paper Number		ELECTIVE - VII					
Category	Core	Year	III	Credits	3	Course Code	23UMATE64-3
		Semester	VI				
Instructional Hours per week		Lecture		Tutorial	Lab Practice	Total	
		5			--	5	
Pre-requisite		Basic knowledge in Algorithm and representations					
Links to other Courses							

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To impart the basic concepts of algorithms.
- To acquaint the student with the basics of the various methods of Algorithms and make the students knowledgeable in the area of Algorithms.
- This course also gives insight into the various algorithm design techniques

Course Learning Outcomes: (for students: To know what they are going to learn)

CLO1: To introduce the concepts of procedures and methods to solve problems.

CLO2: Learn the basics of Algorithms and its implementation.

CLO3: Use the appropriate procedures in context of solution of given problem and demonstrate an Algorithms.

CLO4: To introduce the different types of algorithms to solve problems.

CLO5: To give clear idea on algorithmic design paradigms like Dynamic Programming, Backtracking, Branch and Bound

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	**INTRODUCTION TO ALGORITHMS:** Definition of Algorithms- Overview and importance of algorithms- pseudocode conventions, Asymptotic notations, practical complexities.	18
II	**Divide-and-Conquer:** : General Method – Binary Search- Quick Sort- Merge Sort.	18
III	**Greedy Method:** General method- Knapsack problem Tree vertex splitting- Job sequencing with deadlines.	18
IV	**Dynamic programming**: General method, Multistage Graphs, All pairs shortest path, Single source shortest path.	18
V	**Backtracking & Branch & Bound** • **Backtracking:** General method, 8 Queens, Graph coloring, Hamiltonian cycle. • **Branch & Bound**: General method, Travelling salesperson problem.	18

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Learning Resources:

Recommended Text

1. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,"Fundamentals of Computer Algorithms " Universities Press

Reference Books

1. G. Brassard and P. Bratley, "Fundamentals of Algorithms", PHI, New Delhi, 1997.
2. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, "The design and analysis of Computer Algorithms", Addison Wesley, Boston, 1974
3. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to m Algorithms, Third edition, MIT Press, 2009
4. Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008.

Web resources:

Web resources from NDL Library, E-content from open source libraries

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	2	3	3	3	2	2	2	3	2
CLO2	3	3	3	3	3	3	3	3	3
CLO3	3	3	3	3	3	2	3	3	3
CLO4	3	2	3	2	-	3	2	3	3
CLO5	2	3	3	3	3	3	3	3	2

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">DISCRETE MATHEMATICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELELCTIVE – VIII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATE65-1</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>5</td><td colspan="2"></td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">Students must understand Mathematical reasoning in order to read, comprehend and construct Mathematical arguments. Mathematical logic, which serves as foundation for subsequent discussions is discussed. Discrete Structures such as Sets and Permutations, Recurrence Relation and Mathematical Induction are studied.</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="6">Unit I: Mathematical Logic
Statements and Notation-Connectives-Negation-Conjunction-Disjunction-Statement Formulas and Truth tables-Conditional and Biconditional-well-formed formulas-Tautologies-Equivalence of Formulas-Duality law-Tautological Implications-Functionally Complete Sets of Connectives-Normal forms-DNF-CNF-PDNF-PCNF
Book 1 Chapter 1 Section 1 to 3</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit II: Mathematical Logic(Continued)
The theory of Inference for the Statement Calculus-Validity using truth tables-rules of inference-Consistency of Premises and Indirect Method of Proof-The Predicate Calculus-Predicates-The Statement Function Variables and Quantifiers-Predicate Formulas-Free and Bound Variables-The Universe of Discourse-Inference Theory of the Predicate Calculus.
Book 1 Chapter 1 Section 4 to 6</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit III: Combinatorics
Permutations-Combinations-Pigeonhole Principle, Elements of Probability- Recurrence Relations
Book 2 Chapter 3 Sections 1 to 5</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit IV: Relations and Functions
Relations-Properties of Binary Relations in a Set-Relation Matrix and the Graph of a Relation-Equivalence relations-Partial Ordering-Functions- Composition of Functions-Inverse Functions-Characteristic Function of a Set
Book 1 Chapter 2 Section 3 to 4</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit V: Lattice Theory
Lattices as Partially Ordered Sets-Properties of Lattices-Lattices as Algebraic System-Sublattices-Direct Product and Homomorphism-Some Special Lattices-Boolean Algebra
Book 1 Chapter 4 Section 1 to 2</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, problem solving, analytical ability, professional competency, professional communication and transferable skill.
Recommended Text	1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications toComputer Science, Tata McGraw Hill Publication Company, 1997. 2. Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, Discrete Mathematical Structures by Prentice - Hall of India, Private Limited, New Delhi, 2002
Books for Reference	1. K. H. Rosen, Discrete Mathematics and Its Applications with Combinatorics and Graph Theory, 7th Edition, Mc Graw Hill Education 2. E.G. Goodaire and M.M. Paramenter, Discrete Mathematics with Graph Theory, Prentice HallInternational Editions, New Jersey, 1998. 3. J. Matonsek and J. Nesetril, Invitation to Discrete Mathematics by Clarendon Press, Oxford,1998.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: Examples and counter examples for different types Logical Statements

CLO2: Permutations and Combinations.

CLO3: Problem solving techniques studied in Discrete Mathematics such as Logic, Relations, Functions, Some Algebraic Structure.

CLO4: Equivalence relations, Composition of functions and inverse functions.

CL O5: Lattices as Partially Ordered Sets,Properties of Lattices,Lattices as Algebraic, Special Lattices and Boolean Algebra

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	2	1	3	1	-	-	3	2	1
CLO3	3	1	3	1	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	-	-	3	2	1

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">INTRODUCTION TO MACHINE LEARNING</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELELCTIVE – VIII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23UMATE65-2</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td colspan="2"></td><td>--</td><td colspan="2">5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6"></td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">1. To understand basic concept of machine learning,
2. To understand concept of supervised learning
3. To understand to identify unsupervised data and how to process it.
4. To understand the basic concepts of learning and its type.
5. To understand how to represent data.</td></tr>
<tr><td colspan="2" rowspan="4">Course Outline</td><td colspan="6">UNIT I: INTRODUCTION TO MACHINE LEARNING

Teaching Hours: 11 Hrs.
Definition of Machine Learning - Understanding Objectives of Machine Learning - Various Components of Machine Learning – Data Storage – Data Processing – Deriving Variables – Transformation – Generalization – Sampling –Features of Machine Learning – Types of Machine Learning– Supervised – Unsupervised – Reinforcement Learning - Techniques and Predictive Models – Deployment of Solution – Strategic Solution</td></tr>
<tr><td colspan="6">UNIT II: SUPERVISEDLEARNING

Teaching Hours: 10 Hrs.
Classification and Regression, Generalization, Overfitting, and Underfitting : Relation of Model Complexity to Dataset Size . Supervised Machine Learning Algorithms : Some Sample Datasets, k-Nearest Neighbours, Linear Models Naive Bayes Classifiers, Decision Trees , Support Vector Machines , Uncertainty Estimates from Classifiers :The Decision Function , Predicting Probabilities , Uncertainty inMulticlass Classification.</td></tr>
<tr><td colspan="6">UNIT III: UNSUPERVISED LEARNING AND PREPROCESSING

Teaching Hours: 10 Hrs.
Types of Unsupervised Learning, Challenges in Unsupervised Learning. Reprocessing and Scaling: DifferentKinds of pre-processing , Applying Data Transformations, Scaling Training and Test Data the Same Way, TheEffect of Reprocessing on Supervised Learning,</td></tr>
<tr><td colspan="6">UNIT IV: DIMENSIONALITY REDUCTION, FEATURE EXTRACTION, AND MANIFOLD LEARNING
Principal Component Analysis (PCA), Non-Negative Matrix Factorization (NMF), Manifold Learning with t-SNE,Clustering: k-Means Clustering, Agglomerative Clustering, DBSCAN, Comparing and Evaluating Clustering Algorithms, Summary of Clustering Methods.</td></tr>
</table>

	UNIT V: REPRESENTING DATA AND ENGINEERING FEATURES **Teaching Hours: 10 Hrs.** **Categorical Variables**: One- Hot-Encoding (Dummy Variables), Numbers Can Encode Categorical, Binning, Discretization, Linear Models, and Trees , **Automatic Feature Selection** : Univariate Statistics, Model-Based Feature Selection, Iterative Feature Selection, Utilizing Expert Knowledge
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, problem solving, analytical ability, professional competency, professional communication and transferable skill.
Recommended Texts	1. Andreas C. Müller & Sarah Guido, "Introduction to Machine Learning with Python A Guide For Data Scientists" O"Reilly book, 2017 2. Ethem Alpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005.
Books for Reference	1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012. 2. Hastie, Tibshirani, Friedman, "The Elements of Statistical Learning" (2nd ed).Springer, 2008. 3. Stephen Marsland, "Machine Learning –An Algorithmic Perspective", CRC Press, 2009.

Course Learning Outcomes

1. After studied unit-1, the student will be able to understand the concepts of machine learning
2. After studied unit-2, the student will be able to understand the concepts of supervised learning.
3. After studied unit-3, the student will be able to understand the concepts of Unsupervised learning.
4. After studied unit-4, the student will be able to understand the concepts of learning with its type.
5. After studied unit-5, the student will be able to understand the concepts of representation of data.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	2	3	3	3	2	3	2	3	3
CLO2	3	3	3	3	3	3	3	3	3
CLO3	3	3	3	3	3	2	2	3	3
CLO4	3	3	2	2	3	3	3	3	3
CLO5	2	3	3	3	3	2	3	3	2

+

Title of the Course		PROGRAMMING LANGUAGE JAVA					
Paper Number		ELECTIVE - VIII					
Category	Core	Year	III	Credits	3	Course Code	23UMATE65-3
		Semester	VI				

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total
	5		--	5

Pre-requisite	
Links to other Courses	

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide fundamental knowledge of object-oriented programming.
- To equip the student with programming knowledge in Core Java from the basics up.
- To enable the students to use AWT controls, Event Handling and Swing for GUI.

Course Learning Outcomes: (for students: To know what they are going to learn)

CLO1: Understand the basic Object-oriented concepts.
Implement the basic constructs of Core Java
CLO2: Implement inheritance, packages, interfaces and exception handling of Core Java.
CLO3: Implement multi-threading and I/O Streams of Core Java
CLO4: Implement AWT and Event handling.
CLO5: Use Swing to create GUI.

Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)

Units	Contents	Required Hours
I	**Introduction:** Review of Object Oriented concepts - History of Java - Java buzzwords - JVM architecture - Data types - Variables - Scope and life time of variables - arrays - operators - control statements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data - Static Method String and String Buffer Classes	17
II	**Inheritance**: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. **Packages**: Definition - Access Protection - Importing Packages. **Interfaces**: Definition – Implementation – Extending Interfaces. **Exception Handling**: *try – catch - throw - throws – finally –* Built-inexceptions - Creating own Exception classes.	17
III	**Multithreaded Programming**: Thread Class - Runnable interface – Synchronization – Using synchronized methods – Using *synchronized* statement - Interthread Communication – Deadlock. **I/O Streams:** Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.	17

IV	**AWT Controls:** The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers. **Event Handling:** Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes.	**17**
V	**Swing:** Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel,JTextField - JTextArea - JList - JComboBox - JScrollPane	**17**

Extended Professional Component (is a part ofinternal component only, Not to be included in the External Examinationquestion paper)	Questions related to the above topics, from variouscompetitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication andTransferrable Skill

Learning Resources:

Recommended Texts

1. Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.
2. Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.

Reference Books

1. Head First Java, O'Rielly Publications,
2. Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	3	3	2	3	2	3	2
CLO2	2	3	3	3	2	3	3	3	2
CLO3	3	3	3	3	2	2	2	3	3
CLO4	3	2	2	2	3	3	2	3	3
CLO5	2	3	3	3	3	2	3	3	2

Title of the Course		MATHEMATICS FOR COMPETITIVE EXAMINATIONS-I					
Paper Number		PROFESSIONAL COMPETENCY SKILL					
Category	Core	Year	III	Credits	2	Course Code	23UMATF66
		Semester	VI				

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total
	2		--	4

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total

Course Objectives

1. To introduce the concepts of mathematics with emphasis on analytical ability, and computational skills which are required to write the competitive examinations.
2. The students should learn to calculate the LCM and HCF of a pair of integers and of any set of given numbers, and hence that of fractions.
3. To evaluate the square roots of perfect squares and of perfect cubes. To understand that the square roots and cube roots are inverses of squares, cubes respectively. To understand the term average and what it represents.
4. To learn to solve the tricky questions related to ages, asked in banking and other competitive examinations.
5. All students should be able to understand irrational numbers and how they differ from rational numbers.

Course Outcomes

1. After studied unit-1, the student will be able to answer the questions related to the number system.
2. After studied unit-2, the student will be able to answer real-life simple problems by applying the HCF and/or LCM.
3. After studied unit-3, the student will be able to apply the correct sequence of operations to find out the value of a given mathematical expression.
4. After studied unit-4, the student will be able to solve the problems involving square roots, cube roots, and average.
5. After studied unit-5, the student will be able to carry out the problems related to ages, and simplify products and quotients involving surds.

UNIT - I

Number System.

UNIT - II

H.C.F. and L.C.M. of numbers, Decimal Fractions.

UNIT - III

Simplification.

UNIT - IV

Square roots and Cube Roots, Average.

UNIT -V

Problems on Numbers, Problems on Ages, Surds and Indices.

Text book:

R.S.Aggarwal, [2017] Quantitative Aptitude for Competitive Examinations, S .Chand and Company,

New Delhi.

Chapters 1 to 9.

Reference Book:

1. Praveen R. V. Quantitative Aptitude and Reasoning, PHI Learning Pvt. Ltd, New

Delhi.

Course Material: website links, e-Books and e-journals

https://study91.co.in/subject-category-list/math-classes.

https://unacademy.com/class/mathematics for all Competitive exams/KDPVC3M1

https://artofproblemsolving.com/wiki/index.php/Resources for mathematics Competitions

https://examsdaily.in/free-online-coaching-competitive-exams

https://ariyalur.nic.in/document/tn-government-website-for-preparing-competitiveexams-and-free-online-class/

https://study91.co.in/live-online-classes.

Title of the Course		EXTENSION ACTIVITY					
Paper Number		-					
Category	Core	Year	III	Credits	1	Course Code	23UMATX67
		Semester	VI				
Instructional Hours per week		Lecture		Tutorial	Lab Practice	Total	
		-			--	-	

(Refer to the Regulations)