

**MOTHER TERESA WOMEN'S UNIVERSITY
KODAIKANAL**

DEPARTMENT OF MATHEMATICS

B.Sc. MATHEMATICS



**SYLLABUS TO BE IMPLEMENTED FROM THE ACADEMIC YEAR
2023-2024
(CHOICE BASED CREDIT SYSTEM)**

NEW INITIATIVE IN MODERNISING

UNDER- GRADUATE PROGRAMMING

MATHEMATICS

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Preamble

In pursuit of the Higher Education Department Policy Note 2022-23 Demand 20, Section 1.4, Tamil Nadu State Council for Higher Education took initiative to revamp the curriculum. On 27 July 2022, a meeting was convened by the Member-Secretary Dr. S. Krishnasamy enlightening the need of the hour to restructure the curriculum of both Under-graduate and Post-graduate programme based on the speeches at the Tamil Nadu Legislative Assembly Budget meeting by the Honorable Higher Education Minister Dr K. Ponmudy and Honorable Finance Minister Dr. P. Thiagarajan .at present there are three different modes of imparting education in most of the educational institutions through out the globe. Outcome Based Education, Problem Based Education, and Project Based Education.

Now our Honorable Higher Education Minister announced Industry Aligned Education. During discussion, Member Secretary announced the importance of question papers and evaluation as envisaged by the Honorable Chief Secretary to Government Dr. V. Irai Anbu. This is very well imbedded in Revised Bloom's Taxonomy.

Taxonomy forms three learning domains: the cognitive (knowledge), affective (attitude), and psychomotor (skill). This classification enable to estimate the learning capabilities of students.

Briefly, it is aimed to restructure the curriculum as student-oriented, skill-based, and institution-industry-interaction curriculum with the various courses under

"Outcome Based Education with Problem Based Courses, Project Based Courses, and Industry Aligned Programme" having revised Bloom's Taxonomy for evaluating student's skills.

Three domains

(i) Cognitive Domain

(Lower levels: K1: Remembering; K2: Understanding; K3: Applying;

Higher levels: K4: Analyzing; K5: Evaluating; K6: Creating)

(II) Affective Domain

(III) Psychomotor Domain

1. INTRODUCTION

B.Sc. Mathematics: Programme Outcome, Programme Specific Outcome and Course Outcome

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

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

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

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

UNDER GRADUATE PROGRAMME

Programme Outcomes:

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

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

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

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

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

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

B.SC. MATHEMATICS

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										

Highlights of the Revamped Curriculum:

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

Value additions in the Revamped Curriculum:

Semester Newly introduced Outcome / Benefits Components

I	Foundation Course To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Mathematics and simulating mathematical concepts to real world.	<ul style="list-style-type: none"> • Instil confidence among students • Create interest for the subject
I, II, III, IV	Skill Enhancement papers (Discipline centric / Generic / Entrepreneurial)	<ul style="list-style-type: none"> • Industry ready graduates • Skilled human resource • Students are equipped with essential skills to make them employable
		<ul style="list-style-type: none"> • Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational aspects
		<ul style="list-style-type: none"> • Data analytical skills will enable students gain internships, apprenticeships, field work involving data collection, compilation, analysis etc.
		<ul style="list-style-type: none"> • Entrepreneurial skill training will provide an opportunity for independent livelihood • Generates self – employment • Create small scale entrepreneurs • Training to girls leads to women empowerment
		<ul style="list-style-type: none"> • Discipline centric skill will improve the technical knowhow of solving real life problems using ICT tools
III, IV, V & VI	Elective papers- An open choice of topics categorized under Generic and Discipline Centric	<ul style="list-style-type: none"> • Strengthening the domain knowledge • Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature • Students are exposed to Latest topics on Computer Science / IT, that require strong mathematical background • Emerging topics in higher education / industry / communication network / health sector etc. are introduced with hands-on-training, facilitates

		designing of mathematical models in the respective sectors
IV	Industrial Statistics	<ul style="list-style-type: none"> • Exposure to industry moulds students into solution providers • Generates Industry ready graduates • Employment opportunities enhanced
II-year Vacation activity	Internship / Industrial Training	<ul style="list-style-type: none"> • Practical training at the Industry/ Banking Sector / Private/ Public sector organizations / Educational institutions, enable the students gain professional experience and also become responsible citizens.
V Semester	Project with Viva – voce	<ul style="list-style-type: none"> • Self-learning is enhanced • Application of the concept to real situation is conceived resulting in tangible outcome
VI Semester	Introduction of Professional Competency component	<ul style="list-style-type: none"> • Curriculum design accommodates all category of learners; ‘Mathematics for Advanced Explain’ component will comprise of advanced topics in Mathematics and allied fields, for those in the peer group / aspiring researchers; • ‘Training for Competitive Examinations’ –caters to the needs of the aspirants towards most sought - after services of the nation viz, UPSC, CDS, NDA, Banking Services, CAT, TNPSC group services, etc.
Extra Credits: For Advanced Learners / Honours degree		<ul style="list-style-type: none"> • To cater to the needs of peer learners / research aspirants
Skills acquired from the Courses		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

1. Template for Curriculum Design for UG Programme in Mathematics

Credit Distribution for UG Programme in Mathematics

B.Sc. Mathematics

First Year

Semester-I

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	Core Courses 2 (CC1, CC2)	10	10
	Elective Course 1 (Generic / Discipline Specific) EC1	3	4
Part-IV	Skill Enhancement Course SEC-1 (Non-Major Elective)	2	2
Part-VI	Foundation Course FC	2	2
	Total	23	30

Semester-II

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	Core Courses 2 (CC3, CC4)	10	10
	Elective Course 1 (Generic / Discipline Specific) EC2	3	4
Part-IV	Skill Enhancement Course -SEC-2 (Non-Major Elective) Naan Mudhalvan	2	2
Part-VI	Skill Enhancement Course -SEC-3 (Additional Credits)	2	2
	Total	23	30

Second Year

Semester-III

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	Core Courses 2 (CC5, CC6)	10	10
	Elective Course 1 (Generic / Discipline Specific) EC3	3	4
Part-IV	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	1	2
	Skill Enhancement Course -SEC-5 (Naan Mudhalvan)	2	2
	Total	22	30

Semester-IV

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	Core Courses 2 (CC7, CC8)	10	10
	CC7: Core Industry Module -1 - Industrial Statistics		
	CC8: Any Core paper		
	Elective Course 1 (Generic / Discipline Specific) EC4	3	3
Part-IV	Skill Enhancement Course -SEC6	2	2
	Skill Enhancement Course -SEC-7 (Naan Mudhalvan)	2	2
	Environmental Studies EVS	2	2
Total		25	31

Third Year Semester-V

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-III	Core Courses 3(CC9, CC10, CC11)	12	15
	Elective Courses 2 (Generic / Discipline Specific) EC5, EC6	6	6
	Core /Project with Viva voce CC12	4	5
Part-IV	Value Education	2	2
	Internship / Industrial Training (Carried out in II Year Summer vacation) (30 hours)	2	-
	Naan Mudhalvan	2	2
Total		28	30

Semester-VI

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-III	Core Courses 3 (CC13, CC14, CC15)	12	18
	Elective Courses 2 (Generic / Discipline Specific) EC7, EC8	6	10
Part IV	Professional Competency Skill Enhancement Course SEC8(Naan Mudhalvan)	2	2
Part-V	Extension Activity (Outside college hours)	1	-
		21	30

Total Credits: 142

- The students should be sent to Summer Internship/ Industrial Training during the vacation and the students should submit a report of size 20 to 40 pages.

4. Credit Distribution for UG Programme in Mathematics

Sem I	Credit	Sem II	Credit	Sem III	Credit	Sem IV	Credit	Sem V	Credit	Sem VI	Credit
1.1. Language	3	2.1. Language	3	3.1. Language	3	4.1. Language	3	5.1 Core Course – CC IX	4	6.1 Core Course – CC XIII	4
1.2 English	3	2.2 English	3	3.2 English	3	4.2 English	3	5.2 Core Course – CC X	4	6.2 Core Course – CC XIV	4
1.3 Core Course – CC I	5	2.3 Core Course – CC III	5	3.3 Core Course – CC V	5	4.3 Core Course – CC VII Core Industry Module	5	5.3. Core Course – CC –XI	4	6.3 Core Course – CC XV	4
1.4 Core Course – CC II	5	2.4 Core Course – CC IV	5	3.4 Core Course – CC VI	5	4.4 Core Course – CC VIII	5	5.4. Core Course –/ Project with viva-voce CC -XII	4	6.4 Elective - VII Generic/ Discipline Specific	3
1.5 Elective I Generic/ Discipline Specific	3	2.5 Elective II Generic/ Discipline Specific	3	3.5 Elective III Generic/ Discipline Specific	3	4.5 Elective IV Generic/ Discipline Specific	3	5.5 Elective V Generic/ Discipline Specific	3	6.5 Elective VIII Generic/ Discipline Specific	3
1.6 Skill Enhancement Course SEC-1 (NME)	2	2.6 Skill Enhancement Course SEC-2 (NME)	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurship)	1	4.6 Skill Enhancement Course SEC-6	2	5.6 Elective VI Generic/ Discipline	3	6.6 Extension Activity	1

				al Skill)				e Specific			
		Naan Mudhalvan	2								
1.7 Skill Enhanceme nt - (Foundatio n Course)	2	2.7 Skill Enhanceme nt Course – SEC-3 (Additional Credits)	2	3.7 Skill Enhancement Course SEC-5 (Naan Mudhalvan)	2	4.7 Skill Enhanceme nt Course SEC-7 (Naan Mudhalvan)	2	5.7 Value Education	2	6.7 Profession al Competen cy Skill (Naan Mudhalva n)	2
						4.8 E.V. S	2	5.8 Summer Internship /Industria l Training	2		
								Naan Mudhalva n	2		
	23		23		22		25		28		21
	Total Credit Points										142

5. 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	2	4	3	6	6	2	23
Part V	-	-	-	-	-	1	1
Part VI	2	-	-	-	-	-	2
Total	23	23	22	25	28	21	142

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

WRITTEN EXAMINATION QUESTION PAPER PATTERN

Theory Paper (Bloom's Taxonomy based)

(Common for UG,PG, Certificate, Diploma and P.G. Diploma Programme)

Intended Learning Skills	Maximum 75 Marks Passing Minimum: 50% Duration: Three Hours
Memory Recall/Example/ Counter Example/Knowledge about the Concepts/Understanding	Part-A (10x2=20 Marks) Answer ALL questions Each Question carries 2 marks
	Two questions from each Unit
	Question 1 to Question 10
Descriptions/Application (problems)	Part-B (5x5=25 Marks) Answer ALL questions Each question carries 5 Marks
	Either-or Type Both parts of each question from the same Unit
	Question 11(a) or 11(b) To Question 15(a) or 15(b)
Analysis/Synthesis/ Evaluation	Part-C (3x10 =30 Marks) Answer any THREE Questions Each question carries 10 Marks
	There shall be FIVE questions covering all the Five units
	Question 16 to Question 20

B.Sc. Mathematics -Curriculum Design

I-Semester

Part	Course Code	Course Title	Credit	Hours per week (L/T/P)	CIA	ESE	Total Mark
Part-1	U23TAL101/ U23MAL101/ U23FRL101/ U23HIL101	Language – 1: Tamil / Malayalam/French/Hindi	3	6	25	75	100
Part-2	U23ENL101	Language-2-English	3	6	25	75	100
Part-3	U23MTT101	Core Theory - 1:Algebra&Trigonometry	5	5	25	75	100
	U23MTT102	Core Theory - 2:DifferentialCalculus	5	5	25	75	100
	U23MTE11A	Elective-1:Allied-I:Theory: Physics / Chemistry	3	4	25	75	100
Part-4	U23MTS101	Skill Enhancement Course SEC-1: Computational Mathematics	2	2	25	75	100
Part -6	U23MTF101	Foundation Course FC– Bridge Mathematics	2	2	25	75	100
		Total	23	30	-	-	700

*** No Naan Mudhalvan Course in first semester**

II-Semester

Part	Course Code	List of Courses	Credit	Hours per week (L/T/P)	CIA	ESE	Total mark
Part-1	U23TAL202/ U23MAL202/ U23FRL202/ U23HIL202	Language – 1: Tamil / Malayalam/French/Hindi	3	6	25	75	100
Part-2	U23ENL202	Language-2-English	3	6	25	75	100
Part-3	U23MTT203	CoreTheory - 3:Analytical Geometry (Two & Three Dimensions)	5	5	25	75	100
	U23MTT204	CoreTheory - 4: Integral Calculus	5	5	25	75	100
	U23MTE22A	Elective-2. Allied -II : Theory /Practical: Physics/ Chemistry	3	4	25	75	100
Part-4	U23MTS202	Skill Enhancement Course (Discipline /	2	2	25	75	100

		Subject Specific) – SEC-2 (Soft Skill)					
	U23MTNM21	Naan Mudhalvan Course - 1	2	2	25	75	100
Part-6	U23MTS203	Skill Enhancement Course -SEC-3 – Web Designing	Additional Credits-2		25	75	100
		Total	23	30	-	-	800

*Skill Enhancement Course -SEC-3 is replaced with Naan Mudhalvan Course in Part 4 and is offered as additional Credit Course in Part -6

III-Semester

Part	Course Code	List of Courses	Credit	Hours per week (L/T/P)	CIA	ESE	Total mark
Part-1	U23TAL303/ U23MAL303/ U23FRL303/ U23HIL303	Language – 1: Tamil / Malayalam/French/Hindi	3	6	25	75	100
Part-2	U23ENL303	Language-2-English	3	6	25	75	100
Part-3	U23MTT305	CoreTheory - 5:Vector Calculus and Applications	5	5	25	75	100
	U23MTT306	CoreTheory - 6:Differential Equations and Applications	5	5	25	75	100
	U23MTE33A	Elective-3. Mathematical Statistics Theory & Practical	3	4	25	75	100
Part-4	U23MTS304	Skill Enhancement Course (Discipline / Subject Specific) – SEC-4 (Soft Skill)/(Statistics with R Programming)	1	2	25	75	100
	U23MTNM32	Naan Mudhalvan Course - 2	2	2	25	75	100
		Total	22	30	-	-	700

* Skill Enhancement Course -SEC-5 is offered now as Naan Mudhalvan Course

IV-Semester

Part	Course Code	List of Courses	Credit	Hours per week (L/T/P)	CIA	ESE	Total mark
Part-1	U23TAL404/ U23MAL404/ U23FRL404/ U23HIL404	Language – 1: Tamil / Malayalam/French/Hindi	3	6	25	75	100
Part-2	U23ENL404	Language-2-English	3	6	25	75	100
Part-3	U23MTT407	Core Theory - 7: Industry Module – Industrial Statistics	5	5	25	75	100
	U23MTT408	Core Theory - 8: Elements of Mathematical Analysis	5	5	25	75	100
	U23MTE44	Elective-4. Transformation Techniques	3	3	25	75	100
Part-4	U23MTS405 U23MAS406	Skill Enhancement Course – SEC - 5 (Introduction to Data Science/Computing Mathematics)	2	2	25	75	100
	U23MTNM43	Naan Mudhalvan - 3	2	2	25	75	100
	U23EVS401	Environmental Studies	2	2	25	75	100
		Total	25	31	-	-	800

* Skill Enhancement Course -SEC-7 is offered now as Naan Mudhalvan Course.

V-Semester

Part	Course Code	List of Courses	Credit	Hours per week (L/T/P)	CIA	ESE	Total mark
Part-3	U23MTT509	Core Theory - 9: Abstract Algebra	4	5	25	75	100
	U23MTT510	Core Theory - 10: Real Analysis	4	5	25	75	100
	U23MTT511	Core Theory - 11: Mathematical Modelling	4	5	25	75	100
	U23MTPR51	Core 12: Project with Viva voce	4	5	25	75	100
	U23MTE55A	Elective-5. Introduction to Machine Learning – Theory & Practical	3	3	25	75	100
	U23MTE56A	Elective-6. Optimization	3	3	25	75	100

		Techniques					
Part-4	U23VAE501	Value Education	2	2	25	75	100
	U23MTI501	Internship / Industrial Training (Summer vacation at the end of IV semester activity)	2	-	25	75	100
	U23MTNM54	Naan Mudhalvan - 4	2	2	25	75	100
		Total	28	30	-	-	900

* The Hours of Elective -5 and Elective -6 are reduced by 1 and allotted to Naan-Mudhalvan Course.

* Two extra credits are allotted to Naan Mudhalvan Course and hence the total credits of this semester accounts to 28 from 26

VI-Semester

Part	Course Code	List of Courses	Credit	Hours per week (L/T/P)	CIA	ESE	Total mark
Part-3	U23MTT612	Core Theory - 13: Linear Algebra	4	6	25	75	100
	U23MTT613	Core Theory - 14: Complex Analysis	4	6	25	75	100
	U23MTT614	Core Theory - 15: Mechanics	4	6	25	75	100
	U23MTE67A	Elective-7. Programming Language with C++ with Practical	3	5	25	75	100
	U23MTE68A	Elective-8. Graph Theory and Applications	3	5	25	75	100
Part-4	U23MTNM65	Naan Mudhalvan - 5	2	2	25	75	100
Part-5	U23EAS601	Extension Activity	1	-			
		Total	21	30	-	-	600

* Professional Competency Skill is replaced with Naan Mudhalvan

Total Credits: 142- (Minimum Credit to pass 142)

* The given structure is subject to change as per the instructions received from TANSCHÉ in future

Title of the Course		U23MAT11-ALGEBRA &TRIGONOMETRY						
Category	Core 1	Year	I	Credits	5	Course Code	U23MTT101	
		Seme ster	I					
Instructional Hours Per week		Lecture		Tutorial		Lab Practice		Total
		4		1		--		5
Pre-requisite		12 th Standard Mathematics						
Objectives of the Course		<ul style="list-style-type: none">Basic ideas on the Theory of Equations, Matrices and Number Theory.Knowledge to find expansions of trigonometry functions, solve the oretical and applied problems.						
Course Outline		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. Chapter-6 Section-16,16.1,16.2,17,19,30						
		UNIT II: Summation of Series: Binomial– Exponential –Logarithmic series (Theorems without proof)–Approximations-related problems. Chapter-3 Section-10 Chapter-4Sections-3.1,3.5,3.6,3.7						
		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. Chapter2-Sections-16,16.1to16.4						

CORE COURSE SYLLABUS

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 sub multiple 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	1	1	1	1	1	1	1	1
CLO2	2	1	1	2	2	1	2	1
CLO3	2	1	1	2	2	1	2	1
CLO4	1	1	1	1	1	1	2	1
CLO5	1	1	1	1	1	1	2	1

	<p>UNIT IV: Expansions of $\sin^n \theta$, $\cos^n \theta$ in powers of $\sin \theta$, $\cos \theta$ - Expansion of $\tan^n \theta$ in terms of $\tan \theta$, Expansions of $\cos^n \theta$, $\sin^n \theta$, $\cos^m \theta \sin^n \theta$ - Expansions of $\tan (\theta_1 + \theta_2 + \dots + \theta_n)$ - Expansions of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in terms of θ - related problems.</p> <p>Chapter 2 Sections 2.1, 2.1.1, 2.1.2</p> <p>Chapter 3 Sections 3.1, 3.1.1 to 3.4.3</p>
	<p>Unit V: Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series - related problems.</p> <p>Chapter 4 Sections 4.1 to 4.7 Chapter 5 - Sec 5.3</p> <p>Chapter 6 Sections 6.1 to 6.6</p>
Extended Professional Component (is a part of internal component only, not to be included in the External Examination Question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge, problem solving, analytical ability, professional competency, professional communication and transferable skill.</p>

Textbooks	<p>1.Algebra,VolumeIby T.K. Manicavachagom Pillay, T.Natarajan, K.S.Ganapathy, Viswanathan Publication2007,</p> <p>Unit-1and Unit-2.</p> <p>2.Algebra, Volume II by T.K.Manicavachagom Pillay,T.Natarajan,K.S.Ganapathy, Viswanathan Publication2008</p> <p>Unit-3.</p> <p>3.Trigonometry by P.Duraipandian and Kayalal Pachaiyappa , Muhil publishers,</p> <p>Unit-4,Unit-5.</p>
Reference Books	<p>1. Burnstine and A.W.Panton, Theory of equations</p> <p>2. David C.Lay, Linear Algebra and its Applications,3rdEd.,Pearson Education Asia, Indian Reprint, 2007.</p> <p>3. B.ThomasandR.L.Finney,Calculus,9th Ed., Pearson Education, Delhi, 2005.</p> <p>4. Durell and A.Robson , Advanced Trigonometry, Courier Corporation, 2003.</p> <p>5. Stewart,L.Redlin, and S.Watson, Algebra and Trigonometry, Cengage Learning, 2012.</p> <p>6. Calculus and Analytical Geometry, G.B.Thomas and R.L.Finny, Pearson Publication,9thEdition, 2010. .</p>
Website and e-Learning Source	<p>https://www.mathwarehouse.com/https://www.mathhelp.com/</p> <p>https://www.mathsisfun.com/</p>

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: Classify and Solve reciprocal equations

CLO2: Find the sum of binomial, exponential and logarithmic series

CLO3: Find Eigen values, eigenvectors, verify Cayley –Hamilton theorem and diagonalize a given matrix

CLO4: Expand the powers and multiples of trigonometric functions in terms of sine and cosine

CLO5: 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

Title of the Course		DIFFERENTIAL CALCULUS					
Category	Core 2	YEAR	I	Credits	5	Course Code	U23MTT102
		SEMESTER	I				
Instructional Hours Per week		Lecture	Tutorial	Lab Practice	Total		
		4	1	--	5		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none">➤ 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.					
Course Outline		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 – Feynman’s method of differentiation.					

	Chapter 3 Sections 1.1– 1.6 and Section 2.1 and 2.2
	UNIT- II: Partial Differentiation: Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions. Chapter 8 Sections 1.1 –1.5
	UNIT- III: Partial Differentiation (Continued): Homogeneous functions – Partial derivatives of a function of two variables – Maxima and Minima of functions of two variables - Lagrange’s method of undetermined multipliers. Chapter 8 Sections 1.6,1.7 & Sections 4 and 5
	UNIT- IV: Envelope: Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter. Chapter 9 Sections 1.1–1.4
	UNIT- V: Curvature: Definition of Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutives – Radius of Curvature in Polar Co-ordinates. Chapter 9 Sections 2.1, 2.2 and 2.5 –2.7
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.
Text books	1. S. Narayanan and T.K. Manickavachagom Pillay, Calculus Volume – I -S. Viswanathan Publishers Pvt. Ltd. 2006.
Reference Books	1. G.B.Thomas and R.L.Finney, Calculus, Pearson Education, 2010. 2. M.J.Strauss, G.L.Bradley and K.J.Smith, Calculus, 3 rd Ed., Dorling

	Kindersley (India) P.Ltd. (Pearson Education), Delhi, 2007. 3. R.Courant and F.John, Introduction to Calculus and Analysis (Volumes I & II), Springer-Verlag, New York, Inc., 1989. 4. T.Apostol, Calculus, Volumes I and II.
Website and e- Learning Source	https://nptel.ac.in https://www.mathwarehouse.com/ https://www.mathhelp.com/

Course Learning Outcome (for Mapping with PLOs and PSOs)

Students will be able to

CLO 1: Find the n th 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

Title of the Course	ANALYTICAL GEOMETRY (Two & Three Dimensions)
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Category	Core 3	Year	I	Credits	5	Course Code	U23MTT203
		Semester	II				
Instructional Hours Perweek	Lecture		Tutorial		Lab Practice		Total
	4		1		--		5
Pre-requisite	12 ^{ts} tandard Mathematics						
Objectives of the Course	<ul style="list-style-type: none">• 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.						
Course Outline	UNIT- I: Pole, Polar - conjugate points and conjugate lines – diameters – conjugate diameters of an ellipse - semi diameters- conjugate diameters of hyperbola... TextBook1-Chapter7:Sections7.1to7.3,Chapter8Section8.1 to8.5.						
	UNIT-II: Polar coordinates: General polar equation of straight line – Polar equation of a circle given a diameter, Equation of a straight line, circle, conic – Equation of chord, tangent, normal. Equations of the asymptotes of a hyperbola. Text Book1-Chapter10:Sec10.1to10.8.						
	UNIT- III: System of Planes-Length of the perpendicular–Orthogonal projection. TextBook1-Chapter 2:Sec 2.1to2.10						
	UNIT- IV: Definitions of a cone, vertex, guiding curve, generators, Equation of the cone with a given vertex and guiding curve. Enveloping cone of a sphere, Equations of cones with vertex at orgin are homogeneous –Condition that the general equation of the second degree should represent acone –Condition that economy have three mutually perpendicular generators-Intersection of a line and a quadrio cone. Tangent lines and tangent plane at a point, Condition that a plane may touch a cone. Reciprocal cones- Intersection of two cones with a common vertex- Right circular cone. Equation of the right circular cone with a given						

	<p>vertex, axis and semi-vertical angle.</p> <p>TextBook2-Chapter7:Sec 7.1to7.6</p>
	<p>UNIT-V: Definitions of a cylinder. Equation to the cylinder whose generators intersect a given conic and are parallel to a given line.</p> <p>Enveloping cylinder of a sphere-The right circular cylinder. Equations of the right circular cylinder with a given axis and radius.</p> <p>TextBook2-Chapter:Sec 7.7to7.8</p>
Extended Professional Component(is a part of internal component only, not to be included in the External Examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill.</p>
Text Books	<p>1. Analytical Geometry of 2D by P. Durai pandian –Muhil publishers for Unit–1 and 2.</p> <p>2. Analytical Solid Geometry of 3D by Shanthi Narayan and Dr. P.K .Mittal-S. Chand & Co. Pvt .Ltd.-for Unit–3to5.</p>
Reference Books	<p>1. S.L.Loney ,Co-ordinate Geometry.</p> <p>2. Robert J.T.Bell, Co-ordinate Geometry of Three Dimensions.</p> <p>3. Calculus and Analytical Geometry, G.B.Thomas and R.L .Finny, Pearson Publication, 9th Edition, 2010.</p> <p>4. William H.Mc Crea, Analytical Geometry of Three Dimensions, Dover Publications,</p>

	Inc, New York, 2006. 5. John F.Randolph,Calculus and Analytic Geometry, Wadsworth Publishing Company,CA,USA, 1969. 6. Ralph Palmer Agnew, Analytic Geometry and Calculus with Vectors, McGraw-HillBookCompany,Inc.NewYork,1962.
Website and e-Learning Source	https://nptel.ac.in https://www.mathwarehouse.com https://www.mathhelp.com/ https://www.mathsisfun.com/

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: 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

Title of the Course	INTEGRAL CALCULUS
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and normal and to find the asymptotes of hyperbola

CLO 3: Explain in detail the system of Planes

CLO4: 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

Category	Core 4	Year	I	Credits	5	Course Code	U23MTT204
		Semester	II				
Instructional Hours Per week		Lecture	Tutorial		Lab Practice		Total
		4	1		--		5
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none">• 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.					
Course Outline		UNIT- I: Reduction formulae -Types, integration of product of powers of algebraic and trigonometric functions, integration of product of powers of algebraic and logarithmic functions - Bernoulli’s formula, Feynman’s technique of integration. Chapter1Section13,13.1to13.10,14, 15.1					
		UNIT- II: Multiple Integrals - definition of double integrals - evaluation of double integrals – double integrals in polar coordinates-Change o forder of integration. Chapter5 Sections 1,2.1,2.2,3.1.					
		UNIT- III: Triple integrals –applications of multiple integrals - volumes of solids of revolution - areas of curved surfaces–change of variables- Jacobian. Chapter 5 Sections 4, 5.1 to 5.3, 6.1 to 6.3 & Section 7 Chapter6Sections1.1,1.2,2.1to2.4					

	<p>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.</p> <p>Chapter 7 Sections 1.1 to 1.4, 2.1, 2.3, 3 to 6</p>
	<p>UNIT-V: Geometric and Physical Applications of Integral calculus.</p> <p>Chapter 2 Sections 1.4, 2.1, 2.2, 4, 4.1, 4.2 & 5</p> <p>Chapter 3 Sections 1.1 to 1.5, 2.1 to 2.7</p>
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
Textbook	1. Calculus, Volume II, by S.Narayanan and T.K. Manicavachagom Pillay.–S.Viswanathan,Publishers-2007.
Reference Book	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. P. Dyke, An Introduction to Laplace Transforms and Fourier

	Series, Springer Undergraduate Mathematics Series, 2001(second edition). 4. D.Chatterjee,Integral Calculus and Differential Equations, Tata-McGraw Hill Publishing Company Ltd.
Website and e-Learning Source	<ul style="list-style-type: none"> • https://nptel.ac.in • https://www.mathwarehouse.com/https://www.mathhelp.com/ • https://www.mathsisfun.com/

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: 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

CLO2: Applications of the operator ‘del’ and to Explain solenoidal and irrotational vectors

CLO3: Solve simple line integrals

CLO4: Solve surface integrals and volume integrals

CLO5: 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	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

Title of the Course		VECTOR CALCULUS AND APPLICATIONS					
Category	Core 5	Year	II	Credits	5	Course Code	U23MTT30 5
		Semester	III				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		4	1	--	5		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none">• 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.					
Course Outline		UNIT-I: Vector point function - Scalar point function - Derivative of a vector and derivative of a sum of vectors - Derivative of a product of a scalar and a vector point function - Derivative of a scalar product and vector product.					
		UNIT-II: The vector operator ‘del’, The gradient of a scalar point function - Divergence of a vector - Curl of a vector - solenoidal and irrotational vectors – simple applications.					
		UNIT-III: Laplacian operator, Vector identities - Line integral - simple problems.					
		UNIT-IV: Surface integral - Volume integral – Applications.					
		UNIT-V: Gauss divergence Theorem, Stoke’s Theorem, Green’s Theorem in two dimensions – Applications to real life situations.					

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	<ol style="list-style-type: none"> 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, , (5thedn.) 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

Title of the Course		DIFFERENTIAL EQUATIONS AND APPLICATIONS							
Category	Core 6	Year	II	Credits	5	Course Code	U23MTT306		
		Semester	III						
Instructional Hours per week		Lecture		Tutorial		Lab Practice		Total	
		4		1		--		5	
Pre-requisite		12 th Standard Mathematics							
Objectives of the Course		<ul style="list-style-type: none">• 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.							
Course Outline		UNIT-I: Ordinary Differential Equations: Variable separable - Homogeneous Equation-Non-Homogeneous Equations of first degree in two variables -Linear Equation - Bernoulli’s Equation-Exact differential equations.							
		UNIT-II: Equation of first order but not of higher degree: Equation solvable for dy/dx- Equation solvable for y-Equation solvable for x- Clairauts’ form - Linear Equations with constant coefficients-Particular integrals of algebraic, exponential, trigonometric functions and their products.							
		UNIT-III: Simultaneous linear differential equations- Linear Equations of the Second Order -Complete solution in terms of a known integrals- Reduction to the Normal form-Change of the Independent Variable- Method of Variation of Parameters.							

	UNIT-IV: Partial differential equation: Formation of PDE by Eliminating arbitrary constants and arbitrary functions – complete integral – singular integral-General integral-Lagrange's Linear Equations –Simple Applications.
	UNIT-V: Special methods – Standard forms-Charpit's Methods – Simple Applications
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	Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984. I. Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967. G.F. Simmons, Differential equations with applications and historical notes, 2 nd Ed, Tata Mcgraw Hill Publications, 1991.

Reference Books	<ol style="list-style-type: none"> 1. D.A. Murray, Introductory course in Differential Equations, Orient and Longman 2. H.T. H. Piaggio, Elementary Treaties on Differential Equations and their applications, C.B.S Publisher & Distributors, Delhi, 1985. 3. Horst R. Beyer, Calculus and Analysis, Wiley, 2010. 4. Braun, M. Differential Equations and their Applications. (3rd Edn.), Springer- Verlag, New York. 1983. 5. Tyn Myint-U and Lognath Debnath. Linear Partial Differential Equations for Scientists and Engineers. (4th Edn.) Birhauser, Berlin. 2007. 6. 6.. Boyce, W.E. and R.C.DiPrima. Elementary Differential Equations and Boundary Value Problems. (7th Edn.) John Wiley and Sons, Inc., New York. 2001. 7. Sundrapandian, V. Ordinary and Partial Differential Equations, Tata McGraw Hill Education Pvt.Ltd. New Delhi, 2013
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

Title of the course		INDUSTY MODULE – INDUSTRIAL STATISTICS						
Category	Core 7	Year	II	Credits	5	Course Code	U23 MT T40 7	
		Semester	IV					
Instructional Hours per week		Lecture		Tutorial		Lab Practice		Total
		4		1				5
Pre- requisite		12 th Standard Mathematics						
Objectives of the Course		<ul style="list-style-type: none">• To bridge the gap between industry academia interface to apply the theory learnt to industrial applications• Explain the importance of statistical quality control in industrial settings.• Identify sources of variation in industrial processes and products.• Explain the importance of Analysis of time series, Analysis of Variance and Design of Experiments in Industrial applications.• Create and interpret control charts for attributes.						

Course Outline	<p>UNIT I: Statistical Quality Control: Introduction–Basis of SQC–Benefits of SQC– Process Control and Product control – Control Charts – Tools for SQC -Control chart for variables – control chart for mean (X chart), Range Chart(R chart)Standard deviation chart(σ chart).</p> <p>Chapter1-1.1to1.8</p>
	<p>UNIT II: Control chart for attributes - Natural Tolerance limits and specification limits - Acceptance of sampling plans for attributes -single, double, Multiples and sequential sampling plans.</p> <p>Chapter1 –1.9to 1.12</p>
	<p>UNIT III: Analysis of Time Series: Components–Analysis–Measurement of Trend– Measurement of Seasonal Variation-Index of Industrial production.</p> <p>Chapter2– 2.1 to 2.5 andChapter3– 3.7</p>
	<p>UNIT IV: Analysis of Variance: Introduction–One way classification–two-way classifications with one observation per cell.</p> <p>Chapter5–5.1 to 5.3[5.3.1 to 5.3.4]</p>
	<p>UNIT V: Design of Experiments: Introduction–Three Principles of Experimental Design–Completely Randomised Design–Randomised Block Design.</p> <p>Chapter6 –6.1to 6.5</p>
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>

Textbooks	1. Gupta,S.C. and Kapoor ,V.K.(2008):Fundamentals of Applied Statistics, 4 th Edition(Reprint), Sultan Chand& Sons 2. Montgomery, D. C. (2009): Introduction to Statistical Quality Control, 6 th Edition,Wiley India Pvt .Ltd.
Reference Books	1. S. Leaven worth(1988) Statistical Quality Control (Sixth Edition),Mc Graw hill Bookco, NewYork. 2. Goon, A.M., M.K. Gupta and B.Dasgupta(1987) Fundamentals of Statistics, Vol. II.World Press, Kolkata. 3. Mahajan(1997)Statistical Quality Control, Dhanpat Rai &sons, New Delhi. 4. Papoulis A. Probability, Random Variables and Stochastic process, Tata McGraw Hill Education Pvt. Ltd., NewDelhi. 5. BaisnabA., JasM., Elements of Probability and Statistics, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 1993.
Website and e-Learning	Open Intro Statistics- https://www.openintro.org/book/stat/ http://spcchartsonline.com/-StatisticalQualityControlTutorial "Control Charts"(Online Tutorial): https://www.spcforexcel.com/knowledge/control-chart-basics/control-charts https://www.analyticsvidhya.com/blog/2018/01/anova-analysis-of-variance/-ANOVA Tutorial

INDUSTRIAL STATISTICS PRACTICAL ASSIGNMENT

- ☐ Construction of control chart for mean using Excel/ R/SPSS
- ☐ Control charts for mean using Range in Excel/ R/SPSS
- ☐ Control charts for mean using Standard Deviation in Excel/R/SPSS
- ☐ Control charts for Range using Excel/R/SPSS
- ☐ Control charts for Standard Deviation using Excel / R /SPSS

Note:

1. There will be **no practical exam** for Industrial Statistics.
2. The above activity is mainly intended for providing practical knowledge in Industrial Statistics.
3. Instruct the students to submit the above as an **assignment**.

The above activity is mainly intended for providing practical knowledge in Industrial

Title of the Course		ELEMENTS OF MATHEMATICALANALYSIS							
Category	Core 8	Year	II	Credits	5	Course Code	U23MTT408		
		Semeste r	IV						
Instructional Hours Per week		Lecture		Tutorial		Lab Practice		Total	
		4		1		--		5	
Pre-requisite		12 th Standard Mathematics							
Objectives of the Course		<ul style="list-style-type: none">Identify and characterize sets and functions and understand, test and analyze the convergence and divergence of sequences, series.Understand metric spaces with suitable examples.							
Course Outline		UNIT- I: Sets and Functions: Sets and elements- Operations on sets-functions-real valued functions-equivalence-countability-real numbers-least upper bounds. Chapter1 Sections 1.1–1.7							
		UNIT- II: Sequences of Real Numbers: Definition of a sequence and sub sequence-limit of a sequence–convergent sequences–divergent sequences-bounded sequences-mono tone sequences. Chapter2 Sections 2.1–2.6							
		UNIT- III: Operations on convergent sequences – operations on divergent sequences – limit superior and limit inferior-Cauchy sequences. Chapter2 Sections 2.7–2.10							

	<p>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.</p> <p>Chapter 3 Sections 3.1–3.4 and 3.6</p>
	<p>UNIT-V: Limits and Metric Spaces: Limit of a function on a line -Metric spaces - Limits in metric spaces – Continuous Functions on Metric Spaces: Function continuous at a point on a line- Function continuous on a metric space.</p> <p>Chapter 4 Sections 4.1–4.3, Chapter 5 Sections 5.1–5.3</p>
Extended Professional Component (is apart Of internal component only, not to be included in the External Examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/TNPSC / others to be solved. (To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency , Professional Communication and Transferrable Skill.</p>
Recommended Textbook	<p>1. Richard R. Goldberg, Methods of Real Analysis: Oxford and IBH Publishing, (1 January 2020).</p>
Reference Books	<ol style="list-style-type: none"> 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. K.A. Ross, Elementary Analysis-The Theory of Calculus Series-Undergraduate Texts in Mathematics, Springer Verlag, 2003. 4. K.A. Ross, Elementary Analysis-The Theory of Calculus Series-Undergraduate Texts in Mathematics,

	SpringerVerlag,2003.
Website and e-Learning Source	https://nptel.ac.in https://www.mathwarehouse.com https://www.mathhelp.com/ https://www.mathsisfun.com/

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 count ability 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.

CLO3: Explain the operations on convergent and divergent sequences and to Explain the concept so limit superior and limit inferior and the notion of Cauchy sequences.

CLO4: 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.

CLO5: 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		ABSTRACTALGEBRA						
Category	Core 9	Year	III	Credits	4	Course Code	U23MTT509	
		Semester	V					
Instructional Hours		Lecture		Tutorial		Lab Practice		Total
Per week		4		1		--		5
Pre-requisite		12 th Standard Mathematics						
Objectives of the Course		<ul style="list-style-type: none">• Concepts of Sets, Groups and Rings.• Construction, characteristics and applications of the abstract algebraic structures						
Course Outline		UNIT-I: Introduction to groups- Subgroups- cyclic groups and properties of cyclic groups- Lagrange’s Theorem-A counting principle–Examples Chapter2 Section2.4 and2.5						
		UNIT-II: Normal subgroups and Quotient group- Homomorphism- Automorphism-Examples. Chapter2 Section 2.6 to 2.8						
		UNIT-III: Cayley’s Theorem-Permutation groups-Examples Chapter2 Section2.9 and2.10						
		UNIT-IV: Definition and examples of ring- Some special classes of rings- homomorphism of rings- Ideals and quotient rings- More ideals and quotient rings. Chapter3 Section 3.1 to 3.5						
		UNIT-V: The field of quotients of an integral domain-Euclidean Rings –The particular Euclidean Ring–Examples. Chapter3 Section 3.6to3.8						

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 Book	1. Topics in Algebra – I.N. Herstein, Wiley Eastern Ltd. Second Edition (1 st January 2006)
Reference Books	1. John B. Fraleigh, A First Course in Abstract Algebra, 7 th Ed., Pearson, 2002. 2. M. Artin, Abstract Algebra, 2 nd Ed. Pearson, 2011. 3. Joseph A Gallian, Contemporary Abstract Algebra., 4 th Ed., Narosa, 1999
Website and e-Learning Source	https://www.open.edu/openlearn/mod/resource/view.php?id=72698

Course Learning Outcome (for Mapping with Pos and PSOs)

Students will be able to

CLO1: Explain groups, sub groups and cyclic groups

CLO2: Explain about Normal subgroup, Quotient groups, Homomorphisms and Automorphisms and verify the functions for homomorphism and automorphism properties.

CLO3: Explain Permutation groups and apply Cayley's theorem to problems.

CLO4: Explain Rings, Ideals and Quotient Rings and examine their structure.

CLO5: 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

Title of the Course		REAL ANALYSIS						
Category	Core 10	Year	III	Credits	4	Course Code	U23MTT510	
		Semester	V					
Instructional Hours		Lecture		Tutorial		Lab Practice		Total
Per week		4		1		--		5
Pre-requisite		12 th Standard Mathematics						
Objectives of the Course		<ul style="list-style-type: none">Real Numbers and properties of Real-valued functions.Connectedness, Compactness, Completeness of Metric spaces.Convergence of sequences of functions, Examples and Counter examples.						

Course Outline	UNIT-I: Continuous Functions on Metric Spaces: Open sets –closed sets– Discontinuous function on \mathbb{R}^1 . Connectedness, Completeness and Compactness: More about open sets-Connected sets. Chapter 5 Sections 5.4–5.6, Chapter 6 Sections 6.1,6.2
	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 Sections 6.3–6.8
	UNIT-III: Calculus: Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral-properties of Riemann integral. Chapter 7 Sections 7.1–7.4
	UNIT-IV: Derivatives- Rolle’s theorem, Law of mean, Fundamental theorems of calculus. Chapter 7 Sections 7.5–7.8
	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 Sections 9.1 and 9.2
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 Book	1.MethodsofRealAnalysis-RichardR.Goldberg(John Wiley& sons,2 nd edition)(Indianedition–OxfordandIBHPublishingCo,NewDelhi, 1 st January 2020)
Reference Books	<ol style="list-style-type: none"> 1. Principles of Mathematical Analysis by Walter Rudin, Tata Mc Graw Hill Education, Third edition(1 July2017). 2. Mathematical Analysis Tom M Apostol ,Narosa Publishing House,2nd edition(1974),Addison-Wesley publishing company, New Delhi.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: Explain the concepts of Continuous and Discontinuous functions, open and close sets, Connectedness, Completeness and Compactness

CLO2: Explain the concepts of bounded and totally bounded sets, continuity of inverse functions and Uniform continuity

CLO3: Define the sets of measure zero, to Explain about the existence and properties of Riemann integral

CLO4: Explain the concept of differentiability and to Explain Rolle' s theorem, Law of mean, and Fundamental theorem of calculus

CLO5: 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

Title of the Course		MATHEMATICAL MODELLING						
Category	Core 11	Year	III	Credits	4	Course Code	U23MTT511	
		Semester	V					
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total	
		4	1		--		5	
Pre-requisite		12 th Standard Mathematics						
Objectives of the Course		<ul style="list-style-type: none">Construction and Analysis of Mathematical models found in real life problems.Modelling through differential and difference equations						
Course Outline		UNIT-I: Mathematical Modeling: Simple situations requiring Mathematical modelling, characteristics of mathematical models. Chapter1–section1.1.to 1.5						

	UNIT-II: Mathematical Modelling through differential equations: Linear Growth and Decay Models. Non-Linear growth and decay models, Compartment models. Chapter 2–section2.1 to2.4
	UNIT-III: Mathematical Modelling, through system of Ordinary differential equations of first order: Prey-predator models, Competition models, Model with removal and model with immigrations. Epidemics: simple epidemic model, Susceptible-infected- susceptible (SIS) model, SIS model with constant number of carriers. Medicine: Model for Diabetes Mellitus. Chapter3–Section3.1.1, 3.1.2, 3.2.1, 3.5.1
	UNIT–IV: Introduction to difference equations. Chapter 5-Sections5.1and5.2
	UNIT-V: Mathematical Modelling through difference equations: Harrod Model, cob web model application to Actuarial Science Chapter 5 –Section 5.3(5.3.3not included)
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.JN Kapur, Mathematical Modeling ,New Age International Publishers (2009).
Reference Books	1. Mathematical Modeling by Bimalk. Mishra and Dipak K. Satpathi. Ane Books Pvt. Ltd (1 January 2009). 2. Mathematical Modeling Models, Analysis and Applications, by Sandip Banerjee, CRC Press, Taylor & Francis group, 2014. 3. Mathematical Modeling applications with Geogebra by Jonas Hall & Thomas Lige fjard, John Wiley & Sons, 2017. 4. Mark M. Meerschaert: Mathematical Modeling, Elsevier Publ., 2007. 5. Edward A. Bender: An introduction to mathematical Modeling, CRC Press, 2002. 6. Walter J. Meyer, Concepts of Mathematical Modeling, Dover Publ., 2000.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with Pos and PSOs)

Students will be able to

CLO1: Explain simple situations requiring Mathematical Modelling and to Determine the characteristics of such models

CLO2: Model using differential equations in-terms of linear growth and Decay models.

CLO3: Model using systems of ordinary differential equations of first order, to discuss about various models under the categories ‘Epidemics’ and ‘Medicine’.

CLO4: Explain in detail about difference equations.

CLO5: Model using difference equations

	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 WITHVIVAVOCE					
Category	Core 12	Year	III	Credits	4	Course Code	U23MTPR51
		Semester	V				
Instructional Hours Per week		Lecture	Tutorial	Lab Practice	Total		
		4	1	--	5		
Objectives of the Project		The aim of the mini project is that the student has to understand the real time work place environment. The student should gain a thorough knowledge in the problem and fields which he/she has selected for their project work.					
Project Planning		Mini Project is an involved exercise, which has to be planned well in advance. The topic should be chosen in the beginning of final year itself. Related reading training and discussions of project should be completed in The first term of final year.					

Selection of Team	<p>To meet the stated objectives, it is imperative that mini project is done through a team effort. Though it would be ideal to select the team members at random and this should be strongly recommended, due to practical consideration students may also be given the choice of forming themselves in to teams with Two members.</p> <p>A team leader shall be selected. Team shall maintain the minutes of meeting of the team members and ensure that tasks have been assigned to every team member in writing. Team meeting minutes shall form a part of the project report. Even if students are doing project as groups, each one must independently take different modules of the work and must submit the report.</p>
Selection of Fields	<p>No restrictions shall be placed on the students in the choice of fields/tools/techniques to be utilized for their project work, though open source is strongly recommended, wherever possible. No value shall be placed on the Use of tools in the evaluation of the project.</p>
Project Evaluation :	<ul style="list-style-type: none"> • Continuous Internal Assessment: • Evaluation(External) • Viva-voce(jointly) <p>Three copies of the project report must be submitted by each student. The students may use power point presentation during their viva voce examination.</p>

Title of the Course		LINEARALGEBRA						
		CORE 13						
Asper Number								
Category	Core 13	Year	III	Credits	4	Course Code	U23MTT612	
		Semester	VI					
Instructional Hours per week		Lecture		Tutorial		Lab Practice		Total
		5		1		--		6
Pre-requisite		12 th Standard Mathematics						
Objectives of the Course		<ul style="list-style-type: none">Vector Spaces ,linear dependence and independence of vectors. Dual spaces, Inner product and norm–orthogonalization process.Linear transformations. Various operators on vector Spaces.						
Course Outline		UNIT-I: Vector spaces – Subspaces – Linear Combinations and linear span – Systems of Linear equations–Homogenous Equations– Non-homogenous Equations –Elementary Matrices–Row Reduced-Echelon form [Chapter3]						
		UNIT-II: Linear Dependence and Linear independence–Bases–Dimensions [Chapter3]						
		UNIT-III: Linear transformations, null spaces and ranges–Matrix representation of a linear transformation –invertibility and isomorphisms–dual spaces [Chapter3&5]						

	UNIT– IV: Eigen values, eigen vectors, diagonalizability –invariant subspaces–Cayley–Hamilton theorem [Chapter5]
	UNIT-V: Inner products and norms – Gram Schmidt Orthogonalization Process-Orthogonal complements [Chapter5]
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 Book	I.N.S.Gopalakrishnan, University Algebra, New Age International Publications, Wiley Eastern Ltd.
Reference Books	<ol style="list-style-type: none"> 1. I.N.Herstein, Topics in Algebra, Wiley Eastern Ltd. Second Edition, 2006. 2. S.Lang, Introduction to Linear Algebra, 2nd Ed., Springer, 2005. 3. Linear Algebra-Stephen H.Friedberg, Arnold J.Insel and Lawrence E Spence, 5th edition (2018). Pearson 4. John B.Fraleigh, First course in Algebra, Addison Wesley. 5. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 4th Ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2004. 6. David C.Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.

	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

CLO1: Acquire a detailed knowledge about vector spaces and subspaces.

CLO2: Explain the concepts of Linear Dependence, Linear Independence, Bases and Dimension of basis.

CLO3: Explain the concept of Linear Transformations, their Matrix representation and the notion of dual spaces.

CLO4: Find the Eigen values and Eigen vectors, to apply the concepts for d

CLO4: Find the Eigen values and Eigen vectors, to apply the concepts for diagonalization.

CLO5: Explain about Inner product and norms and to apply GramSchmidt Orthogonalization processto 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

Title of the course		COMPLEX ANALYSIS					
Category	Core 14	Year	III	Credits	4	Course Code	U23MTT613
		Semester	VI				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre- requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none">• Apply concept and consequences of analyticity and C-• Understand the concept to 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.					
Course Outline		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. Chapter4					

	<p>UNIT-II:</p> <p>Conformal mapping: Mappings–Mapping by exponential function–Linear transformation–The transformation $w = \frac{1}{z}$ Mappings by Linear fractional transformations(bilinear)</p> <p>Chapter 7</p>
	<p>UNIT-III:</p> <p>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.</p> <p>Chapter 8: Section 8.2–8.11</p>
	<p>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.</p> <p>Chapters 5 & 9: Sections 5.3, 5.5, 5.6 & 9.1–9.9</p>
	<p>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).</p> <p>Chapters 10: Sections 10.1 –10.3 (omit Type 4)</p>
Extended Professional Component (Is a part of internal component only, not to be included in the External Examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC/TNPSC/ others to be solved. (To be discussed during the Tutorial hour)</p>

Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill.
Recommended Text Book	Complex Analysis, P. Duraipandian & Kayalal Pachiyappa, S. Chand & Company PVT. LTD, New Delhi, 2016.
Reference Books	<ol style="list-style-type: none"> 1. Linear Algebra–Stephen HFriedberg, Arnold JInsel and Lawrence ESpence, 5th Edition 920180, Pearson. 2. S.Ponnusamy and H.Silverman, Complex variables with applications, Birkhauser, 2006 3. Theodore W. Gamelan, Complex Analysis, Springer Verlag, 2008 4. Joseph Bak and Donald J. Newman, Complex analysis, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.
Website 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

CLO2: Explain the concept of Conformal mappings and mappings by linear transformations and linear fractional transformations

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

CLO 4: Find the convergence of 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

Title of the Course		MECHANICS						
Category	Core 15	Year	III	Credits	4	Course Code	U23MTT614	
		Semester	VI					
Instructional Hours Per week		Lecture		Tutorial		Lab Practice		Total
		5		1		--		6
Pre-requisite		12 th Standard Mathematics						
Objectives of the Course		<ul style="list-style-type: none">• Equilibrium of a particle under the action of given forces• Simple Harmonic Motion• Projectiles						
Course Outline		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 and Chapter 3						

	<p>UNIT- II: Forces on a Rigid Body: Moment of a Force – General motion of a body–Equivalent systems of forces-Parallel Forces</p> <p>– Forces acting along a Triangle - A specific reduction of Forces: Reduction of coplanar forces into a force and couple–Problems involving frictional forces.</p> <p>Chapter4: Sections 4.1 to4.4, 4.6 (Omit Sections 4.5, 4.7 to4.9)</p> <p>Chapter 5:Sections5.1 to5.2</p>
	<p>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.</p> <p>Chapter11</p> <p>Chapter12:Sections–12.1to12.3 (Omit Section 12.4)</p>
	<p>UNIT –IV: Projectiles: Forces on a projectile – Projectile projected on an inclined plane.</p> <p>Chapter 13: Sections 13.1, 13.2 (Omit Section 13.3)</p>
	<p>UNIT- V: Central Orbits: General orbits – Central orbit – Conic as a centered orbit.</p> <p>Chapter 16</p>
Extended Professional Component(is a part of internal Component only, not To be included in The External Examination Question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC/ others to be solved</p> <p>(To be discussed during the Tutorial hour)</p>
Skills acquired From this course	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
Recommended Text Book	<p>Mechanics-P.Duraipandian, Lakmi Duraipandian and Muthamizh Jaya pragasam, S. Chand and co.PrivateLimited-Reprint2016.</p>

Reference Books	<ol style="list-style-type: none"> 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 andsons Pvt ltd., NewYork, 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

CLO1: Define Resultant, Component of a Force, Coplanar forces, like and unlike parallel forces, Equilibrium of a Particle, Limitinge quilibrium 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

CLO3: Define work, energy, power, rectilinear motions under varying forces. Define Simple Harmonic Motion and find its Geometrical representation.

CLO4: Define Projectile, impulse, impact and laws of impact. Prove that the path of a projectileis a parabola .Find the direct and oblique impact of smooth elastic spheres

CLO5: 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

B.Sc. Mathematics

ELECTIVE COURSES

Syllabus

Title of the course		MATHEMATICAL STATISTICS					
Category	Elective 3/Ancillary 3	Year	II	Credits	3	Course Code	U23MTE33A
		Semester	III				
Instructional Hours per week		Lecture	Tutorial	Lab Practice		Total	
		3	1			4	
Pre- requisite		12 th Standard Mathematics					
Objectives of the Course		<p>To provide an understanding of the fundamental concepts of probability theory and statistical inference.</p> <p>To develop skills in applying probability theory and statistical inference to solve real-world problems.</p> <p>To introduce students to various probability distributions and their applications in statistical inference.</p> <p>To provide a solid foundation for advanced courses in probability theory and statistical inference.</p>					
Course Outline		<p>UNIT I: Probability:</p> <p>Definition of Sample Space–Events–Definition of Probability–Addition and Multiplication laws of probability–independence of events-Conditional Probability–Baye’s theorem–Simple Problems.</p> <p>Chapter 4-sections 4.1– 4.3and sections 4.5-4.8</p> <p>UNIT II :UNIT-II: Random Variables</p> <p>(Discrete and Continuous)–Distribution Function–Mathematical Expectation –Conditional Expectation and Conditional variance- Moment generating Function-Probability Generating Function–Cumulants–Characteristic Function–Simple Problems.</p> <p>Chapter 5-sections 5.1–5.4.3</p> <p>Chapter 6–Sections 6.1–6.12</p>					
		<p>UNIT III: Discrete distribution:</p> <p>Binomial, Poisson Continuous distribution: and Normal</p> <p>Chapter 7-sections 7-7.3.</p> <p>Chapter 8-sections 8.1– 8.2.7</p>					

	UNIT IV: Sampling distribution & Test of Significance: Sampling- Tests of significance – Null Hypothesis-Tests of significance for large samples. Chapter 12
	UNIT V: Tests of significance for small samples: Using the chi-square distribution-Student's t-distribution-F-distribution Chapter 13 sections 13-13.5 Chapter 14 sections 14-14.2.10 & Sections 14.5–14.5.5
	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 examinations various competitive 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
Text Book	1. S.C.Gupta & V.K.Kapoor: Fundamentals of Mathematical Statistics, Sultan & sons.
Reference Book	<ul style="list-style-type: none"> • H.C.Saxena Elementary Statistics, Abhiror Prakashan, New Delhi, 2008. • T.Veerarajan, Fundamental of Applied Statistics, yes dee Publishing Private Limited, 2017. • Kapoor, Mathematical statistics, second edition, Delhi Pusthk Sadan, 1961. • P.R.Vittal, Mathematical Statistics, Margham Publications, Chennai, 2004.
Website and e-Learning Source	https://www.zweigmedia.com/RealWorld/Summary7.html - Interactive Statistics & Probability learning https://wise.cgu.edu/wp-content/uploads/2015/04/StatWISE1110p.xls You can download this Excel work book to have easy access to basic statistics distributions On your computer. The work book includes Z, t, F, chi-square, and binomial distributions as well as selected computations such as estimating the median for grouped data.

Course Learning Outcome (for Mapping with Pos and PSOs)

Students will be able to:

CO1: Define sample space, events, and probability and apply the addition and Multiplication of probability to calculate probabilities of events.

CO2: Define random variables, probability density function, cumulative distribution function,

And their properties.

CO3: Understand and apply the Binomial, Poisson, and Normal distributions to solve real-

World problems.

CO4: Understand the concept of sampling distribution and apply the Central Limit Theorem to Calculate the mean and standard deviation of the sampling distribution..

CO5: Use the chi-squared distribution, Student's t-distribution ,and F-distribution to Test hypotheses for small samples.

Title of the course		TRANSFORMATION TECHNIQUES					
Paper Number		Elective 4					
Category	Elective 4/Ancillary 4	Year	II	Credits	3	Course Code	U23MTE44
		Semester	IV				
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total
		2	1				3
Pre- requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none">• To solve certain types of differential equations using Laplace Transforms• To discuss the basic concepts relating Fourier series.• To provide a solid foundation or advanced courses improbability theory and statistical inference.					
Course Outline		UNIT I: The Laplace transforms: Definitions, Piecewise continuity –Sufficient condition for the existence of the Laplace Transform–results derived from the definitions–Laplace Transform of Periodic functions–Some General theorems–Using Laplace Transforms evaluate certain integrals. -Z transform and its applications Chapter IX Sections1.1, 1.2 and Sections 2–5 Text Book 1					
		UNIT II: The Inverse transforms– Modifying the results to get the inverse Laplace transforms. Chapter IX Sections 6,7 Text Book 1					
		UNIT III: Laplace transformation can be used to solve ordinary differential equations with constant coefficients – Solving system of differential equations–solving differential equations with variable coefficients-Solving equations involving integrals by Laplace Transforms Chapter IX Sections8 to 11 Text Book 1					

	UNIT IV: Fourier Transforms: Fourier integral theorem– Fourier sine and cosine integrals-Complex form of Fourier integral– Inversion formula for complex Fourier Transform –Fourier sine and cosine transform Chapter VIII Pages 8.1– 8.8 Text Book 2
	UNIT V: Properties of Fourier Transform– Convolution Theorem–Parseval's identity. Chapter VIII Pages 8.8–8.19 Text Book 2
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 examinations various competitive 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
Text Book	2. S. Narayanan and T.K. Manicka vasagam Pillai ,Differential Equations and its applications ,(Reprint Oct 2014–2015), S. Viswanathan (Printers and Publishers) Private Ltd, Chennai-600003. 3. P.R. Vittal ,Differential Equations, Fourier and Laplace Transforms, Probability – (3 rd Edition, Reprint 2012), Margham Publications, Chennai–600017.
Reference Book	George F .Simmons, Differential Equations with applications and Historical Notes,(12 th Reprint) TATA MAGRAW-Hill Publishing Company Ltd., New Delhi.
Website and e-Learning Source	https://mathworld.wolfram.com/LaplaceTransform.html https://mathworld.wolfram.com/FourierSeries.html

Course Learning Outcome(for Mapping with Pos and PSOs)

Students will be able to:

CO1: Find the Laplace transform of the given function

CO2: Find the inverse Laplace transformation for the given function.

CO3: Solve the differential equations using Laplace transforms.

CO4: Find the Fourier sin and cosine integrals for the given function.

CO5: Convolute the given transformations

Title of the course		INTRODUCTION TO MACHINE LEARNING					
Category	Elective 5	Year	III	Credits	3	Course Code	U23MTE55A
		Semester	V				
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total
		2	1				3
Pre- requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none">To introduce students to the concept of Machine Learning and its applications.To familiarize students with the different types of Machine Learning, such as Supervised, Unsupervised, Reinforcement Learning ,and Deep Learning.To teach students about Classification and Model Selection					
Course Outline		UNIT I:IntroductiontoPython &Machine Learning Overview of Machine Learning and its applications - Components of Machine learning :Data, Feature Extraction, Model Selection, Training, Evaluation–Understanding Python: why Python, First Python program, Python Basics, data Structure and loops –Feature Engineering with Python: Pandas–Data visualization: Line chart, Bar chart, pie chart ,Boxplot, -Sea born: Dist plot ,Joint plot.					

	<p>UNIT II :Classification and Model Selection</p> <p>Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning, deep learning-Classification of machine Learning Concepts- Distance based Machine learning methods – K Nearest Neighbor- classifications –Decision Tree Learning-Naïve Bayes–Linear regression– Logistic Regression–Linear regression</p> <p>Models–Support Vector Machine</p>
	<p>UNIT III: Unsupervised Machine Learning</p> <p>Introduction to Clustering Techniques-requirements of clustering Algorithm–Types of Clustering Method–Clustering strategies– Partitioning clustering-:K-Means Clustering–kernel K means</p> <p>UNIT IV: Hierarchical Clustering-Evaluation Metrics-Principal Component Analysis (PCA)–Kernel principal Component analysis</p> <p>UNIT V: Machine learning Algorithms Designing Machine Learning Algorithms – classification Metrics– Regression Metrics – Statistical learning theory–Ensemble methods</p>
Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	<p>Questions related to the above topics, from examinations various competitive UPSC/ TNPSC/ others to be solved (To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge problem solving, analytical ability professional competency , professional communication and transferrable skill</p>

Text Book	<p>1. Machine Learning using Python by Manaranjan Pradhan and U Dinesh Kumar, Wiley, 2019</p> <p>Unit I: Chapter 1–1.1, 1.2 upto page no.6; Chapter 2– 2.1, 2.3, 2.4, 2.5; Chapter 3–3.6; Chapter 4– 4.1 to 4.7, 4.8–4.8.1 & 4.8.2</p> <p>2. Machine Learning–V.K. Jain– Khanna Publishing Pvt .Ltd, 2018</p> <p>Unit II: Chapter 1–1.2 to 1.15; Unit III: chapter 2–2.1 to 2.9</p> <p>Unit IV: Chapter 2–2.13 to 2.16: Unit V: Chapter 3–3.1 to 3.6</p>
Reference Book	<p>1. Data Science and Machine Learning using Python– 2022 by Dr. Reema Thareja, Bpb Publication, 2020.</p> <p>2. Data Science and Machine Learning by N. Meenakshi and K.E. Rajakumari, 2021.</p>
Website and e-Learning Source	<p>1. https://www.simplilearn.com/introduction-to-machine-learning-guide-pdf</p> <p>2. http://www.r2d3.us/visual-intro-to-machine-learning-part-1/</p> <p>3. https://www.w3schools.com/python/python_ml_getting_started.asp-MLTutorials</p> <p>4. https://www.simplilearn.com/tutorials/machine-learning-tutorial-MLTutorials</p> <p>5. https://www.nbshare.io/</p>

Course Learning Outcome (for Mapping with Pos and PSOs)

Students will be able to:

CO1: Students will gain an understanding of the basics of Machine Learning, including its applications and types.

CO2: Students will gain knowledge of Classification and Model Selection techniques, including various distance – based Machine Learning methods.

CO3: Students will be able to implement and evaluate Unsupervised Machine Learning techniques such as Clustering and PCA.

CO4: Students will be able to design Machine Learning Algorithms for classification and

Regression tasks and evaluate their performance using relevant metrics.

CO5: Students will be able to apply Statistical Learning Theory and Ensemble methods to improve Machine Learning algorithms' performance.

Title of the course		OPTIMIZATION TECHNIQUES					
Category	Elective 6	Year	III	Credits	3	Course Code	U23MTE56A
		Semester	V				

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total
	2	1		3
Pre- requisite	12 th Standard Mathematics			
Objectives of the Course	<ul style="list-style-type: none"> To provide students with the necessary mathematical tools to formulate and solve linear programming problems using graphical and simplex methods To introduce students to transportation problems, assignment problems, sequencing, replacement ,and theory of games and their applications To equip students with the necessary skills to solve inventory problems using deterministic models and waiting line problems. To teach student show to use project network diagrams and CPM/PERT techniques for project management and scheduling. 			
Course Outline	UNIT I: Linear programming: Problem formulation ,graphical solution, Simplex method, artificial variables techniques, Big-M method Chapter2, Chapter3–3.1 to 3.2.1			
	UNIT II: Transportation problem: Formulation, optimal solution, unbalanced transportation problem, Degeneracy; Assignment problem, formulation, optimal solution, variants of assignment problem. Chapter7, Chapter8-8.1 to 8.8			
	UNIT III: Sequencing: Introduction, flow, shop sequencing ,n jobs through two machines ,n jobs through three machines Replacement: Introduction: Replacement of items that deteriorate with time, when money value is not considered, replacement of items when money value is considered. Chapter14–14.1 to 14.5, Chapter11– 11.1 to 11.3			

	UNIT IV: Theory of Games: Introduction – Terminology, Solution of games with saddle points and without saddle points, 2×2 games, dominance principle, $m \times n$ games, Graphical method. Chapter 16–16.1 to 16.7
	UNIT V: Waiting Lines: Introduction, Terminology, Single Channel, Poisson arrivals and exponential service times with infinite population and finite population models, Multiple channel, Poisson arrivals and exponential service times with infinite population. Network: Project Network diagram – CPM and PERT computations. Chapter 13–13.1 to 13.7, Chapter 15 –15.1 to 15.7
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 examinations various competitive 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
Text Book	1. V. Sundaresan, K.S. Ganapathy Subramaian and K. Ganesan, Resource Management Techniques. A.R Publications, 2002. 2. Operations Research, by R.K. Gupta, Krishna Prakashan India (p), Meerut Publications, 2020.
Reference Book	1. Gupta P.K. and Hira D.S. ,Problems in Operations Research - S. Chand & Co., 2014. 2. Kanti Swaroop, Gupta P.K and Man mohan, Problems in Operations Research, Sultan Chand & Sons ,2014.
Website and e-Learning Source	1. https://www.linearprogramming.info/ Solve a Linear Programming model with Open Solver - Excel Add-in that solves optimization models. 2. https://realpython.com/linear-programming-python/Linear Programming With Python 3. https://www.princeton.edu/~rvdb/LPbook/

Course Learning Outcome (for Mapping with Pos and PSOs)

Students will be able to:

CO1: Formulate and solve linear programming problems using graphical and simplex methods confidently.

CO2: Use artificial variables techniques and the Big-M method to solve linear programming problems.

CO3: Solve transportation problems, assignment problems, sequencing, replacement, and theory of games problems and apply them to solve real –world problems.

CO4: Analyze waiting line problems using single-channel and multi-channel models and apply them to solve real-world problems.

CO5: Use project network diagrams and CPM/PERT techniques for project management and scheduling.

Title of the course		PROGRAMMING IN C++					
Category	Elective 7	Year	III	Credits	3	Course Code	U23MTE67A
		Semester	VI				
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total
		4	1				5
Pre- requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none">• To understand about object –oriented languages and their applications• To introduce basic concepts of C++language• To provide knowledge about various conversions• To enlighten the various inheritance system• To impart knowledge on files and exception handling					
Course Outline		UNIT I: Introduction to C++; Tokens, Keywords, Identifiers, Variables, Operators, Manipulators, Data types -Expressions and Control Structures in C++; Simple C++Programs. Chapters1,3					
		UNIT II: Functions in C++ - Main Function - Function Proto typing – Parameters Passing in Functions-Values Return by Functions–Inline Functions–Friend and Virtual Functions–Math Library functions Chapter 4					
		UNIT III: Classes and Objects; Constructors and Destructors; Operator Overloading and Type Conversions-Type of Constructors–Function Definition-Function overloading–Function Overriding. Chapters 5-7					
		UNIT IV: Inheritance: Single Inheritance – Multilevel Inheritance – Multiple Inheritance-Hierarchical Inheritance- Hybrid Inheritance- Pointers, Virtual Functions and Polymorphism; Managing Console I/O operations. Chapters 8-10					

	UNIT V: Working with Files: Classes for File Stream Operations - Opening and Closing a File – End of -File Deduction - File Pointers - Updating a File –Error Handling during File Operations– Command – line Arguments Chapter11
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 examinations various competitive 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
Text Book	E. Balagurusamy , 2008, Object Oriented Programming with C++, Tata McGraw –Hill Publishing Company Ltd.
Reference Book	1. Robert Lafore, Object Oriented Programming in Microsoft C++, Galgotia publication. 2. Byron S. Gottfried, Schaum’s Outline of programming with C++,2 nd Edition. 3. “Let us C++”– Yeswant Kanetkar–BPBPublications,1999.
Website and e-Learning Source	1. http://cppannotations.sourceforge.net/ 2. https://www.cplusplus.com/doc/tutorial/ 3. https://www.programiz.com/cpp-programming 4. https://www.w3schools.com/cpp/default.asp-C++freetutorial

Course Learning Outcome(for Mapping with Pos and PSOs)

Students will be able to:

- CO1:** Recalling various concepts relating to languages and applications
- CO2:** Understanding various functions of C++language
- CO3:** Applying various classes and objects
- CO4:** Analyzing different types of inheritance system.
- CO5:** Understanding working about files and exception handling

Title of the course		GRAPH THEORY AND APPLICATIONS					
Category	Elective 8	Year	III	Credits	3	Course Code	U23MTE68A
		Semester	VI				
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total
		4	1				5
Pre- requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none">• Understand the fundamental concepts of graph theory.• Learn about the connectivity and separability of graphs.• Develop an understanding of vector spaces of a graph• Gain knowledge about matrix representation of a graph					
Course Outline		UNIT I: Graphs – Sub graphs - Isomorphism and degrees - Walks and connected graphs - Cycles in graphs – Cut vertices and cut edges. Chapter1:Section 1.1–1.7					
		UNIT II: Eluera in graphs - Fleury's algorithm - Hamiltonian graphs –Weighted graphs. Chapter2:Section2.1 –2.4Chapter4					
		UNIT III: Bi partite graphs – Marriage problem-Trees- Connector problem. Matrix representations – Vector spaces associated with graphs – Cycle space–Cut-set space. Chapter 3:Section3.1–3.4Chapter4:Section4.1					
		UNIT IV: Planar graphs - Euler formula - Platonic solids - Dual of a plane graph -Characterization of planar graphs. Chapter5:Section 5.1–5.5					
		UNIT V: Vertex colouring – Edge colouring-An algorithm for vertex colouring – Directed graphs. Chapter 6–6.1-6.3 Chapter 7–7.1					

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 examinations various competitive 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
Text Book	S.A .Choudum, A First course in Graph Theory, Macmillan Publishers India Pvt Ltd, 2000.
Reference Book	F. Harary, Graph Theory, Narosa Publishing Company, 2001. Narsingh Deo, Graph Theory with applications to Engineering & Computer Science, Prentice Hal l of India, New Delhi, 1997.
Website and e-Learning Source	https://d3gt.com/-Learn Graph Theory Interactively https://www.mathsisfun.com/graph/index.html https://brilliant.org/courses/graph-theory-intro/ http://mathworld.wolfram.com/GraphTheory.html

Course Learning Outcome(for Mapping with Pos and PSOs)

Students will be able to:

CO1: Be able to define and classify graphs based on various parameters such as degree ,isolated

And pendent vertices, and iso morphisms.

CO2: Be able to identify and explain the properties of trees, including pendent vertices, Distances and centres ,rooted and binary trees, spanning trees, and fundamental circuits

CO3: Be able to demonstrate understanding of the connectivity and separability of graphs,

Including Euler graphs, Hamiltonian paths and circuits ,and the various types of cut sets.

CO4: Be able to explain the concepts of vector spaces of a graph, and their applications

CO5:Be able to use matrix representation of a graph and to solve problems related to graph theory.

B.Sc. Mathematics

SKILL ENHANCEMENT COURSES

[DISCIPLINE/SUBJECT SPECIFIC]

Syllabus

Title of the course		COMPUTATIONAL MATHEMATICS					
Category	SEC 1	Year	I	credit	2	Course code	U23MTS101
		semester	I				
Instructional Hours per week		Lecture	Instructional Hours per week		Lecture	Instructional Hours per week	
		1			1	2	
Pre- requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none">•To introduce students to computational mathematics and its applications in solving mathematical problems.•To familiarize students with the basics of Sci lab programming language and its use in numerical computations.•To teach student show to implement numerical algorithms for solving mathematical problems using Sci lab.• To enable students to use computational methods to solve mathematical problems and interpret the results obtained					
Course Outline		UNIT I:IntroductiontoScilab Sci lab Environment Manipulating the command line- Variable sin Memory - Startup Commands – The Sci lab Menu Bar–Tool boxes Vectors Initialising vectors in Sci lab – Mathematical operations on vectors - Relational operations on vectors - Logical operations on vectors Functions Built-in logical functions-Elementary Mathematical Functions– Mathematical functions on scalars Chapter2–2.1,2.2,2.5,2.8,2.9:Chapter3–3.2to3.8 TextBook:1					
		UNIT II: Matrices: Introduction-Arithmetic operators for Matrices– Basic matrix processing Programming in Sci lab: Introduction – Variables & Variable names- Assignment statements- Arithmetic, Relational & Logical operators - Input & Output - Flow control/branching /conditional statements – Break and continue- Handling Matrices with Loops. Chapter4–4.1,4.2, 4.3;Chapter5–5.1to5.8 TextBook:1					

	<p>UNIT III: Scripts- The Concept of Functions – User Defined Functions- Special Function command. Graphic output: Introduction - 2d Plotting - - Function versions for graphic commands -3d plotting</p> <p>Chapter5–5.9to5.12:Chapter8–8.1–8.4</p> <p>TextBook:1</p>
	<p>UNIT IV: Numerical Methods using SCI LAB[Concepts, Problem & Sci lab code] Solution of Algebraic and Transcendental Equation :Bisection method - Newton- Raphson method –Regula Falsi method -Secant method. Interpolation: Finite Difference Operators–Newton’s Gregory Forward Interpolation Method, - Newton’s Gregory backward Interpolation Method – Lagrange interpolation method Chapter 1 &2</p> <p>Text Book :2</p>
	<p>UNIT V: Numerical Differentiation: Equal interval–Un equal Interval Numerical Integration: Newton Cotes formula–Trapezoidalrule-Simpson's1/3rule–Simpson's 3/8 rule – Monte Carlo method</p> <p>Chapter4&5</p> <p>TextBook:2</p>
Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	<p>Questions related to the above topics, from examinations various competitive UPSC/ TNPSC/ others to be solved (To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge problem solving, analytical ability professional competency , professional communication and transferrable skill</p>

Text Book	<ol style="list-style-type: none"> 1. SCI LAB (A Free Software to MATLAB)- Author : Achuthsankar S Nair & Hema Ramchandran-:S. Chand Publishing-:2012. 2. Numerical Method Skit: Format lab, Scilab and octaveusers by Rohan Verma.
Reference Book	<ol style="list-style-type: none"> 1. Introduction to Sci lab: For Engineers and Scientists.- Sandeep Nagar 2. Computing in Sci lab-Chetana Jain– Cambridge University 3. Computer – Based Numerical & Statistical Techniques- M. Goyal- Infinity Science Press Llc
Website and e- Learning Source	<ol style="list-style-type: none"> 1. https://www.scilab.org/tutorials-ScilabTutorials 2. https://egyankosh.ac.in/bitstream/123456789/88092/1/Unit-15.pdf 3. https://www.edx.org/course/scilab-programming-for-beginners 4. https://www.scilab.org/sites/default/files/Scilab_beginners.pdf 5. https://spoken-tutorial.org/tutorial-search/?search_foss=Scilab&search_language=English

Course Learning Outcome:

Students will be able to:

CO1: Students will be able to design and publish their own web pages using HTML.

CO2: Students will be able to define styles using pseudo-elements and link a style sheet to an HTML document.

CO3: Students will be able to create webpage layouts and designs using CSS, and style various elements such as background, text, and font.

CO4: Students will be able to design and implement forms and form elements in their webpages.

CO5: Students will be able to create a well-structured website with appropriate titles and themes.

Title of the course		WEB DESIGNING					
Categor	SEC	Year	I	Additional	2	Course	U23MTS203

y	3	Semester	II	Credits		Code	
Instructional Hours per week	Lecture	Tutorial		Lab Practice		Total	
	1	1				2	
Pre- requisite	12 th Standard Mathematics						
Objectives of the Course	<ul style="list-style-type: none">Understand the fundamentals of web design and electronic publishingLearn how to create lists and nested lists using HTMLLearn how to create web page layouts and designs using CSSLearn how to work with block elements, objects, lists, and tables using CSSUnderstand the usage of themes, div, span, tables, and frames in web design.						
Course Outline	UNIT I: Introduction to Web Design & HTML Basics WWW, Website, Working of Websites, Webpages, Front End, Back End, Client and Server Scripting Languages, Responsive Web Designing, Types of Websites (Static and Dynamic Websites)–Free Editors –Notepad++ HTML Basics: Introduction ,Basic Structure of HTML Chapter1–1.4 to1.7:Chapter 2– 2.1, 2.2						
	UNIT II: Formatting Tags–HTML Tables–HTML Lists–HTML Forms–HTML–HTML5 Introduction-HTML embed multimedia -HTML Layout Chapter 2–2.3 to2.12						
	UNIT III: Introduction to CSS: -Types of CSS, CSS Properties, Border Properties Chapter 3–3.1 to3.5						
	UNIT IV: Block properties, Positioning Properties, CSS Lists, CSS Tables, CSS Menu Design CSS Image Gallery Chapter 3–3.6 to3.11						
	UNIT V: JavaScript: Introduction to Client-Side Scripting Language, Variables in Java Script, Operators in JS, Conditions Statements, JS Popup Boxes, JS Events, Basic Form Validations in Java Script. Chapter 5–5.1 to5.9						

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 examinations various competitive 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
Text Book	WebDesigning&Publishing–Satishjain,M.GeethaIyer,BPBPublishations–2022
Reference Book	1. Hirdesh Bharadwaj, Web designing ,Paper Back,2016. 2. Brain D.Miller, Principles of webdesign, Allworth Publications, 2022.
Website and e-Learning Source	<ol style="list-style-type: none"> 1. https://digital.com/wp-content/uploads/html-cheat-sheet.pdf 2. https://tutorial.techaltum.com/webdesigning.html-WebDesigningTutorial 3. https://www.w3schools.com/html/-HTMLtutorial 4. https://www.w3schools.com/css/default.asp-CSSTutorial 5. https://www.w3schools.com/css/default.asp-JavascriptTutorial

Course Learning Outcome:

Students will be able to:

CO1- Students will be able to design and publish their own webpages using HTML.

CO2- Students will be able to define styles using pseudo-elements and link a style sheet to an HTML document.

CO3- Students will be able to create web page layouts and designs using CSS, and style various elements such As back ground, text, and font.

CO4- Students will be able to design and implement forms and form elements in their

webpages.

CO5- Students will be able to create a well-structured website with appropriate titles and themes

Title of the course		STATISTICS WITH R PROGRAMMING						
Category	SEC 4	Year	II	Credits	2	Course Code	U23MTS304	
		Semester	III					
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total	
		1	1				2	
Pre- requisite		12 th Standard Mathematics						
Objectives of the Course		<ul style="list-style-type: none">• To analyze data using the statistical tool R.• To create vectors, lists, matrices, arrays and data frames using R.• To draw charts and graphs using R.• To automate data analysis, working collaboratively and openly on code.• To know how to generate dynamic documents						
Course Outline		UNIT I: Features of R—Reserved words—Identifiers—Constants—Variables—Operators—Operator Precedence –Strings – Basic Data Types Chapter 1, &Chapter2-2.1, 2.2						
		UNIT II: Creating and combining vectors – Accessing Vector Elements – Modifying Vectors-Vector arithmetic and Recycling-Vector Element Sorting–Reading Vectors-Creating Lists -Accessing List elements –Updating List Elements –Merging Lists-List to Vector conversion Chapter 2-2.3,2.4						
		UNIT III: Creating matrices – Creating Arrays – Creating factors – Creating Data Frames -Aggregating Data -Sorting Data -Merging Data -Reshaping data -Sub-setting data-Data Type Conversion – Bar charts–Histogram–Line graphs– Pie charts– Graphical analysis and summaries of Data using Descriptive Statistics Chapter 2 –2.5 to2.9,Chapter5– 5.1to 5.4						
		UNIT IV: Decision making (using if statement -if...else statement-Nested If...Else statement-if else function- Switch statement)-Loops (for loop– while Loop – repeat Loop) –Function definition and Function Calling–Function without arguments-Built-in functions. Chapter 3,Chapter4–4.1to4.3						
		UNIT V: Probabilitydistribution–Ztest–F–test–ttest–Correlation–Regression –Forecasting–Time Series Analysis Chapter7–7.1 to7.5,Chapter11						

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 examinations various competitive 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
Text Book	1. JeevaJose(2018),"Beginner's Guide for Data Analysis using R Programming",Khanna Book Publishing Co. Ltd., NewDelhi. 2. Statistics Using R–SudhaG.Purohit, Sharad D.Gore,Shailaja R.Deshmukh–NarosaPublishing House,2015.
Reference Book	1. Modern Statistics with R–Måns Thulin–FREEONLINEBOOK.. 2. P.Dalgaard. Introductory Statistics with R,2 nd Edition. Springer2008. 3. Gardener,M(2012)Beginning R: The Statistical Programming Language, Wiley Publications
Website and e-Learning Source	1. https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf 2. http://wise.cgu.edu/wp-content/uploads/2016/07/Getting-Started-with-R-and-RStudio.pdf 3. https://www.w3schools.com/r/-RTutorial 4. https://www.programiz.com/r-learnRprogramming 5. https://www.upgrad.com/blog/r-shiny-tutorial-make-interactive-web-applications-in-r/ R. Shiny Tutorial:-How to Make Interactive Web Applications in R. 6. https://swirlstats.com/ -Easy to learn R Programming.

Course Outcomes

CO1: The students will be able to analyze data using the statistical tool R.

CO2: Create vectors, lists, matrices, arrays and data frames using R.

CO3:Design and implement the program using data frame, list to provide the solution for various problem

CO4: Ability to apply statistical techniques using R Programming for decision making.

CO5: Study about factors and tables and to solve statistical problems.

Title of the course		INTRODUCTION TO DATA SCIENCE					
Catego	SE	Year	II	Credits	2	Course Code	U23MTS405

ry	C 6	Semester	VI				
Instructional Hours per week	Lecture	Tutorial		Lab Practice		Total	
	1	1				2	
Pre-requisite	12 th Standard Mathematics						
Objectives of the Course	<ul style="list-style-type: none">• Understand the importance of data science in today's world.• Build models for prediction and classification.• Implement supervised and unsupervised machine learning algorithms.• Understand the Hadoop frame work.						
Course Outline	UNIT I:Data science in a big data world Benefits and uses–Facets of data–Data science process–Big data eco system and data science. Chapter1-1.1–1.4						
	UNIT II: The Data science process: Overview–research goals-retrieving data-transformation–Exploratory Data Analysis– Model building. Chapter 2-2.1-2.6						
	UNIT III: Algorithms: Applications of Machine learning in Data Science–Machine learning algorithms –Modeling process–Types–Supervised–Unsupervised. Chapter 3– 3.1 –3.3						
	UNIT IV: Introduction to Hadoop: Hadoop frame work–Spark–replacing Map Reduce Chapter 5–5.1						
	UNIT V: Introduction to No SQL No SQL–ACID–CAP–BASE–types Chapter 6–6.1						

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 examinations various competitive 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
Text Book	1,DavyCielen,ArnoD.B.Meysman,MohamedAli,“IntroducingDataScience”,maningpublications 2016.
Reference Book	1.Introduction to Data Science-B. UmaMaheswari, R.Sujatha–WILLEY-2021. 2. MurtazaHaider,“Getting Started with DataScience–Making Sense of Data with Analytics”, IBMpress,E-book.
Website and e- Learning Source	1. Python DataScience Handbook: Essential Tools for Working with Databy JakeVanderPlas https://jakevdp.github.io/PythonDataScienceHandbook/ 2. An Introduction to Machine Learning by Alpaydin https://www.cmpe.boun.edu.tr/~ethem/i2ml2e/ 3. https://www.open.edu/openlearn/science-maths-technology/learn-code-data-analysis/content-section-overview?active-tab=content-tab- tab- Learn to code for data analysis–Free Course 4. https://www.w3schools.com/datascience/-DataScienceTutorial 5. https://www.kaggle.com/code/helgejo/an-interactive-data-science-tutorial-Free data Science Tutorial 6. https://www.nbshare.io/-Datasciencelearning

Course Outcomes

CO1: Identify the different faces of the data and explain the data science process.

CO2: Retrieve and transform data, perform exploratory data analysis, and build models.

CO3: Evaluate and compare machine learning algorithms and apply them to real-World data science problems.

CO4: Understand the Hadoop frame work and use it for big data processing.

CO5: Explain the concepts of No SQL databases and apply them to solve data management problems.

Title of the course		COMPUTING MATHEMATICS					
Category	SEC 6	Year	II	Credits	2	Course Code	
		Semester	VI				
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total
		4	1				2
Pre- requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none">To provide students with the necessary mathematical tools to perform matrix operations and vector algebraTo introduce students to the concept of ordinary differential equations and their applications in real-world problemsTo teach students how to use Euler's method, Modified Euler's method, and Runge –Kutta method to solve first and second-order differential equations.To provide students with an understanding of special functions such as Bessel function, Legendre polynomial, Hermite polynomial, and improper integralsTo equip students with the necessary skills to use Fast Fourier Transform for signalProcessing and data analysis.					
Course Outline		UNIT I: Matrices and Vector Space: Creation of a matrix-matrix Operations–Vector Algebra–Applications Chapter1-1.1 to1.6					
		UNIT II: Least Square Curve Fitting: Fitting of linear data – Nonlinear data–Polynomial Fitting-Applications Chapter3–3.1 to3.6					

	UNIT III: Ordinary Differential Equations: Eulers Method- First order Differential Equation – Second order Differential Equation–Modified Euler’s method– Second order Runge -Kutta Method –Applications Chapter4– 4.1 –4.4, 4.8–4.8.1, 4.8.2, 4.8.3, 4.8.4, 4.8.5,
	UNIT IV: Special functions: Bessel function of the first kind–Legendre polynomial– Hermite polynomial –Improper Integral–Applications Chapter6– 6.1 to6.7
	UNIT V: Fourier Analysis: Periodic function–Fourier Series–Harmonic function–Fourier series expansion–Fast Fourier Transformation Chapter7–7.1 to7.6
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 examinations various competitive 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
Text Book	Computing in Scilab–ChetanaJain–Cambridge University Press..
Reference Book	1.Numerical methods kit for Matlab, Scilab and octave user – Rohan Verma – University of Delhi,2020. 2.ComputerbasednumericalandStatisticalTechniques–M.Goyal–InfinityPress,2008
Website and e-Learning Source	1.MathWorks: https://www.mathworks.com/ 2.WolframMathWorld: http://mathworld.wolfram.com/ 3.NumericalRecipes: https://www.nr.com/ 4. MATLAB Academy: https://matlabacademy.mathworks.com/

Course Outcome

CO1: Understand the fundamental concepts of matrices and vector space and apply them to solve problems in physics, engineering, and computer science.

CO2: Fit linear and nonlinear data using least square curve fitting techniques and apply them to solve real-world problems.

CO3: Analyze and solve first and second-order differential equations using Euler's method, Modified Euler's method, and Runge-Kutta method.

CO4: Apply special functions such as Bessel function, Legendre polynomial, Hermite polynomial, and improper integrals to solve mathematical problems.

CO5: Use Fourier series expansion and Fast Fourier Transform to analyze signals and data.

ALLIED MATHEMATICS

Syllabus

Title of the course		ALLIED MATHEMATICS –I					
Category	Allied1	Year	III	Credits	3	Course Code	U23MAA11
		Semester	VI				
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total
		4	1				5
Pre- requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none">• To explore the fundamental concepts of Mathematics.• To acquire knowledge about finding approximate roots of the polynomial equations.• To improve students’ ability in applications of matrices and calculus.• Students are exposed to understanding the concept of derivatives and their applications.• To exposed on able and triple integrals and their applications.					
Course Outline		UNIT I: SOLUTIONS OF TRANSCENDENTAL ANDALGEBRAIC EQUATIONS Iteration method, Bisection method, Newton’s method-Regula Falsi method, Horner’s method (without proof) (Simple problems only) Chapter1Text Book 1					
		UNIT II: SOLUTIONS OF SIMULTANEOUS EQUATIONS Gauss Elimination method - Gauss Jordan method – Gauss Seidel Iterative method –Gauss Jacobi method(Restricted to three variables only)(Simple problems only) Chapter2					
		UNIT III: MATRICES Characteristic equation of a square matrix– Eigen values and eigen vectors – Cayley – Hamilton theorem [without proof] – Verification and computation of inverse matrix. Chapter1-Sec– 1.1.1,1.1.2, 1.2, 1.4.3					

	UNIT IV: DIFFERENTIAL CALCULUS n-th derivatives – Leibnitz theorem [without proof] and applications– Jacobians–Curvature and radius of curvature in Cartesian co-ordinates and polar co-ordinates. Chapter 2 Sec–2.7,4.1,4.1.1,4.2
	UNIT V: APPLICATION OF INTEGRATION Evaluation of double, triple integrals –Simple applications to area, volume, and centroid. Chapter 3 Sec-3.4, 3.4.1,3.5.1, 3.5.2, 3.6
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 examinations various competitive 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
Text Book	1. P. Kandasamy, K. Thilagavathy (2003) Calculus of Finite differences & Numerical Analysis, S. Chand & Company Ltd., New Delhi-55. 2. P. Duraipandian and Dr.S. Udaya baskaran (1997), “Allied Mathematics”, Vol I & II. Chennai: Muhil Publishers.
Reference Book	1. S.J.Venkatesan, “Allied Mathematics-I”, Sri Krishna Publications, Chennai. 2. P.R.Vittal(2003), “Allied Mathematics”, Margham Publication, Chennai. 3. A.Singaravelu, “Numerical Methods”, Meenakshi Publications
Website and e-Learning Source	1. https://www.mathwarehouse.com/ 2. https://www.mathhelp.com/ 3. https://www.mathsisfun.com/

Course Outcomes

CO1: Find out the approximate roots of polynomial equations.

CO2: Develop the skills of finding roots of simultaneous equations

CO3: Demonstrate knowledge about matrices and their applications

CO4: Carryout calculations of problems related to curvature and radius of curvature.

CO5: Evaluate double and triple Integrals, and enabled to understand the Applications of integration in real-life situations.

Title of the course		ALLIED MATHEMATICS -II						
Category	Allied 2	Year	III	Credits	3	Course Code	U24MAA11	
		Semester	VI					
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total	
		4	1				5	
Pre- requisite		12 th Standard Mathematics						

Objectives of the Course	<ul style="list-style-type: none"> 1. This course is designed for the students to expose the topics such as expansions of trigonometric functions, partial differential equations, and integration. 2. To gain knowledge of expansions of trigonometric functions. 3. To acquire the knowledge of solving partial differential equations. 4. Basic knowledge of vector calculus. 5. To understand and carry out the calculations of a given set of data.
Course Outline	<p>UNIT I: TRIGONOMETRY</p> <p>Expansions of $\sin n\theta$, $\cos n\theta$, $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ – Expansions of $\sin\theta$, $\cos\theta$, $\tan\theta$ in terms of θ – Hyperbolic and inverse hyperbolic functions – Logarithms of complex numbers.</p> <p>Chapter 6 (6.1, 6.1.1-6.1.3, 6.2, 6.2.1-6.2.3, 6.3, 6.4), Vol II,</p> <p>UNIT II: PARTIAL DIFFERENTIAL EQUATIONS</p> <p>Formation-complete integrals and general integrals-Four standard types-Lagrange's equations</p> <p>Chapter: 6 (6.1, 6.1.1, 6.2, 6.3, 6.4), Vol III,</p> <p>UNIT III: VECTOR DIFFERENTIATION</p> <p>Vector functions- Derivative of a vector function- Scalar and vector point functions-Gradient of a scalar point function-Gradient-Directional derivatives-Unit vector normal to a surface – angle between the surfaces-divergence, curl.</p> <p>Chapter 8- (8.1, 8.1.1, 8.2, 8.3, 8.3.1, 8.3.2, 8.4, 8.4.1, 8.4.2, 8.4.3, 8.4.4), Vol I</p> <p>UNIT IV: VECTOR INTEGRATION</p> <p>Green's theorem in the plane- Gauss divergence theorem-Stoke's theorem [without proofs]. Chapter 8- (8.6.1-8.6.3), Vol I.</p> <p>UNIT V: FINITE DIFFERENCES</p> <p>Operator E, Relation between Δ, ∇ and E – Interpolation – Newton – Gregory forward & backward formulae for interpolation- Lagrange's interpolation formula for unequal intervals (without proof).</p> <p>Chapter 5- (5.1, 5.2), Vol III.</p>

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 examinations various competitive 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
Text Book	P.Duraipandian and S.Udayabaskaran (1997),“Allied Mathematics”,VolI &II. Chennai: Muhil Publishers.
Reference Book	<ol style="list-style-type: none"> 1. S.P. Raja gopalan and R.Satta nathan (2005),“Allied Mathematics”,VolI & II. New Delhi:Vikas Publications. 2. S.J.Venkatesan,“Allied Mathematics-II”,SriKrishna Publications,Chennai. 3. P.R.Vittal(2003),“Allied Mathematics” ,Margham Publications,Chennai. 4. P.Kandhasamy,K.Thilagavathy(2003),“Allied Mathematics” VolI & II, New Delhi: Tata Mc Graw Hill. 5. P.Kandasamy, K.Thilagavathy(2003) Calculus of Finite differences & Numerical Analysis,S.Chand& Company Ltd.,NewDelhi-55.
Website and e-Learning Source	<ol style="list-style-type: none"> 1. https://www.mathwarehouse.com/ 2. https://www.mathsisfun.com/

Course Outcomes

CO1:Find out the expansions of trigonometric functions and carryout problems related to Hyperbolic and inverse hyper bolic functions.

CO2: Provide a basic knowledge of partial differential equations and develops knowledge

on handling practical problems. Develop the skills of finding roots of simultaneous equations.

CO3: Demonstrate knowledge of solving problems involving vector and scalar functions.

CO4: Carryout calculations of problems related to vector integration

CO5: Evaluate finite differences using various interpolation methods