B.SC.,
MATHEMATICS

SYLLABUS

AUGUST- 2023

TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION,
CHENNAI – 600 005

NEW INITIATIVE IN MODERNISING

UNDER-GRADUATE PROGRAMME IN MATHEMATICS

CONTENTS

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 earning to real life situations.

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

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

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

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 Components	Outcome / Benefits
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.	• Instil confidence among students • Create interest for the subject
I, II, III, IV	**Skill Enhancement papers** (Discipline centric / Generic / Entrepreneurial)	• Industry ready graduates • Skilled human resource • Students are equipped with essential skills to make them employable
		• Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational aspects
		• Data analytical skills will enable students gain internships, apprenticeships, field work involving data collection, compilation, analysis etc.
		• Entrepreneurial skill training will provide an opportunity for independent livelihood • Generates self – employment • Create small scale entrepreneurs • Training to girls leads to women empowerment
		• 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	• 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	• Exposure to industry moulds students into solution providers • Generates Industry ready graduates • Employment opportunities enhanced
II year Vacation	Internship / Industrial Training	• Practical training at the Industry/ Banking Sector / Private/ Public sector organizations / Educational

activity		institutions, enable the students gain professional experience and also become responsible citizens.
V Semester	Project with Viva – voce	• Self-learning is enhanced • Application of the concept to real situation is conceived resulting in tangible outcome
VI Semester	Introduction of Professional Competency component	• 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**		• 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

B.Sc Mathematics Programme Structure

Sem	Part	Course Code	Courses	List of Courses	T/P	Credit	Hours/ week	Max .Marks		
								Int.	Ext.	Total
I	Part-I	2311T	T/OL	தமிழ் இலக்கிய வரலாறு-I /Other Language-I	T	3	6	25	75	100
	Part-II	2312E	E	General English-I	T	3	6	25	75	100
	Part-III	23BMA1C1	CC-I	Algebra &Trigonometry	T	5	5	25	75	100
		23BMA1C2	CC-II	Differential Calculus	T	3	4	25	75	100
		-	Generic Elective (Allied)	Numerical Methods with Applications/ Physics / Chemistry	T	3	3	25	75	100
				Practical -Respective Allied Theory	P	2	2	25	75	100
	Part-IV	23BMA1S1	SEC-I	Latex	T	2	2	25	75	100
		23BMA1FC	FC	Bridge Mathematics	T	2	2	25	75	100
				TOTAL	**-**	**23**	**30**	**200**	**600**	**800**
II	Part-I	2321T	T/OL	தமிழ் இலக்கிய வரலாறு-II/ Other Language-II	T	3	6	25	75	100
	Part-II	2322E	E	General English-II	T	3	6	25	75	100
	Part-III	23BMA2C1	CC-III	Analytical Geometry (Two & Three Dimensions)	T	4	5	25	75	100
		23BMA2C2	CC-IV	Integral Calculus	T	4	4	25	75	100
		-	Generic Elective (Allied)	Astronomy or Allied Physics II or Allied Chemistry II	T	3	3	25	75	100
				Practical -Respective Allied Theory	P	2	2	25	75	100
	Part-IV	23BMA2S1	SEC-II	Computing Skills (Office Automation)	T	2	2	25	75	100
		23BMA2S2	SEC-III	Mathematics for Competitive Examination	T	2	2	25	75	100
						23	**30**	**200**	**600**	**800**
III	Part-I	2331T	T/OL	தமிழக வரலாறும் பண்பாடும்/ Other Languages	T	3	6	25	75	100
	Part-II	2332E	E	General English-III	T	3	6	25	75	100
	Part-III	23BMA3C1	CC-V	Vector Calculus and its Applications	T	4	5	25	75	100
		23BMA3C2	CC-VI	Differential Equations and Applications	T	4	4	25	75	100
		-	Generic Elective (Allied)	Mathematical Statistics Theory & Practical	T	3	3	25	75	100
				Practical -Respective Allied Theory	P	2	2	25	75	100

	Part-IV	23BMA3S1	SEC-IV	Web Designing	T	2	2	25	75	100
		233AT/ 23BMA3S2	SEC-V	Adipadai Tamil/ Data Analysis using SPSS	T	2	2	25	75	100
						23	**30**	**200**	**600**	**800**
IV	Part-I	2341T	T/OL	தமிழும் அறிவியலும் / Other Languages	T	3	6	25	75	100
	Part-II	2342E	E	General English-IV	T	3	6	25	75	100
	Part -III	23BMA4C1	CC-VII	Industry Mathematics: Linear Programming Problem	T	4	4	25	75	100
		23BMA4C2	CC-VIII	Elements of Mathematical Analysis	T	3	3	25	75	100
		-	Generic Elective (Allied)	Transformation Techniques	T	3	3	25	75	100
				Practical -Respective Allied Theory	P	2	2	25	75	100
	Part-IV	23BMA4S1	SEC-VI	Introduction to Data Science	T	2	2	25	75	100
		234AT/ 23BMA4S2	SEC-VII	Adipadai Tamil/ Computational Mathematics	T	2	2	25	75	100
		23BES4	EVS	Environmental Studies	T	2	2	25	75	100
						24	**30**	**225**	**675**	**900**
V	Part-III	23BMA5C1	CC-IX	Abstract Algebra	T	4	5	25	75	100
		23BMA5C2	CC-X	Real Analysis	T	4	5	25	75	100
		23BMA5C3	CC-XI	Mathematical Modelling	T	4	5	25	75	100
		23BMA5PR	CC-XII	Project with Viva voce		4	5	25	75	100
		23BMA5E1	DSE-I	Optimization Techniques	T	3	4	25	75	100
		23BMA5E2	DSE-II	Programming in C with Practical	T&P	3	4	25	75	100
	Part-IV	23BVE5		Value Education	T	2	2	25	75	100
		23BMA5I		Internship / Industrial Training (Summer vacation at the end of IV semester activity)		2	-	25	75	100
						26	**30**	**200**	**600**	**800**
VI	Part-II	23BMA6C1	CC-XIII	Linear Algebra	T	4	6	25	75	100
		23BMA6C2	CC-XIV	Complex Analysis	T	4	6	25	75	100
		23BMA6C3	CC-XV	Mechanics	T	4	6	25	75	100
		23BMA6E1	DSE-III	Programming in C++ with Practical	T&P	3	5	25	75	100
		23BMA6E2	DSE-IV	Graph Theory and its Applications	T	3	5	25	75	100
	Part-IV	23BMA6S1	Professional Competency Skill	Essential Reasoning and Quantitative Aptitude	T	2	2	25	75	100
		--		Extension Activity		1				
						21	**30**	**150**	**450**	**600**
						140	**-**	**1175**	**3525**	**4700**

- TOL-Tamil/Other Languages,
- E – English
- CC - Core course –Core competency, critical thinking, analytical reasoning, research skill & teamwork
- Generic Elective (Allied)
- SEC-Skill Enhancement Course
- FC- Foundation Course
- T- Theory, P-Practical

Chairperson details: Dr.R.Jahir Hussain, Assistant Professor, Department of Mathematics, Dr. Zakir Husain College, Ilayangudi, Mobile No: 9095712469

B.Sc Mathematics

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">ALGEBRA & TRIGONOMETRY</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE M1</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA1C1</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">1</td><td>--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Basic ideas on the Theory of Equations, Matrices and Number Theory.
• Knowledge to find expansions of trigonometry functions, solve theoretical and applied problems.</td></tr>
<tr><td colspan="2">Unit I</td><td colspan="6">Reciprocal Equations-Standard form–Increasing or decreasing the roots of a given equation- Removal of terms, Approximate solutions of roots of polynomials by Horner’s method – related problems.</td></tr>
<tr><td colspan="2">Unit II</td><td colspan="6">Summation of Series: Binomial– Exponential –Logarithmic series (Theorems without proof) – Approximations - related problems.</td></tr>
<tr><td colspan="2">Unit III</td><td colspan="6">Characteristic equation – Eigen values and Eigen Vectors-Similar matrices - Cayley – Hamilton Theorem (Statement only) - Finding powers of square matrix, Inverse of a square matrix up to order 3, Diagonalization of square matrices - related problems.</td></tr>
<tr><td colspan="2">Unit IV</td><td colspan="6">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 $\tan(\theta_1+\theta_2+,\ldots,+\theta_n)$-Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of θ - related problems.</td></tr>
<tr><td colspan="2">Unit V</td><td colspan="6">Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series - related problems.</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Knowledge, problem solving, analytical ability, professional competency, professional communication and transferable skill.</td></tr>
</table>

Recommended Text	1. W.S. Burnstine and A.W. Panton, Theory of equations 2. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007 3. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005 4. C. V. Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003 5. J. Stewart, L. Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012. 6. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010. 7. Arumugam .S & Thangapandi Isaac Tigonometry Palayamkottaai ,New Gamma Publishing House 8. Manicavachagom Pillai,T.K.Natarajan & K.S.Ganapathy Algebra (Vol 1 & Vol2). S.Viswanthan Publishers and printers
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Classify and Solve reciprocal equations

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

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

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

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

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

<table>
<tr><td>Title of the Course</td><td colspan="6">DIFFERENTIAL CALCULUS</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE M2</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA1C2</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">3</td><td>1</td><td>--</td><td colspan="2">4</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">• The basic skills of differentiation, successive differentiation, and their applications.
• Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.</td></tr>
<tr><td>Unit I</td><td colspan="6">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.</td></tr>
<tr><td>Unit II</td><td colspan="6">Partial Differentiation: Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions.</td></tr>
<tr><td>Unit III</td><td colspan="6">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.</td></tr>
<tr><td>Unit IV</td><td colspan="6">Envelope: Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter.</td></tr>
<tr><td>Unit V</td><td colspan="6">Curvature: Definition of Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutes – Radius of Curvature in Polar Co-ordinates.</td></tr>
<tr><td>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="6">Questions related to the above topics, from various competitive examinations UPSC / / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td>Skills acquired from this course</td><td colspan="6">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td>Recommended Text</td><td colspan="6">1. 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, 2010.
3. M.J. Strauss, G.L. Bradley and K. J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2007.
4 Arumugam .S & Thangapandi Isaac, Calculus Palayamkottaai ,New Gamma Publishing House
5 Manicavachagom Pillai,T.K.Natarajan & K.S.Ganapathy Calculus (Vol 2 & Vol3). S.Viswanthan Publishers and printers</td></tr>
</table>

Reference Books	1. R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989. 2. T. Apostol, Calculus, Volumes I and II. 3. S. Goldberg, Calculus and mathematical analysis.
Website and e-Learning Source	https://nptel.ac.in /

Course Learning Outcome (for Mapping with PLOs and PSOs)

Students will be able to

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

CLO 2: Find the partial derivative and total derivative coefficient

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

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

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

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

Course Code 23BMA1S1	LaTeX		Credits 2
Year &Semester: I YEAR & I SEMESTER	Course Category	SEC	Total:(L+T+P) Per week: 1+1 = 2

Course Objective

- To enable the students to acquire basic concepts of LaTeX
- To get knowledge to prepare sample reports, sample articles, sample presentation and sample poster

	Details	No. of Hours
UNIT I	Preamble : Motivation - Running LaTeX - Resources - Basic LaTeX - Sample Document and Key Concepts - Type Style - Environments - Lists - Centering - Tables - Verbatim - Vertical and Horizontal Spacing	6
UNIT II	Typesetting Mathematics - Examples - Equation Environments - Fonts, Hats, and Underlining - Braces -Arrays and Matrices - Customized Commands -Theorem-like Environments - Math Miscellany - Math Styles - Bold Math - Symbols for Number Sets - Binomial Coefficient	6
UNIT III	Further Essential LaTeX : Document Classes and the Overall Structure - Titles for Documents - Sectioning Commands - Miscellaneous Extras - Spacing - Accented Characters - Dashes and Hyphens - Quotation Marks - Troubleshooting - Pinpointing the Error - Common Errors - Warning Messages .	6
UNIT IV	Packages - Inputting Files - Inputting Pictures - Making a Bibliography - Making an Index –Latex through the years	6
UNIT V	Sample Article –Sample Report – Sample presentation - Sample Poster – Internet Resources	6
	Total	**30**

Course Outcomes

CO	On completion of this course, students will able to
1	Learn LaTeX.
2	Typesetting Mathematics
3	know the essential of LaTeX, Document Classes and the Overall Structure
4	Know the packages, Inputting Files, Inputting Pictures, Making a Bibliography
5	prepare theSample Article, Sample Report, Sample presentation and SamplePoster

Text Book

1	Learning LaTeX : David F. Griffiths, Desmond J. Higham. - SIAM -Society for Industrial and Applied Mathematics, Philadelphia **Chapter 1 ,2,3,4 and 5**

Reference Books	
1. A Guide to LaTeX, Helmut Kopka Patrick W. Daly, Electronic Publishing (Fourth edition) © Addison Wesley Longman Limited 2004. 2. LaTeXTutorials,A PRIMER, Indian TEX Users Group, Trivandrum, India 2003 September 3. LaTeX Beginner's Guide, Stefan Kottwitz, Published by Packt Publishing Ltd. 32 Lincoln road Olton,Birmingham, B27 6PA, UK	
Web Resources	
1.	Overleaf: https://www.overleaf.com/
2.	ShareLaTeX: https://www.sharelatex.com/
3	LaTeXWikibook: https://en.wikibooks.org/wiki/LaTeX

Title of the Course		**Bridge Mathematics**					
Paper Number		**FOUNDATION 1**					
Category	FC	**Year**	I	**Credits**	2	**Course Code**	**23BMA1FC**
		Semester	I				
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**		
		2	-	--	2		
Pre-requisite		12^{th} Standard Mathematics					
Objectives of the Course		To bridge the gap and facilitate transition from higher secondary to tertiary education; To instil confidence among stakeholders and inculcate interest for Mathematics;					
Unit I		Algebra: Binomial theorem, General term, middle term, problems based on these concepts					
Unit II		Sequences and series (Progressions). Fundamental principle of counting. Factorial n.					
Unit III		Permutations and combinations, Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups.					
Unit IV		Trigonometry: Introduction to trigonometric ratios, proof of sin(A+B), cos(A+B), tan(A+B) formulae, multiple and sub multiple angles, sin(2A), cos(2A), tan(2A) etc., transformations sum into product and product into sum formulae, inverse trigonometric functions, sine rule and cosine rule					
Unit V		Calculus: Limits, standard formulae and problems, differentiation, first principle, uv rule, u/v rule, methods of differentiation, application of derivatives, integration - product rule and substitution method.					
Recommended Text		1. NCERT class XI and XII text books. 2. Any State Board Mathematics text books of class XI and XII					
Website and e-Learning Source		https://nptel.ac.in					

Course Learning Outcome

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

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

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

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

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

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

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

	POs						PSOs	
	1	2	3	4	5	6	1	2
CLO1	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

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">ANALYTICAL GEOMETRY (Two & Three Dimensions)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE M3</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td>Credits</td><td>4</td><td>Course Code</td><td colspan="2">23BMA2C1</td></tr>
<tr><td>Semester</td><td>II</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">1</td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• Necessary skills to analyze characteristics and properties of two- and three-dimensional geometric shapes.
• To present mathematical arguments about geometric relationships.
• To solve real world problems on geometry and its applications.</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="8">Pole, Polar - conjugate points and conjugate lines – diameters – conjugate diameters of an ellipse - semi diameters- conjugate diameters of hyperbola.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="8">Polar coordinates: General polar equation of strai 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.</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="8">System of Planes-Length of the perpendicular–Orthogonal projection.</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="8">Representation of line–angle between a line and a plane – co – planar lines–shortest distance between two skew lines –length of the perpendicular–intersection of three planes.</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="8">Equation of a sphere-general equation-section of a sphere by a plane-equation of the circle- tangent plane- angle of intersection of two spheres- condition for the orthogonality- radical plane.</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="8">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="8">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="8">1. Dr S.Arumugam and Prof A.Thangapadi Isaac Analytical Geometry 2d and 3d.
2. Robert J. T. Bell, Co-ordinate Geometry of Three Dimensions.
3. William F. Osgood and William C. Graustein, Plane and Solid Analytic Geometry, Macmillan Company, NewYork, 2016.</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="8">1. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010.
2. Robert C. Yates, Analytic Geometry with Calculus, Prentice Hall, Inc., New York, 1961.
3. Earl W. Swokowski and Jeffery A. Cole, Algebra and</td></tr>
</table>

	Trigonometry with Analytic Geometry, Twelfth Edition, Brooks/Cole, Cengage Learning, CA, USA, 2010. 4. William H. McCrea, Analytical Geometry of Three Dimensions, Dover Publications, Inc, New York, 2006. 5. John F. Randelph, Calculus and Analytic Geometry, Wadsworth Publishing Company, CA, USA, 1969. 6. Ralph Palmer Agnew, Analytic Geometry and Calculus with Vectors, McGraw-Hill Book Company, Inc. New York, 1962.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

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

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

CLO 3: Explain in detail the system of Planes

CLO 4: Explain in detail the system of Straight lines

CLO 5: Explain in detail the system of Spheres

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

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">INTEGRAL CALCULUS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE M4</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA2C2</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="2">--</td><td colspan="2">4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Knowledge on integration and its geometrical applications, double, triple integrals and improper integrals.
• Knowledge about Beta and Gamma functions and their applications.
• Skills to Determine Fourier series expansions.</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="7">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, Feyman’s technique of integration.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="7">Multiple Integrals - definition of double integrals - evaluation of double integrals – double integrals in polar coordinates - Change of order of integration.</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="7">Triple integrals –applications of multiple integrals - volumes of solids of revolution - areas of curved surfaces–change of variables - Jacobian.</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="7">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.</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="7">Geometric and Physical Applications of Integral calculus.</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="7">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="7">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="7">1. Dr S.Arumugam and Prof A.Thangapadi Isaac Integral Calculus.
2.
3. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.
4. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.
5. D. Chatterjee, Integral Calculus and Differential Equations, Tata-McGraw Hill Publishing Company Ltd.
6. P. Dyke, An Introduction to Laplace Transforms and Fourier Series, Springer Undergraduate Mathematics Series, 2001 (second edition).</td></tr>
</table>

Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

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

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

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

CLO 4: Explain beta and gamma functions and to use them in solving problems of integration

CLO 5: Explain Geometric and Physical applications of integral calculus

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

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">COMPUTING SKILLS(OFFICE AUTOMATION)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">SEC-II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA2S1</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">2</td><td colspan="2"></td><td colspan="2">--</td><td>2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• To provide Knowledge about the Microsoft excel, Microsoft Word and Microsoft Power Point</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="8">Introduction to computers –Meaning-Definition-Brief History of computers-Generation of computers-Classification of computers-Components of computer –Computers Vs Human Beings-advantage of computers-Limitation of computers</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="8">Introduction to Ms word-Working with word documents-Formating documents : Moving-Printing and editing documents-Using Undo and Redo Features-Spell checking –formatting text-Inserting Page numbers-Header and Footer –using tables and Graphics.</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="8">Microsoft excel –Building a spread sheet Using auto fill –Add and remove Rows and columns-Undo and redo –Copying and moving fields-creatng and copying formula-Naming ranges using functions-creating a chart</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="8">Microsoft access- creating a new database-creating a new table –creating a primary key-adding fields –editing fields –deleting fields –changing the views and moving fields –Reports and queries.</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="8">Microsoft Powerpoint –Creating Basic Presentation –Building Presentation-Modifying Visual elements –Formatting and Checking Text. Adding object-Applying transitions0Animatio Effects- Slide show</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="8">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="8">Balagurusamy , Office Automation and word processing
Bajaj k.k Office Automation,Macmillan
N.KrishnanWindows and Msoffice 2000</td></tr>
</table>

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">MATHEMATICS FOR COMPETITIVE EXAMINATION</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">SEC-III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>I</td><td>Credits</td><td>2</td><td>Course Code</td><td colspan="2">23BMA2S2</td></tr>
<tr><td>Semester</td><td>II</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">2</td><td></td><td colspan="2">--</td><td colspan="2">2</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">Basic Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• To update the skillsin numerical and quantitative techniques</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="8">HCF-LCM Square roots and cube roots problems on numbers</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="8">Decimal fractions ,simplifications , Time and Distance.</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="8">Surds and indices –percentage –Profit and Loss, Simple interest and Compound interest</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="8">Ratio and proportion –Partnership –Alligation or Mixture-Probability.</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="8">Average –Problems on Age Calendar</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="8">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="8">Dr R.S,Agarwal “Qualitative Aptitude for Competitive Examinations”, Sultan &Chand Company Ltd .New Delhi 2007</td></tr>
</table>

Semester-III

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">VECTOR CALCULUS AND ITS APPLICATIONS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE M5</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA3C1</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="2">--</td><td colspan="2">5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Knowledge about differentiation of vectors and on differential operators. Knowledge about derivatives of vector functions.
• Skills in evaluating line, surface and volume integrals.
• The ability to analyze the physical applications of derivatives of vectors.</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="7">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.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="7">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.</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="7">Laplacian operator, Vector identities - Line integral - simple problems.</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="7">Surface integral - Volume integral – Applications.</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="7">Gauss divergence Theorem, Stoke’s Theorem, Green’s Theorem in two dimensions – Applications to real life situations.</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="7">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="7">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="7">1. Dr S.Arumugam and Prof A.Thangapadi Isaac Vector Calculua
2. J.C. Susan ,Vector Calculus, , (4th Edn.) Pearson Education, Boston, 2012.
3. A. Gorguis, Vector Calculus for College Students, Xilbius Corporation, 2014.
4. J.E. Marsden and A. Tromba ,Vector Calculus, , (5thedn.) W.H. Freeman, New York, 1988.</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="7">https://nptel.ac.in</td></tr>
</table>

Course Learning Outcome (for Mapping with POs and PSOs)
Students will be able to

CLO 1: Find the derivative of vector and sum of vectors, product of scalar and vector point function and to Determine derivatives of scalar and vector products
CLO 2: Applications of the operator 'del' and to Explain soleonidal and ir-rotational vectors
CLO 3: Solve simple line integrals
CLO 4: Solve surface integrals and volume integrals
CLO 5: Verify the theorems of Gauss, Stoke's and Green's(Two Dimension)

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

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">DIFFERENTIAL EQUATIONS AND APPLICATIONS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE M6</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA3C2</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="2">--</td><td colspan="2">4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Knowledge about the methods of solving Ordinary and Partial Differential Equations.
• The understanding of how Differential Equations can be used as a powerful tool in solving problems in science.</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="7">Ordinary Differential Equations: Variable separable - Homogeneous Equation-Non-Homogeneous Equations of first degree in two variables -Linear Equation - Bernoulli’s Equation-Exact differential equations.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="7">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.</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="7">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.</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="7">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.</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="7">Special methods – Standard forms-Charpit’s Methods – Simple Applications</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="7">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="7">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="7">1. Dr S.Arumugam and Prof A.Thangapadi Isaac Vector Calculus
2. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
3. I. Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967.</td></tr>
</table>

	4. G.F. Simmons, Differential equations with applications and historical notes, 2nd Ed, Tata Mcgraw Hill Publications, 1991.
Reference Books	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. TynMyint-U and LognathDebnath. 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

<table>
<tr><td>Title of the Course</td><td colspan="6">WEB DESIGNING</td></tr>
<tr><td>Paper Number</td><td colspan="6">CORE M8</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC4</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA3S1</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2"></td><td>2</td><td>-</td><td colspan="2">--</td><td>2</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="5">• Understand the fundamentals of Web design and electronic publishing.
• Learn how to create lists and nested lists using HTMLs</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="5">Introduction to web design &HTML Basics WWW, Website, Web pages ,Front End, Basic End, Client and Server Scripting Languages, Responsive Web Designing ,types of websides- Free Editors – Notepad++</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="5">HTML Basics: Introduction , Basic structure of HTML, Formatting Tags- HTML Tables –HTML Lists –HTML forms –HTML-HTML5 Introduction –HTML embed multimedia-HTML Layout</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="5">Introduction to CSS : Types of CSS, CSS Properties ,Border properties.</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="5">Block Properties ,Positioning Properties, CSS Lists ,CSS tables, CSS Menu, Design CSS Image gallery</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="5">JavaScript: Introduction to client side scripting Language ,Variables in Java script, Operators in JS, conditions statement s, JS Popup Boxes, JS Events, Basic Form Validations in Javascript</td></tr>
<tr><td colspan="2"></td><td colspan="5"></td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="5">Studnets will be able to design and publish their own web pages using HTML</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="5">1.Web designing and Publishing –Saishjain , M.GeethaIyer, BPB Publicatiobs-2022.</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="5">HirrdeshBharadwaj, Web designing ,Paper back 2016.
Brain d. Miller , Principles of Web design, allworth Publications ,202.</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="5">https://nptel.ac.in</td></tr>
</table>

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">DATA ANALYSIS USING SPSS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">SEC</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC5</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA3S2</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>1</td><td>-</td><td colspan="2">1</td><td colspan="2">2</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Train the students to gain Knowledge in the statistical software (SPSS) Packages for problem Solving
• Introduce the Basic functions of SPSS</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="6">Introduction to SPSSSPSS,-Introduction opening a Data file SPP Data Editor-Running statistical Analysis- editing and Manipulating Data –Missing Values –Editing SPSS Output –Viewing results –Printing SPSS output-Importing and Exporting data files</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="6">Charts and Graphs in SPSS: Bar Chart-Line Chart-Scatter Plot—Dot Plots –Pie charts</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="6">Descriptive statistics and t-test using SPSS : Measure of central Tendency-Measures of dispersion-slewness and kurtosis-One sample T-test-independent samples t-test and Paired t-test es.</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="6">Analysis of Variance & Correlationusing SPSS: One Way ANOVA-Two way ANOVA-Correlation –Spearman’s Correlation –Rank Correlation.</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="6">Regression and Chi-square Test using SPSSLinear Regression –Multiple Regression –Chi square Test</td></tr>
<tr><td colspan="2"></td><td colspan="6"></td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Studnets relating the SPSS Packages and Files</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">1.SPSS FOR YOU –A.Rajathi ,P.Chandran-MJP Publishers 2006
Statistical Methods for Practice and Research ,A guide to Data Analysis using SPSS by Ajai S.Gaur and Sanjaya S.Gaur –SAGE Publications india Pvt Ltd..</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="6">https://nptel.ac.in</td></tr>
</table>

Semester-IV

<table>
<tr><td>Title of the Course</td><td colspan="7">INDUSTRY MATHEMATICS: LINEAR PROGRAMMING PROBLEM</td></tr>
<tr><td>Paper Number</td><td colspan="7">CORE M7</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td>Credits</td><td>4</td><td>Course Code</td><td>23BMA4C1</td></tr>
<tr><td>Semester</td><td>IV</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td colspan="2">4</td><td>1</td><td colspan="2">--</td><td colspan="2">4</td></tr>
<tr><td>Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="7">Identify and characterize sets and functions and Understand, test and analyze the convergence and divergence of sequences, series</td></tr>
<tr><td>UNIT I:</td><td colspan="7">Introduction –origin and development of OR-Nature and features of OR-Scientific method in OR-Modelling in OR-Advantage and Limitation of Model-General Solution methods of OR Models-Applications of OR-LPP-Mathematical formulation of the problem-Illustration on Mathematic formulation of LPP-Graphical Solution Method-General LPP-Canonical and Standard forms of LPP</td></tr>
<tr><td>UNIT II</td><td colspan="7">Use of Artificial Variables (Big M Method-Two Phase Method)Duality in Linear Programming-General primal and dual Pair –Formulating a dual Problem-Primal –Dual Pair in a Matrix form –Duality theorems-Complementary slackness theorem-Duality and simplex method –Dual simplex method</td></tr>
<tr><td>UNIT III</td><td colspan="7">Introduction – L.P formulation of T.P-Existence solution in T.P- The transportation table-Loops in T.P-Solution of a Transportation problem-Finding an initial basic-feasible solution (NWCM-LCM-VAM0-Degeneracy in TP-Transportation Algorithm (MODI Method)-Unbalanced T.P-Maximization T.P</td></tr>
<tr><td>UNIT IV</td><td colspan="7">Assignment problem-Introduction-Mathematical formulation of the problem –Test for optimality by using Hungarian Method-Maximization case in Assignment Problem</td></tr>
<tr><td>UNIT V</td><td colspan="7">Sequencing problem-Introduction –Problem of Sequencing –Basic terms used in sequencing –n jobs to be operated on two machines –problems –n jobs to be operated on K machines –problems –Two jobs operated on K machines (Graphical Method)-Problems</td></tr>
<tr><td>Recommended Text</td><td colspan="7">1, Operation Research (14th Edition)by Kantiswarub, P.K.Gupta and Man Mohan Sultan Chand & sons , New Delhi ,2008</td></tr>
<tr><td>Website and e-Learning Source</td><td colspan="7">https://nptel.ac.in</td></tr>
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<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">ELEMENTS OF MATHEMATICAL ANALYSIS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE M8</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td>Credits</td><td>3</td><td>Course Code</td><td colspan="2">23BMA4C2</td></tr>
<tr><td>Semester</td><td>IV</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">2</td><td colspan="2">1</td><td colspan="2">--</td><td>3</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• Identify and characterize sets and functions and Understand, test and analyze the convergence and divergence of sequences, series.
• Understand metric spaces with suitable examples</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="8">Sets and Functions: Sets and elements- Operations on sets- functions- real valued functions- equivalence-countability- real numbers- least upper bounds.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="8">Sequences of Real Numbers: Definition of a sequence and subsequence-limit of a sequence – convergent sequences– divergent sequences- bounded sequences-monotone sequences</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="8">Operations on convergent sequences – operations on divergent sequences – limit superior and limit inferior-Cauchy sequences.</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="8">Series of Real Numbers: Convergence and divergence – series with non –negative terms-alternating series-conditional convergence and absolute convergence- tests for absolute convergence.</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="8">Limits and Metric Spaces: Limit of a function on a real line - Metric spaces - Limits in metric spaces – Continuous Functions on Metric Spaces: Function continuous at a point on there a line- Function continuous on a metric space.</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="8">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="8">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="8">1. Richard R. Goldberg, Methods of Real Analysis: Oxford and IBH Publishing, (1 January 2020).
2. Ethan D. Bloch, The Real Numbers and Real Analysis, Springer, 2011.
3. G.M. The fundamentals of Mathematical Analysis, vol I. Pergamon Press, New York, 1965.</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="8">T. M. Apostol, Calculus (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2002.
R.G. Bartle and D. R Sherbert, Introduction to Real Analysis, John Wiley and Sons (Asia) P. Ltd., 2000.</td></tr>
</table>

	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.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

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

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

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

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

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

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

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">INTRODUCTION TO DATA SCIENCE</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">SEC</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC6</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA4S1</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>1</td><td>-</td><td colspan="2">1</td><td colspan="2">2</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Understand the Importance of Data Science in Today’s world
• Build Models for prediction and classification</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="6">Data Science in a big data world,-Benefits and uses -Facets of Data –Data Science process-Big data ecosystem and data science.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="6">The –research goals –retrieving data –transformation-Exploratory Data analysis-Model Building</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="6">Algorithm: Applications of Machine learning in Data Science –Machine learning algorithms –Modeling proicess –Types –Supervised-Unsupervised.</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="6">Introduction to Hadoop : Hadoop to framework –Spark –Replacing Mapreduce.</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="6">Introuction to NoSQL : NoSQL-ACID-CAP-BASE-Types</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Studnets relating the Sexplain the data science process</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">1.”Introducing data Science” Davy cielen, ArnoD.B.Meysman, Mohamed Ali Manning publications 2016.</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="6">https://nptel.ac.in</td></tr>
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<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">COMPUTATIONAL MATHEMATICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">SEC</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC7</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA4S2</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>1</td><td>1</td><td colspan="2">-</td><td colspan="2">2</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• To provide students with the necessary mathematical tools to perform matrix operation
• To introduce students to the concept of ODE In real world problems</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="6">Matrices and vector spaces Creation of a Matrix-Matrix operations – Vector algebra.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="6">Least square Curve fitting –Fitting of linear Data –Non linear data-Polynomial fitting-Applications.</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="6">Ordinary differential Equaions , Eulers Method-First order Differential equations –Second Order Differential Equations-Modified Euler Method- Second Oder Runge-Kutta Method-Applications</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="6">Special functions: Bessel function of the first kid –Legendre polynomial –Hermite polynomial –Improper integral –Applications</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="6">Fourier Analysis Periodic function –Fourier series –Harmonic function-Fourier series expansion –Fast fourier transformation</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="6">Studnets relating the fundamentals of matrices</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="6">1.Computing in Scilab- chetana jain –Cambidge university Press</td></tr>
<tr><td colspan="2">Website and e-Learning Source</td><td colspan="6">https://nptel.ac.in</td></tr>
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Semester-V

Title of the Course		**ABSTRACT ALGEBRA**					
Paper Number		**CORE M9**					
Category	Core	**Year**	III	**Credits**	4	**Course Code**	23BMA5C1
		Semester	V				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	4	1	--	5

Pre-requisite	12th Standard Mathematics
Objectives of the Course	• Concepts of Sets, Groups and Rings. • Construction, characteristics and applications of the abstract algebraic structures
UNIT-I:	Introduction to groups- Subgroups- cyclic groups and properties of cyclic groups- Lagrange's Theorem-A counting principle – Examples
UNIT-II:	Normal subgroups and Quotient group- Homomorphism-Automorphism -Examples.
UNIT-III:	Cayley's Theorem-Permutation groups - Examples
UNIT-IV:	Definition and examples of ring- Some special classes of rings-homomorphism of rings- Ideals and quotient rings- More ideals and quotient rings.
UNIT-V:	The field of quotients of an integral domain-Euclidean Rings - The particular Euclidean Ring – Examples
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / 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	Topics in Algebra–I.N.Herstein, Wiley Eastern Ltd. Second Edition (1st January 2006)
Reference Books	1. Dr S.Arumugam and Prof A.Thangapandy Isaac Modern Algebra John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002. 2. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011. 3. Joseph A Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1999.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Explain groups, subgroups and cyclic groups

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

CLO 3: Explain Permutation groups and apply Cayley's theorem to problems
CLO 4: Explain Rings, Ideals and Quotient Rings and examine their structure
CLO 5: Discuss about the field of quotient of an integral domain and to Explain in detail about Euclidean Rings

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

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">REAL ANALYSIS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE M10</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA5C2</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">1</td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• Real Numbers and properties of Real–valued functions.
• Connectedness, Compactness, Completeness of Metric spaces.
• Convergence of sequences of functions, Examples and counter examples</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="8">Continuous Functions on Metric Spaces: Open sets– closed sets– Discontinuous function on R1. Connectedness, Completeness and Compactness: More about open sets-Connected sets.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="8">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.</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="8">Calculus: Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral-properties of Riemann integral.</td></tr>
<tr><td colspan="2">UNIT-IV:</td><td colspan="8">Derivatives-Rolle’s theorem, Law of mean, Fundamental theorems of calculus.</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="8">Taylor’s theorem-Point wise convergence of sequences of functions, uniform convergence of sequences of functions.</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="8">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="8">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="8">Dr S.Arumugam and
Prof A.Thangapandy Isaac ,Real Analysis
Methods of Real Analysis-Richard R.Goldberg (John Wiley & sons, 2nd edition) (Indian edition –Oxford and IBH Publishing Co, New Delhi, 1st January 2020)</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="8">1. Principles of Mathematical Analysis by Walter Rudin, Tata McGraw Hill Education, Third edition (1 July 2017).
2. Mathematical Analysis Tom M A postal, Narosa Publishing House, 2nd edition (1974), Addison-Wesley publishing company, New Delhi.</td></tr>
<tr><td colspan="2">Website and</td><td colspan="8">https://nptel.ac.in</td></tr>
</table>

e-Learning Source	

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

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

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

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

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

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

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

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">MATHEMATICAL MODELLING</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">CORE M11</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA5C3</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="2">--</td><td colspan="2">5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Construction and Analysis of Mathematical models found in real life problems.
• Modelling through differential and difference equations</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="7">Mathematical Modelling: Simple situations requiring mathematical modelling, characteristics of mathematical models.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="7">Mathematical Modelling through differential equations: Linear Growth and Decay Models. Non-Linear growth and decay models, Compartment models.</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="7">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.</td></tr>
<tr><td colspan="2">UNIT – IV:</td><td colspan="7">Introduction to difference equations.</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="7">Mathematical Modelling through difference equations: Harrod Model, cob web model application to Actuarial Science</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="7">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="7">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="7">J N Kapur, Mathematical Modeling, New Age International publishers (2009).</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="7">1. Mathematical Modeling by Bimalk. Mishra and DipakK.Satpathi. Ane Books Pvt. Ltd(1 Januuary 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 Ligefjard, John Wiley & Sons, 2017
4. Mark M. Meerschaert: Mathematical Modeling, Elsevier</td></tr>
</table>

	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

CLO 1: Explain simple situations requiring Mathematical Modelling and to Determine the characteristics of such models

CLO 2: Model using differential equations in-terms of linear growth and Decay models

CLO 3: Model using systems of ordinary differential equations of first order, to discuss about various models under the categories 'Epidemics' and 'Medicine'

CLO 4: Explain in detail about difference equations

CLO 5: 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 WITH VIVA VOCE					
Paper Number		CORE M12					
Category	Core	Year	III	Credits	4	Course Code	23BMA5PR
		Semester	V				

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total
	4	-	--	5

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">OPTIMIZATION TECHNIQUES</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">DSE-I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA5E1</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="2">--</td><td colspan="2">4</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="7">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Replace Problem
• Inventory Control
• Queuing System</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="7">Replace Problem and System Reliability-Introduction –Replacement of Equipment/ Assert that Deteriorates gradually—replacement of Equipment that fails suddenly.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="7">Inventory control-Types of inventories-Reason for carrying inventories-Costs Associated with inventories-Factors affecting Inventory Control-The Concept of EOQ-
Deterministic Inventory Problems with no shortages with shortages problem of EOQ with price Breaks.</td></tr>
<tr><td colspan="2">Unit III:</td><td colspan="7">Queuing theory-Introduction-Queuing System –Elements of Queuing System-Operating characteristics of a Queuing system-Deterministic Queuing system-Probability Distributions of Queuing system Classification of queuing Models –Definition of transient and steady states-Poisson Queuing System- (M/M/1)::(∞/FIFO). (M/M/I)::(∞/SIRO),(M/M/I)☹N/FIFO) Generlized model Birth-Death process</td></tr>
<tr><td colspan="2">Unit IV</td><td colspan="7">Network Scheduling by PERT/CPM-Network Basic Components –Drawing network-Critical path Analysis-PERT Analysis-Distinction between PERT and CPM</td></tr>
<tr><td colspan="2">Unit V</td><td colspan="7">Game theory –Two person zero –Sum Games-Basic terms-Maximum-MinimaxPrinciple-Games without saddle points –Mixed strategies-Graphical solution of 2xn and mx2 games-Deterministic property-General solutionof mxn rectangular games</td></tr>
<tr><td colspan="2" rowspan="2">Recommended Text Book</td><td colspan="7">1, Operation Research (14th Edition)by Kantiswarub, P.K.Guptaand Man Mohan Sultan Chand & sons , New Delhi ,2008</td></tr>
<tr><td colspan="7">https://nptel.ac.in</td></tr>
</table>

Title of the Course		**PROGRAMMING IN C WITH PRACTICAL**					
Paper Number		**DSE-II**					
Category	ELECTIVE	**Year**	III	**Credits**	3	**Course Code**	23BMA5E2
		Semester	II				

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

Pre-requisite	+2 Mathematics
Objectives of the Course	• To gain knowledge in C Language • To Include fundamental programming skills
UNIT-I:	Introduction –Importance of C-Programming style –Character set –C Tokens –Keywords and identifiers –Constants –Variables –Data types –Declaration of Variables-Declaration of storage class-assigning values to variables-defining symbolic constant
UNIT-II:	Operators and expressions-arithmetic ,relational, logical,assignment,increment and decrement,bitwise ,conditional special operators-arithmetic expressions-evaluation of expressions –precedence of arithmetic expressions.
UNIT-III:	Managing Input and Output operations –reading a character writing a character –formatted input –formatted output-decision making with if –simple if ,if else ,nesting of if else ,else if ,switch, goto,while do while, for statements –jumps in loops
UNIT-IV:	Arrays-one dimenaionL arrays –decleration of one dimensional arrays –initialization of one dimensional arrays .-two dimensional arrays initializing two dimensional arrays-multi dimensional arrays-dynamic arrays
UNIT-V:	Structure definition –declaring structure variables –accessing structure members structure initialization
Course Outcome	On completion of this course ,students will Remember the program of C with syntax and semantics
Recommended Text	E.BalagurusamyProgramming in ANSI C .Fifth Edition ,Tata McGraw Hill- 2010

Title of the Course		**PROGRAMMING IN CPRACTICAL**					
Paper Number		**ELECTIVE**					
Category	ELECTIVE	**Year**	III	**Credits**	1	**Course Code**	
		Semester	V				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	-	-	1	1

Pre-requisite	+2 Mathematics
Objectives of the Course	• To gain knowledge in C Language • To Include fundamental programming skills

Course Outline	1.Create a one dimensional array of characters and store inside it by reading from standard input 2.Write a program to input 20 arbitrary number and its frequency in a tabular form frequency of each number ,Print the number and its frwquency in a tabular form 3.Write a program to find the GCD and LCM of two numbers 4.Write a Program to generate the Fibonacci series 5.Write a program to perform following operations on a 2D array a. Addition b. Multiplication c.Transpose 6.Write a recursive function that adds first 'n' Natural numbers 7.Write recursive function that finds factorial of number

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">LINEAR ALGEBRA</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE M13</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA6C1</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">5</td><td colspan="2">1</td><td colspan="2">--</td><td>6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• Vector Spaces, linear dependence and independence of vectors . Dual spaces, Inner product and norm – orthogonalization process.
• Linear transformations. Various operators on vector spaces</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="8">Vector spaces – Subspaces – Linear Combinations and linear span - Systems of Linear equations – Homogenous Equations – Non-homogenous Equations – Elementary Matrices – Row reduced -Echelon form.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="8">Linear Dependence and Linear independence – Bases – Dimensions</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="8">Linear transformations, null spaces and ranges – Matrix representation of a linear transformation –invertibility and isomorphisms – dual spaces</td></tr>
<tr><td colspan="2">UNIT – IV:</td><td colspan="8">Eigen values, eigen vectors, diagonalizability – invariant subspaces – Cayley– Hamilton theorem</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="8">Inner products and norms – Gram Schmidt Orthogonalization Process - Orthogonal complements</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="8">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="8">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="8">Dr S.Arumugam and
Prof A.Thangapandy Isaac ,Modern Algera
Linear Algebra - Stephen H Friedberg, Arnold J Insel and Lawrence E Spence, 5th edition (2018) Pearson</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="8">1. I.N.Herstein, Topics in Algebra, Wiley EasternLtd. Second Edition, 2006.
2. N.S.Gopalakrishnan, University Algebra, New Age International Publications, Wiley Eastern Ltd.
3. John B.Fraleigh, First course in Algebra, Addison Wesley.
4. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 4th Ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2004.</td></tr>
</table>

	5. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007. 6. S. Lang, Introduction to Linear Algebra, 2nd Ed., Springer, 2005. 7. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

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

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

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

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

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

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

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">COMPLEX ANALYSIS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE M14</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA6C2</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">5</td><td colspan="2">1</td><td colspan="2">--</td><td>6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• Apply concept and consequences of analyticity and C-R equations.
• Understand the concept of mappings and transformations.
• Compute complex contour integrals and applying Cauchy‘s integral in various versions.
• Understand zeros and singularities of an analytic function, apply their properties in the evaluation of definite integral.</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="8">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.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="8">Conformal mapping: Mappings – Mapping by exponential function – Linear transformation – The transformation w=1z– Mappings by 1z – Linear fractional transformations (bilinear)</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="8">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.</td></tr>
<tr><td colspan="2">UNIT – IV:</td><td colspan="8">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</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="8">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).</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="8">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="8">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="8">Dr S.Arumugam and
Prof A.Thangapandy Isaac Complex Analysis</td></tr>
</table>

	Complex variables and application, Seventh Edition by James Ward Brown and Ruel V. Churchill, Mc-Graw Hill Book Co., International Edition, 2009.
Reference Books	1. Theodore W. Gamelan, Complex Analysis, Springer Verlag, 2008 2. Joseph Bak and Donald J. Newman, Complex analysis, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997. 3. Richard A. Silverman, Introductory Complex Analysis. Dover Publications, 1972. 4. S. Ponnusamy and H. Silverman, Complex variables with applications, Birkhauser, 2006.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

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

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

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

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

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

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

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="8">MECHANICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="8">CORE M15</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td>Credits</td><td>4</td><td>Course Code</td><td colspan="2">23BMA6C3</td></tr>
<tr><td>Semester</td><td>IV</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">5</td><td colspan="2">1</td><td colspan="2">--</td><td>6</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="8">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="8">• Equilibrium of a particle under the action of given forces
• Simple Harmonic Motion
• Projectiles</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="8">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.</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="8">Forces on a Rigid Body: Moment of a Force – General motion of a body – Equivalent systems of forces- Parallel Forces – Forces acting along a Triangle - A specific reduction of Forces: Reduction of coplanar forces into a force and couple – Problems involving frictional forces.</td></tr>
<tr><td colspan="2">UNIT-III:</td><td colspan="8">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.</td></tr>
<tr><td colspan="2">UNIT – IV:</td><td colspan="8">Projectiles: Forces on a projectile – Projectile projected on an inclined plane</td></tr>
<tr><td colspan="2">UNIT-V:</td><td colspan="8">Central Orbits: General orbits – Central orbit – Conic as a centered orbit</td></tr>
<tr><td colspan="2">Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</td><td colspan="8">Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
(To be discussed during the Tutorial hour)</td></tr>
<tr><td colspan="2">Skills acquired from this course</td><td colspan="8">Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</td></tr>
<tr><td colspan="2">Recommended Text</td><td colspan="8">1. A. Ruina and R. Pratap, Introduction to Statics and Dynamics, , Oxford University Press, 2014.
2. S.L. Loney, The Elements of Statics and Dynamics, Cambridge University Press, 1904.</td></tr>
<tr><td colspan="2">Reference Books</td><td colspan="8">1. J.L. Meriam and L. G. Kraige, Engineering Mechanics: Statics, Seventh Edition,Wiley and sons Pvt ltd., New York, 2012.
2. J.L. Meriam, L. G. Kraige, and J.N. Bolton, Engineering Mechanics: Dynamics, 8thedn, Wiley and sons Pvt ltd., New York, 2015.
3. A. K. Dhiman, P.Dhinam and D. Kulshreshtha, Engineering Mechanics (Statics and Dynamics) ,McGraw Hill Education(India) Private Limited, New Delhi, 2015.</td></tr>
</table>

Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will able to

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

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

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

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

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

Title of the Course		**PROGRAMMING IN C++ WITH PRACTICAL**					
Paper Number		**ELECTIVE**					
Category	Elective	**Year**	III	**Credits**	3	**Course Code**	23BMA6E1
		Semester	VI				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	4	1	--	5

Objectives of the Course	• To understand about object –oriented languages and their applications • To introduce basic concepts of c++ language • To provide knowledge about various conversatiuons
UNIT-I:	Introduction to C++, Tokens , Keywords , identifiers ,variables ,Operators, Manipulators, Data Types-Expressions and control structures in C++,Simple C++ Programs
UNIT-II:	Functions in C++ -Main functions –Function Prototyping –Parameters Passing in Functions –Valuess return by Functions –inline functions –Friend and Virtual Functions –Math Library functions.
UNIT III	Classes and Objects; Constructors and Destructors ;Operator Overloading and type Conversations –Typre of Constructors –Function Definition –Function Overloading –Function Overriding
UNIT IV	Inheritance- Single inheritance-Multilevel inheritance-Multiple inheritance –Hierarchialinheritance –Hybrid Inheritance-Pointers -
Recommended Book	E.Balagurusamy 2008, Object Oriented Programming with C++, Tata McGraw Hill Publishing Company Ltd

Title of the Course		**PROGRAMMING IN C++ PRACTICAL**					
Paper Number		**ELECTIVE**					
Category	Elective	**Year**	III	**Credits**	2	**Course Code**	
		Semester	VI				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	1	0	--	2

•
1.Write a Program to illustrate New and Delete keywords for dynamic memory allocation 2.Write a Program illustrating Class Declaration ,Definition and accessing Class Members

	3.Write a Program to Demonstrate the 1) Operator Overloading 2) Function Overloading 4.Write a program to demonstrate Friend function and Friend Class 5.Write a program to generate Fibanocci series 6.Write a C++ Program 1.Reading a Matrix 2. Addition of two matrix3.Multiplication of Two Matrix 7Write a Program to Access Members of a student class student using a Pointer

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="7">GRAPH THEORY AND ITS APPLICATIONS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="7">ELECTIVE</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">23BMA6E2</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td>4</td><td colspan="2">1</td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2"></td><td colspan="7"></td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="7">• Students will acquire the basic ideas on graphs and Subgraphs
• Students will acquire the knowledge on Eulerian graph , Hamiltonian Graph</td></tr>
<tr><td colspan="2">UNIT-I:</td><td colspan="7">Graphs-Definition and examples –Degrees—Sub graphs-Isomorphism-Ramsey numbers-Independent Sets and Coverings –Intersection graphs and Line graphs –Matrices and –Operatioson Graphs</td></tr>
<tr><td colspan="2">UNIT-II:</td><td colspan="7">Degree Sequences- Graphic Sequences –Walks –Trials and Paths –Connectedness and C-Blocks –Connectivity-Eulerian graphs –Hamiltonian graphs</td></tr>
<tr><td colspan="2">UNIT III</td><td colspan="7">Trees-Characteristic of Trees –Centre of a tree-Matchings-Matchings in Bipartite graphs</td></tr>
<tr><td colspan="2">UNIT IV</td><td colspan="7">Planar Graphs and properties –Characterization of Planar grphs-Thickness , crossing and outer planarity-chromatic number and Chromatic index-The five color theorem and Four color problem</td></tr>
<tr><td colspan="2">UNIT V</td><td colspan="7">Chromatic Polynomials-Definition and Basic properties of Directed graph –Paths and Connections –Digraphs and Matrices –Tournaments.</td></tr>
<tr><td colspan="2">Recommended Book</td><td colspan="7">Invitation to graph theory by Dr S.Arumugam and S.Ramachandran,Scitech publications (India) Pvt .Ltd 2001</td></tr>
</table>

<table>
<tr><td>Title of the Course</td><td colspan="6">ESSENTIAL REASONING AND QUANTITATIVE APTITUDE</td></tr>
<tr><td>Paper Number</td><td colspan="6">Professional Competency Skill</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">PCS</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code 23BMA6S1</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">1</td><td>1</td><td colspan="2">-</td><td>2</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">• Develop Problem solving skills for competitative examinations
• Understand the concepts of averages , simple interest , compound interest</td></tr>
<tr><td>UNIT-I:</td><td colspan="6">Quantitative Aptitude: Simplifications=averages-Concepts –problem-Problems on numbers-Short cuts- concepts –Problems</td></tr>
<tr><td>UNIT-II:</td><td colspan="6">Profit and Loss –short cuts-Concepts –Problems –Time and work - Short –uts -Concepts -Problems.</td></tr>
<tr><td>UNIT-III:</td><td colspan="6">Simple interest –compound interest- Concepts- Prolems</td></tr>
<tr><td>UNIT-IV:</td><td colspan="6">Verbal Reasoning : Analogy- coding and decoding –Directions and distance –Blood Relation</td></tr>
<tr><td>UNIT-V:</td><td colspan="6">Analytical Reasoning :Data sufficiency
Non-Verbal Reasoning : Analogy ,Classification and series</td></tr>
<tr><td></td><td colspan="6"></td></tr>
<tr><td>Skills acquired from this course</td><td colspan="6">Studnets relating the concepts of compound interest and simple interest</td></tr>
<tr><td>Recommended Text</td><td colspan="6">1.”Quantitative Aptitude” by R.S aggarwal ,S.Chand & Company Ltd 2007</td></tr>
<tr><td></td><td colspan="6"></td></tr>
<tr><td>Website and e-Learning Source</td><td colspan="6">https://nptel.ac.in</td></tr>
</table>