

B.SC.,
MATHEMATICS

Manonmaniam Sundaranar University
Tirunelveli

SYLLABUS
FROM THE
ACADEMIC YEAR
2023-2024

TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION,
CHENNAI - 600 005

**NEW INITIATIVE IN MODERNISING
UNDER-GRADUATE PROGRAMME IN MATHEMATICS**

Revamped Curriculum Design and Syllabus

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1. Introduction

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

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

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

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

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

Under Graduate Programme

Programme Outcomes:

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

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

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

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

PO5: Scientific Reasoning: Ability to 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 solutionis 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.	<ul style="list-style-type: none"> • Instil confidence among students • Create interest for the subject
I, II, III, IV	Skill Enhancement papers (Discipline centric / Generic / Entrepreneurial)	<ul style="list-style-type: none"> • Industry ready graduates • Skilled human resource • Students are equipped with essential skills to make them employable
		<ul style="list-style-type: none"> • Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational aspects
		<ul style="list-style-type: none"> • Data analytical skills will enable students gain internships, apprenticeships, field work involving data collection, compilation, analysis etc.
		<ul style="list-style-type: none"> • Entrepreneurial skill training will provide an opportunity for independent livelihood • Generates self – employment • Create small scale entrepreneurs • Training to girls leads to women empowerment
		<ul style="list-style-type: none"> • Discipline centric skill will improve the Technical knowhow of solving real life problems using ICT tools
III, IV, V & VI	Elective papers- An open choice of topics categorized under Generic and Discipline Centric	<ul style="list-style-type: none"> • Strengthening the domain knowledge • Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature • Students are exposed to Latest topics on Computer Science / IT, that require strong mathematical background • Emerging topics in higher education / industry /

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

Skills acquired from the Courses	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
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2. Template for Curriculum Design for UG Programme in Mathematics

Credit Distribution for UG Programme in Mathematics

B.Sc Mathematics

First Year

Semester-I

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	Core Courses 2 (CC1, CC2)	8	8
	Elective Course 1 (Generic / Discipline Specific)EC1	5	6
Part-IV	Skill Enhancement Course SEC-1	2	2
	Foundation Course FC	2	2
		23	30

Semester-II

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	Core Courses 2 (CC3, CC4)	8	8
	Elective Course 1 (Generic / Discipline Specific) EC2	5	6
Part-IV	Skill Enhancement Course -SEC-2	2	2
	Skill Enhancement Course -SEC-3 (Discipline Specific / Generic)	2	2
		23	30

4. Credit Distribution for UG Programme in Mathematics

Sem I	Credit	Sem II	Credit
1.1. Language	3	2.1. Language	3
1.2 English	3	2.2 English	3
1.3 Core Course – CC I	4	2.3 Core Course – CC III	4
1.4 Core Course – CC II	4	2.4 Core Course – CC IV	4
1.5 Elective I Generic/ Discipline Specific	5	2.5 Elective II Generic/ Discipline Specific	5
1.6 Skill Enhancement Course SEC-1	2	2.6 Skill Enhancement Course SEC-2	2
1.7 Skill Enhancement - (Foundation Course)	2	2.7 Skill Enhancement Course –SEC-3	2
	23		23

5. Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II
Part I	3	3
Part II	3	3
Part III	13	13
Part IV	4	4
Part V	-	-
Total	23	23

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

**6. Illustration for B.Sc Mathematics Curriculum Design
First Year Semester-I**

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	1.1 Language - Tamil	3	6
Part-II	1.2 Language - English	3	6
Part-III	1.3 Core Course - CCI Algebra & Trigonometry	4	4
	1.4 Core Course - CCII Differential Calculus	4	4
	1.5 Elective I - Choose any one from the following : 1. Programming Language C with Practical* 2. Allied Physics with Practical 3. Allied Chemistry with Practical	T - 3 P - 2	6
Part-IV	1.6 Skill Enhancement Course – SEC 1 Mathematics for Competitive Examination I	2	2
	1.7 Foundation Course FC – Bridge Mathematics	2	2
		23	30

* Should be taken by Mathematics department staff only.

T – Theory and P - Practical

Semester-II

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	2.1 Language – Tamil	3	6
Part-II	2.2 Language – English	3	6
Part-III	2.3 Core Course - Analytical Geometry (Two & Three Dimensions)	4	4
	2.4 Core Course - Integral Calculus	4	4
	2.5 Elective II - Choose any one from the following 1. Programming Language C++ with Practical* 2. Allied Physics with Practical 3. Allied Chemistry with Practical	T - 3 P - 2	6
Part-IV	2.6 Skill Enhancement Course - SEC 2 Mathematics for Competitive Examination II	2	2
	2.7 Skill Enhancement Course - SEC 3 LaTeX	2	2
		23	30

* Should be taken by Mathematics department staff only

T – Theory and P - Practical

7 7.1 Suggestive Topics in Core Component

- Classical Algebra
- Trigonometry
- Differential Calculus
- Integral Calculus
- Analytical Geometry (2D / 3D)
- Vector Analysis
- Differential Equations
- Abstract Algebra
- Linear Algebra
- Sequences & Series
- Fourier Series
- Real Analysis
- Transform Techniques (Laplace, Fourier)
- Complex Analysis
- Mechanics (Statics / Dynamics)
- Mathematical Modeling
- Industrial Mathematics and more

Suggestive Topics in Elective Courses (Generic / Discipline-centric)

Group I:

- Allied Physics
- Allied Chemistry
- Statistical Methods
- Bio Mathematics
- Bio Statistics
- Programming Language with practical (C, Python, Java, R, etc.)
- Object Oriented Programming with C++
- Principles of Econometrics
- Introduction to Actuarial Science
- Principles of Accounting practices
- Logistics & Supply chain management
- Forecasting Techniques
- Simulation
- Introduction to Data Science
- Cloud Computing
- Introduction to Machine Learning
- Data Structures
- Introduction to Artificial Intelligence
- Neural network models
- Financial Mathematics and more

Group II –Suggestive Elective Courses (Discipline-centric)

- Numerical Methods with Applications
- Mathematical Statistics
- Optimization Techniques
- Graph Theory & Applications
- Special functions with Applications
- Discrete Mathematics
- Combinatorial Mathematics
- Number Theory& Cryptography
- Difference equations with application
- Formal Languages & Automata Theory
- Astronomy / Elements of Space Science
- Stochastic Processes
- Fuzzy Sets & its applications
- Introduction to Research Methodology
- Integral Transforms & Z Transforms
- Algorithms
- Computational Geometry and more

Suggestive Topics in Skill Enhancement Courses (SEC)

Group III - Skill Enhancement Courses (SEC)

- Statistics with R / Excel / SPSS
- LaTeX
- E- Commerce & Tally
- Computing skills (Office Automation)
- Android App development
- Web Designing
- Mathematics for Competitive examinations
- Computational Mathematics
- Data Analysis using latest package
(R / Matlab / Maxima/ Torus / GeoGebra /GIMP) and more

B.Sc Mathematics
Core Component Syllabus

8. Syllabus for different Courses of B.Sc Mathematics

Title of the Course		ALGEBRA & TRIGONOMETRY					
Paper Number		CORE M1					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	I				
Instructional Hours per week	Lecture		Tutorial		Lab Practice	Total	
	4		--		--	4	
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Basic ideas on the Theory of Equations, Matrices and Number Theory. • Knowledge to find expansions of trigonometry functions, solve theoretical and applied problems. 					
Course Outline		Unit I: Reciprocal Equations-Standard form-Increasing or decreasing the roots of a given equation- Approximate solutions of roots of polynomials by Horner's method – related problems.					
		Unit II: Summation of Series: Binomial– Exponential –Logarithmic series (Theorems without proof) – Approximations - related problems.					
		Unit III: Characteristic equation – Eigen values and Eigen Vectors- Similar matrices - Cayley – Hamilton Theorem (Statement only) - Finding powers of square matrix, Inverse of a square matrix up to order 3 - related problems.					
		Unit IV: Expansions of $\sin^n\theta$, $\cos^n\theta$ in powers of $\sin\theta$, $\cos\theta$ - Expansion of $\tan^n\theta$ in terms of $\tan\theta$, Expansions of $\cos^n\theta$, $\sin^n\theta$, $\cos^m\theta\sin^n\theta$ –Expansions of $\tan(\theta_1+\theta_2+\dots+\theta_n)$ - related problems.					
		Unit V: Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities - related problems.					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, problem solving, analytical ability, professional competency, professional communication and transferable skill.
Recommended Text	<ol style="list-style-type: none"> 1. T.K. Manicavachagom Pillar. I. Natarajan and K S. Ganapathy, Algebra, Vol 1, S. Viswanathan (Printers & Publication) PVT. LID 2015 2. S. Arumugam and A. Thangapandi Issac, Theory of Equations and Trigonometry, New Gamma Publishing House, Palayamkottai. 2006
ReferenceBooks	<ol style="list-style-type: none"> 1. W.S. Burnstine and A.W. Panton, Theory of equations 2. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007 3. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005 4. C. V. Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003 5. J. Stewart, L. Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012. 6. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Classify and Solve reciprocal equations

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

CLO 3: Find Eigen values, eigen vectors, verify Cayley – Hamilton theorem.

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.

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

Title of the Course		DIFFERENTIAL CALCULUS					
Paper Number		CORE M2					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	I				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		4	--	--	4		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • The basic skills of differentiation, successive differentiation, and their applications. • Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems. 					
Course Outline		UNIT-I: Successive Differentiation: Introduction (Review of basic concepts) – The n^{th} derivative – Standard results – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the n^{th} derivative of a Product.					
		UNIT-II: Partial Differentiation: Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient .					
		UNIT-III: Partial Differentiation (Continued): Homogeneous functions – Partial derivatives of a function of two variables - Lagrange’s method of undetermined multipliers.					
		UNIT-IV: Envelope: Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter.					
		UNIT-V: Curvature: Definition of Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutives – Radius of Curvature in Polar Co-ordinates.					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC // TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. S. Narayanan and T K. Manicavachagom Pillax, Calculus, Vol 1, S. Viswanathan (Printers & Publication) PVT. LID. 2015. 2. S. Armugam and A. Thangapandi Issac, Calculus, New Gamma Publishing House, Palayamkottai 2011
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. 4. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002. 5. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010. 6. M.J. Strauss, G.L. Bradley and K. J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2007.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with 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: Use the Lagrange's method of undetermined multipliers

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

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

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

Title of the Course		PROGRAMMING LANGUAGE C WITH PRACTICAL					
Paper Number		ELECTIVE II					
Category	Elective	Year	I	Credits	5	Course Code	
		Semester	II				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		4	--	2	6		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		To study the basic concepts and structure of C program and to train the students to write simple C programs.					
Course Outline		UNIT-I: Introduction – Character set, C tokens ,keywords and identifiers, Constants ,Variables and Data types.					
		UNIT-II: Operators – Arithmetic, relational, logical assignment, increment and decrement, Conditional, Bitwise special operators, Precedence of operators, Managing input and output operators – getchar() ,putchar(), scanf() and printf().					
		UNIT-III: Decision making and branching-Simple if, if else, nested if and the else if ladder statements, The switch statement, The ?: operator, The goto statement. Decision making and looping-while, Do while and for statement, jumps in loops.					
		UNIT-IV: One dimensional and two dimensional arrays–declaration, initialization of arrays, Multidimensional arrays, Character arrays and strings: Declaring and initializing string variables, Reading and writing of strings, string handling functions.					
		UNIT-V: User defined functions–Definition of function ,return values and their types, function calls, function declaration, Category of functions, Nesting of functions, recursion.					

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	E. Balaguruswamy - Programming in ANSI C –Tata McGraw Hill Publishing company limited –III Edition(2017).
Reference Books	<ol style="list-style-type: none"> 1. C. ReemaThareja, ProgramminginC- Oxford University Press(2018). 2. Ramasamyet.al.-Programming in C-Scetech Publication(INDIA) Pvt.Ltd. II Edition(2015). 3. Ashok N. Kamathane- Programming with Ansi and Turbo C– Dorling Kindersley (India) Pvt.Ltd, (2009).
Website and e-Learning Source	https://nptel.ac.in

List of Practicals :

1. Program to print the even numbers from 1 to 100
2. Program to read three values using scan statement and print the following results:
a) Sum of the values b) Average of the three values c) Largest of the three
3. Program to read and display the following table of data:

Name	Code	Price
Fan	67831	1234.50
Motor	450	5786.70

The name and code must be left justified and price must be right justified.

4. Program to compute the real roots of a quadratic equation
5. Program to evaluate the investment equation $V = P(1 + r)^n$ and print the tables which would give the value of V for various combination of the following values of P, r and n.
P : 1000, 2000, . . . , 10000
r : 0.10, 0.11, . . . , 0.20
n : 1, 2, . . . , 10
6. Program to print all intergers that are not divisible by either 2 or 3 and lie between 1 and 100 and also should account the number of sets intergers and print the result

7. Program to merge two given one dimensional arrays A and B (which are sorted in ascending order) into a single sorted array C which is in ascending order.
8. Program to read a string from the keyboard and determine whether the string is a palindrome or not.
9. Develop a modular interactive program using functions that reads the value of three sides of a triangle and displays either its area or its perimeter as per the request of the user. Given the three sides a, b and c, perimeter = a+b+c and area = $\sqrt{s(s-a)(s-b)(s-c)}$ where $s = (a+b+c)/2$.
10. Develop your own functions for performing following operations in strings.
 - a) Copying one string to another
 - b) Comparing two strings
 - c) Adding a string to the end of another string

Write a program to test your functions.

Title of the Course		MATHEMATICS FOR COMPETITIVE EXAMINATION-I					
Paper Number		SEC-I					
Category	Skill Enhance- ment Course	Year	I	Credits	2	Course Code	
		Semester	I				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		2	--	--	2		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> To learn the techniques for solving aptitude problems and to enable the students prepare themselves for various competitive examinations. 					
Course Outline		UNIT-I: Simplification, averages.					
		UNIT-II: Ratio and proportion.					
		UNIT-III: Partnership-percentages.					
		UNIT-IV: Profit and Loss					
		UNIT-V: Problems on numbers.					

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
Reference Books	R.S.Agarwal -Objective arithmetic,Published by S.Chand& Co Ltd.Edition 2018
RecommendedText	<ol style="list-style-type: none"> 1. R.S.Agarwal - Arithmetic subjective and Objective ,Published by S.Chand& Co Ltd. Revised Edition 1st April 2017 2. Rajesh Verma,Fast track Objective arithmetic,Arihant Publications India Limited Fourth Edition,1st January 2018.
Website and e-Learning Source	https://nptel.ac.in

Title of the Course		Foundation course - Bridge Mathematics					
Paper Number		FOUNDATION 1					
Category	Core	Year	I	Credits	2	Course Code	FC
		Semester	I				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		2	-	--	2		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<p>To bridge the gap and facilitate transition from higher secondary to tertiary education;</p> <p>To instil confidence among stakeholders and inculcate interest for Mathematics;</p>					
Course Outline		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		<p>1. NCERT class XI and XII text books.</p> <p>2. Any State Board Mathematics text books of class XI and XII</p>					

Title of the Course		ALGEBRA AND DIFFERENTIAL EQUATIONS					
Paper Number		ALLIED MATHEMATICS I					
Category	Allied	Year	I	Credits	3	Course Code	
		Semester	I				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		5	1	--	6		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		To explain the simple concepts of the theory of equations and to find the roots of the equations by using techniques in various methods.					
Course Outline		UNIT-I: Theory of Equations – Formation of Equations – Relation between roots and coefficients – Reciprocal equations.					
		UNIT-II: Transformation of Equations –Approximate solutions to equations –Newton’s method and Horner’s method.					
		UNIT-III: Matrices – Characteristic equation of a matrix – Eigen values and Eigen vectors – Cayley Hamilton theorem and simple Problems.					
		UNIT-IV: Differential equation of first order but of higher degree – Equations solvable for p, x, y – Partial differential equations –formations – solutions –Standard form $Pp+Qq=R$.					
		UNIT-V: Laplace transformation–Inverse Laplace transform.					

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	Dr.S.Arumugam & Isaac – Allied Mathematics Paper- I, New Gamma Publishing House (2012), PalayamKottai.
Reference Books	<ol style="list-style-type: none"> 1. Narayanan.S and T.K.Manikavachagam Pillai-Differential Equations and its applications, S.Viswanathan Printers Pvt.Ltd,2006. 2. T.Veerarajan-Algebra and Trigonometry- Yes Dee Publishing Pvt.Ltd.,(2009)
Website and e-Learning Source	https://nptel.ac.in

Title of the Course		ANALYTICAL GEOMETRY (Two & Three Dimensions)					
Paper Number		CORE M3					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	II				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		--		--	4
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Necessary skills to analyze characteristics and properties of two- and three-dimensional geometric shapes. • To present mathematical arguments about geometric relationships. • To solve real world problems on geometry and its applications. 					
Course Outline		UNIT-I: Pole, Polar - conjugate points and conjugate lines – diameters – conjugate diameters of an ellipse - semi diameters- conjugate diameters of hyperbola.					
		UNIT-II: Polar coordinates: General polar equation of straight line – Polar equation of a circle given a diameter, Equation of a straight line, circle, conic – Equation of chord, tangent, normal.					
		UNIT-III: System of Planes-Length of the perpendicular–Orthogonal projection.					
		UNIT-IV: Representation of line–angle between a line and a plane – co – planar lines–shortest distance between two skew lines –length of the perpendicular.					
		UNIT-V: 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.					

<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<ol style="list-style-type: none"> 1. T.K. Manicavachagam Pillay & T. Natarajan, Analytical geometry (Part-I – Two dimensions), S. Viswanathan (Printers and Publishers) Pvt. Ltd. (2012). 2. T.K. Manicavachagam Pillay & T. Natarajan, Analytical geometry (Part-II – Three dimensions), S. Viswanathan (Printers and Publishers) Pvt. Ltd. (2012). 3. S. Arumugam and A. Thangapandi Issac, Analytical geometry 3D and Vector Calculus, New Gamma Publishing House, Palayamkottai, 2011.
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. S. L. Loney, Co-ordinate Geometry. 2. Robert J. T. Bell, Co-ordinate Geometry of Three Dimensions. 3. William F. Osgood and William C. Graustein, Plane and Solid Analytic Geometry, Macmillan Company, New York, 2016. 4. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010. 5. Robert C. Yates, Analytic Geometry with Calculus, Prentice Hall, Inc., New York, 1961. 6. Earl W. Swokowski and Jeffery A. Cole, Algebra and Trigonometry with Analytic Geometry, Twelfth Edition, Brooks/Cole, Cengage Learning, CA, USA, 2010. 7. William H. McCrea, Analytical Geometry of Three Dimensions, Dover Publications, Inc, New York, 2006. 8. John F. Randolph, Calculus and Analytic Geometry, Wadsworth Publishing Company, CA, USA, 1969. 9. 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
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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

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

Title of the Course		INTEGRAL CALCULUS					
Paper Number		CORE M4					
Category	Core	Year	I	Credits	4	Course Code	
		Semester	II				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		4	--	--	4		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Knowledge on integration and its geometrical applications, double, triple integrals and improper integrals. • Knowledge about Beta and Gamma functions and their applications. • Skills to Determine Fourier series expansions. 					
Course Outline		UNIT-I: Reduction formulae -Types, integration of product of powers of algebraic and trigonometric functions, integration of product of powers of algebraic and logarithmic functions - Bernoulli's formula.					
		UNIT-II: Multiple Integrals - definition of double integrals - evaluation of double integrals – double integrals in polar coordinates - Change of order of integration.					
		UNIT-III: Triple integrals –applications of multiple integrals - volumes of solids of revolution - areas of curved surfaces–change of variables - Jacobian.					
		UNIT-IV: Beta and Gamma functions – infinite integral - definitions–recurrence formula of Gamma functions – properties of Beta and Gamma functions- relation between Beta and Gamma functions - Applications.					
		UNIT-V: Geometric and Physical Applications of Integral calculus.					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. S. Narayanaqn, T.K. Manicavachagam Pillay, Calculus Vol II, S.Viswanathan (Printers and Publishers) Pvt. Ltd. (2009). 2. S. Arumugam & A. Thangapandi Issac, Calculus, New Gamma Publishing House, Palayamkottai. (2011).
Reference Books	1. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002. 2. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007. 3. D. Chatterjee, Integral Calculus and Differential Equations, Tata-McGraw Hill Publishing Company Ltd. 4. P. Dyke, An Introduction to Laplace Transforms and Fourier Series, Springer Undergraduate Mathematics Series, 2001 (second edition).
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

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

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

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

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

Title of the Course		PROGRAMMING IN C++ WITH PRACTICAL					
Paper Number		ELECTIVE II					
Category	Elective	Year	I	Credits	5	Course Code	
		Semester	II				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		4	--	2	6		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		To study the basic concepts and structure of C program and to train the students to write simple C programs.					
Course Outline		UNIT-I: Introduction, Tokens, Keywords, Identifiers and constants, Basic data types, User defined data types, storage classes, Derived data types, Symbolic constants.					
		UNIT-II: Introduction ,The main function, function prototyping, Call by reference, Return by references, Inline functions, Default arguments, constant Arguments, Recursion, Function overloading, Friend and virtual functions, Math library functions, C structures Revisited, Specifying a class, Defining member functions, A C++ program with class, Making an outside functions inline, Nesting member functions, Private member functions, Arrays within a class, Memory allocation for objects, Static member functions, Array of objects, objects as function arguments, Friend functions, Returning objects.					
		UNIT-III: Introduction, Constructors, Parameterized constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, , Constructing Two-dimensional arrays, constant objects, Destructors.					
		UNIT-IV: Introduction, Defining operator overloading, Overloading unary operator, Overloading Binary operator, Overloading Binary operators using Friends, Manipulation of strings using operators, Some other operator overloading examples, Rules for Overloading Operators					
		UNIT-V: Introduction, Defining Derived classes, Single inheritance, Making a private member inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance.					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. E.BalaguruSamy, Object Oriented Programming with C++,Tata Mc Graw Hill Education Private Limited, New Delhi(Fifth Print 2012).
Reference Books	1.Reema Thareja,Object Oriented Programming with C++, Oxford University Press(January 2018)
Website and e-Learning Source	https://nptel.ac.in

List of Practicals :

1. Program to print the following output using for loops

```
1
22
333
4444
55555
.....
```

2. Program to calculate the variance and standard deviation of N numbers.

$$\text{Variance} = \frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^2$$

$$\text{Standard derivative} = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^2} \text{ where } \bar{x} = \frac{1}{N} \sum_{i=1}^N (x_i)$$

3. Write a program to read a matrix of size m x n from the keyboard and display the same on the screen using functions.
4. Write a function power power () to raise a number m to a power n . The function takes a double value for m and int value for n and returns the result Correctly: Use a default value of 2 for n to make the function to Calculate Squares when This arguement Is Omitted . Write a main that gets the values of m and n from the user to test the function.

5. Write a class to represent a vector (a series of float values) Include member function" to perform the following tasks

- a) To create the vector
- b) to modify the value of a given element
- c) To multiply by a Scalar value
- d) To display the vector in the form (10, 20, 30, ...)

write a program to test your class

6. Create two classes DM and DB to Store the value of distances. DM. Stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add One object of DM with another object of DB. Use a friend function to carry out the additions operation, The object that Stores the results may be a DM object or DB object, depending on the units in which the results are required. The display should be in the format of Feet and inches or meters and Centimeters depending on the object on display.

7. Define a class String that Could work as a user-defined String type. Include Constructors that will enable us to create an uninitialized String String S1; //String with length 0 and also to initialize an object with a String Constant at the time of constant at the time of creation like string S2 ("Well done!"); Include a function that adds two strings to make a third string, Write a complete program to test your class to see that it does the following tasks:

- a) Create uninitialized String objects
- b) Create object with string constants
- c) Concatenes two strings properly
- d) Displays desired String object

8. Create a class FLOAT Hat contains one float data member. Overload all the four arithmetic operators So that they operate on the objects of FLOAT.

9. Define a class string. Write a program to compare two strings by using overload == operator.

Title of the Course		MATHEMATICS FOR COMPETITIVE EXAMINATION II					
Paper Number		SEC II					
Category	Skill Enhancement Course	Year	I	Credits	2	Course Code	
		Semester	II				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		2	--	--	2		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		To learn the techniques for solving aptitude problems. Also to motivate the students for attending various competitive examinations.					
Course Outline		UNIT-I: Simple interest and Compound interest.					
		UNIT-II: Time and work.					
		UNIT-III: Time and Distance.					
		UNIT-IV: Chain Rule.					
		UNIT-V: Pipes and Cistern					

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	R.S.Agarwal- Objective Arithmetic, Published by S.Chand & Co Ltd., Edition (2018).
Reference Books	<ol style="list-style-type: none"> 1. Rajesh Verma- Fasttrack Objective arithmetic, Arihant Publications (India) Limited., Fourth Edition 1st January 2018. 2. R.S. Aggarwal, Arithmetic Subjective and objective, Published by S.Chand and Co. Ltd. Revised Edition. 1st April 2017.
Website and e-Learning Source	https://nptel.ac.in

Title of the Course		LaTeX					
Paper Number		SEC III					
Category	Skill Enhancement Course	Year	I	Credits	2	Course Code	
		Semester	II				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		2	--	--	2		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		To introduce coding and decoding concepts. Also to develop the students in the field of coding theory					
Course Outline		UNIT-I: Typing text: Words, sentences and paragraphs-symbols not on the keyboard-comments and footnotes-Changing font Characteristics-Lines, paragraphs and pages-spaces- Boxes.					
		UNIT-II: Text environments: some general rules for displayed text environments-List of environments-style and size environments-proclamations(theorem-like structures)-Proof environments-Tabular environments-Tabbing environments-Miscellaneous displayed text environments.					
		UNIT-III: Typing math: Math environments-spacing rules-equations--spacing rules-equations-Basic constructs-Arithmetic operations-Delimiters-Operators-Math accents-Stretchable horizontal lines-formula gallery.					
		UNIT-IV: More math: Spacing of symbols building new symbols-math alphabets and symbols-vertical spacing-Tagging and grouping-Generalized fractions-Boxed formulas.					
		UNIT-V: Latex documents: The structure of a document-The preamble-Abstract-Sectioning-Cross referencing-Bibliographies.					

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	George Gratzer, More Math into LaTeX, 4 th edition, Springer, 2007
Reference Books	<ol style="list-style-type: none"> 1. Helmut Kopka and Patric W. Daly, A guide to LaTeX, Fourth edition, Addison-Wesley. 2. David R. Wilkins, Getting started with LaTeX, Second Edition.
Website and e-Learning Source	https://nptel.ac.in

Title of the Course		VECTOR CALCULUS AND FOURIER SERIES					
Paper Number		ALLIED MATHEMATICS II					
Category	Allied	Year	I	Credits	3	Course Code	
		Semester	II				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		5	1	--	6		
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		To know the concepts of vector differentiation and vector integration.					
Course Outline		UNIT-I: Vector differentiation–Gradient–Divergence and curl.					
		UNIT-II: Evaluation of double and triple integrals					
		UNIT-III: Vector integration–Line, surface and volume integrals.					
		UNIT-IV: Green's, Stoke's and Divergence theorems(without proof)–simple problems.					
		UNIT-V: Fourier series–Even and odd functions–Half range Fourier series.					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	<ol style="list-style-type: none"> 1. Dr.S.Arumugam & others- Allied Mathematics Paper-II ,New Gamma Publishing House, Palayamkottai, 2012. 2. T.K.ManicavachagomPillai–Calculus (VolII), S.Vishvanathan Printer and Publisher PVT.LTD(2012)
Reference Books	<ol style="list-style-type: none"> 1. Dr. S.Arumugam and others–Analytical Geometry 3D &Vector Calculus, New Gamma Publishing House, Palayamkottai. (2017). 2. Susan.J.C–Vector Calculus(4thEdition),Pearson Education, Boston(2012). 3. Murray Spiegel-Vector analysis –Schaum Publishing company, NewYork (2009).
Website and e-Learning Source	https://nptel.ac.in

