



SREE AYYAPPA COLLEGE FOR WOMEN
(Re-accredited with B Grade by NAAC)
Chunkankadai, Nagercoil

Department of Mathematics
(2018-2024)

Courses Offered: B. Sc
Programme: Mathematics

B. Sc Mathematics
Subject Code Details

Batch	Subject Code
2019-2022	S Code
2020-2023	A Code
2021-2024	S Code
2022-2025	S Code
2023-2026	E Code

B. Sc Mathematics
Subject Code Details

Year	I B. Sc Mathematics	II B. Sc Mathematics	III B. Sc Mathematics
2018-2019	S Code	S Code	J Code
2019-2020	S Code	S Code	S Code
2020-2021	A Code	S Code	S Code
2021-2022	C Code	A Code	S Code
2022-2023	C Code	C Code	A Code
2023-2024	E Code	C Code	C Code

Academic Year: 2023-2024

(Odd Semester)

I B. Sc Mathematics

Semester	Subject	Subject Code	Credits
I	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	E1TL11 / EMY11 / E1HD11	4
	Part II- Communication English	E2EN11	4
	Core 1- Classical Algebra	EMMA11	4
	Core 2 - Calculus	EMMA12	4
	Allied Physics Physics I	EAPH11	3
	Allied Physics Practical I	EAPHP1	1
	Skill Based Paper- Mathematics for Competitive Exam I	ESMA11	2
	Foundation Course – Bridge Mathematics	CAMA11	2

II B. Sc Mathematics

III	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	C1TL11 / C1MY21 / C1HD21	4
	Part II- Communication English	C1EN31	4
	Core 1 – Sequence and Series	CMMA31	4
	Core 2 – Allied Statistics I	CAST11	4
	Skill Based Paper – Vector Calculus	CSMA3A	4
	Non-Major – Food Chemistry	CNCH3A	2
	Common Paper - Yoga	CYOG3A	2

III B. Sc Mathematics

V	Abstract Algebra I	CMMA51	4
	Real Analysis I	CMMA52	4
	Statics	CMMA53	4
	Fourier Transforms and Transforms Integral Transforms	CMMA54	4
	Major Elective I – Discrete Mathematics	CMMA5B	4
	Major Elective II – Operation Research I	CEMA5D	4
	Common Skill Based Paper - Personality Development	CCSB5A	2

Academic Year: 2022-2023

(Odd Semester)

I B. Sc Mathematics

Semester	Subject	Subject Code	Credits
I	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	C1TL11 / CMY11 / C1HD11	4
	Part II- General English	C2EN11	4
	Core I- Calculus & Classical Algebra	CMMA11	4
	Professional English for Physical Sciences I	CPPS11	4
	Allied Physics Physics I	CAPH11	3
	Allied Physics Practical I	CAPHP1	1
	Part IV - Common Paper – Environmental Studies	CEVS11	2

II B. Sc Mathematics

III	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	C1TL11 / C1MY21 / C1HD21	4
	Part II- General English	C1EN31	4
	Core 1 – Sequence and Series	CMMA31	4
	Core 2 – Allied Statistics I	CAST11	4
	Skill Based Paper – Vector Calculus	CSMA3A	4
	Non-Major – Food Chemistry	CNCH3A	2
	Arimuga Tamil I	CNTL3A	2
	Common Paper - Yoga	CYOG3A	2

III B. Sc Mathematics

V	Abstract Algebra II	AMMA51	4
	Real Analysis II	AMMA52	4
	Statics	AMMA53	4
	Transforms and its Applications	AMMA54	4
	Major Elective I – Discrete Mathematics	AMMA5B	4
	Major Elective II – Operation Research I	AEMA5D	4
	Common Skill Based Paper - Personality Development	ACSB5A	2

Academic Year: 2022-2023

(Even Semester)

I B. Sc Mathematics

Semester	Subject	Subject Code	Credits
II	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	C1TL21 / C1MY21 / C1HD21	4
	Part II- General English	C2EN21	4
	Core 1- Analytical Geometry of 3D & Differential Equations	CMMA21	4
	Professional English for Physical Sciences II	CPPS21	4
	Allied Physics Physics II	CAPH21	3
	Allied Physics Practical II	CAPH2P	1
	Part IV - Common Paper – Value Based Education	CVBE21	2


II B. Sc Mathematics

IV	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	C1TL41 / C1MY41 / C1HD31	4
	Part II- General English	C1EN41	4
	Core 1 – Abstract Algebra I	CMMA41	4
	Core 2 – Allied Statistics II	CAST21	4
	Skill Based Paper – Trigonometry, Laplace Transforms and Fourier Series	CSMA4A	4
	Non-Major – Applied Chemistry	CNCH4A	2
	Arimuga Tamil II	CNTL4A	2
	Common Paper – Computer for Digital Era	CCDE4A	2
	Extension Activity – NSS, Sports	C5EA41	1

III B. Sc Mathematics

VI	Complex Analysis	AMMA61	4
	Graph Theory	AMMA62	4
	Number Theory	AMMA63	4
	Dynamics	AMMA64	4
	Numerical Methods	AMMA65	4
	Major Elective I – Fuzzy Mathematics	AEMA6A	4
	Nan Mudhalvan - Project Data Analysis with Tableau		



K.R. 
Head of the Department

Academic Year: 2021-2022

(Odd Semester)

I B. Sc Mathematics

Semester	Subject	Subject Code	Credits
I	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	C1TL11 / CMY11 / C1HD11	4
	Part II- General English	C2EN11	4
	Core I- Calculus & Classical Algebra	CMMA11	4
	Professional English for Physical Sciences I	CPPS11	4
	Allied Physics Physics I	CAPH11	3
	Allied Physics Practical I	CAPHP1	1
	Part IV - Common Paper – Environmental Studies	CEVS11	2

II B. Sc Mathematics

III	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	A1TL11 / A1MY21 / A1HD21	4
	Part II- General English	A1EN31	4
	Core 1 – Sequence and Series	AMMA31	4
	Core 2 – Allied Statistics I	AAST11	4
	Skill Based Paper – Vector Calculus	ASMA3A	4
	Non-Major – Food Chemistry	ANCH3A	2
	Arimuga Tamil I	ANTL3A	2
	Common Paper - Yoga	AYOG3A	2

III B. Sc Mathematics

V	Abstract Algebra II	SMMA51	4
	Real Analysis II	SMMA52	4
	Statics	SMMA53	4
	Transforms and its Applications	SMMA54	4
	Major Elective I – Discrete Mathematics	SMMA5B	4
	Major Elective II – Operation Research I	SEMA5D	4
	Common Skill Based Paper - Personality Development	SCSB5A	2

Academic Year: 2021-2022

(Even Semester)

I B. Sc Mathematics

Semester	Subject	Subject Code	Credits
II	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	C1TL21 / C1MY21 / C1HD21	4
	Part II- General English	C2EN21	4
	Core 1- Analytical Geometry of 3D & Differential Equations	CMMA21	4
	Professional English for Physical Sciences II	CPPS21	4
	Allied Physics Physics II	CAPH21	3
	Allied Physics Practical II	CAPH2P	1
	Part IV - Common Paper – Value Based Education	CVBE21	2

II B. Sc Mathematics

IV	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	A1TL41 / A1MY41 / A1HD31	4
	Part II- General English	A1EN41	4
	Core 1 – Abstract Algebra I	AMMA41	4
	Core 2 – Allied Statistics II	AAST21	4
	Skill Based Paper – Trigonometry, Laplace Transforms and Fourier Series	ASMA4A	4
	Non-Major – Applied Chemistry	ANCH4A	2
	Arimuga Tamil II	ANTL4A	2
	Common Paper – Computer for Digital Era	ACDE4A	2
	Extension Activity – NSS, Sports	A5EA41	1

III B. Sc Mathematics

VI	Complex Analysis	SMMA61	4
	Graph Theory	SMMA62	4
	Number Theory	SMMA63	4
	Dynamics	SMMA64	4
	Numerical Methods	SMMA65	4
	Major Elective I – Fuzzy Mathematics	SEMA6A	4
	Major Elective II – Operation Research II	SEMA6D	4



E.R. 

Head of the Department

Academic Year: 2020-2021

(Odd Semester)

I B. Sc Mathematics

Semester	Subject	Subject Code	Credits
I	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	A1TL11 / AMY11 / A1HD11	4
	Part II- General English	A2EN11	4
	Core 1- Calculus & Classical Algebra	AMMA11	4
	Professional English for Physical Sciences I	APPS11	4
	Allied Physics Physics I	AAPH11	3
	Allied Physics Practical I	AAPHP1	1
	Part IV - Common Paper – Environmental Studies	AEVS11	2

II B. Sc Mathematics

III	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	S1TL11 / S1MY21 / S1HD21	4
	Part II- General English	S1EN31	4
	Core 1 – Real Analysis I	SMMA31	4
	Core 2 – Allied Statistics I	SAST11	4
	Skill Based Paper – Vector Calculus	SSMA3A	4
	Non-Major – Food Chemistry	SNCH3A	2
	Arimuga Tamil I	SNTL3A	2
	Common Paper - Yoga	SYOG3A	2

III B. Sc Mathematics

V	Abstract Algebra II	SMMA51	4
	Real Analysis II	SMMA52	4
	Statics	SMMA53	4
	Transforms and its Applications	SMMA54	4
	Major Elective I – Discrete Mathematics	SMMA5B	4
	Major Elective II – Operation Research I	SEMA5D	4
	Common Skill Based Paper - Personality Development	SCSB5A	2

Academic Year: 2020-2021

(Even Semester)

I B. Sc Mathematics

Semester	Subject	Subject Code	Credits
II	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	A1TL21 / A1MY21 / A1HD21	4
	Part II- General English	A2EN21	4
	Core 1- Analytical Geometry of 3D & Differential Equations	AMMA21	4
	Professional English for Physical Sciences II	APPS21	4
	Allied Physics Physics II	AAPH21	3
	Allied Physics Practical II	AAPH2P	1
	Part IV - Common Paper – Value Based Education	AVBE21	2

II B. Sc Mathematics

IV	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	S1TL41 / S1MY41 / S1HD31	4
	Part II- General English	S1EN41	4
	Core 1 – Abstract Algebra I	SMMA41	4
	Core 2 – Allied Statistics II	SAST21	4
	Skill Based Paper – Trigonometry, Laplace Transforms and Fourier Series	SSMA4A	4
	Non-Major – Applied Chemistry	SNCH4A	2
	Arimuga Tamil II	SNTL4A	2
	Common Paper – Computer for Digital Era	SCDE4A	2
	Extension Activity – NSS, Sports	S5EA41	1

III B. Sc Mathematics

VI	Complex Analysis	SMMA61	4
	Graph Theory	SMMA62	4
	Number Theory	SMMA63	4
	Dynamics	SMMA64	4
	Numerical Methods	SMMA65	4
	Major Elective I – Fuzzy Mathematics	SEMA6A	4
	Major Elective II – Operation Research II	SEMA6D	4



K.R.

Head of the Department

Academic Year: 2019-2020

(Odd Semester)

I B. Sc Mathematics

Semester	Subject	Subject Code	Credits
I	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	S1TL11 / SIMY11 / S1HD11	4
	Part II- General English	S2EN11	4
	Core 1- Calculus	SMMA11	4
	Core 2 – Classical Algebra	SMMA12	4
	Allied Physics Physics I	SAPH11	3
	Allied Physics Practical I	SAPHP1	1
	Part IV - Common Paper – Environmental Studies	SEVS11	2

II B. Sc Mathematics

III	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	S1TL11 / SIMY21 / S1HD21	4
	Part II- General English	S2EN31	4
	Core 1 – Real Analysis I	SMMA31	4
	Core 2 – Allied Statistics I	SAST11	4
	Skill Based Paper – Vector Calculus	SSMA3A	4
	Non-Major – Food Chemistry	SNCH3A	2
	Arimuga Tamil I	SNTL3A	2
	Common Paper - Yoga	SYOG3A	2

III B. Sc Mathematics

V	Abstract Algebra II	SMMA51	4
	Real Analysis II	SMMA52	4
	Statics	SMMA53	4
	Transforms and its Applications	SMMA54	4
	Major Elective I – Discrete Mathematics	SMMA5B	4
	Major Elective II – Operation Research I	SMMA5D	4
	Common Skill Based Paper - Personality Development	SCSB5A	2

Academic Year: 2018-2019

(Odd Semester)

Academic Year: 2019-2020

(Even Semester)

I B. Sc Mathematics

Semester	Subject	Subject Code	Credits
II	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	S1TL21 / S1MY21 / S1HD21	4
	Part II- General English	S2EN21	4
	Core 1- Analytical Geometry of 3D	SMMA21	4
	Core 2 – Differential Equations	SMMA22	4
	Allied Physics Physics II	SAPH21	3
	Allied Physics Practical II	SAPH2P	1
	Part IV - Common Paper – Value Based Education	SVBE21	2

II B. Sc Mathematics

IV	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	S1TL41 / S1MY41 / S1HD31	4
	Part II- General English	S1EN41	4
	Core 1 – Abstract Algebra I	SMMA41	4
	Core 2 – Allied Statistics II	SAST21	4
	Skill Based Paper – Trigonometry, Laplace Transforms and Fourier Series	SSMA4A	4
	Non-Major – Applied Chemistry	SNCH4A	2
	Arimuga Tamil II	SNTL4A	2
	Common Paper – Computer for Digital Era	SCDE4A	2
	Extension Activity – NSS, Sports	S5EA41	1

III B. Sc Mathematics

VI	Complex Analysis	JMMA61	4
	Graph Theory	JMMA62	4
	Number Theory	JMMA63	4
	Dynamics	JMMA64	4
	Numerical Methods	JMMA65	4
	Major Elective I – Fuzzy Mathematics	JEMA6A	4
	Major Elective II – Operation Research II	JEMA6D	4



K.R.

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Academic Year: 2018-2019

(Odd Semester)

I B. Sc Mathematics

Semester	Subject	Subject Code	Credits
I	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	S1TL11 / S1MY11 / S1HD11	4
	Part II- General English	S2EN11	4
	Core 1- Calculus	SMMA11	4
	Core 2 – Classical Algebra	SMMA12	4
	Allied Physics Physics I	SAPH11	3
	Allied Physics Practical I	SAPHP1	1
	Part IV - Common Paper – Environmental Studies	SEVS11	2

II B. Sc Mathematics

III	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	S1TL11 / S1MY21 / S1HD21	4
	Part II- General English	S2EN31	4
	Core 1 – Real Analysis I	SMMA31	4
	Core 2 – Allied Statistics I	SAST11	4
	Skill Based Paper – Vector Calculus	SSMA3A	4
	Non-Major – Food Chemistry	SNCH3A	2
	Arimuga Tamil I	SNTL3A	2
	Common Paper - Yoga	SYOG3A	2

III B. Sc Mathematics

V	Abstract Algebra	JMMA51	4
	Real Analysis II	JMMA52	
	Mechanics	JMMA53	4
	Major Elective I – Discrete Mathematics	JMMA5B	4
	Major Elective II – Operation Research I	JMMA5D	4
	Common Skill Based Paper - Personality Development	JCSB5A	2

Academic Year: 2018-2019

(Even Semester)

I B. Sc Mathematics

Semester	Subject	Subject Code	Credits
II	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	S1TL21 / S1MY21 / S1HD21	4
	Part II- General English	S2EN21	4
	Core 1- Analytical Geometry of 3D	SMMA21	4
	Core 2 – Differential Equations	SMMA22	4
	Allied Physics Physics II	SAPH21	3
	Allied Physics Practical II	SAPH2P	1
	Part IV - Common Paper – Value Based Education	SVBE21	2

II B. Sc Mathematics

IV	Part I – Tamil - Pothu Tamil / Malayalam-Malayala Kavitha / Hindi	S1TL41 / S1MY41 / S1HD31	4
	Part II- General English	S1EN41	4
	Core 1 – Abstract Algebra I	SMMA41	4
	Core 2 – Allied Statistics II	SAST21	4
	Skill Based Paper – Trigonometry, Laplace Transforms and Fourier Series	SSMA4A	4
	Non-Major – Applied Chemistry	SNCH4A	2
	Arimuga Tamil II	SNTL4A	2
	Common Paper – Computer for Digital Era	SCDE4A	2
	Extension Activity – NSS, Sports	S5EA41	1

III B. Sc Mathematics

VI	Complex Analysis	JMMA61	4
	Graph Theory	JMMA62	4
	Number Theory	JMMA63	4
	Dynamics	JMMA64	4
	Numerical Methods	JMMA65	4
	Major Elective I – Fuzzy Mathematics	JEMA6A	4
	Major Elective II – Operation Research II	JEMA6D	4



K.R. 
Head of the Department

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 Programmping 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
- To create the vector
 - to modify the value of a given element
 - To multiply by a Scalar value
 - 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:
- Create uninitialized String objects
 - Create object with string constants
 - Concatenes two strings properly
 - 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 Enhance- ment 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.Manicavachagom Pillai–Calculus (VoIII), 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

2021 onwards

1. VISION AND MISSION OF THE UNIVERSITY.

**MANONMANIAM SUNDARANARUNIVERSITY, TIRUNELVELI-627012.
UG COURSES- AFFILIATED COLLEGES**

VISION AND MISSION

Vision:

- ❖ "To provide quality education to reach the un-reached"

Mission:

- ❖ To conduct research, teaching and outreach programs to improve conditions of human living.
- ❖ To create an academic environment that honours women and men of all races, caste, creed, cultures and an atmosphere that values intellectual curiosity, pursuit of knowledge, academic freedom and integrity.
- ❖ To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups.
- ❖ To develop partnerships with industries and government so as to improve the quality of workplace and to serve as catalyst for economic and cultural development.
- ❖ To provide quality/inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled.

2. VISION AND MISSION OF THE MATHEMATICS DEPARTMENT

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI-627012.

UGC COURSES- AFFILIATED COLLEGES

Department of Mathematics

Vision and Mission

Vision

- The long term vision is to be an internationally leading Mathematics Department that will offer innovative educational programs in Mathematical Sciences and their applications in science and technology

Mission

- ❖ To create an environment that will identify, nurture and encourage mathematical intelligence.
- ❖ To enhance use of mathematical knowledge readily for problem solving, exploring all subjects by proper understanding of the mathematical content with various possible representation.
- ❖ To improve the skills of students in Practical Applications and Life Skills by means of a close and continuous monitoring of their progress throughout the course.

3.PREAMBLE

The LOCF (Learning outcomes based curriculum framework) committee constituted University Grants Commission (UGC) is pleased to submit the report concerning the syllabi of B.Sc with Mathematics as a subject. The committee discussed the framework of syllabi in its meetings and suggests the implementation these syllabi in the Colleges based on following facts.

1. The learning outcomes of each paper are designed so that these may help learners understand the main objectives of studying the course
2. This will enable learners to select elective papers depending on the individual inclinations and contemporary requirements
3. The objectives of the LOCF are to mentally prepare the students to learn mathematics leading graduate degree with mathematics as a subject.
4. These syllabi in mathematics under CBCS are recommended keeping in view of the wide applications of mathematics in science, engineering, social science, business and a host of other areas.
5. The study of the syllabi will enable the students to equip with the state of the art of the subject and will empower them to get jobs in technological and engineering fields as well as business, education and healthcare sectors.
6. The LOCF committee in Mathematics had prepared this draft paying suitable attention objectives and learning outcomes of the papers. These syllabi may be implemented with minimum modifications with appropriate justifications keeping in view regional, national and international contents and needs.
7. The outcomes of each paper may be modified as per the local requirements.
8. The text books mentioned in references are denotative/demonstrative. The divisions of each paper in units are specified to the context mentioned in course. These units will help the learners to complete the study of concerned paper in certain periods and prepare them for examination.
9. The mathematics is a vast subject with immense diversity. Hence it is difficult for every student to learn each branch of mathematics, even though each paper has its unique importance. Under these circumstances, LOCF in Mathematics suggests a number of elective papers also with compulsory papers. A student can select elective papers as per his needs and interests.
10. The committee expects that the papers may be taught using various Computer Algebraic systems (CAS) softwares such as Mathematica, MATLAB, Maxima and R to strengthen the conceptual understanding and to wide up the horizon of student's self experience.
11. The committee of the LOCF in Mathematics expects that the concern colleges will encourage their faculty members to include necessary topics in addition to courses suggested by LOCF committee. It is hoped that the needs of all around development in the careers of learners will be fulfilled by the recommendations of LOCF in mathematics.

4. PROGRAMME STRUCTURE

MANONMANIAMSUNDARANARUNIVERSITY, TIRUNELVELI-627012.

UGCOURSES- AFFILIATEDCOLLEGES

B.Sc. Mathematics

(ChoiceBased Credit System)

(Witheffectfromtheacademicyear2021- 2022 onwards)

	Part	Sub. No.	Subject Status	Subject Title	Hrs/ Week	Credits	Marks				
							Maximum			Passing Minimum	
							Int.	Ext	Tot.	Ext.	Tot.
I	I	1	Language	Tamil/OtherLanguages	6	4	25	75	100	30	40
	II	2	Language	CommunicativeEnglish	6	4	25	75	100	30	40
	III	3	Core-IPaper-I	Calculus and ClassicalAlgebra	6	4	25	75	100	30	40
		4	Addonmajor(Mandatory) Paper-II	ProfessionalEnglishforP hysicalSciences-I	4	4	25	75	100	30	40
		5	Allied-I(ForMaths students)	Statistics-I OR Physicswith Practical /Chemistry withPractical/ ComputerScience**	6	3	25	75	100	30	40
			Allied-I (ForScience students)	AlgebraandDifferentialE quations	6	4	25	75	100	30	40
IV	6	Common	EnvironmentalStudies	2	2	25	75	100	30	40	
			Total		30	21/23					
II	I	7	Language	Tamil/OtherLanguages	6	4	25	75	100	30	40
	II	8	Language	English	6	4	25	75	100	30	40
	III	9	Core- IIPaper- III	Differential Equationsand Analytical GeometryofThree Dimensions	6	4	25	75	100	30	40
		10	Addon major(Mandat ory)Paper-IV	ProfessionalEnglishforP hysicalsciences-II	4	4	25	75	100	30	40
		11	Allied- II(ForMath sStudents)	Statistics-II OR Physics with Practical /Chemistry with Practical /ComputerScience**	6	3	25	75	100	30	40
			Allied-II(For ScienceSt udents)	Vector Calculus &FourierSeries	6	4	25	75	100	30	40
IV	12	Common	Valuebasededucation	2	2	25	75	100	30	40	
			Total		30	21/23					

** The Allied Computer Science shall be taken by the Department of Mathematics

Sem	Part	Sub. No.	Subject Status	Subject Title	Hrs/week	credits	Mark					
							Maximum			Passing minimum		
							Int.	Ext.	Tot.	Ext.	To	
III	I	13	Language	Tamil/Other Languages	6	4	25	75	100	30	40	
	II	14	Language	English	6	4	25	75	100	30	40	
	III	15	Core-III Paper-V	Sequences and Series	6	4	25	75	100	30	40	
		16	Allied-II	Statistics-I OR Physics with Practical / Chemistry with Practical / Computer Science	6	3	25	75	100	30	40	
		17	Skill Based Core	Vector Calculus	4	4	25	75	100	30	40	
	IV	18	Non-Major Elective	Any one of the following 1.1) Mathematics for Competitive Examinations-I 1.2) Fundamentals of Statistics-I	2	2	25	75	100	30	40	
		19	Common	Yoga*	2	2	25	75	100	30	40	
	Total					30	25/27					
	IV	I	20	Language	Tamil/Other Languages	6	4	25	75	100	30	40
		II	21	Language	English	6	4	25	75	100	30	40
III		22	Core-IV Paper-VI	Abstract Algebra	6	4	25	75	100	30	40	
		23	Allied-II	Statistics-II OR Physics with Practical / Chemistry with Practical/ Computer Science	6	3	25	75	100	30	40	
IV		24	Skill Based Core	Trigonometry, Laplace Transforms and Fourier Series	4	4	25	75	100	30	40	
		25	Non-Major Elective	Any one of the Following: 2.1) Mathematics for Competitive Examinations-II 2.2) Fundamentals of Statistics-II	2	2	25	75	100	30	40	
V		26	Common	Computers for Digital Era*	2	2	25	75	100	30	40	
			Extension activities	NCC/NSS/YRC/YWF/PE	-	1	-	-	-	-	-	
Total					30	26/28						
V		III	27	Core-V Paper-VII	Linear Algebra	5	4	25	75	100	30	40
	28		Core-VI Paper-VIII	Real Analysis	5	4	25	75	100	30	40	
	29		Core-VII Paper-IX	Statics	5	4	25	75	100	30	40	

		30	Core-VIII Paper-X	Integral Transforms and Z Transforms	5	4	25	75	100	30
		31	Major Elective-I Paper-XI	Anyone of the Following: 1.1) Programming in C 1.2) Discrete Mathematics 1.3) Combinatorial Mathematics	4	4	25	75	100	30
		32	Major Elective -II Paper-XII	Anyone of the Following: 2.1) Operations Research-I 2.2) Stochastic Process 2.3) Math Typing using LaTeX	4	4	25	75	100	30
	IV	33	Skill Based Common	Personality Development	2	2	25	75	100	30
			Total		30	26				
VI	III	34	Core-IX Paper-XIII	Complex Analysis	5	4	25	75	100	30
		35	Core-X Paper-XIV	Graph Theory	5	4	25	75	100	30
		36	Core-XI Paper-XV	Number Theory	4	4	25	75	100	30
		37	Core-XII Paper-XVI	Dynamics	4	4	25	75	100	30
		38	Core-XIII Paper-XVII	Numerical Methods	4	4	25	75	100	30
		39	Major Elective-III Paper-XVIII	Any one of the following 3.1) Astronomy 3.2) Fuzzy Mathematics 3.3) Mathematical Modeling	4	4	25	75	100	30
		40	Major Elective-IV Paper-XIX	Any one of the following 4.1) Operations Research-II 4.2) Coding Theory 4.3) Programming in C++	4	4	25	75	100	30
			Total		30	28				

5. EVALUATION SCHEME (INTERNAL, EXTERNAL, PASSING MINIMUM)

Evaluation Scheme

Internal Marks	25 Marks
External Marks	75 Marks
Maximum Marks	100 Marks
Passing Minimum	40 Marks

6. MODEL QUESTION PAPER

MODEL QUESTION PAPER- CBCS-PATTERN (UG MATHEMATICS)

MAXIMUM MARKS: 75

TIME: 3 HOURS

Part -A (10×1 = 10 Marks)

Answer all the questions, Choose the correct answer

Question No. 1,2	Unit -I	Question No. 7,8	Unit -IV
Question No. 3,4	Unit -II	Question No. 9,10	Unit -V
Question No. 5,6	Unit -III		

Part -B(5×5 = 25 Marks)

Answer all the questions, Choosing either (a) or (b).

Question No. 11(a) or11 (b)	Unit -I	Question No. 14(a) or14 (b)	Unit -IV
Question No. 12(a) or12 (b)	Unit -II	Question No. 15(a) or15 (b)	Unit -V
Question No. 13(a) or13 (b)	Unit -III		

Part -A (8×5 = 40 Marks)

Answer all the questions, Choosing either (a) or (b).

Question No. 16(a) or16 (b)	Unit -I	Question No. 19(a) or19 (b)	Unit -IV
Question No. 17(a) or17 (b)	Unit -II	Question No. 20(a) or20 (b)	Unit -V
Question No. 18(a) or18 (b)	Unit -III		

Semester-I/III
Allied Paper-I
Statistics- I (For Mathematics Students)

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-III	Allied		Statistics-I	90	-	-	3

Contact hours per semester:90

Contact hours per week:6

Year	Semester	Internal Marks	External Marks	Total marks
I/II	I/III	25	75	100

Objective: To study the concepts of measures of dispersion and measures of central tendencies and also to develop the concept of probability distributions.

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

CO No.	Course Outcomes	Knowledge Level
CO 1	Find and relate the concepts of moments, skewness and kurtosis and to demonstrate the method of least squares and to classify parabolic, exponential and logarithmic curves.	K1, K2, K3
CO 2	Interpret correlation and regression and to illustrate Karl's Pearson's coefficient of correlation and also the lines of regression and coefficient of regression	K2
CO 3	Develop the statistical techniques used in the theory of attributes and to analyze consistency of data and criteria independence and to interpret Yule's coefficient of association.	K3, K4
CO 4	Explain distribution function and its properties, able to find mathematical expectation and to find the cumulants using generating function.	K2
CO 5	Distinguish discrete and continuous probability distributions and to construct binomial, Poisson distribution	K4, K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs \ COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	2	1
CO2	3	2	3	3	2
CO3	2	2	3	2	1
CO4	2	1	2	1	1
CO5	3	2	3	2	2
Total contribution of COs to PSOs	13	9	14	10	7
Weighted Percentage of COs contribution to PSOs	86.66	60	93.33	66.67	46.66

Course Content**UNIT-1:**

Moments, Skewness and Kurtosis - Curve fitting - method of least squares - Fitting lines - Parabolic, Exponential and Logarithmic curves.

UNIT-2:

Correlation and Regression - Scatter Diagram - Karl Pearson's coefficient of correlation - Properties of Lines of Regression - Coefficient of Regression and properties - Rank Correlation.

UNIT-3:

Association of Attributes - Consistency of data - Criteria of independence - Yule's Coefficient of Association.

UNIT-4:

Random variable - Distribution function - Properties of Distribution function - Mathematical Expectation - Multiplication theorem of Expectation - Moment generating function - Cumulants - Characteristic function - Properties of Characteristic function.

UNIT-5:

Discrete and continuous Probability Distributions - Binomial and Poisson Distribution and their moments, Generating function, characteristic function, properties and simple applications. Normal Distribution - Standard normal distribution and their properties - simple problems.

Text Books:

1. Arumugam & Thangapandi Isaac, Statistics, New Gamma Publishing House, July 2016 for Unit I, II, III
2. Gupta, S.C and V.K. Kapoor - Fundamentals of Mathematical Statistics, Sultan Chand & sons, New Delhi, (2002) for (Unit IV & V)

Books for Reference:

1. Vittal, V.R., Mathematical Statistics, Maragatham Publications, 2004
2. D.C. Sacheti & Kapoor Statistics, Sultan Chand & Sons, New Delhi, 2017.

MODEL QUESTION PAPER
CALCULUS AND CLASSICAL ALGEBRA
(For those who joined in July 2021 onwards)

Time: Three hours

Maximum: 75 marks.

Part-A (10×1 = 10 marks)

Answer All questions

SLNo	Choose the correct Answer.	Course outcome	Knowledge Level
1.	The curvature of the curve $ax+by+c=0$ is..... a) b b) a c) 0 d) none of the above	CO 1	K1, K5
2.	The radius of the curvature of $y = e^x$ at (0,1) is..... a)1 b) 2 c) $2\sqrt{2}$ d) none of the above	CO 1	K1, K5
3.	The value of $\int_1^b \int_1^a \frac{dx dy}{xy}$ a) $\log\left(\frac{a}{b}\right)$ b) $\log(ab)$ c) $\log\log b$ d) none of the above	CO 2	K2, K3
4.	The Jacobian of $u = x + y$ and $v = x - y$ is..... a) 2 b) 1 c) -2 d) none of the above	CO 2	K2, K3
5.	$\int_0^1 x^2(1-x)dx = \dots$ a)2 b) $\frac{1}{12}$ c) $\frac{1}{3}$ d) none of the above	CO 3	K2, K4
6.	$\int_0^\pi \int_0^{\pi/2} \int_0^1 r^2 \sin\theta dr d\theta d\phi = \dots$ a) $\frac{\pi}{2}$ b) $\frac{\pi}{3}$ c) $\frac{\pi}{4}$ d) none of the above.	CO 3	K4
7.	The least degree of the equation with rational coefficients one of whose roots $\sqrt{2} + \sqrt{3}$ is..... a) 3 b)2 c) 4 d) none of the above	CO 4	K4, K5
8.	If α, β, γ are the roots of $x^3 + px^2 + qx + r = 0$ then $\sum \frac{1}{\alpha}$ a) $-\frac{q}{r}$ b) $\frac{q}{r}$ c) $\frac{p}{r}$ d) none of the above	CO 4	K6
9.	The roots of the equation $x^n + 1=0$ (n is even) are a) All imaginary b) (n-1) imaginary c)(n-2) imaginary d) none of the above	CO 5	K3
10.	One of the roots of the equation $2x^3 + 3x^2 - 3x - 2 = 0$ is -2, the other roots are..... a) -2, -1 b) $-\frac{1}{2}, 1$ c) $-\frac{1}{2}, -1$ d) none of the above	CO 5	K6

PART B – (5×5 = 25 marks)

SLNo	Answer ALL questions, choosing either (a) or (b)	Course outcome	Knowledge Level
11.	a) Find the p-r equation (pedal equation) of the curve $r^2 = a^2 \sin 2\theta$ Or b) Find the co-ordinates of the center of curvature of the curve $x^3 + y^3 = 3axy$ at $\left(\frac{a}{2}, \frac{a}{2}\right)$.	CO 1	K1
12.	a) Find the area of the region common to $y^2 = 4ax$ and $x^2 = 4ay$. Or b) If $u = 2xy, u = x^2 - y^2, x = r \cos\theta, y = r \sin\theta$, evaluate $\frac{\partial(u,v)}{\partial(r,\theta)}$ without actual substitution.	CO 2	K2, K3
13.	a) Prove that $\frac{\Gamma(n+1)}{2} = \frac{(2n)! \sqrt{\pi}}{4^n n!}$ Where $n=0,1,2,\dots$ Or	CO 3	K5

	b) Prove that $\int_0^{\pi/4} \sin^p \theta \cos^q \theta d\theta = \frac{1}{2} \beta\left(\frac{p+1}{2}, \frac{q+1}{2}\right)$	CO 3	K5
14.	a) Show that the sum of the 6 th powers of the roots of $x^7 - x^4 + 1 = 0$ is 3 Or b) If α, β, γ are the roots of the equation $x^3 + ax^2 + bx + c = 0$, form the equation whose roots are $\alpha\beta, \alpha\gamma$ and $\beta\gamma$	CO 4 CO 4	K2, K4 K2, K5
15.	a) Transform the equation $x^4 - 4x^3 - 18x^2 - 3x + 2 = 0$ into an equation with the third term absent. Or b) Remove the fractional coefficient from the equation $x^3 + \frac{1}{4}x^2 - \frac{1}{16}x + \frac{1}{72} = 0$	CO 5 CO 5	K6 K6

PART C - (5 × 8 = 40marks)

SLNo	Answer ALL questions, choosing either (a) or (b)	Course outcome	Knowledge Level
16.	a) Find the coordinates of the center of curvature of $y = x \log x$ at the point where $\frac{dy}{dx} = 0$. Or b) Find the evolute of the asteroid $x^{2/3} + y^{2/3} = a^{2/3}$	CO 1 CO 1	K1, K6 K1, K6
17.	a) By changing the order of integration, evaluate the integral $\int_0^1 \int_y^{2-y} xy \, dx dy$ Or b) By changing into polar coordinates, show that $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx dy = \frac{\pi}{4}$. Hence evaluate $\int_0^\infty e^{-t^2} dt$.	CO 2 CO 2	K2, K4 K2, K4
18.	a) Evaluate $\int_0^1 x^m (1-x^n)^p dx$ in terms of gamma functions and hence find $\int_0^1 \frac{dx}{\sqrt{1-x^n}}$. Or b) Using gamma functions evaluate $\iint xy(1-x-y)^{1/2} dx dy$ over the area enclosed by the lines $x = 0, y = 0$ and $x + y = 1$ in the positive quadrant.	CO 3 CO 3	K3, K5 K3, K5
19.	a) Solve $6x^3 - 11x^2 + 6x - 1 = 0$ where roots are in harmonic progression Or b) If $a + b + c + d = 0$, show that $\frac{a^5+b^5+c^5+d^5}{5} = \frac{a^2+b^2+c^2+d^2}{2} \cdot \frac{a^3+b^3+c^3+d^3}{3}$	CO 4 CO 4	K3 K3
20.	a) Show that the equation $x^4 - 3x^3 - 4x^2 - 2x + 1 = 0$ can be transformed into a reciprocal equation by diminishing the roots by unity. Hence solve the given equation. Or b) Solve the equation $6x^6 - 35x^5 + 56x^4 - 56x^2 + 35x - 6 = 0$.	CO 5 CO 5	K1 K1

➤ K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

PROGRAMME OUTCOMES FOR B.Sc MATHEMATICS**PROGRAMME OUTCOMES**

1. 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 and statistics. Thus, this programme helps the learners in building a social foundation for higher studies in mathematics.
2. The skills and knowledge gained has intrinsic beauty, which leads to proficiency in analytical reasoning. This can be utilized in modelling and solving real life problems
3. Students undergoing this programme learn to logically questions assertions, to recognise patterns and to distinguish between essential and irrelevant aspects of problems. They also share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to learn behave responsibly in a rapidly changing independent society
4. Students completing this programme will be able to present mathematics clearly and precisely, make vague 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.
5. Completion of this programme will also enable the learners to join teaching profession in primary and secondary schools.
6. This programme will also help students to 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.

8. PROGRAM SPECIFIC OUTCOMES

PROGRAM SPECIFIC OUTCOMES

After the completion of B.Sc. program in mathematics, the students are able to have

PSO 1: A Solid Foundation in Knowledge: B.Sc. degree is the culmination of depth knowledge of my core branches of mathematics such as Calculus, Classical Algebra, Analytical Geometry, Differential Equations, Sequence and Series, Abstract Algebra, Real and Complex Analysis, Number Theory, Mechanics, Operation Research, Statistics, Graph Theory, Discrete Mathematics, Trigonometry, Transforms and their application and C++/Python. Thus, this programme helps students in creating a solid foundation for further higher studies and research in mathematics

PSO 2: A Competency in Skills: The skills and knowledge gained have intrinsic logic which leads to proficiency in analytical reasoning critical understanding, analysis and synthetic in order to solve theoretical and practical problems. This can orient students towards applications of mathematics in other disciplines and moreover, it can also be applied in modelling and solving the real-life problems.

PSO 3: A Problem-Solving Techniques: Students undergoing this programme learn to logically understand the question assertions to classify the patterns and to evaluate the difference between the necessities and unnecessities of the problems which helps to analyze the problem clearly and to take correct decision for solving the problems.

PSO 4: Interdisciplinary and Research Skills: Students completing this programme will be able to create and present mathematical concepts clearly and precisely, to describe mathematical ideas from multiple perspectives and to explain fundamental concepts of mathematics to non-mathematics people in a better manner.

PSO 5: A Proficiency in Employments: The programme will help students build up with employability for government jobs, jobs in banking, insurance and investments sectors, data analysis jobs and jobs in various other public and private enterprises.

9.COURSE OUTCOMES

Semester-I Core-I

Calculus and Classical Algebra

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-III	Core-I		Calculus and Classical Algebra	90	---	-	4

Contact hours per semester:90

Contact hours per week:6

Year	Semester	Internal Marks	External Marks	Total marks
I	I	25	75	100

Objective: To explain the curvature and radius of curvature in polar coordinates and Cartesian coordinates. Also to find the roots of the equations by various methods.

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

CO No.	Course Outcome	Knowledge Level
CO1	Apply the mathematical knowledge to analyze the properties of a curve such as curvature, radius of curvature, Involute and Evolute.	K3, K4
CO2	Classify double and triple integrals	K4
CO3	Identify Beta and gamma function and to apply the rules of beta and gamma function in evaluating double and triple integrals.	K3
CO4	Construct different types of equations and to find the roots of the equations by Newton's Theorem	K1,K6
CO5	Solve the different types of reciprocal equations and to find the number of real roots using Descartes rule of signs.	K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	3	3	3	3	2
CO2	2	3	3	3	1
CO3	3	3	3	1	1
CO4	3	1	3	2	2
CO5	3	1	2	1	2
Total contribution of COs to PSOs	14	11	14	10	8
Weighted Percentage of COs contribution to PSOs	93.33	73.33	93.33	66.66	53.33

Course Content

- UNIT-1:** Curvature, Radius of Curvature and Centre of curvature in Cartesian and polar Co-ordinates- Pedalequation-Involute and Evolute.
- UNIT-2:** Double and Triple Integrals -Changing the order of integration- Jacobians and change of variables.
- UNIT-3:** Beta and Gamma functions – Applications of Beta and Gamma Functions in evaluation of Double and Triple Integrals.
- UNIT-4:** Theory of Equations – Formation of equations –Relation between roots and coefficients – symmetric function of the roots. Sum of the powers of the roots of an equation – Newton's theorem.
- UNIT-5:** Reciprocal equation-Transformation of equations-Descartes' rule of signs.

Text Books:

1. Narayanan.S and T.K.Manickavachagam Pillai-Differential Equations and its applications, S. Viswanathan Printers Pvt.Ltd,2006.
2. Manickavachagam Pillai.T.K,and S,Narayanan -Algebra -Viswanathan Publishers and Printers Pvt.Ltd,2004.

Books for Reference:

1. Kandasamy Pand K. Thilagavathi- Mathematics for B.Sc., Volume II –2004, S.Chand & Co., New Delhi.
2. Kandasamy Pand K. Thilagavathi-Mathematics for B.Sc.,-2004, Volume I and Volume IV, S.Chand & Co., New Delhi.
3. Apostol T.M. - Calculus, Vol. I (4th edition) John Wiley and Sons, Inc., New York 1991.
4. Apostol T.M. Calculus, Vol. II (2nd edition) John Wiley and Sons, Inc., New York 1969.

CO-PSO mapping (Course Articulation Method)	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	1	3	3	3
CO5	3	1	3	1	3
Total contribution of COs to PSO	14	11	14	10	8
Weighted Percentage of COs contribution to PSO	93.33	73.33	93.33	66.66	53.33

Semester I/III
Allied paper-I
Algebra and Differential equations
(For Science Students)

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-IV	Allied		Algebra and Differential equations	90	-	-	3

Contact hours per semester:90

Contact hours per week:6

Year	Semester	Internal Marks	External Marks	Total marks
I/II	I/III	25	75	100

Objective: 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 Outcomes (COs)

On successful completion of the course, the learners should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Construct different types of equations and to compare and to find the relationships between roots and coefficients.	K6, K1
CO2	Identify the transformation of equations and to find approximate solutions to equations by making use of Newton's Method and Korner's Method.	K3
CO3	Identify types of matrices and to find the characteristic equation of matrix. Eigen values and eigen vectors can be determined by applying Cayley Hamilton Theorem.	K3, K5
CO4	Distinguish the differential equations of first order and higher degrees and to identify the equations which are all solvable for p, x, y and the equations in the standard form $Pp+Qq=R$.	K3, K4
CO 5:	Identify and distinguish Laplace transformation and inverse Laplace transformation	K3,K4

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	3	2	3	1	2
CO2	3	3	3	2	1
CO3	2	3	3	1	2
CO4	3	3	2	3	2

CO5	2	2	3	2	2
Total contribution of COs to PSOs	13	13	14	9	9
Weighted Percentage of COs contribution to PSOs	86.6	86.6	93.3	60	60

Course Content

UNIT-1:

Theory of Equations – Formation of Equations – Relation between roots and coefficients – Reciprocalequations.

UNIT-2:

Transformation of Equations – Approximate solutions to equations – Newton's method and Horner's method.

UNIT-3:

Matrices – Characteristic equation of a matrix – Eigen values and Eigen vectors – Cayley Hamilton theorem and simple Problems.

UNIT-4:

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-5:

Laplace transformation – Inverse Laplace transform.

Text Books:

1. Dr. S. Arumugam & Isaac – Allied Mathematics Paper- I, New Gamma Publishing House (2012), Palayamkottai

Books for Reference:

4. Narayanan. S and T.K. Manikavachagam Pillai - Differential Equations and its applications, S. Viswanathan Printers Pvt. Ltd, 2006.
5. T. Veerarajan - Algebra and Trigonometry - Yes Dee Publishing Pvt. Ltd., (2009)

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	1	2
CO2	3	3	3	2	1
CO3	2	3	3	1	2
CO4	3	3	2	1	2

Semester -II

Core II

Differential Equations and Analytical Geometry of Three dimension

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-IV	Core-II		Differential Equations and Analytical Geometry of Three dimension	90	-	-	4

Contact hours per semester:90

Contact hours per week:6

Year	Semester	Internal Marks	External Marks	Total marks
I	II	25	75	100

Objective: To explain ordinary differential equations with constant and variable coefficients and to describe sphere, intersection of two spheres and tangency of spheres

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

CO No.	Course Outcomes	Knowledge Level
CO1	Solve the differential equations which are all solvable for x, y, p and Clairaut's form. Also, to illustrate the method of solving the differential equations of the form $f_1(D)x + g_1(D)y = h_1(t)$, $f_2(D)x + g_2(D)y = h_2(t)$.	K2, K6
CO2	Identify and solve the second order linear differential equation with constant coefficients and to interpret the linear equations of second order with variable coefficients.	K2, K3, K6
CO3	Analyze the 3D-co-ordinate systems and how to find the direction cosines and direction ratios. Also to find the angle between planes, the length of the perpendicular and angle of bisection.	K1, K4
CO4	Find and classify the equation of lines in different forms and calculate the image of the point, image of a line and to distinguish lines and planes. The angle between the line and plane can be determined. coplanar lines can be shown and the shortest distance between.	K1, K2, K5
CO5	The equations of spheres and circles of intersection can be interpreted and	K2, K4

	to illustrate and analyze the tangency of sphere.	
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K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create
CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	3	2	3	1	2
CO2	3	2	3	2	1
CO3	3	3	2	3	2
CO4	2	3	3	2	1
CO5	3	1	2	1	1
Total contribution of Cos to PSOs	14	11	13	9	7
Weighted Percentage of COs contribution to PSOs	93.33	73.33	86.66	60	46.66

Course Content

Unit I:

First order higher degree equations -Solvable for x,y,p and Clairaut's Form-Simultaneous Differential equations of the form $f_1(D)x + g_1(D)y = h_1(t)$, $f_2(D)x + g_2(D)y = h_2(t)$

Unit II:

Ordinary Differential Equations-Second Order linear Differential Equations with constant Coefficients-Find the P.I for the function of the form $e^{ax}f(x)$ and $x^n f(x)$ -Linear Equation of second order with Variable coefficients.

Unit III:

Analytical Geometry of 3D -Co-Ordinate system, Direction Cosines, Direction Ratios-Equation of planes in different forms-angle between planes-Length of perpendicular-angle of bisection.

Unit IV:

Equation of a line in different forms-image of a point-image of a line-The plane and the straight line-angle between plane and the line-Coplanar lines-Shortest distance between two lines.

Unit V:

Sphere-Tangent plane-Circle of intersection-Tangency of spheres-Orthogonal spheres.

Text Books:

1. Narayanan.S and T.K.Manikavachagam Pillai-Differential Equations and its applications. S.Viswanathan Printers Pvt.Ltd,2006
2. Manickavachagam Pillai.T.K.,and T.Natarajan-A Text book of Analytical Geometry-Part II-Three dimensions-S.Viswanathan (Printers & Publishers) Pvt.Ltd(2012)

Book For Reference

1. Kandasamy.P and K.Thilagavathi-Mathematics for B.Sc., Vol. III and VI-S.Chand and Co.,New Delhi (2004)
2. Braun .M-Differential equations and their applications (III Edition)Springer-Verlag,Newyork (1983)
3. Boyce. W.E and R.C.Diprima-Elementary Differential Equations and Boundary value problems (VI Editions)-John Wiley and Sons,Inc,Newyork (2001)

Semester -II/IV

Allied Paper -II
Statistics-II (For Mathematics Students)

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-IV	Allied		Statistics-II	90	-	-	4

Contact hours per semester:90

Contact hours per week:6

Year	Semester	Internal Marks	External Marks	Total marks
I/II	II/IV	25	75	100

Objective: To know the importance of Correlation and regression and also to explain the basic concepts of various types of distribution.

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

CO No.	Course Outcomes	Knowledge Level
CO 1	To list out the characteristics of index numbers and to find Laspeyer's and Paache's, Fisher and Bowley's Edgeworth's index numbers. The method to classify and analyse the unit test, commodity reversal test, time reversal test and circular tests can be shown.	K1, K2
CO2	Construct testing of hypothesis and to distinguish null hypothesis and alternative hypothesis. Type I and Type II errors can be classified. The level of significance and test of significance for large samples can be explained.	K2, K4, K6,
CO3	Identify the distributions such as t-distributions and F-distribution. By making use of t-test the single mean and difference of means can be found out. Variance ratio test based on Chi-Square distribution by making use of this the goodness of fit can be decided.	K1, K3, K5
CO4	To find analysis of variance. One way and two way classified data can be explained and to randomize block design. Latin squares can be analysed and constructed.	K1, K4, K5
CO5	To explain statistical quality control and its advantages. Process control can be illustrated by making use of this control chart, range chart, P-chart can be designed	K2, K3

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	3	2	3	1	1
CO2	3	3	3	3	2
CO3	3	2	2	3	2
CO4	2	3	2	3	3
CO5	3	2	3	2	1
Total contribution of COs to PSOs	14	12	13	12	9
Weighted Percentage of COs contribution to PSOs	93.33	80	86.66	80	60

Course Content

UNIT-1:

Characteristics of index numbers – Laspeyres and Paache's – Fisher's and Browley and Edgeworth's index numbers Tests – Unit Test, Commodity Reversal Test, Time Reversal Test, Circular Test.

UNIT-2:

Testing of Hypothesis – Null hypothesis and Alternate hypothesis – Type I and Type II errors – Critical Region, Level of significance – Test of significance for large samples – Testing a single proportion – Difference of proportions Testing a single mean and Difference of means..

UNIT-3:

Tests based on t-distribution – Single mean and Difference of means – Tests based on F-Distribution – Variance Ratio Test based on Chi-Square Distribution – Independence – Goodness of fit.

UNIT-4:

Analysis of Variance – one way and two way classified data – Basic of experimental design – Randomized Block Design – Latin Square – Simple Problems.

UNIT-5:

Statistical Quality control – Definition – Advantages, Process Control – Control Chart, Mean Chart, Range Chart, P-Chart, Product Control – Sampling Inspection Plans.

Text Books:

1. Statistics – Arumugan & Thangapandi Issac, New Gamma Publications, 2016 (Unit-I, II & III).
2. Gupta. S.C & V.K. Kapoor – Fundamentals of Mathematical Statistics – (2002) Sultan Chand & Sons, New Delhi, for (Unit-IV & V).

Books for Reference:

1. Vittal. P.R – Mathematical Statistics, Maragatham Publications, 2004.
2. DCSacheti & Kapoor – Statistics, Sultan Chands New Delhi, Reprint-2017
3. R.S.N Pillai & Bagavathi, Statistics Theory and Practice, S Chand and Company Ltd, Reprint 2018.

Semester II/IV
Vector Calculus and Fourier Series
Allied Paper II (For Science students)

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-IV	Allied		Vector Calculus and Fourier Series	90	-	-	4

Contact hours per semester:90

Contact hours per week:6

Year	Semester	Internal Marks	External Marks	Total marks
II/II	II/IV	25	75	100

Objective: To know the concepts of vector differentiation and vector integration.

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

CO No.	Course outcomes	Knowledge level
CO1	Analyze what is meant by vector differentiation and how to apply vector differentiation and its properties..	K4, K3
CO2	Evaluate the double and triple integrals.	K5
CO3	Analyze and apply vector integration. By making use of Vector integration line, surface and volume integrals can be interpreted.	K2, K3, K4
CO4	Analyze and apply Green's, Stokes and divergence theorems	K3
CO5	Determine the functions whether the functions are odd or even. By making use of these concepts half range series can be found out.	K3, K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	3	3	3	2	2
CO2	3	3	3	3	2
CO3	3	3	2	2	1
CO4	2	2	3	1	1
CO5	3	2	2	2	1
Total contribution of	14	13	13	10	7

COs to PSOs					
Weighted Percentage of COs contribution to PSOs	93.33	86.66	86.66	66.67	46.67

Course Content:

UNIT-1:

Vector differentiation—Gradient—Divergence and curl.

UNIT-2:

Evaluation of double and triple integrals

UNIT-3:

Vector integration—Line, surface and volume integrals.

UNIT-4:

Green's, Stoke's and Divergence theorems (without proof)—simple problems.

UNIT-5:

Fourier series—Even and odd functions—Half range Fourier series.

Text Books:

1. Dr. S. Arumugam & others- Allied Mathematics Paper-II, New Gamma Publishing House, Palayamkottai, 2012.

2. T.K. Manicavachagom Pillai—Calculus (Vol III), S. Vishvanathan Printer and Publisher PVT. LTD (2012)

Books for Reference:

1. Dr. S. Arumugam and others—Analytical Geometry 3D & Vector Calculus, New Gamma Publishing House, Palayamkottai. (2017).
2. Susan. J.C—Vector Calculus (4th Edition), Pearson Education, Boston (2012).
3. Murray Spiegel—Vector analysis—Schaum Publishing company, New York (2009).

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Contribution of	14	13	13	10	9

Semester-III

Core-III

SEQUENCES AND SERIES

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-III	Core-III		Sequences And Series	90	-	-	4

Contact hours per semester:90

Contact hours per week:6

Year	Semester	Internal Marks	External Marks	Total marks
II	III	25	75	100

Objective: To acquire basic ideas of classical analysis and to study the behavior of sequences and series.**Course Outcomes:** On successful completion of the course, the students should be able to

CO No.	Course Outcome	Knowledge Level
CO1	Analyse the real number system and also to classify rational and irrational numbers. To find the upper bounds, least upper bounds and maximum element and to elaborate triangle inequality and Cauchy-Schwartz Inequality.	K1, K2, K4
CO2	Categorize the sequences as bounded sequences, monotonic sequences, convergent sequences and divergent sequences. Also to find the algebra of limits	K1, K4
CO3	Demonstrate the behavior of monotonic sequences and to apply Cauchy's first limit theorem, Make use of Cauchy's Second limit theorem and Cesaro's Theorem. Construct subsequence and to explain Cauchy's general principle of convergence.	K2, K3, K6
CO4	Interpret the series and to apply n^{th} term test, Comparison test, Kummer's test, D'Alembert's ratio test, Raabe's test, Gauss test and root test to compile the nature of the series.	K2, K3, K6
CO5	Analyse the alternating series. Apply the test for convergence for series of arbitrary terms. Also to identify the power series and to determine the radius of convergence.	K1, K3, K4, K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	3	3	3	3	3
CO2	2	2	3	3	1
CO3	3	3	2	3	2
CO4	3	1	3	2	2
CO5	3	1	2	1	2
Total contribution of COs to PSOs	14	10	13	12	10
Weighted Percentage of COs contribution to PSOs	93.33	66.67	86.67	0.8	66.67

Course Content

UNIT-1:

Inequalities, Triangle inequalities, Cauchy-Schwartz inequality, Sequences, Bounded Sequences, Monotonic Sequences. (Sec 2.1-2.3, 2.5, 3.1-3.4).

UNIT-2:

Convergent Sequences, Divergent and Oscillating Sequences, The algebra of limits, Behaviour of monotonic Sequences. (Sec 3.5-3.8)

UNIT-3:

Some theorems on limits, Subsequences, Cauchy Sequences, Series of positive terms- Infinite series, Comparison test (Sec 3.9, 3.10, 3.12, 4.1 & 4.2).

UNIT-4:

Kummer's test, Root test and condensation test (Section 4.3, 4.4)

UNIT-5:

Series of arbitrary terms, Alternating Series, Tests for convergence of series of arbitrary terms.

TextBooks:

- ❖ S. Arumugam, A. Thangapandi Issac and A. Somasundaram- "Sequences and series"- Yesdee Publications, Chennai. (First reprint 2021).

Book for Reference:

- Shanti Narayan & Dr. M.D. Raishingania, Elements of Real Analysis S. Chand & Co., Revised Edition 16th (2014)
- Ellina Grigorieva- Methods of Solving Sequence and series Problem- Springer Link.
- Richard R. Goldberg "Methods of real analysis" Oxford and IBH Publications Co. Pvt. Ltd. New Delhi, Indian Edition 1975.
- Tom. M. Apostol- Mathematical Analysis, Narosa Publishing house, New Delhi. (Reprint 1985).

Semester -III
Skill Based Core- Paper I
VECTOR CALCULUS

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-III	Skill Based Core-I		Vector Calculus	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
II	III	25	75	100

Objective: To lay a good foundation of vector differentiation and vector integration. Also to solve problems related to this.

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

CO No.	Course Outcome	Knowledge Level
CO1	Classify the vector point function and scalar point function. Determine the derivative of a vector and derivative of product of scalar and vector function.	K2,K5
CO2	Find divergence, curl. Make use of the Laplacian operator.	K1,K3
CO3	Interpret the integration of point function and to illustrate line integral. To solve surface integral.	K5,K6
CO4	Analyze and solve the volume integral. Also to illustrate and make use of Gauss Divergence Theorem to solve problems.	K2, K3,K6
CO5	To solve problems based on Green's theorem and Stoke's Theorem	K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	3	3	1	3
CO2	2	2	3	2	1
CO3	3	3	3	3	2
CO4	3	1	2	2	1
CO5	1	1	2	3	3
Total contribution of COs to PSOs	12	10	13	12	10
Weighted Percentage of COs contribution to PSOs	80	66.67	86.67	80	66.67

Course Content

UNIT-1:

Vector point functions, Scalar point functions – Derivative of a vector and derivative of sum of vectors – Derivative of product of a scalar and vector point function – The vector operator ∇ - Gradient

UNIT-2:

Divergence–Curl, solenoidal, irrotational vectors–Laplacian operator.

UNIT-3:

Integration of point function–Line integral–Surface integral.

UNIT-4:

Volume Integral–Gauss divergence theorem (Statement without Proof)–Problems.

UNIT-5:

Green's theorem and Stoke's theorem (Statement without Proof)–Problems.

TextBook:

- ❖ Duraipandian and Laxmi Duraipandian, Vector Analysis-Emerald Publishers (Revised Edition, Reprint 2005).

Books for References:

- Dr. S. Arumugam and others–Vector Calculus, New Gamma Publishing House. (2006).
- Susan J.C–Vector Calculus (4th Edition), Pearson Education, Boston (2012).
- Murray Spiegel-Vector analysis – Schaum Publishing company, New York (2009).
- Dr. M.K. Venkataraman and Mrs. Manorama Sridhar, Vector Calculus and Fourier Series, The National Publishing Company, Chennai-1, (2002)
- R. Gupta, Vector Calculus, FIREWAL Media (An imprint of Lakshmi Publications Pvt. Ltd)-New Edition, Copyright © 2010.

PS01	PS02	PS03	PS04	PS05
3	4	3	3	3
12	10	13	12	10
30	20	25	20	20

SEMESTER-III
Non -Major Elective Paper I

Mathematics for competitive Examinations -I

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-III	Non major-I		Mathematics for competitive Examinations -I	30	-	-	2

Contact hours per semester:30

Contact hours per week:2

Year	Semester	Internal Marks	External Marks	Total marks
II	III	25	75	100

Objective: To learn the techniques for solving aptitude problems and to enable the students prepare themselves for various competitive examinations.

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

CO No.	Course Outcome	Knowledge Level
CO1	Interpret simplification and find averages	K1, K2
CO2	Determine ratio and proportion	K5
CO3	Assess partnership and solve percentage problems	K4, K5
CO4	Distinguish profit and loss	K4
CO5	Solve problems on numbers	K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	3	3	3	3
CO2	3	2	3	3	1
CO3	2	3	2	3	2
CO4	3	1	3	2	2
CO5	1	1	1	3	2
Total contribution of COs to PSOs	12	10	12	14	10
Weighted Percentage of COs contribution to PSOs	80	66.67	80	93.33	66.67

Course Content

Unit -1:

Simplification, averages.

Unit -2:

Ratio and proportion.

Unit-3 :

Partnership-percentages.

Unit-4 :

Profit and Loss

Unit-5:

Problems on numbers.

Text Book:

- ❖ R.S.Agarwal -Objective arithmetic, Published by S.Chand & Co Ltd. Edition 2018

Book for References:

- ❖ R.S.Agarwal - Arithmetic subjective and Objective, Published by S.Chand & Co Ltd. Revised Edition 1st April 2017
- ❖ Rajesh Verma, Fast track Objective arithmetic, Arihant Publications India Limited Fourth Edition, 1st January 2018.

Course Outcome	Internal Marks	External Marks	Total marks
III	25	75	100

Course Outcome	PS01	PS02	PS03	PS04	Contribution of COs to PSOs	Weighted Percentage contribution to PSOs
CO1	3	3	3	3	12	15.00%
CO2	3	3	3	3	12	15.00%
CO3	3	3	3	3	12	15.00%
CO4	3	3	3	3	12	15.00%
CO5	3	3	3	3	12	15.00%
Contribution of COs to PSOs	15	15	15	15	60	75.00%
Weighted Percentage contribution to PSOs	80	80	80	80	320	60.00%

SEMESTER-III
Non -Major Elective Paper I
FUNDAMENTALS OF STATISTICS-I

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-III	Non major-I		Fundamentals of Statistics-I	30	-	-	2

Contact hours per semester:30

Contact hours per week:2

Year	Semester	Internal Marks	External Marks	Total marks
II	III	25	75	100

Objective: To introduce the new concept of Measure of Central Tendency to other major students .Also to study about correlation, regression and to solve simple problems.

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

CO No.	Course Outcome	Knowledge Level
CO1	Analyse the classification of datas.Also to construct bar diagram and Pie chart.	K3, K6
CO2	Illustrate measure of central tendency and to find mean,median and mode.	K1,K2
CO3	Explain the measure of dispersion .Also to find standard deviation,variance,quartile deviation and to obtain the relationship between them.	K4,K5
CO4	Interpret correlation and to solve rank correlation problems.	K2,K6
CO5	To find solution for regression equations	K1, K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	3	3	3	3
CO2	3	2	3	3	1
CO3	3	3	3	3	3
CO4	3	2	3	3	2
CO5	1	2	2	1	2
Total contribution of COs to PSOs	13	12	14	13	11
Weighted Percentage of COs contribution to PSOs	86.67	80	93.33	86.67	73.33

Course Content

UNIT-1:

Classification of datas–BarDiagram–Pie chart.

UNIT-2:

Measures of central tendency: Mean, median, mode (with frequency).

UNIT-3:

Measures of dispersion: Range-standard deviation, Variance-Quartile deviation.

UNIT-4:

Correlation-Rank correlation (Problem only)

UNIT-5:

Regression equations (Problem only)

Text Book:

- Dr. S. Arumugam, A. Thangapandi Issac- Statistics, New Gamma Publishing House, Palayamkottai. (2016)

Books for Reference:

- S.P. Gupta-Elementary Statistical Methods, Sultan Chand & Sons, (2017).
- T. Veerarajan, Fundamentals of mathematical Statistics, Yes Dee Publishing Pvt, Ltd.. (2017)
- C.B. Gupta and Vijay Gupta, An Introduction to Statistical Methods, Vikas Publishing House Pvt. Ltd. New Delhi -(1973)

CO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	1	3	3	1	3
Contribution of PSOs	13	12	14	13	11
Total Percentage Contribution	86.67	80	88.89	86.67	77.33

Semester -IV
CORE -IV
ABSTRACT ALGEBRA

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-III	Core		Abstract Algebra	90	-	-	4

Contact hours per semester:90

Contact hours per week:6

Year	Semester	Internal Marks	External Marks	Total marks
II	IV	25	75	100

Objective: To acquire knowledge about the concept of groups,rings and fields and to study about the concept of homomorphism.

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

CO No.	Course Outcome	Knowledge Level
CO1	Explain the definitions of groups and its examples.Also to determine the order of an element.Illustrate about Subgroups.	K2,K4
CO2	Interpret cyclic groups and to find the generators of cyclic subgroups. Illustrate and apply Lagrange's Theorem,Euler's Theorem and Fermat's Theorem.	K1,K3,K6
CO3	Elaborate about Normal Subgroups and group homomorphism.Illustrate Isomorphism ,Automorphism .Also to apply Cayley's theorem wherever required.	K4,K5
CO4	Compare and classify Rings and its types.Illustrate about Integral domain and Fields .To summarize about maximal and minimal ideals.	K1,K6
CO5	Utilize the concept of homomorphism and isomorphism on rings .Also to find kernel of homomorphism and to make use of fundamental theorem.	K3,K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	3	3	3	3
CO2	2	2	3	3	3
CO3	3	3	2	2	2
CO4	2	1	3	1	2
CO5	2	2	2	1	2
Total contribution of COs to PSOs	12	11	13	10	12
Weighted Percentage of COs contribution to PSOs	80	73.33	86.67	66.67	80

Course Content

UNIT-1: Groups – definition and examples-Elementary properties of groups – subgroup – order of an element– centre of a group –Normaliser and Centralizer – Product of two Subgroups – order of HK – Intersection and union of subgroups

UNIT-2 Cyclic groups–generators of a cyclic group–Cosets and Lagrange’s theorem– Euler’s theorem– Fermat’s theorem.

UNIT-3: Normal Subgroups–Quotient groups – Group Homomorphism – Canonical homomorphism – Kernel of a homomorphism–Isomorphism–Automorphism–Inner automorphism–Permutation groups– Cayley’s theorem.

UNIT-4: Rings: Definition and examples – Types of rings – Elementary properties of a ring – Integral domain – Field – Subrings – Subfields – Ideals – Principal ideal – Quotient ring – Maximal and prime ideals.

UNIT-5: Homomorphism of rings – Isomorphism – Kernel of a homomorphism – Fundamental theorem.

TextBook:

- ❖ S.Arumugam and A.Thangapandi Issac “ Modern Algebra ” - Scitech Publications, Privatelimited.(2008)

Books for Reference:

- M. L.Santiago, Modern Algebra–McGraw-Hill Education India Pvt. Limited,(2002).
- T K. Manicka Vachagampillai and others - Modern Algebra – Visvanathan Publishers(2011).
- Visvanathan Nayak, Modern Algebra–Emerald Publishers, Reprint 1992.

PS01	PS02	PS03	PS04	PS05	PS06
3	3	3	3	3	3
3	3	3	3	3	3
3	3	3	3	3	3
3	3	3	3	3	3
3	3	3	3	3	3
3	3	3	3	3	3
12	11	13	10	12	12
80	75.5	86.5	66.5	80	80

SEMESTER -IV
Skill Based Core-Paper- II
TRIGONOMETRY,LAPLACE TRANSFORMS AND FOURIER SERIES

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-III	Skill Based Core		Trigonometry, Laplace Transforms and Fourier Series	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
II	IV	25	75	100

Objective: To understand the concept of Trigonometry and to acquire knowledge about Laplace Transform and its inverse. Also to study the concept of Fourier series and to solve problems by making use of it.

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

CO No.	Course Outcome	Knowledge Level
CO1	Summarize about Trigonometry and to illustrate about the expansion of $\sin^n x$, $\cos^n x$, $\sin^n x$, $\cos^n x$	K2,K3
CO2	Obtain the relationship between hyperbolic functions and circular function. Explain about inverse hyperbolic functions.To find summation of the series using C+iS method.	K1,K4
CO3	Illustrate laplace transform	K5
CO4	Solve differential equations with constant coefficients by making use of Laplace Transforms.	K6
CO5	Solve problems based on Fourier series . Identify the odd and even functions and to deduce half range series.	K3,K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	3	3	3	3
CO2	2	2	3	3	3
CO3	3	3	2	2	2
CO4	3	2	3	1	2
CO5	3	3	1	1	1
Total contribution of COs to PSOs	14	13	12	10	11
Weighted Percentage of COs contribution to PSOs	93.33	86.67	80	66.67	73.33

Course Content:

UNIT-1:

Trigonometry: Expansion of $\sin nx, \cos nx, \tan nx$ and expansions of $\sin^n x$ and $\cos^n x$.

UNIT-2:

Hyperbolic functions – Relation between hyperbolic functions and circular functions – Inverse hyperbolic functions – Logarithm of a complex number – Summation of series using C+iS method

UNIT-3:

Laplace transforms.

UNIT-4:

Inverse transforms, Solving linear differential equations with constant coefficients using Laplace Transforms.

UNIT-5:

Fourier Series – Definition, Finding Fourier coefficients for a given periodic function with period 2π and $2l$, odd and even functions, Half range series.

TextBook:

- ❖ Arumugam. Sand Thangapandi Issac. A – Trigonometry and Fourier Series.
- ❖ T.K. Manickavachagam Pillai and S. Narayanan – Differential equations and its applications, S. Viswanathan Publishers 2011.

Books for reference:

- T. Veerarajan – Algebra and Trigonometry – YES DEEP Publishing pvt. Ltd., Chennai. (2020).
- Ray Hanna. J – Fourier Series, Transforms and Boundary value Problems, Dover Publications New York, 2008.
- Dr. M.K. Venkataraman and Mrs. Manorama Sridhar, Vector Calculus and Fourier Series, The National Publishers Company, Chennai (2002).

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Contribution of COs to PSOs	14	13	13	10	11
Weighted Percentage	93.33	86.67	80	66.67	77.77
CO1	3	2	2	3	3
CO2	2	2	3	2	3
CO3	3	3	2	2	2
CO4	3	2	3	1	2
CO5	3	3	1	1	1

SEMESTER -IV
Non-Major Elective -II
MATHEMATICS FOR COMPETITIVE EXAMINATION-II

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-IV	Non Major		Mathematics for competitive examinations-II	30	-	-	4

Contact hours per semester:30

Contact hours per week:2

Year	Semester	Internal Marks	External Marks	Total marks
II	IV	25	75	100

Objective: To learn the techniques for solving aptitude problems. Also to motivate the students for attending various competitive examinations.

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

CO No.	Course Outcome	Knowledge Level
CO1	Analyse and solve the problems based on simple interest and compound interest.	K2,K6
CO2	Apply short tricks on solving time and work problems	K3
CO3	Making use of the concept of time and distance while solving problems	K5
CO4	Utilize Chain rule	K4
CO5	Find solutions for pipes and Cistern problem	K1

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	3	3	3	3
CO2	2	2	3	3	3
CO3	3	3	2	2	2
CO4	3	2	3	2	3
CO5	3	3	1	3	3
Total contribution of COs to PSOs	14	13	12	13	14
Weighted Percentage of COs contribution to PSOs	93.33	86.67	80	86.67	93.33

Course Content:

UNIT-1:

Simple interest and Compound interest.

UNIT-2:

Time and work.

UNIT-3:

Time and Distance.

UNIT-4:

Chain Rule.

UNIT-5:

Pipes and Cistern

TextBook:

- ❖ R.S.Agarwal- Objective Arithmetic, Published by S.Chand & Co Ltd., Edition (2018).

Books for Reference:

- Rajesh Verma-Fastrack Objective arithmetic, Arihant Publications (India) Limited., Fourth Edition 1st January 2018.
- R.S.Agarwal, Arithmetic Subjective and objective, Published by S.Chand and Co.Ltd. Revised Edition on 1st April 2017.

CO	PS01	PS02	PS03	PS04	PS05
CO1	1	2	3	3	3
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Contribution of PS01 to PS05	14	12	12	13	14
Weighted Percentage contribution to PS05	23.33	20.00	20.00	21.67	23.33

SEMESTER -IV
Non-Major Elective -II
FUNDAMENTALS OF STATISTICS-II

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credit (C)
Part-IV	Non Major		Fundamentals of Statistics-II	30	-	-	4

Contact hours per semester:30

Contact hours per week:2

Year	Semester	Internal Marks	External Marks	Total marks
II	IV	25	75	100

Objective: To know the concept of attributes and to study the index numbers and simple problems.

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

CO No.	Course Outcome	Knowledge Level
CO1	Explain the theory of Attributes	K3
CO2	Illustrate about index numbers and to determine the weighted index numbers.	K1,K5
CO3	Analyse and predict consumer price index numbers	K6
CO4	Evaluate Time series	K4
CO5	Apply curve fitting for straight line ,parabola and exponential curve	K2

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	2	3	3	3	3
CO2	2	2	3	3	3
CO3	3	3	2	2	2
CO4	3	2	1	2	3
CO5	2	3	1	3	3
Total contribution of COs to PSOs	12	13	11	13	14
Weighted Percentage of COs contribution to PSOs	80	86.67	73.33	86.67	93.33

Course Content:

UNIT-I

Theory of attributes–two attributes.

UNIT –II

Index number –weighted index number.

UNIT – III

Consumer Price index number –conversion of index number.

UNIT –IV

Time series –measurement of trends.

UNIT-V

Curve fitting–Straight line –Parabola –Exponential curve.

TextBook:

- ❖ Dr. S. Arumugam, A.Thangapandilssac- Statistics, New Gamma Publishing House,Palayamkottai (2016).

Books for Reference:

- S.P.Gupta-Elementary Statistical Methods,Sultan Chand & Sons,2017).
- T. Veerarajan Fundamentals of mathematical Statistics, YesDee Publishing Pvt.Ltd.Edition .(2017)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	3	3
CO2	2	2	2	2	2
CO3	3	2	2	2	2
CO4	3	2	2	2	2
CO5	2	2	2	2	2
Total contribution of COs to PSOs	12	13	11	13	14
Weighted Percentage COs contribution to PSOs	80	86.67	73.33	86.67	93.33

II	SI	SI	II	SI	Total contribution of COs to PSO
22.33	0.8	22.87	22.33	80	Weighted Percentage of COs contribution to PSO

Semester-V

Core-V

LINEAR ALGEBRA

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Core-V		Linear Algebra	75	-	-	4

Contact hours per semester:75

Contact hours per week:5

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective:To acquire knowledge about vectors spaces,Inner product space and linear transformations.Also to solve problems in Matrices

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

CO No.	Course Outcome	Knowledge Level
CO1	Explain the definitions and general properties of vector spaces. Also to explain subspace. They know where to apply fundamental theorem of homomorphism.	K1, K2
CO2	Determine the span of a set and to check whether the given set is Linearly dependent or not.Also to find basis and dimensions.	K4
CO3	Illustrate and apply Rank Nullity theorem.Explain the definitions and examples of inner product space.Apply Gram Schmidt Orthogonalization process.	K3,K6
CO4	Construct matrices and also to summarize the elementary transformations.Determine the Inverse of matrix and rank of a matrix. To make use ofCayley Hamilton Theorem.	K2, K6
CO5	Determine Eigen Values and Eigen Vectors. Identify bilinear forms and quadratic forms.Also To deduce Diagonal form from Quadratic form.	K4,K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	2	2	3	3	1
CO3	3	3	2	3	2
CO4	2	1	3	2	2
CO5	2	2	2	1	3

Total contribution of COs to PSOs	12	11	13	12	11
Weighted Percentage of COs contribution to PSOs	80	73.33	86.67	0.8	73.33

Course Content

UNIT-1:

Vectorspaces:Definitionandexamples–Elementaryproperties–subspaces–lineartransformations–Fundamentaltheoremofhomomorphism.

UNIT-2:

Spanofaset–linear dependenceandindependence–basisanddimension.

UNIT-3:

Rank - Nullity theorem – Matrix of a linear transformation – Inner product space – Definitionandexamples–orthogonality –orthogonalcomplement–Gram Schmidorthogonalizationprocess.

UNIT-4:

Matrices –Elementarytransformation–Inverse and power of a matrix using CayleyHamilton’stheorem–Inverse and rank of a matrix using elementary transformations.

UNIT-5:

Eigen values and Eigen vectors – Properties and problems – Bilinear forms – Quadratic forms –Reductionofquadraticformtodiagonalform.

TextBook:

- ❖ S.Arumugan&ThangapandiIssac ,Modern Algebra-Scitech Publication,Reprint(2008).

BooksforReference:

- SharmaJ.NandVashisthaA. R.LinearAlgebra-KrishnaPrakashNandir1981.
- JohnB. Fraleigh–AfirstCourseinAbstractAlgebra 7thedition, Pearson, 2002.
- N. Ramabhadran&R.Balakrishnan,Textbookofalgebra – VikasPublishingCo.RevisedEdition1985.
- Ward Cheney and David Kincaid,Linear Algebra-Theory and Applications.Jones and Barlett India PVT Ltd, New Delhi -First Edition(2010)

					Weighted Percentage of COs contribution to PSOs

Semester-V

Core-VI

REAL ANALYSIS

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Core-VI		Real Analysis	75	-	-	4

Contact hours per semester:75

Contact hours per week:5

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To acquire knowledge about the real number system and metric spaces. Also to study the concepts of connectedness and compactness.

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

CO No.	Course Outcome	Knowledge Level
CO1	Explain about Metric spaces and to construct an open ball. Also to interpret interior	K1, K3
CO2	Interpret about closed sets and to find closure. To determine limit points. Analyze about complete metric space. Discuss about Cantor's intersection theorem and Baire's Category theorem.	K2, K4
CO3	Summarize continuity. Illustrate about uniform continuity.	K3, K5
CO4	Explain about connectedness and to deduce the connected subsets of \mathbb{R} . To obtain the relationship between connectedness and continuity	K4, K6
CO5	Illustrate about compactness and to find the connected subsets of \mathbb{R} . Illustrate and make use of Heine Borel Theorem. To determine the relationship between compactness and continuity.	K3, K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	3	3	3	3	3
CO2	2	2	3	3	1
CO3	3	3	2	3	2
CO4	1	2	3	2	2
CO5	1	2	2	3	3
Total contribution of	10	12	13	14	11

COs to PSOs					
Weighted Percentage of COs contribution to PSOs	66.67	80	86.67	93.33	73.33

Course Content

UNIT-1:

Metricspaces –Examples –boundedsets –openball–opensets –subspaces–interiorofaset.

UNIT-2:

Closedsets–closure–limitpoints–dense set–completemetricspace–Cantor’s intersectiontheorem–Baire’s categorytheorem.

UNIT-3:

Continuity–Homeomorphism–UniformContinuity

UNIT-4:

Connectedness–Connectedsubsetsof \mathbf{R} –Connectedness andcontinuity–Contractionmappingtheorem.

UNIT-5:

Compactness–Compactmetricspaces–Compactsubsetsof \mathbf{R} –HeineBoreltheorem–Equivalent characterizations forcompactness–Compactnessand Continuity.

TextBook:

- ❖ Dr. S. Arumugan,ModernAnalysis–YesDeePublishingPvt.Ltd.Reprint(2019).

Books for Reference:

- RichardR.Goldberg–MethodsofRealAnalysis-OxfordandIBHPublishingCo.NewDelhi,Indian edition 1985.
- RVisvanathanNayak,RealAnalysis-EmeraldPublishers, Reprint1992.
- Dr.B.S.Vatsa,Introductionto Real Analysis,CBS Publishers and Distributors,New Delhi.

1	2	3	4	5	6
3	3	3	3	3	3
3	3	3	3	3	3
3	3	3	3	3	3
13	14	12	12	11	Total contribution of COs to PSO
80.00	93.33	80	80	73.33	Weighted Average of CO contribution to PSO

Semester-V

**Core-VII
STATICS**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Core-IX		Statics	75	-	-	4

Contact hours per semester:75

Contact hours per week:5

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To provide the basic knowledge of equilibrium of a particle and to develop a working knowledge to handle practical problems.

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

CO No.	Course Outcome	Knowledge Level
CO1	Explain the forces acting at a point and to apply the parallelogram law of forces, Triangle law of forces and Lami's theorem.	K2,K4
CO2	Interpret parallel forces and moments. Analyse the resultant of two parallel forces and the resultant of two unlike unequal parallel forces. To apply Varignon's theorem.	K1,K6
CO3	Summarize equilibrium of three forces acting on a rigid body and to illustrate three coplanar forces theorem and to make use of the above theorem to solve problems	K3,K5
CO4	Explain about laws of friction. Also to determine the angle of friction and illustrate about the equilibrium of a particle and to make use of the concepts to solve the problems.	K1,K2,K6
CO5	Interpret the equilibrium of strings. To deduce the equation of catenary and its geometrical properties.	K2,K4

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	3	3	3	3

CO2	3	2	3	3	1
CO3	3	3	2	3	3
CO4	1	2	3	2	3
CO5	1	2	1	3	3
Total contribution of COs to PSOs	11	12	12	14	13
Weighted Percentage of COs contribution to PSOs	73.33	80	80	93.33	86.67

Course Content

UNIT-1:

Forces acting at a point – Parallelogram law of forces – Triangle law of forces – Lami's theorem

UNIT-2:

Parallel forces and moments – resultant of two parallel forces – resultant of two unlike unequal parallel forces – Varignon's theorem

UNIT-3:

Equilibrium of three forces acting on a rigid body – three coplanar forces theorem.

UNIT-4:

Friction – Law of friction – angle of friction – equilibrium of a particle (i) on a rough inclined plane (ii) under a force parallel to the plane (iii) under any force

UNIT-5:

Equilibrium of strings – equation of the common catenary – tension at any point – geometrical properties of common catenary

Text Book:

- ❖ M.K. Venkatraman – Statics, Agasthiar Publications, Trichy (2020).

Books for reference:

- S. Narayanan, Statics S. Chand and Company, New Delhi (1985).
- K. Viswanatha Naik and M. Kari, Statics, Emerald Publishers, Chennai.
- I. Rajeswari – Mechanics - Saras Publication, Nagercoil (2016).

Semester-V
Core-VIII
INTEGRAL TRANSFORMS AND Z TRANSFORMS

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Core-VIII		Integral Transforms and Z transforms	75	-	-	4

Contact hours per semester:75

Contact hours per week:5

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To develop the knowledge of transforms and to solve problems in Fourier transforms and Z transforms.

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

CO No.	Course Outcome	Knowledge Level
CO1	Apply Fourier transforms and to explain the properties.	K2,K4
CO2	Solve problems on infinite Fourier cosine and Sine Transforms	K1,K6
CO3	Identify and solve Finite Fourier transforms	K3,K5
CO4	Illustrate Z transforms and its properties.	K1,K2,K6
CO5	Utilize inverse Z transforms to solve difference equations.	K2,K4

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	3	3	3	3
CO2	3	2	3	3	1
CO3	1	3	2	2	3
CO4	2	2	3	1	3
CO5	2	3	2	2	3
Total contribution of COs to PSOs	11	13	13	12	13
Weighted Percentage of COs contribution to PSOs	73.33	86.67	86.67	80	86.67

Course Content

UNIT-1:

Fourier Transforms–Properties of Fourier Transforms.

UNIT-2:

Infinite Fourier Cosine and Sine Transforms–Properties.

UNIT-3:

Finite Fourier Transforms.

UNIT-4:

Z-transforms–Properties.

UNIT-5:

Inverse Transforms- Introduction to difference equations and find solution using inverse Z transforms

TextBook:

- ❖ Singaravelu.A–Engineering mathematics (volumelII) –MeenakshiAgency,Chennai(2019).

Books for Reference:

- MuthuKumaraswamy.R- Transforms and Partial Differential Equation Equations–YesDee Publications –Second Edition(2019).
- Gangatharan,Engineering Mathematics (volume I)–Prentice Hall of India Pvt.Ltd.(2007).
- Dr.C.Muthulakshmi@Saisikala and R.Ponraj- Transformsand their applications,Charulatha Publication(2020).

COs	P201	P202	P203	P204	P205
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	1	3	3	3	3
CO4	2	3	3	3	3
CO5	2	3	3	3	3
Contribution of COs to P20s	11	13	13	13	13
Total Percentage Contribution of P20s	73.33	86.67	86.67	80	86.67

CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Total contribution of COs to PSO	15	15	15	15	15	15
Weighted Percentage of COs contribution to PSO	73.33	80	80	80	80	80

Semester-V
Major Elective-I
PROGRAMMING IN C

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Non Major - I		Programming in C	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To study the basic concepts and structure of C program and to train the students to write simple C programs.

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

CO No.	Course Outcome	Knowledge Level
CO1	Summarize about character set. Classify the keywords and identifiers. Identify the constants, variables and data types.	K3,K4
CO2	Apply different types of operators and to make use of input and output operators.	K1,K6
CO3	Compile programs by utilizing decision making and branching statements. Also to apply Decision making and looping statements while develop a program.	K2,K5
CO4	Make use of one dimensional and two dimensional arrays. Also to utilize Character arrays and strings and its functions while compiling the program	K3,K6
CO5	Illustrate user defined functions and illustrate the definitions of functions and return values and their types. Also to categorize function call, function declaration.	K2,K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	3	2	2	2	3

CO2	2	3	3	3	2
CO3	2	3	2	2	3
CO4	2	2	3	3	3
CO5	2	2	2	3	3
Total contribution of COs to PSOs	11	12	12	13	14
Weighted Percentage of COs contribution to PSOs	73.33	80	80	86.67	93.33

Course Content

UNIT-1:

Introduction – Character set, C tokens ,keywords and identifiers, Constants ,Variables andDatatypes.

UNIT-2:

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-3:

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, DOWHILE and for statement, jumps in loops.

UNIT-4:

Onedimensional and twodimensional 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-5:

User defined functions –

Definition of function, return values and their types, function calls, function declaration, Category of functions, Nesting of functions, recursion.

Text Book:

- ❖ E. Balaguruswamy - Programming in ANSI C – Tata McGraw Hill Publishing company limited – III Edition (2017).

Books for references:

- C. Reema Thareja, Programming in C - Oxford University Press (2018).
- Ramasamy et al. - Programming in C - Scitech Publication (INDIA) Pvt. Ltd. II Edition (2015).
- Ashok N. Kamathane - Programming with ANSI and Turbo C – Dorling Kindersley (India) Pvt. Ltd. (2009).

1	2	3	4	5	6
13	11	13	14	12	10
88.67	73.33	88.67	93.33	80	80

Semester-V
Major Elective-I
DISCRETE MATHEMATICS

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Non Major - I		Discrete Mathematics	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To study concepts of mathematical logics and to understand the basics of Lattices and Boolean Algebra.

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

CO No.	Course Outcome	Knowledge Level
CO1	Illustrate and use the statements, notations and connectives. Construct truth table and utilize conditional and biconditional statements.	K2, K3
CO2	Analyze and explain Predicate calculus	K1, K4
CO3	Elaborate Groups and monoids. Also to develop Group codes	K6
CO4	Construct Lattices and special lattices. Analyze and explain Boolean algebra	K5
CO5	Convert From one form to another form (Decimal, Binary, Octal, Hexadecimal). Evaluate Binary addition, subtraction multiplication and division.	K2, K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	1	3
CO2	3	3	3	3	2
CO3	3	3	2	1	3
CO4	2	3	3	3	3

CO5	1	3	2	3	2
Total contribution of COs to PSOs	12	14	13	11	13
Weighted Percentage of COs contribution to PSOs	80	93.33	86.67	73.33	86.67

Course Content

UNIT-1: Mathematical logic – Statements and notation, Connectives, Negation, Conjunction, Disjunction, Statement formula and truth table, Conditional and biconditional statements. Well defined formulae, tautologies.

UNIT-2: Normal forms - The theory of inference for the statement calculus, The Predicate, Theory of inference for the Predicate Calculus.

UNIT-3: Algebraic structures - Groups and monoids, Simple properties, Group codes.

UNIT-4: Lattices and Boolean algebra - Lattices as posets, Properties of lattices, special lattices, Boolean algebra, Gating networks, Minimal sums of products.

UNIT-5: Number system and codes - Decimal, Binary, Octal, Hexadecimal – Conversion from one to another – Binary addition, subtraction, multiplication and division, BCD, Weighted excess time, Gray code.

Text Book:

- ❖ J.P. Tremblay and Manohar - Discrete mathematical structures with application to Computer Science (Tata McGraw Hill) New Delhi, 43rd edition 2013.

Books for Reference:

- M. K. Venkataraman and others – Discrete mathematics - The National Publishing Pvt. Ltd. (2000).
- G. Balaji – Discrete mathematics – Balaji Publishers Chennai (2013).
- T. Veerarajan – Discrete mathematics Tata McGraw Hill – 2009.
- Garrett Birkhoff - Lattice Theory, American Mathematical Society (1948).
- M.K. Sen, B.C. Chakraborty, Introduction to Discrete Mathematics, Books and Allied (P) Ltd (2009).

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3

8	11	10	9	10	Total contribution of COs to PSO
22.22	33.33	33.33	33.33	33.33	Weighted Percentage of COs contribution to PSO

Semester-V
Major Elective-I
COMBINATIONAL MATHEMATICS

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Non Major - I		Combinational Mathematics	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To know the basic concepts of pairings and to understand relations

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

CO No.	Course Outcome	Knowledge Level
CO1	Explain Selections and to find binomial coefficients. Classify ordered selections and unordered selections.	K1, K3
CO2	Solve pairing problems	K3
CO3	Explain recurrence and classify the types of relations using generating functions.	K2, K5
CO4	Illustrate The inclusion and exclusion principles.	K4, K6
CO5	Construct and solve block designs and square block designs.	K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	1	3
CO2	2	1	2	3	1
CO3	2	2	2	1	2
CO4	2	1	1	3	1
CO5	1	3	2	3	1

Total contribution of COs to PSOs	10	9	10	11	8
Weighted Percentage of COs contribution to PSOs	66.67	60	66.67	73.33	53.33

Course Content

UNIT-1:

Selections and Binomial coefficients–Permutations–Ordered selections–unordered selections–Miscellaneous Problems.

UNIT-2:

Pairings Problems–Pairings within a set–Pairing between sets.

UNIT-3:

Recurrence–Fibonacci–type relations using generating functions–Miscellaneous methods.

UNIT-4:

The Inclusion–Exclusion Principles.

UNIT-5:

Block designs–square block designs.

TextBook:

- ❖ Ian C. Andersen–A first course in combinatorial mathematics –Clarendon Press,Oxford(1989).

Books for Reference:

- Ralph P. Grimaldi, B. V. Ramona –Discrete and combinatorial mathematics–an applied introduction (I V edition).

Cos					
CO1	3	3	3	1	3
CO2	2	1	2	3	3
CO3	2	1	2	3	2
CO4	2	3	1	3	3
CO5	3	3	2	3	3
Total contribution of COs to PSOs	12	11	10	13	14
Weighted Percentage of COs contribution to PSOs	80	73.33	66.67	86.67	93.33

Course Content

UNIT-1:

Linear Programming Problem: Mathematical formulation of LPP–Graphical method, Simplex method–Artificial variable technique.

UNIT-2:

Concept of Duality–Primal and Dual problems–Duality–Dual Simplex method.

UNIT-3:

Transportation Problem: North-west Corner rule–Matrix-Minima method–Vogel’s approximation method–MODI method–Degeneracy and unbalanced Transportation problem.

UNIT-4:

Assignment Problem: Hungarian method –Unbalanced assignment problems.

UNIT-5:

Sequencing Problem: n jobs and two machines – n jobs and three machines – 2 jobs and m machines.

TextBook:

- ❖ Kanti Swarup, P. K. Gupta and Manmohan – Operations Research – Sultan Chand and sons, (New Delhi) 12th edition (2006)

Books for Reference:

- Gupta P. K. and D. S. Hira – Operations Research – S. Chand & Sons Reprint (2012).
- B. J. Ranganathan and A. S. Srikantappa – Operations Research – Yes Dee Publishing House, Chennai (2017).
- Hamdy A. Taha – Operations Research, An Introduction - 8th Edition Prentice–Hall India (2006).
- A. C. S. Kumar, Operation Research, Yes Dee Publications, Chennai, 3rd Reprint 2019.

CO3	1	1	2	3	1	1
CO4	2	2	1	3	3	2
CO5	3	3	3	3	3	3
Total contribution of COs to PSOs	11	11	10	13	11	11
Weighted Percentage of COs contribution to PSOs	17.33	17.33	16.67	20.00	17.33	17.33

Semester-V
Major Elective-I
STOCHASTIC PROCESS

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective		Stochastic Process	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	V	25	75	100

Objective: To understand the concepts of stochastic process and understand the generalization of Poisson process

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

CO No.	Course Outcome	Knowledge Level
CO1	Determine the generating functions .Also to analyze and explain Stochastic Process and specification of stochastic process	K1,K3
CO2	Interpret Markov Chains .Also to analyze the classification of states and chains. Illustrate the stability of Markov chain.	K2,K4
CO3	Classify Markov chain with denumerable states and Markov chain with continuous state space.	K2,K5
CO4	Illustrate Markov Process with discrete state space by using Poisson Process.	K1,K6
CO5	Elaborate Erlang Process.	K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	3	3	3	1	3
CO2	2	1	2	3	3

CO3	1	1	2	3	2
CO4	2	3	1	3	3
CO5	3	3	2	3	2
Total contribution of COs to PSOs	11	11	10	13	13
Weighted Percentage of COs contribution to PSOs	73.33	73.33	66.67	86.67	86.67

Course Content:

UNIT-1:

Generating functions–Laplace transform of probability distribution, Classification of distribution, Stochastic process, specification of stochastic process.

UNIT-2:

Markov chains – Definition and examples , Higher transition probabilities ,Generalisation of independent Bernoulli Trails, classification of states and chains ,Determination of Higher Transition Probabilities– stability of Markov systems.

UNIT-3:

Markov chain with Denumerable number states – Reducible chains ,Statistical inference for Markov chains, Markov chain with continuous state space, Non homogeneous chains.

UNIT-4:

Markov process with discrete state space–Poisson process, Poisson process and related distributions, Generalisation of Poisson process,Birth and Death process.

UNIT-5:

Markov process with Discrete state space–Derived Markov chains, Erlang Process.

TextBook:

- ❖ J.Medhi–Stochastic Process–New Age International Publishers Pvt.Ltd.Third Edition. 2009.

Books for Reference:

- SuddhenduBiswas – Applied Stochastic Process – New Central Agency Pvt. Ltd.,Kolkatta(2012).
- PaulG.Hoel,SidneyPort&CharlesJ.Stone–IntroductiontoStochasticprocess–WavelandPress–Boston(1987).
- V.Thangaraj, Stochastic Process and their applications,New Age International Publishers,NewDelhi,First Edition (1995).

CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
Total contribution of COs to PSO	11	11	11	11	11
Weighted Percentage of COs contribution to PSOs	73.33	73.33	73.33	73.33	73.33

Semester-VI
Major Elective- IV
MATH TYPE USING LATEX

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-IV	Major Elective		Math Type using Latex	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce coding and decoding concepts. Also to develop the students in the field of coding theory

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

CO No.	Course Outcome	Knowledge Level
CO1	Type words, sentences and symbols not in the keyboard using Tex	K1,K3
CO2	Analyze Text environments	K2,K4,K5
CO3	Type math by making use of spacing rules, equations	K5
CO4	Type spacing of symbols building new symbols, math alphabets and symbols	K2,K6
CO5	Write latex documents by making use of abstract, sectioning, cross referencing and Bibliographies.	K4

➤ K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	1	3	3	3	3
CO2	2	1	3	2	1

CO3	2	1	2	3	2
CO4	3	2	3	3	1
CO5	3	3	3	3	3
Total contribution of COs to PSOs	11	10	14	14	10
Weighted Percentage of COs contribution to PSOs	73.33	66.67	93.33	93.33	66.67

Course Content:

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.
(Chapter 5, section 5.1 to 5.9, pages 61 to 115)

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.
(Chapter 6, section 6.1 to 6.8, pages 117 to 149)

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.
(Chapter 7, section 7.1 to 7.9, pages 151 to 186)

Unit-IV

More math: Spacing of symbols building new symbols-math alphabets and symbols-vertical spacing-Tagging and grouping-Generalized fractions-Boxed formulas.
(Chapter 8, section 8.1 to 8.6, pages 187 to 206)

Unit-V

Latex documents: The structure of a document-The preamble-Abstract-Sectioning-Cross referencing-Bibliographies.
(Chapter 10, section 10.1 to 10.6, pages 245 to 270)

Text Book:

- ❖ George Gratzler, More Math into LaTeX, 4th edition, Springer, 2007.

Books for Reference:

- Helmut Kopka and Patric W. Daly, A guide to LaTeX, Fourth edition, Addison-Wesley.
- David R. Wilkins, Getting started with LaTeX, Second Edition.

Practical:

Typing texts and Tables: Chapter 4.1- Inserting Figures Chapter 5.1-Mathematical Equations: Chapter 6.3- Inserting references: Chapter 7.6-Preparing an article for mathematical journal.

Work Book:iSkills,LaTeX for Beginners workbook 5thedition, March 2014.

CO1	1	1	1	1	1	1	1
CO2	1	1	1	1	1	1	1
CO3	1	1	1	1	1	1	1
CO4	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1
Total contribution of COs to PSO	5	5	5	5	5	5	5
Weighted Percentage of COs contribution to PSO	100	100	100	100	100	100	100

Semester-VI

Core-IX

COMPLEX ANALYSIS

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Core-IX		Complex Analysis	75	-	-	4

Contact hours per semester:75

Contact hours per week:5

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To understand the concepts of complex variables and to learn about elementary transformations in complex variables.

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

CO No.	Course Outcome	Knowledge Level
CO1	Explain analytic functions and determine the functions of a complex variables and to utilize Cauchy Reimann equations	K2, K3
CO2	Elaborate Bilinear Transformations and classify the elementary transformations. Also to find fixed points.	K4, K5
CO3	Illustrate complex integrations and to make use of Cauchy's Integral Formula	K1, K6
CO4	Explain Series Expansions and to determine Taylor's Series, Laurent's Series. Determine zeros of an analytic function.	K2, K6
CO5	Determine residues and to make use of Cauchy's Residue Theorem. Also to evaluate definite integrals	K4, K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					

CO1	3	3	3	3	3
CO2	2	2	2	3	1
CO3	3	3	3	3	2
CO4	1	2	2	2	2
CO5	1	2	1	1	3
Total contribution of COs to PSOs	10	12	11	12	11
Weighted Percentage of COs contribution to PSOs	66.67	80	73.33	80	73.33

Course Content

UNIT-1: Analytic functions - Functions of a complex variable, Limits, theorems on limit, continuous function, Differentiability, The Cauchy-Riemann equations, Analytic functions, Harmonic functions.

UNIT-2: Bilinear Transformations – Elementary Transformations, Cross Ratio, Fixed Points of Bilinear Transformations, Some Special Bilinear Transformations.

UNIT-3: Complex Integration – Definite Integral, Cauchy's Theorem, Cauchy's Integral Formula, Higher Derivatives.

UNIT-4: Series Expansions – Taylor's Series, Laurent's Series, Zeros of an Analytic Function, Singularities.

UNIT-5: Calculus of Residues– Residues, Cauchy's Residue Theorem, Evaluation of Definite Integrals.

TextBook:

- ❖ Arumugam.SandT.Issac–“ComplexAnalysis”–ScitechPublishingHouse–Chennai,(2002).

Books for Reference:

- Churchill.R.V.andJ.W.Brown–“Complexvariables and Applications”– McGrawHillInternationalEditions–IXEdition,2013.
- Ponnuswamy.S “Foundations of Complex Analysis”, Narosa Publication House, NewDelhi, IIEdition2005.
- Duraipandian.P andLakshmiDuraipandian–“ComplexAnalysis”–EmeraldPublications, Chennai(2001).

CO1	1	1	1	1	1	1	1
CO2	1	1	1	1	1	1	1
CO3	1	1	1	1	1	1	1
CO4	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1
Total contribution of Cos to PSO's	5	5	5	5	5	5	5
Weighted Percentage of CO's contribution to PSO's	60	60	60	60	60	60	60

**Semester-VI
Core-X
GRAPH THEORY**

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Core-X		Graph Theory	75	0	-	4

Contact hours per semester:75
Contact hours per week:5

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce the notion of graph theory and its applications and to learn the techniques in Graph Theory.

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

CO No.	Course Outcome	Knowledge Level
CO1	Construct graph and to explain its definition. Determine degrees. Also to perform operations on graph	K2,K3
CO2	Classify degree sequence and graphic sequence. Illustrate connectedness, compactness and connectivity.	K4,K5
CO3	Construct Eulerian Graphs and Hamiltonian graphs. Elaborate the characterizations of trees and to find centre of a tree.	K1,K6
CO4	Interpret Planar graphs and to determine chromatic numbers and chromatic index.	K2, K6
CO5	Explain Chromatic Polynomials and the properties of digraphs.	K4

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					

CO1	3	3	3	3	3
CO2	2	2	3	3	1
CO3	1	3	2	3	2
CO4	2	2	1	1	2
CO5	1	2	1	1	3
Total contribution of Cos to PSOs	9	12	10	11	11
Weighted Percentage of COs contribution to PSOs	60	80	66.67	73.33	73.33

Course Content

UNIT-1:

Definition and examples of graphs –degrees- subgraphs–isomorphism–independent sets and coverings–matrices–operations of graphs.

UNIT-2:

Degree sequences–graphic sequences– walks–trails and paths –connectedness and components–connectivity.

UNIT-3:

Eulerian graphs–Hamiltonian graphs, Trees and its characterization–centre of a tree.

UNIT-4:

Planar graphs-Definition and properties–chromatic number and chromatic index.

UNIT-5:

Chromatic polynomials, definition and basic properties of digraphs, paths and connectedness in digraphs.

Text Book:

- ❖ Arumugam.S&S.Ramachandran–Invitation to Graph Theory, Scitech Publications, Chennai, 2002.

Books for reference:

- Kumaravelu.SandSusheelaKumaravelu –Graph theory-Nagercoil, 2002.
- NarasinghDeo–Graph theory with application to engineering and computer science, Prentice–Hall of India Pvt.Ltd., New Delhi, 1979.

CO1	1	1	1	1	1
CO2	1	1	1	1	1
Total contribution of COs to PSOs	2	2	2	2	2
Weighted Percentage of COs contribution to PSOs	50	50	50	50	50

Semester-VI

Core-XI

NUMBER THEORY

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Core-XI		Number Theory	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To highlight the beauties in the world of numbers and to prepare the students for coding through congruence.

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

CO No.	Course Outcome	Knowledge Level
CO1	Explain Peano's theorem and to utilize mathematical induction. Also to make use of binomial theorem	K1, K5
CO2	Illustrate Division Algorithm. Determine GCD. To deduce the Diophantine equation $ax+by=c$	K3, K5
CO3	Interpret the fundamental theorem of arithmetic. Explain The Sieve of Eratosthenes and to use Goldbach Conjecture.	K2, K6
CO4	Summarize the basic properties of congruences and to apply Chinese Remainder Theorem	K2, K4
CO5	Elaborate Fermat's Theorem, Wilson's Theorem and to apply Kraitichik Factorization Method.	K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	3	3	3	3	3
CO2	2	2	3	3	1
CO3	1	3	2	3	2

CO4	2	2	1	1	2
CO5	1	2	1	1	3
Total contribution of COs to PSOs	9	12	10	11	11
Weighted Percentage of COs contribution to PSOs	60	80	66.67	73.33	73.33

Course Content

UNIT-1:

Peano's Axioms–Mathematical induction–The Binomial Theorem–Early Number Theory.

UNIT-2:

Division Algorithm–GCD–Euclidean Algorithm–The Diophantine Equation $ax+by=c$.

UNIT-3:

The fundamental Theorem of Arithmetic – The Sieve of Eratosthenes– The Goldbach conjecture.

UNIT-4:

Basic properties of congruences–Linear congruence and The Chinese Remainder Theorem.

UNIT-5:

Fermat's Theorem–Wilson's Theorem–The Fermat–Kraitchik Factorization Method.

Text Book:

- ❖ David.M.Burton –Elementary Number Theory-Tata McGraw Hill Education Pvt. Ltd-(Sixth Edition)-2007.

Books for Reference:

- Ivan Niven and H. Zuckerman-An Introduction to Theory of Numbers, Cambridge University Press-2019.
- Kumaravelu.S, and Susheela Kumaravelu-Element of Number Theory Nagercoil, 2002.

CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Total contribution of COs to PSO	15	15	15	15	15
Weighted Percentage of COs contribution to PSO	80	80	80	80	80

Semester-VI

Core-XII DYNAMICS

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Core-XII		Dynamics	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To provide a basic knowledge of the behaviour of objects in motion and to develop a working knowledge to handle practical problems.

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

CO No.	Course Outcome	Knowledge Level
CO1	Illustrate projectiles and to find the equation of path, range and maximum height and time of flight.	K2, K3
CO2	Elaborate about the collision of elastic bodies. Interpret law of impact and classify direct and oblique impact.	K1, K4
CO3	Determine simple harmonic motion in a straight line. Summarize the composition of SHM of the same period in the same line and along two perpendicular directions.	K2, K6
CO4	Interpret motion under the action of central forces. Derive velocity and acceleration in polar coordinates.	K5, K6
CO5	.Obtain the differential equation of central orbit .Also to deduce the pedal equation of central orbit.	K3, K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					

CO1	3	3	3	3	3
CO2	2	2	3	3	2
CO3	3	3	2	3	2
CO4	2	2	3	1	2
CO5	2	2	2	1	3
Total contribution of COs to PSOs	12	12	13	11	12
Weighted Percentage of COs contribution to PSOs	80	80	93.33	73.33	80

Course Content

UNIT-1:

Projectiles–Equation of path–range–maximum height–time offflight.

UNIT-2:

Collision of elastic bodies–Laws of impact–direct and oblique impact.

UNIT-3:

Simple Harmonic Motion (SHM) in a straight line-Geometrical representation–composition of SHM of the same period in the same line and along two perpendicular directions.

UNIT-4:

Motion under the action of central forces– velocity and acceleration in polar co-ordinates.

UNIT-5:

Differential Equation of central orbit-pedal equation of central orbit–problems to find the law of force towards the pole when the orbit is given.

TextBook:

- ❖ Venkatraman, M.K.-A TextBook on Dynamics, Agasthiar Publication, Trichy,2020.

Books for Reference:

- Narayanan, S-Dynamics,S.Chand& company(New Delhi),16thEdition,1986.
- Duraipandian.P, LaxmiDuraipandian and MuthamizhJayapragasam-Mechanics S.Chand& Company (2003).
- I.Rajeswari–Dynamics – Saras Publication, Nagercoil, I edition (2019).

CO-PSO mapping (Course Articulation Method)	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	2	2	2
CO2	2	2	2	2	2
CO3	2	2	2	2	2
CO4	2	2	2	2	2
CO5	1	2	2	2	2
Total contribution of COs to PSOs	9	12	12	14	11
Weighted Percentage of COs contribution to PSO	23.3	30	30	35	28.3

**Semester-VI
Core-XIII**

NUMERICAL METHODS

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Core-XIII		Complex Analysis	75	-	-	4

Contact hours per semester:75

Contact hours per week:5

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce finite differences and to solve numerical problems by different methods.

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

CO No.	Course Outcome	Knowledge Level
CO1	Obtain solution for numerical algebraic and Transcendental equations by making use of various methods.	K1,K3,K4
CO2	Find finite difference for first and higher order differences. To classify forward and backward differences.	K2,K6
CO3	To apply interpolation formula in Newton's Forward and backward, Guass Forward and backward formula.	K5,K6
CO4	Make use of numerical differentiation and integration in Newton's forward & backward differences for differentiation. Also to utilize Trapezoidal rule and Simpson's 1/3 and 3/8 rule.	K3,K4
CO5	Solve Difference equations and to determine the order and degree of difference equation. Solve linear difference equation and	K1,K6

	find complementary function and to deduce particular Integral of the function.	
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K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	2	3	3	3	3
CO2	2	2	3	3	1
CO3	2	3	2	3	2
CO4	2	2	2	3	2
CO5	1	2	2	2	3
Total contribution of COs to PSOs	9	12	12	14	11
Weighted Percentage of COs contribution to PSOs	73.33	80	80	93.33	73.33

Course Content

UNIT-1:

Solution of Numerical algebraic and Transcendental Equations : Bisection method– Newton’s method. Criterion of order of convergence of Newton’s method. Regula False method – Gauss elimination–Gauss Jacobi–Gauss Seidal method.

UNIT-2:

Finite Difference: First and higher order differences – Forward and backward differences – Properties of Operator – Differences of a polynomial– Factorial Polynomial.

UNIT-3:

Interpolation: Newton’s Forward–backward, Gauss forward–backward interpolation formula–Bessel’s formula. Divided differences – Newton’s divided difference formula – Lagrange’s interpolation formula.

UNIT -4:

Numerical Differentiation and integration : Newton’s forward and backward differences for differentiation- Derivatives using Bessel’s formula-Trapezoidal rule-Simpson’s 1/3 rule & 3/8 rule.

UNIT-5:

Difference equations: Definitions-order and degree of difference equation-Linear difference equation-finding complementary function-particular integral-simple applications.

TextBook:

- ❖ Venkatraman.M.K-Numerical methods in Science and Engineering National Publishing Company- Edition 1998.

Books for Reference:

- Kandasamy.P.K.Thilagavathy and K.Gunavathy, Numerical Methods, S.Chand & Company Ltd.Edn.2006.
- Autar Kaw and Egwwn Enc Kalu– Numerical methods with Application Abidet. Autokaw.com 2nd Edition, 2011.
- Dr.A.Singaravelu ,Statistics & Numerical Methods, Meenakshi Agency (2012).

Major Elective- III
ASTRONOMY

Category	Course Type	Course Code	Course Title	Internal Marks (I)	External Marks (II)	Total Marks (III)
Part-III	Major Elective-III		Astronomy	60		

Contact hours per semester: 60

Contact hours per week: 4

Year	Semester	Internal Marks	External Marks	Total marks
III				100

Objective: To introduce the exciting world of Astronomy to students and to understand the movements of the celestial sphere.

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

CO No.	Course Outcome	Knowledge Level
CO1	Explain Spherical Trigonometry. Also to elaborate the fundamental of spherical trigonometry, derive the cosine, sine and Napier's formulae.	K3, K2
CO2	Imagine the celestial sphere, illustrate about the rising and setting of a star, diurnal and Circumpolar stars and morning evening stars.	K1, K4
CO3	Imagine Earth and to explain refraction. Deduce Lambert formula and Cassini's formula.	K2, K6
CO4	Illustrate Geometric parallax and Heliocentric parallax.	K3, K2
CO5	Historic Kepler's laws. Also to classify true anomaly mean anomaly and eccentric anomaly and to obtain the relation ship between them.	K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Creativity

CO-PO mapping (Course Articulation Method)

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	1
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	1	3	3	3
Total contribution of COs to PSO	10	11	13	14	11
Weighted Percentage contribution of COs to PSO	66.67	77.33	80	93.33	73.33

Semester-VI

Major Elective- III
ASTRONOMY

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective-III		Astronomy	60	-	-	4

Contact hours per semester: 60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce the exciting world of Astronomy to students and to understand the movements of the celestial sphere.

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

CO No.	Course Outcome	Knowledge Level
CO1	Explain Spherical Trigonometry .Also to elaborate the fundamental of spherical trigonometry, the sine, the cosine, four parts and Napier's formula.	K3,K5
CO2	Imagine the celestial sphere, Illustrate about the rising and setting of a star. Identify and Classify circumpolar stars and morning, evening stars.	K1,K4
CO3	Imagine Earth and to explain refraction. Deduce Tangent formula and Cassini's formula.	K2,K6
CO4	Illustrate Geocentric parallax and Heliocentric parallax	K3,K5
CO5	Elaborate Kepler's laws. Also to classify True anomaly, mean anomaly and eccentric anomaly and to obtain the relationship between them.	K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	2	3	3	3	3
CO2	2	2	3	3	1
CO3	2	3	2	3	2
CO4	2	2	2	3	2
CO5	2	1	2	2	3
Total contribution of COs to PSOs	10	11	12	14	11
Weighted Percentage of COs contribution to PSOs	66.67	73.33	80	93.33	73.33

Course Content

UNIT-1:

Spherical Trigonometry: Spherical triangle – The fundamental formula of Spherical trigonometry, the sine, cosine, four parts and Napier formula (without proof) and simple problems.

UNIT-2:

The Celestial Sphere: Celestial co-ordinates – Diurnal motion – Rising and setting of a star sidereal time – circumpolar stars – Morning and evening stars – Twilight.

UNIT-3:

Earth – length of a day – Refraction – Tangent formula – Cassini's formula – Effects of refraction.

UNIT-4:

Geocentric parallax – Effects – Heliocentric parallax – Effects.

UNIT-5:

Kepler's laws – verification of Kepler's laws – True anomaly, mean anomaly, Eccentric anomaly – Relation between them.

Text Book:

- ❖ Kumaravelu. Sand Susheela Kumaravelu – Astronomy for degree classes, Rainbow Printers, Nagercoil (2005).

Book for Reference:

- Ramachandran. G. V – Astronomy, Mission Press, Palayamkottai, 1965.

CO-PO mapping (Course Articulation Method)

COs	PS01	PS02	PS03	PS04	PS05
CO1	2	4	3	3	3
CO2	2	1	3	3	1
CO3	2	1	2	3	1
CO4	1	2	2	3	2
CO5	2	2	1	2	2
Total contribution of COs to PSOs	9	9	11	14	11
Weighted Percentage of COs contribution to PSOs	60	60	73.33	60.33	73.33

Semester-VI

Major Elective- III
FUZZY MATHEMATICS

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective -III		Fuzzy Mathematics	60	-	-	4

Contact hours per semester:60

Contact hours per week :4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce fuzzy concepts to students and to facilitate the student to study fuzzy operations and fuzzy numbers

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

CO No.	Course Outcome	Knowledge Level
CO1	Explain Crisp sets and fuzzy sets and illustrate the characteristics and significance of Paradigm Shift.	K1,K2
CO2	Elaborate the Additional properties of α cuts and the extension principle for fuzzy sets.	K1,K4
CO3	Perform fuzzy set operations. Also to determine fuzzy complements, fuzzy intersections and fuzzy unions.	K5,K6
CO4	Determine fuzzy numbers and Linguistic variables. Apply arithmetic operations on intervals and on fuzzy numbers. Construct lattice of fuzzy numbers.	K2,K3,K4
CO5	Analyze and classify fuzzy decision making, individual decision making, Multi person decision making problems.	K5,K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	2	3	3	3	3
CO2	2	1	3	3	1
CO3	2	1	2	3	2
CO4	1	2	2	3	2
CO5	2	2	1	2	3
Total contribution of COs to PSOs	9	9	11	14	11
Weighted Percentage of COs contribution to PSOs	60	60	73.33	93.33	73.33

Course Content

UNIT-1:

Crisp Sets–Fuzzy Sets–Basic Types–Basic Concepts–Characteristics and Significance of Paradigm Shift.

UNIT-2:

Additional properties of α -cuts– representations of fuzzy sets– Extension principle for fuzzy sets.

UNIT-3:

Fuzzy set operations–Fuzzy complements–Fuzzy intersections:t-norms–Fuzzy Unions:t-conorms –Combinations of operations.

UNIT-4:

Fuzzy numbers – linguistic variables-arithmetic operations on intervals-arithmetic operations on fuzzy numbers-Lattice of fuzzy numbers-Fuzzy Equations.

UNIT-5:

Fuzzy decision making – Individual Decision Making-Multi-person decision making-fuzzy linear programming.

TextBook:

- ❖ George J. Klir and Bo Bo Yuan– Fuzzy sets and Fuzzy Logic Theory Applications, Prentice Hall of India, 2002, New Delhi.

Book for Reference:

- George J. Klir and Tina A. Folger– Fuzzy sets, uncertainty and Information – Prentice Hall of India, 2003, New Delhi.

CO-PSO mapping (Course & Evaluation Method)

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	3	3	3
CO2	3	1	3	3	1
CO3	2	1	2	3	2
CO4	3	3	2	3	1
CO5	3	3	1	1	3
Total contribution of COs to PSO	10	9	11	12	10
Weighted Percentage of COs contribution to PSO	66.67	60	72.73	88.89	66.67

Semester-VI
Major Elective- III
MATHEMATICAL MODELLING

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective -III		Mathematical Modelling	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To study the mathematical models through ODE and difference equations.

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

CO No.	Course Outcome	Knowledge Level
CO1	Illustrate mathematical modelling through ODE. Classify and elaborate linear growth, non-linear and growth decay problems, Compartment models, Dynamic problems and geometrical problems.	K1, K2
CO2	Explain population dynamics, Epidemics. Analyze the compartment models in economics, medicines, arms race bullets and international trade.	K2, K3, K5
CO3	Explain mathematical modelling problem through second order ODE.	K5, K6
CO4	Illustrate mathematical modelling through difference equation.	K2, K6
CO5	Explain mathematical modelling through graphs.	K3, K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	2	3	3	3	3
CO2	2	1	3	3	1
CO3	2	1	2	3	2
CO4	2	2	2	3	1
CO5	2	2	1	1	3
Total contribution of COs to PSOs	10	9	11	13	10
Weighted-Percentage of COs contribution to PSOs	66.67	60	73.33	86.67	66.67

Course Content

UNIT-1:

(Mathematical modeling through O.D.E(First order)): Linear growth and Decay models –Non –linear growth and Decay models – Compartment Models –Dynamics Problems–Geometrical Problems.

UNIT-2:
Population dynamics – Epidemics – Compartment Models – Economics, Medicine, Arms race, Battles and International Trade.

UNIT-3:
(Mathematical Modelling through O.D.E. (Second order)): Planetary motion – circular motion – Motion of satellites – Modelling through linear difference equations of second order.

UNIT-4:
(Mathematical Modelling through difference equations): Basic theory of difference equation with constant coefficients – Economics and Finance – Population dynamics and genetics – Probability theory.

UNIT-5: (Modelling through graphs): Solutions that can be modeled through graphs – models in terms of directed graphs, signed graphs, weighted digraphs and unoriented graphs.

Text Book:

- ❖ Kapur.J.N – Treatment as in “Mathematical Modelling” New Age International Publishers, 2004.

Books for Reference:

- Kapur.J.N – Mathematical Modelling in Biology and Medicine – East West Press – 1985.
- Singh – Mathematical Modelling, International Bookhouse – 2003.
- Frank R. Giordano, Maurice D. Weir and William P. Fox, - A first course in mathematical modelling, Thomson Learning, London and New York, 2003.
- Kapur.J.N, Mathematic modeling, New Age International Pvt., Ltd., Reprint (2007).

COs	PS01	PS02	PS03	PS04	PS05
CO1	2	3	1	2	3
CO2	2	1	3	2	1
CO3	2	1	2	2	2
CO4	2	2	2	2	1
CO5	1	2	1	1	3
Total contribution of COs to PS0s	9	9	11	9	10
Weighted Percentage of COs contribution to PS0s	60	60	73.33	60	66.67

Semester-VI
Major Elective- IV
OPERATIONS RESEARCH-II

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective -III		Operations Research	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce games and strategies. Also to understand networking problems.

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

CO No.	Course Outcome	Knowledge Level
CO1	Interpret the games and strategies. Solve two persons zero sum games. Make use of mixed strategies and dominance property.	K2,K3
CO2	Analyze the replacement of items that deteriorate with time. Illustrate replace montage of a machine taking money value into consideration and elaborate the replacement of items that completely fail suddenly and Staffing problems.	K1,K5
CO3	Explain the queueing models and to classify into (M/M/1:FCFS),(M/M/1:∞/FCFS),(M/M/S:/FCFS)	K4,K6
CO4	Compose network scheduling using PERT/CPM. Explain the rules of network construction. Make use of PERT calculation.	K2,K3
CO5	Analyse and solve inventory control problems.	K5,K6

➤ K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	2	3	3	2	3
CO2	2	1	3	2	1
CO3	2	1	2	2	2
CO4	2	2	2	2	1
CO5	1	2	1	1	3
Total contribution of COs to PSOs	9	9	11	9	10
Weighted Percentage of COs contribution to PSOs	60	60	73.33	60	66.67

UNIT-1:

Games and Strategies: Two Person Zero sum Games – The Maximin – Minimax Principle – Games without Saddle Points – Mixed Strategies – Graphical Solution of $2 \times n$ and $m \times 2$ games – Dominance Property.

UNIT-2:

Replacement of items that deteriorate with time – replacement of a machine taking money value into consideration – replacement of items that completely fail suddenly and Staffing Problems.

UNIT-3:

Queueing models: General concept and definitions – characteristics – properties of Poisson process Models (M/M/1:FCFS), (M/M/1:∞/FCFS), (M/M/S:FCFS).

UNIT-4:

Networks Scheduling by PERT/CPM: Network and basic components – Rules of Network Construction – Time Calculation in network – Critical Path Method – PERT Calculation.

UNIT-V:

Inventory Control : Introduction – Types of Inventories – Inventory decisions – Deterministic inventory Problem – EOQ problems without shortages.

Text Book:

- ❖ Kanti Swarup, P.K. Gupta and Manmohan – Operations Research – Sultan Chand & Sons – 2006, 12th Edition.

Books for Reference:

- Gupta, P. K. and D. S. Hira – Operations Research – S. Chand & Sons – VIII Edition.
- B. J. Ranganathan and A. S. Srikantappa – Operations Research, Yes Dee Publishing House, Chennai (2017).
- Hillier, F. S. and G. J. Lieberman – Introduction to Operations Research, 9th Ed., Tata McGraw Hill, Singapore, 2009.
- Hamdy A. Taha, -Operations Research, An Introduction, 8th Ed., Prentice-Hall India, 2006.
- Hadley, G. - Linear Programming, Narosa Publishing House, New Delhi, 2002.

CO-PSO mapping (Course Articulation Method)	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	3	2	2
CO2	2	1	1	2	1
CO3	3	1	2	2	1
CO4	2	2	2	2	2
CO5	3	2	2	2	2
Total contribution of COs to PSOs	10	9	11	10	10
Weighted Percentage of COs contribution to PSOs	66.67	60	72.73	66.67	66.67

Semester-VI
Major Elective- IV
CODING THEORY

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective -IV		Coding Theory	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce coding and decoding concepts. Also to develop the students in the field of coding theory

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

CO No.	Course Outcome	Knowledge Level
CO1	Analyze and illustrate basic assumptions and correcting, detecting error patterns. Also to interpret effects of error correction and detection.	K3, K4
CO2	Elaborate linear codes and illustrate the bases for C and C ⁺ generating matrices on coding	K1, K2
CO3	Illustrate parity check matrices and determine the equivalent codes	K3, K5
CO4	Explain some bounds for codes and classify perfect codes, hamming codes, extended codes, the extended Golay code and decode them.	K4, K6
CO5	Summarize about polynomials and words, cyclic codes. Make use of polynomial encoding and decoding	K6

➤ K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
Cos					
CO1	1	3	3	2	3
CO2	2	1	3	2	1
CO3	2	1	2	2	2
CO4	2	2	3	2	1
CO5	3	2	3	2	3
Total contribution of COs to PSOs	10	9	14	10	10
Weighted Percentage of COs contribution to PSOs	66.67	60	93.33	66.67	66.67

Course Content:

UNIT -1:

Introduction to coding theory, Basic assumptions, Correcting and detecting error patterns – information rate – effects of error correction and detection – finding the most likely code word transmitted.

UNIT-2:

Linear codes – subspaces independence – basis, dimension – matrices – Bases for C and C^+ generating matrices on coding.

UNIT-3:

Parity check matrices – equivalent codes – distance of a linear code – Linear codes – cosets – MLD for linear codes – Reliability of MLD for linear codes.

UNIT-4:

Some bounds for codes – perfect codes – hamming codes – extended codes – The extended Golay code – decoding the extended Golay code – Golay code.

UNIT-5:

Polynomial and words – introduction to cyclic codes – Polynomial encoding and decoding – finding cyclic codes – Dual cyclic codes.

Text Book:

- ❖ Coding theory, The essentials – Marcel Dekker, Inc. Madison Avenue, New York.

Books for Reference:

- Elwyn Berlekamp – Algebraic Coding Theory – Springer-1970
- San Ling and Chaoping Xing, coding theory A first course, Cambridge University Press, New York (2004)

	P201	P202	P203	P204	P205
CO1	1	1	1	1	1
CO2	2	1	1	1	1
CO3	2	2	2	2	2
CO4	2	3	1	2	3
CO5	2	3	2	2	2
Total contribution of COs to P20s	9	12	14	10	12
Weighted Percentage of COs contribution to P20s	60	80	93.33	66.67	80

Semester-VI
Major Elective- IV
PROGRAMMING IN C++

Category	Course Type	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical	Credits (C)
Part-III	Major Elective -IV		Programming in C++	60	-	-	4

Contact hours per semester:60

Contact hours per week:4

Year	Semester	Internal Marks	External Marks	Total marks
III	VI	25	75	100

Objective: To introduce coding and decoding concepts. Also to develop the students in the field of coding theory

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

CO No.	Course Outcome	Knowledge Level
CO1	Illustrate and make use of the concepts of tokens, expressions and control structures	K3,K4
CO2	Utilize the functions in C++ and to apply it while writing programs	K1,K2
CO3	Interpret constructors and destructors	K3,K5
CO4	Explain and apply operator overloading while writing programs	K4,K6
CO5	Make use of inheritance and classes to compile a program	K6

➤ K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Create

CO-PSO mapping (Course Articulation Method)

PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
COs					
CO1	1	3	3	2	3
CO2	2	1	3	2	1
CO3	2	2	2	2	2
CO4	2	3	3	2	3
CO5	2	3	3	2	3
Total contribution of COs to PSOs	9	12	14	10	12
Weighted Percentage of COs contribution to PSOs	60	80	93.33	66.67	80

Course Content:

Unit-I: Tokens, Expressions and control structures

Introduction, Tokens, Keywords, Identifiers and constants, Basic data types, User defined data types, storage classes, Derived data types, Symbolic constants.

UNIT-II: Functions in C++

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: Constructors and Destructors

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: Operator Overloading and Type Conversations

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: Inheritance: Extending Classes

Introduction, Defining Derived classes, Single inheritance, Making a private member inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance.

Text Book:

- ❖ E. Balaguru Samy, Object Oriented Programming with C++, Tata McGraw Hill Education Private Limited, New Delhi (Fifth Print 2012).

Book for References :

- Reema Thareja, Object Oriented Programming with C++, Oxford University Press (January 2018)

Sampurna Bachel
Syllabus I, II only

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI
UG COURSES – AFFILIATED COLLEGES

B.Sc. Mathematics

(Choice Based Credit System)

(with effect from the academic year 2020-2021 onwards)

Sem	Part	Sub. No.	Subject Status	Subject title	Hrs/ Week	Cre- dits	Marks				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
I	I	1	Language	Tamil/Other Languages	6	4	25	75	100	30	40
	II	2	Language	Communicative English	6	4	25	75	100	30	40
	III	3	Core -I	Calculus and Classical Algebra	6	4	25	75	100	30	40
		4	Add on major (Mandatory)	Professional English for Physical sciences -I	4	4	25	75	100	30	40
		5	Allied-I (For Maths Students)	Statistics-I	6	3	25	75	100	30	40
				OR Physics With Practicals/ Chemistry With Practicals/ Computer Science	6	4	25	75	100	30	40
5	Allied-I (For Science Students)	Algebra and Differential Equations	6	4	25	75	100	30	40		
IV	6	Common	Environmental Studies	2	2	25	75	100	30	40	
II	I	7	Language	Tamil/Other Languages	6	4	25	75	100	30	40
	II	8	Language	English	6	4	25	75	100	30	40
	III	9	Core-2	Differential Equations and Analytical Geometry of Three Dimensions	6	4	25	75	100	30	40
				Add on major (Mandatory)	Professional English for physical sciences II	4	4	25	75	100	30
		11	Allied-II (For Maths Students)	Statistics -II OR Physics With Practicals/ Chemistry With Practicals /Computer Science	6	3	25	75	100	30	40
				6	4	25	75	100	30	40	
	11	Allied – II (For Science Students)	Vector Calculus & Fourier Series	6	4	25	75	100	30	40	
IV	12	Common	Value Based Education	2	2	25	75	100	30	40	

CALCULUS & CLASSICAL ALGEBRA (90 Hours)

- Unit I:** Curvature, Radius of Curvature and Centre of curvature in Cartesian and polar Co-ordinates- Pedalequation-Involute and Evolute
- Unit II** Double and Triple Integrals - Changing the order of integration - Jacobians and change of variables
- Unit III** Beta and Gamma functions – Application of Beta and Gamma Functions in evaluation of Double and Triple Integrals.
- Unit IV** Theory of Equations – Formation of equations – Relation between roots and coefficients – symmetric function of the roots. Sum of the powers of the roots of an equation – Newton's theorem
- Unit V** Reciprocal equation-Transformation of equations- Descarte's rule of signs

Text Book:

- Narayanan S and T.K. Manickavasagam Pillai –Calculus Volume I (2004), Volume II (2004), S. Viswanathan Printer Pvt.Ltd.
- Manickavasagam Pillai .T.K and S. Narayanan - Algebra – Viswanathan Publishers and Printers Pvt. Ltd., -2004

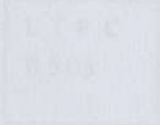
Books for Reference :

- Kandasamy P and K. Thilagavathi - Mathematics for B.Sc., Volume II – 2004, S. Chand & Co., New Delhi.
- Apostol T.M. - Calculus, Vol. I (4th edition) John Wiley and Sons, Inc., New York 1991.
- Apostol T.M. - Calculus, Vol. II (2nd edition) John Wiley and Sons, Inc., New York 1969)
- Stewart, J - Single Variable Calculus (4th edition) Brooks / Cole, Cengage Learning 2010.
- Kandasamy P and K. Thilagavathi - Mathematics for B.Sc., - 2004, Volume I and Volume IV, S. Chand & Co., New Delhi.
- Arumugam .S, Thangapandi Issac – Classical Algebra, New Gamma Publishing

House, Palayamkottai.

Dublin University Press, 1954.

- Burnside, W.S. and A.W. Panton - The Theory of Equations,
- MacDuffee, C.C. - Theory of Equations, John Wiley & Sons Inc., 1954.



SEMESTER – I/III

Statistics

For Mathematics Students) Paper – I (90 Hours)

Objectives:

- To study the concept of measures of dispersion and measures of central tendencies
- To develop the concept Probability distributions

- UnitI** Moments, Skewness and Kurtosis - Curve fitting - method of least squares – Fitting lines – Parabolic, Exponential and Logarithmic curves. **16L**
- UnitII** Correlation and Regression – Scatter Diagram – Karl Pearson's coefficient of correlation – Properties – Lines of Regression – Coefficient of Regression and properties – Rank Correlation. **16L**
- UnitIII** Association of Attributes – Consistency of data – criteria for independence – Yule's coefficient of Association. **14L**
- UnitIV** Random variable – Distribution function – properties of Distribution function – Mathematical Expectation – Addition theorem of Expectation – Multiplication theorem of Expectation – Moment generating function – cumulants – characteristic function – Properties of characteristic function. **22L**
- UnitV** Discrete and continuous Probability Distributions - Binomial and Poisson Distribution and their moments, Generating function, characteristic function, properties and simple applications. Normal Distribution – Standard normal distribution and their properties – simple problems. **22L**

Text Book:

Gupta .S.C and V.K. Kapoor – Fundamentals of Mathematical Statistics – (2002) Sultan Chand & Sons, New Delhi.

Books for Reference :

- Vittal, V.R. – Mathematical Statistics (2004) Maragatham Publications
- D.C. Sancheti & Kapoor – Statistics
- M.L. Khanna – Statistics
- S. Arumugam & others – Statistics

Allied Mathematics (Semester I/III)

(For Science Students) Paper – I

Algebra and Differential Equations (90 Hours)

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.

Text Book:

- ❖ Dr. S. Arumugam & others – Allied Mathematics –I

DIFFERENTIAL EQUATIONS & ANALYTICAL GEOMETRY OF THREE DIMENSIONS
(90 Hours)

- Unit I** First order higher degree equations – solvable for x, y, p and Clairaut's form – Simultaneous differential equations of the form $f_1(D)x + g_1(D)y = h_1(t), f_2(D)x + g_2(D)y = h_2(t)$
- Unit II** **(Ordinary differential equation)**
Second order linear differential equations with constant coefficients – Find the P.I for functions of the form $e^{ax}f(x)$ and $x^n f(x)$ - Linear equations of second order with variable coefficients
- Unit III** Analytical Geometry of 3D Co-ordinate system, direction cosines, direction ratios- Equation of plane in different forms - angle between planes- Length of perpendicular-angle bisection.
- Unit IV** Equation of a line in different forms - image of a point – image of a line- The plane and the straight line- angle between plane and line- Coplanar lines- Shortest distance between two lines
- Unit V** Sphere – Tangent plane – circle of intersections – Tangency of Spheres – Orthogonal Spheres.

Text Book:

- Narayanan .S and T.K. Manickavachagam Pillai – Differential equations and its applications, 2003 - S. Viswanathan Printers.
- T.K. Manicavachagam Pillay and T. Natarajan- A text book of Analytical Geometry - Part-II Three Dimensions- S. Viswanathan (Printers & Publishers) Pvt Ltd (2012)

Books for Reference :

- Kandasamy .P and K. Thilagavathi - Mathematics for B.Sc., Vol.III – 2004 – S.Chand and Co., New Delhi.
- Braun .M. - Differential Equations and their applications(III edition) Springer – Verlag, New York1983)
- Boyce .W.E and R.C. Dprima – Elementary differentialequations and Boundary value Problems (VII editions) - John Wiley and Sons, Inc, New York2001.
- Sankaranarayan and Manguldoss – DifferentialEquations.
- Duraipandian .P. Laxmi Duraipandian and D.Muhilan - Analytical Geometry of Three Dimension - Emerald Publishers.
- Kandasamy .P. and K. Thilagavathi – Mathematics for B.Sc., Vol. IV – 2004 S.Chand and Co. NewDelhi.
- Loney .S.L. - The Elements of Coordinate Geometry - Mcmillanand CompanyLondon.
- B. StephenJohn- Analytical Geometry of 3D and vector differentiation : IDEALpublication.

SEMESTER – II / IV
Statistics

L T PC

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(For Mathematics Students) Paper – II (90Hours)

Objectives:

- To know the concept of index numbers
- To study the distribution functions
- To understand the Analysis of variance

- UnitI** Characteristics of index numbers – Laspeyer’s and Paasche’s – Fisher’s and Bowley’s Marshall and Edgeworth’s index numbers – Tests – Unit test, Commodity Reversal test, Time Reversal test, circular test. **12L**
- UnitII** Testing of Hypothesis – Null hypothesis and Alternate hypothesis – Type I and Type II errors - Critical Region, Level of significance – Test of significance for large samples – Testing a single proportion – Difference of proportions. Testing a single mean and Difference of means. **18L**
- UnitIII** Tests based on t-distribution – single mean and Difference of means – Tests based on F-distribution – Variance Ratio test – Tests based on Chi-square Distribution – Independence – Goodness of fit. **16L**
- UnitIV** Analysis of variance – one way and two way classified data – Basis of experimental design – Randomized Block Design – Latin square – simple problems. **22L**
- UnitV** Statistical Quality control – Definition – Advantages, Process control – Control chart, Mean chart, Range chart, P-chart, Product Control – Sampling Inspection Plans. **22L**

Text Book:

- Gupta .S.C & V.K. Kapoor – Fundamentals of Mathematical Statistics – (2002) Sultan Chand & Sons, New Delhi.

Books for Reference :

- Vittal .P.R – Mathematical Statistic (2004) – MaragathamPublications
- DC Sancheti & Kapoor –Statistics
- M.L. Khanna –Statistics
- S. Arumugam & others –Statistics

**Allied Mathematics (Semester II/IV)
(For Science Students) Paper – II
Vector Calculus & Fourier Series (90 Hours)**

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, Stokes and Divergence theorems (without proof) – simple problems.
UNIT V	Fourier series – Even and odd functions – Half range Fourier series.

Text Books:

- ❖ Dr. S. Arumugam & others – Vector Calculus
- ❖ T.K. Manicavachagom Pillai – Calculus (Vol II)

UG COURSES – AFFILIATED COLLEGES

B.Sc. Mathematics

(Choice Based Credit System)

(with effect from the academic year 2020-2021 onwards)

Sem.	Part	Sub. No	Subject Status	Subject Title	Hrs / Week	Credits	Mark				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.

III	I	13	Language	Tamil/Other Languages	6	4	25	75	100	30	40
	II	14	Language	English	6	4	25	75	100	30	40
	III	15	Core-III Ppaer-V	Sequences and Series	6	4	25	75	100	30	40
		16	Allied-II	Statistics-I OR Physics with Practicals / Chemistry with Practicals / Computer Science	6	3	25	75	100	30	40
	17	Skill Based core	Vector Calculus	4	4	25	75	100	30	40	
IV	IV	18	Non - Major Elective	Any one of the following 1.1) Mathematics for Competitive Examinations-I 1.2) Fundamentals of Statistics-I	2	2	25	75	100	30	40
		19	Common	Yoga*	2	2	25	75	100	30	40

IV	I	20	Language	Tamil / Other Languages	6	4	25	75	100	30	40
	II	21	Language	English	6	4	25	75	100	30	40
	III	22	Core-IV Paper-VI	Abstract Algebra	6	4	25	75	100	30	40
		23	Allied-II	Statistics-II OR Physics with Practicals / Chemistry with Practicals / Computer Science	6	3	25	75	100	30	40
	24	Skill Based Core	Trigonometry, Laplace Transforms and Fourier Series	4	4	25	75	100	30	40	

IV	25	Non-Major Elective	Any one of the Following : 2.1) Mathematics for Competitive Examinations – II 2.2) Fundamentals of Statistics – II	2	2	25	75	100	30	40
	26	Common	Computers for Digital Era*	2	2	25	75	100	30	40
V		Extension Activities	NCC / NSS / YRC / YWF / PE	-	1	-	-	-	-	-

V	III	27	Core-V Paper-VII	Linear Algebra	5	4	25	75	100	30	40
		28	Core-VI Paper-VIII	Real Analysis	5	4	25	75	100	30	40
		29	Core-VII Paper-IX	Statics	5	4	25	75	100	30	40
		30	Core-VIII Paper-X	Transforms and their Applications	5	4	25	75	100	30	40
		31	Major Elective-I Paper-XI	Any one of the following 1.1. Programming in C 1.2. Discrete Mathematics 1.3. Combinatorial Mathematics	4	4	25	75	100	30	40
		32	Major Elective – II Paper-XII	Any one of the following: 2.1 - Operations Research- I 2.2 - Stochastic Process 2.3. MS Office	4	4	25	75	100	30	40
	IV	33	Skill Based Common	Personality Development	2	2	25	75	100	30	40

VI	III	34	Core-IX Paper-XIII	Complex Analysis	5	4	25	75	100	30	40
		35	Core-X Paper-XIV	Graph Theory	5	4	25	75	100	30	40
		36	Core-XI Paper-XV	Number Theory	4	4	25	75	100	30	40
		37	Core-XII Paper-XVI	Dynamics	4	4	25	75	100	30	40
		38	Core-XIII Paper-XVII	Numerical Methods	4	4	25	75	100	30	40
		39	Major Elective- III Paper- XVIII	Any one of the following: 3.1 Astronomy 3.2 Fuzzy Mathematics 3.3. Mathematical Modeling	4	4	25	75	100	30	40
		40	Major Elective- IV Paper- XIX	Any one of the following: 4.1. Operations Research - II 4.2. Coding Theory 4.3. Python	4	4	25	75	100	30	40

Semester – III
CORE – III
Paper - V(6hrs /week)
SEQUENCES AND SERIES – I (90 hours) (AMMA31)

Objectives:

- ❖ To acquire basic ideas of classical analysis.
- ❖ To study the behaviour of sequences and series.

Course Learning Outcomes: It enables the students to

1. accommodate the concept of different types of sequences and series.
2. know how to apply various tests to test the convergence of series.

UNIT – 1:

Real number system: The field of axioms, the order axioms, the rational numbers, the irrational numbers, upper bounds, maximum element, least upper bound (supremum). The completeness axiom, absolute values, the triangle inequality Cauchy – Schwartz's inequality. (Text Book 1:)

UNIT – 2:

Sequences: Bounded sequences – monotonic sequences – Convergent sequences – divergent and oscillating sequences – The algebra of limits. (Text Book 2)

UNIT – 3:

Behaviour of monotonic sequences – Cauchy's first limit theorem – Cauchy's second limit theorem – Cesaro's theorem – subsequences – Cauchy sequence – Cauchy's general principle of convergence. (Text Book 2)

UNIT – 4:

Series: Infinite series – n^{th} term test – Comparison test – Kummer's test – D'Alembert's ratio test – Raabe's test – Gauss test – Root test. (Text Book 2)

UNIT – 5:

Alternating series – Leibnitz's test – Tests for Convergence for series of arbitrary terms – Multiplication of series – Abel's theorem – Merten's theorem – Power series – Radius of Convergence. (Text Book 2)

Text Books:

- Tom.M Apostol – Mathematical Analysis, Narosa Publishing house, New Delhi. II Edition. for unit – 1.
- S. Arumugam and Thangap and ilssac- " Sequences and series " – Scitech Publications, Chennai. for unit - 2,3,4 & 5.

Book for Reference:

- Elements of Real analysis Shanti Narayan & Dr.M.D.Raishinghamia S.Chand & Co.,Revised Edition.
- Ellina Grigorieva - Methods of Solving Sequence and series Problem-Springer Link.
- Richard R. -" Methods of real analysis" Goldberg (Oxford and IBH Publications Co.) 1

Semester - III
SKILL BASED CORE – PAPER I (4hrs/week)
VECTOR CALCULUS (60 hours) (ASMA3A)

Objectives:

- ❖ To lay a good foundation of vector differentiation and vector integration.
- ❖ To solve problems related to this.

Course Learning Outcomes: It enables the students to

1. recognize the importance of integration.
2. relate the line integral, surface integral and volume integral.

UNIT – 1:

Vector point functions – Scalar point functions – Derivative of a vector and derivative of sum of vectors – Derivative of product of a scalar and vector point function – The vector operator ∇ - Gradient.

UNIT – 2:

Divergence – Curl, solenoidal, irrotational vectors – Laplacian operator.

UNIT – 3:

Integration of point function – Line integral – Surface integral.

UNIT – 4:

Volume Integral – Gauss divergence theorem (Statement without Proof) – Problems.

UNIT – 5:

Green's theorem and Stoke's theorem (Statement without Proof) – Problems.

Text Book:

Duraipandian and Laxmi Duraipandian, Vector Analysis- Emerald Publishers(Revised Edition, Reprint 2005).

Books for References:

- Dr. S. Arumugam and others – Vector Calculus, New Gamma Publishing House.(2006).
- Susan. J. C – Vector Calculus (4th Edition), Pearson Education, Boston (2012).
- Murray Spiegel - Vector analysis – Schaum Publishing company, New York (2009).

Semester - III

Non – Major Elective Paper – I (2hrs/week)

MATHEMATICS FOR COMPETITIVE EXAMINATION – I (30hours) (ANMA3A)

Objectives:

- ❖ To learn the techniques for solving aptitude problems
- ❖ To enable the students prepare themselves for various competitive examinations

Course Learning Outcomes: It enables the students to

1. understand the techniques to solve the problems easily.
2. apply simple ideas to solve problems.

UNIT – 1:

Simplification, averages.

UNIT – 2:

Ratio and Proportion.

UNIT – 3:

Partnership - Percentage.

UNIT – 4:

Profit and Loss.

UNIT – 5:

Problems on Numbers.

Text Book:

1. R. S. Agarwal - Objective Arithmetic, Published by S.Chand & Co Ltd.Edition(2018).

Books for Reference:

- R. S. Aggarwal, Arithmetic Subjective and objective, Published by S.Chand and.Co.Ltd. Revised Edition.
- Rajesh Verma -Fast track objective arithmetic, Arihant Publications(India) Limited., Revised Edition.

Semester – III

Non – Major Elective Paper – I (2hrs/week)

FUNDAMENTALS OF STATISTICS – I (30 hours) (ANMA3B)

Objectives:

- ❖ To introduce the new concept Measures of central tendency to other major students.
- ❖ To study about correlation, regression and to solve the simple problems.

Course Learning Outcomes: It enables the students to

1. know formulas to find mean, median mode.
2. understand correlation and regression.

UNIT – 1:

Classification of datas – Bar Diagram – Pie chart.

UNIT – 2:

Measures of central tendency: Mean, median, mode (with frequency).

UNIT – 3:

Measures of dispersion: Range – standard deviation, Variance – Quartile deviation.

UNIT – 4:

Correlation – Rank correlation (Problems only)

UNIT – 5:

Regression equations (Problems only)

Text Book:

Dr. S. Arumugam, A.Thangapandi Issac- Statistics, New Gamma Publishing House, Palayamkottai. (2016)

Books for Reference:

- S. P. Gupta - Elementary Statistical Methods, Sultan Chand & Sons,2017).
- T. Veerarajan Fundamentals of mathematical Statistics, Yes Dee Publishing Pvt,Ltd..(2017)

Semester – IV
Core – IV
Paper-VI (6hrs/week)
ABSTRACT ALGEBRA (90 hours) (ASMA41)

Objectives:

- ❖ To acquire the knowledge about the concept of groups, rings and fields.
- ❖ To study the concept of homomorphism.

Course Learning Outcomes: It enables the students to

1. grasp the concept of cyclic groups, normal subgroups.
2. know the fundamental theorems of homomorphism and how to apply it.

UNIT – 1:

Groups – definition and examples – subgroup – order of an element – centre of a group – Normaliser and Centralizer – Product of two Subgroups – order of HK – Intersection and union of subgroups.

UNIT – 2:

Cyclic groups – generators of a cyclic group – cosets – Lagrange's theorem – Euler's theorem – Fermat's theorem.

UNIT – 3:

Normal Subgroups: Quotient groups – Group Homomorphism – Canonical homomorphism – Kernel of a homomorphism – Isomorphism – Automorphism – Inner automorphism – Permutation groups – Cayley's theorem.

UNIT -4:

Rings: Definition and examples – Types of rings – Elementary properties of a ring – Integral domain – Field – Subrings – Subfields – Ideals – Principal ideal – Quotient ring – Maximal and prime ideals – Principal ideal domain – UFD.

UNIT -5:

Homomorphism of rings – Isomorphism – Kernel of a homomorphism – Fundamental theorem – Polynomial rings – Division algorithm.

Text Book:

S.Arumugam and A.Thangapandi Issac " Modern Algebra " - Scitech Publications, Private limited. (2008)

Books for Reference:

1. M. L. Santiago, Modern Algebra - McGraw Hill Education India Pvt. Limited,(2002).
2. T. K. ManickaVachagam pillai and others - Modern Algebra – S.Visvanathan Publishers (2011).
3. Visvanathan nayak, Modern Algebra -Emerald Publishers, Reprint 1992.

Semester – IV

Skill Based Core – Paper – II (4hrs/week)

TRIGONOMETRY, LAPLACE TRANSFORMS AND FOURIER SERIES (60 hours) (ASMA4A)

Objectives:

- ❖ To understand the concept of Trigonometry.
- ❖ To acquire knowledge about Laplace transform and its inverse.
- ❖ To study the concept of Fourier series and solve problems in Fourier series.

Course Learning Outcomes: It enables the students to

1. know the relation between hyperbolic function and circular function.
2. understand the concept of even and odd function.

UNIT – 1:

Trigonometry: Expansion of $\sin nx$, $\cos nx$, $\tan nx$ and expansions of $\sin^n x$ and $\cos^n x$.

UNIT – 2:

Hyperbolic functions – Relation between hyperbolic functions and circular functions – Inverse hyperbolic functions – Logarithm of a complex number – Summation of series using $C + iS$ method.

UNIT – 3:

Laplace transforms – Inverse Laplace transforms.

UNIT – 4:

Solving linear differential equations with constant coefficients and simultaneous equations using Laplace Transforms.

UNIT -5:

Fourier Series – Definition – Finding Fourier coefficients for a given periodic function with period 2π and $2l$ – odd and even functions – Half range series.

Text Book:

1. Arumugam. S and Thangapandi Issac. A – Trigonometry and Fourier Series.
2. T. K. Manickavachagam Pillai and S. Narayanan – Differential equations and its applications.

Books for reference:

- T. Veerarajan – Algebra and Trigonometry – YES DEE Publishing pvt. Ltd., Chennai.(2020).
- Ray Hanna .J – Fourier Series, Transforms and Boundary value Problems, Dover Publications New York, 2008.

Semester – IV
Non – Major Elective Paper – II (2hrs/week)
MATHEMATICS FOR COMPETITIVE EXAMINATION – II (30 hours) (ANMA4A)

Objectives:

- ❖ To learn the techniques for solving aptitude problems.
- ❖ To motivate the students for attending various competitive examinations.

Course Learning Outcomes: It enables the students to

1. learn the simple techniques to solve problems.
2. get confidence to attend the various competitive examination.

UNIT – 1:

Simple interest and Compound interest.

UNIT – 2:

Time and work.

UNIT – 3:

Time and Distance.

UNIT – 4:

Chain Rule.

UNIT – 5:

Pipes and Cistern

Text Book:

1. R. S. Agarwal - Objective Arithmetic, Published by S.Chand & Co Ltd. Edition(2018).

Books for Reference:

- Rajesh Verma -Fast track objective arithmetic, Arihant Publications(India) Limited., Revised Edition.
- R. S. Aggarwal, Arithmetic Subjective and objective, Published by S.Chand and.Co.Ltd. Revised Edition.

Semester - IV

Non – Major Elective Paper –II (2hrs/week)

FUNDAMENTALS OF STATISTICS II (30 hours) (ANMA4B)

Objectives:

- ❖ To know the concept of attributes.
- ❖ To study index numbers and simple problems.

Course Learning Outcomes: It enables the students to

1. realise the importance of curve fitting.
2. calculate different types of index numbers.

UNIT – I

Theory of attributes – two attributes.

UNIT – II

Index number - weighted index number.

UNIT – III

Consumer Price index number - conversion of index number .

UNIT – IV

Time series - measurement of trends.

UNIT – V

Curve fitting – Straight line – Parabola - Exponential curve.

Text Book:

Dr. S. Arumugam, A.Thangapandi Issac- Statistics, New Gamma Publishing House, Palayamkottai (2016).

Books for Reference:

- S. P. Gupta - Elementary Statistical Methods, Sultan Chand & Sons,2017).
- T. Veerarajan Fundamentals of mathematical Statistics, Yes Dee Publishing Pvt.Ltd.Edition . (2017)

Semester - V

Core -V

Paper – VII (5hrs/week)

LINEAR ALGEBRA (75 hours) (AMMA51)

Objectives:

- ❖ To acquire knowledge about vectors spaces, Inner product spaces and linear transformations.
- ❖ To solve problems in matrices.

Course Learning Outcomes: It enables the students to

1. understand the relation between matrix and linear transformation.
2. learn the method of finding Eigen values and Eigen vectors of a matrix.
3. study the concept of linear dependence and independence sets, basis.

UNIT – 1:

Vector spaces: Definition and examples – Elementary properties – subspaces – linear transformations – Fundamental theorem of homomorphism.

UNIT – 2:

Span of a set – linear dependence and independence – basis and dimension – theorems.

UNIT – 3:

Rank and Nullity theorem – matrix of a linear transformation – Inner product space – Definition and examples – orthogonality – orthogonal complement – Gram Schmidt orthogonalization process.

UNIT – 4:

Matrices – Elementary transformation – Inverse – rank – Cayley Hamilton theorem – Application of Cayley Hamilton theorem.

UNIT – 5:

Eigen values and Eigen vectors – Properties and problems – Bilinear forms – Quadratic forms – Reduction of quadratic form to diagonal form.

Text Book:

S.Arumugan & Thangapandi Issac, Modern Algebra- Scitech publication, Reprint (2008).

Books for Reference:

- Sharma J.N and Vashistha A. R. Linear Algebra - Krishna Prakash Nandir 1981.
- John B. Fraleigh – A first Course in Abstract Algebra 7th edition, Pearson, 2002.
- N. Ramabhadran & R. Balakrishnan , Text book of algebra –Vikas Publishing Co. Revised Edition 1985.

Semester - V

Core-VI

Paper-VIII (5hrs/week)

REAL ANALYSIS (75 hours) (AMMA52)

Objectives:

- ❖ To acquire knowledge about the real number system and metric spaces.
- ❖ To study the concepts of connectedness and compactness.

Course Learning Outcomes:

1. grasp the basic concept interior and closure of a set.
2. accommodate the notions of various metric spaces.

UNIT - 1:

Metric spaces – Examples – bounded sets – open ball – open sets – subspaces – interior of a set.

UNIT - 2:

Closed sets – closure – limits points – dense sets – complete metric space – Cantor's intersection theorem – Baire's category theorem.

UNIT - 3:

Continuity – Homomorphism – Uniform Continuity – Discontinuous functions of \mathbf{R} .

UNIT - 4:

Connectedness – Connected subsets of \mathbf{R} – Connectedness and continuity – Contraction mapping theorem.

UNIT - 5:

Compactness – Compact metric spaces – Compact subsets of \mathbf{R} – Heine Borel theorem – Equivalent characterisations for compactness – Compactness and Continuity.

Text Book:

Dr. S. Arumugan, Modern Analysis – Yes Dee Publishing Pvt.Ltd. Reprint (2019).

Book for Reference:

- Richard R. Goldberg -Methods of Real Analysis - Oxford and IBH Publishing Co. New Delhi.
- R Visvanathan nayak, Real Analysis -Emerald Publishers, Reprint 1992.
- Real Analysis – Viswanath Naik. K, Emerald Publishers , Chennai.

Semester - V

Core-VII

Paper- IX (5hrs/week)

STATICS (75 hours) (AMMA53)

Objectives:

- ❖ To provide the basic knowledge of equilibrium of a particle.
- ❖ To develop a working knowledge to handle practical problems.

Course Learning Outcomes: It enables the students to

1. recognize the concept of friction.
2. know the method to solve the problems related to that.

UNIT – 1:

Forces acting at a point – Parallelogram law of forces – Triangle of forces – Lami's theorem – Problems.

UNIT – 2:

Parallel forces and moments – resultant of two parallel forces – resultant of two unlike unequal parallel forces – Varignon's theorem – Problems.

UNIT – 3:

Equilibrium of three forces acting on a rigid body – three coplanar forces theorem – Problems.

UNIT – 4:

Friction – Laws of friction – angle of friction – equilibrium of a particle (i) on a rough inclined plane (ii) under a force parallel to the plane (iii) under any force – Problems.

UNIT – 5:

Equilibrium of strings – equation of the common catenary – tension at any point – geometrical properties of common catenary – Problems.

Text Book:

M. K. Venkatraman – Statics, Agasthiar Publications, Trichy (2020).

Books for reference:

1. S. Narayanan, Statics S. Chand and Company, New Delhi(1985).
2. K. Viswanatha Naik and M. Kari, Statics Emerald Publishers, Chennai.
3. I.Rajeswari –Mechanics- Saras Publication,(2016).

Semester - V

Core-VIII

Paper – X (5hrs/week)

TRANSFORMS AND THEIR APPLICATIONS (75 hours) (AMMA54)

Objectives:

- ❖ To develop the knowledge of Transforms.
- ❖ To solve problems in Fourier Transforms and Z- transforms.

Course Learning Outcomes: It enables the students to

1. develop the Knowledge on Fourier & Z Transforms.
2. get notions to solve the problems related to that.

UNIT – 1:

Fourier Transforms – Properties of Fourier Transforms.

UNIT – 2:

Infinite Fourier Cosine and Sinne Transforms – Properties.

UNIT – 3:

Finite Fourier Transforms.

UNIT – 4:

Z -transforms – Properties.

UNIT – 5:

Inverse Z -transforms.

Text Book:

Singaravelu .A– Engineering mathematics (volume III) – Meenakshi Agency, Chennai(2019).

Books for Reference:

1. Muthucumaraswamy.R - Transforms and Partial Differential Equation Equations –Yes Dee Publications – Second Edition(2019).
2. A. Gangatharan, Engineering Mathematics (volume I) – Prentice Hall of Iindia Pvt.Ltd. (2007).
3. Dr.C.Muthulakshmi @ Saisikala and R.Ponraj - Transforms and their applications, Charulatha Publication (2020).

Semester - V

Major Elective - I

Paper - XI (4hrs/week)

1.1 PROGRAMMING IN C (60 hours) (AMMA5A)

Objectives:

- ❖ To study the basic concept and structure of C program.
- ❖ To train the students to write simple C programs.

Course Learning Outcomes: It enables the students to

1. gain Knowledge to write programs in C.
2. train the students to acquire knowledge in C language.

UNIT - 1:

Introduction – Character set – C tokens – keywords and identifiers – Constants – Variables and Data types.

UNIT - 2:

Operators – Arithmetic, relational, logical assignment, increment and decrement, Conditional, Bitwise special operators – Precedence of operators – Managing input and output operators – get char(), putchar, scanf() and printf().

UNIT - 3:

Decision making and branching: Simple if, if else, nested if and the else if ladder statements – The switch statement – The ?: operator – The go to statement. Decision making and looping: Introduction – while, Do while and for statement – jumps in loops.

UNIT - 4:

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 handing functions.

UNIT - 5:

User defined functions – Definition of function – return values and their types – function calls – function declaration – Category of functions – Nesting of functions – recursion.

Text Book:

E. Balaguruswamy - Programming in ANSI C –Tata McGraw Hill Publishing company limited – III Edition (2017).

Books for references:

1. C. Reema Thareja, Programming in C- Oxford University Press (2018).
2. Ramasamy et.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).

Semester - V
Major Elective - I
Paper - XI (4hrs/week)
1.2 DISCRETE MATHEMATICS (60 hours) (SMMA5B)

Objectives:

- ❖ To study concepts of mathematics logic.
- ❖ To understand the basics of Lattices and Boolean Algebra.

Course Learning Outcomes: It enables the students to

1. know the number system and codes.
2. get basic ideas of Decimals, Binary, Octal and Hexadecimal and Gray code.

UNIT - 1: (Mathematical logic)

Statement and notation – Connectives – Negation – Conjunction – Disjunction – Statement formula and truth table – Conditional and biconditional – Well defined formulae – tautologies.

UNIT - 2:

Normal forms – The theory of interference for the statement calculus – The Predicate – The theory of inference for the Predicate Calculus.

UNIT - 3: (Algebraic structures)

Groups and monoids – Simple properties – Group codes.

UNIT - 4: (Lattices and Boolean algebra)

Lattices and posets – Properties of lattices – special lattices – Boolean algebra – Gating networks – Minimal sums of products.

UNIT - 5: (Number system and codes)

Decimal, Binary, Octal, Hexadecimal – Conversion from one to another – Binary addition, subtraction, multiplication and division – BCD – Weighted excess time – Gray code.

Text Book:

Tremblay and Manohar – Discrete mathematical structures with application to Computer Science (Tata McGraw Hill) New Delhi 1997.

Books for Reference:

1. M. K. Venkataraman and others – Discrete mathematic - The National Publishing Pvt.Ltd.(2000).
2. G. Balaji – Discrete mathematics – Balaji Publishers Chennai (2013).
3. T. Veerarajan – Discrete mathematics Tata McGraw Hill – 2009.

Semester - V

Major Elective I

Paper – XI (4hrs/week)

1.3 COMBINATIONAL MATHEMATICS (60 hours) (AMMA5C)

Objectives:

- ❖ To know the basic concepts of Pairings.
- ❖ To understand relations.

Course Learning Outcomes: It enables the students to

1. develop Block design & Square block designs.
2. study the basic concept of Permutations.

UNIT – 1:

Selections and Binomial coefficients – Permutations – Ordered selections – unordered selections – Miscellaneous Problems.

UNIT – 2:

Parings Problems – Pairings within a set – Pairing between sets.

UNIT – 3:

Recurrence – Fibonacci – type relations using generating functions – Miscellaneous methods.

UNIT – 4:

The inclusion – Exclusion Principles.

UNIT – 5:

Block designs – square block designs.

Text Book:

Ian C.Andersen – A first course in combinatorial mathematics – Clarendon Press, Oxford(1989).

Books for Reference:

1. Ralph P. Grimaldi, B.V. Ramona – Discrete and combinatorial mathematics – an applied introduction (IV edition).

Semester - V

Major Elective - II

Paper – XII (4hrs/week)

2.1 OPERATIONS RESEARCH – I (60 hours) (AMMA5D)

Objectives:

- ❖ To introduce the various techniques of operations research.
- ❖ To make the students to solve real life problems.

Course Learning Outcomes: It enables the students to

1. learn the relationship between Primal and Dual Problems.
2. study about transportation Problem.

UNIT – 1:

Linear Programming Problem: Mathematical formulation of LPP – Graphical method, Simplex method – Artificial variable technique.

UNIT – 2:

Concept of Duality – Primal and Dual problems – Duality – Dual Simplex method.

UNIT – 3:

Transportation Problem: North-west Corner rule – Matrix-Minima method – Vogel's approximation method – MODI method – Degeneracy and unbalanced Transportation problem.

UNIT – 4:

Assignment Problem: Hungarian method – Unbalanced assignment problems.

UNIT – 5:

Sequencing Problem: n jobs and two machines – n jobs and three machines – 2 jobs and m machines.

Text Book:

KantiSwarup, P. K. Gupta and Manmohan – Operations Research – Sultan Chand and sons – 2006, 12th edition.

Books for Reference:

- Gupta P. K and D. S. Hira – Operations Research – S. Chand & Sons-VII Edition.
- B. J. Ranganath and A. S. Srikantappa – Operations Research – Yes Dee Publishing House, Chennai (2017).
- Hamdy A. Taha – Operations research, An introduction - 8th Edition Prentice – Hall India (2006).

Semester – V
Major Elective – II

Paper – XII (4hrs/week)

2.2 STOCHASTIC PROCESS (60 hours) (AMMA5E)

Objectives:

- ❖ To understand the concepts of Stochastic process.
- ❖ To know Markov chains.

Course Learning Outcomes: It enables the students to

1. enrich the Knowledge in determination of Higher Transition Probabilities.
2. understand the generalisation of Poisson process.

UNIT – 1:

Generating functions – Laplace transform of probability distribution – Classification of distribution – Stochastic process – introduction – specification of stochastic process.

UNIT – 2:

Markov chains – Definition and examples – Higher transition probabilities – Generalisation of independent Bernoulli Trails – classification of states and chains – Determination of Higher Transition Probabilities – stability of Markov systems – Graph Theoretic approach.

UNIT – 3:

Markov chain with Denumerable number states – Reducible chains – Statistical inference for Markov chains – Markov chain with continuous state space – Non homogeneous chains.

UNIT – 4:

Markov process with discrete state space – Poisson process – Poisson process and related distributions – Generalisation of Poisson process – Birth and Death process.

UNIT – 5:

Markov process with Discrete state space – Derived Markov chains – Erlang Process.

Text Book:

J. Medhi – Stochastic Process – New Age International Publishers Pvt. Ltd. Third Edition.

Book for Reference:

1. Suddhendu Biswas – Applied Stochastic Process – New Central Agency Pvt. Ltd., Kolkatta (2012).
2. Paul G.Hoel, Sidney Port & Charles J.Stone – Introduction to Stochastic process –Waveland Press – Boston(1987).

Semester - V
Major Elective - II

Paper - XII (4hrs/week)

2.3 M.S OFFICE (60 hours) (SMMA5F)

Objectives:

- ❖ To develop the knowledge of computer.
- ❖ To know the importance of Word, Excel and PowerPoint.

Course Learning Outcomes: It enables the students to

1. enrich the knowledge in formatting document of various types.
2. prepare excel worksheets & PowerPoint Design.

UNIT - 1:

MS Word: Creating a document – saving, printing, editing and closing the document – copying, pasting, finding and replacing a text – adding headers and footers.

UNIT - 2:

Formatting a document – Turning Bold on/off – Underline on/off – highlight on/off – changing font size – page setup – changing margins – bullets and numbering – working with tables – changing the column width and row height – inserting or deleting a row/column – mail merge.

UNIT - 3: MS Excel:

Creating a worksheet – entering, editing, deleting data in cells – saving and previewing the worksheet – entering formulas – Working with basic functions – SUM, AVERAGE, MAX and MIN – sorting.

UNIT - 4:

Formatting a worksheet – inserting, deleting a row/column, changing font size – Graphs and charts – Simple calculations using mathematical, Statistical logical functions.

UNIT - 5: MS Power point:

Creating a simple presentation – adding transition effects to a presentation – adding sound effects to a presentation – creating hyperlinks between slides – changing the backward – inserting images on slides.

Text Book:

Dr. P. Rizwan Ahmed, " Office Automation 2010 ", Margham Publications 2016.

Books for reference:

1. Stephen.L.Nelson & Julia Kelly - "The Compete Reference", TataMc Graw Hill Publishing company Ltd(2001).
2. Sumner Mary-"Enterprise Resource Planning" Pearson Education,.I-Edition2004.

Semester – VI

Core – IX

Paper – XIII (5hrs/week)

COMPLEX ANALYSIS (75 hours) (AMMA61)

Objectives:

- ❖ To understand the concepts of complex variables.
- ❖ To learn about elementary transformations in complex variables.

Course Learning Outcomes: It enables the students to

1. know the concept of complex integration, Cauchy integral formula.
2. understand the importance of singularity and residues.

UNIT – 1: (Analytic functions)

Functions of a complex variable – Derivatives – Cauchy – Riemann equations –sufficient conditions– Polar form– Analytic functions– Harmonic functions.

UNIT – 2: (Integrals)

Definite integrals – Contours – Cauchy – Goursat theorem – anti-derivatives and independence of path–Cauchy Integral formula – Morera's theorem.

UNIT – 3: (Series)

Taylor's series – Examples – Laurent's series – Zeros of analytic functions –Residues–Residue theorem–Principal part of functions–Residues at poles.

UNIT – 4: (Evaluation of Integrals)

Evaluation of improper real integrals – improper integrals involving sines and cosines – Definite integrals involving sines and cosines.

UNIT – 5: (Transformations)

Basic properties–Bilinear maps–fixed points.

Text Book:

- Arumugam.S and T. Issac–“Complex Analysis” –Scitech Publishing House–Chennai,(2002).

Books for Reference :

1. Churchill.R.V. and J.W.Brown–“Complex variables and Applications”– McGraw Hill International Editions – IX Edition,2013.
2. Ponnuswamy.S “Foundations of Complex Analysis”, Narosa Publication House, NewDelhi, II Edition 2005.
3. Duraipandian.P and Lakshmi Duraipandian–“ComplexAnalysis”–Emerald Publications, Chennai (2001).

Semester -VI

Core – X

Paper – XIV (5hrs/week)

GRAPH THEORY (75 hours) (AMMA62)

Objectives:

- ❖ To introduce the notion of graph theory and its applications
- ❖ To learn the techniques in graph theory

Course Learning Outcomes: It enables the students to

1. know different types of graphs.
2. understand the concepts of walks, trails and paths.

UNIT – 1:

Definition and examples of graphs – degrees - subgraphs – isomorphism – independent sets and coverings – matrices – operation on graphs.

UNIT – 2:

Degree sequences – graphic sequences – walks – trails and paths – connectedness and components–connectivity.

UNIT – 3:

Eulerian graphs – Hamiltonian graphs – characterization of trees – centre of a tree.

UNIT – 4:

Definition and properties of planar graphs – chromatic number and chromatic index.

UNIT – 5:

Chromatic polynomials – definition and basic properties of digraphs – paths and connectedness in digraphs.

Text Book:

Arumugam.S & S.Ramachandran–Invitation to graph Theory, Scitech publications,Chennai, 2002.

Books for reference:

- Kumaravelu.S and Susheela Kumaravelu – Graph theory- Nagercoil,2002.
- Narasingh Deo–Graph theory with application to engineering and computer science, Prentice – Hall of India pvt.Ltd., NewDelhi,1979.

Semester – VI

Core – XI

Paper – XV (4hrs/week)

NUMBER THEORY (60 hours) (AMMA63)

Objectives:

- ❖ To highlight the beauties in the world of numbers
- ❖ To prepare the students for coding through congruence

Course Learning Outcomes: It enables the students to

1. learn Fermat's Theorem & Wilson's Theorem.
2. understand the importance of Division algorithm.

UNIT-1:

Peano's Axioms – Mathematical induction – The Binomial Theorem – Early Number Theory.

UNIT – 2:

Division Algorithm – GCD – Euclidean Algorithm – The Diophantine Equation $ax+by=c$.

UNIT – 3:

The fundamental Theorem of Arithmetic – The Sieve of Eratosthenes – The Goldbach conjecture.

UNIT – 4:

Basic properties of congruences – Linear congruence and the Chinese Remainder Theorem.

UNIT – 5:

Fermat's Theorem – Wilson's Theorem – The Fermat – Kraitichik Factorization Method.

Text Book:

David.M.Burton-ElementaryNumberTheory-Tata McGraw Hill Education Pvt. Ltd- (SixthEdition)-2007.

Books for Reference :

- Ivan Niven and H. Zuckerman-An Introduction to Theory of Numbers, Cambridge University Press -2019.
- Kumaravelu.S, and Susheela Kumaravelu -Elements of Number Theory- Nagercoil,2002.

Semester – VI

Core – XII

Paper – XVI (4hrs/week)

DYNAMICS (60 hours) (AMMA64)

Objectives:

- ❖ To provide a basic knowledge of the behavior of objects in motion
- ❖ To develop a working knowledge to handle practical problems

Course Learning Outcomes: It enables the students to

1. develop the Knowledge in Projectiles.
2. learn about the differential equation of central orbit.

UNIT – 1:

Projectiles – Equation of path – range–maximum height – time of flight – range on an inclined plane - problems.

UNIT – 2:

Collision of elastic bodies – Laws of impact – direct and oblique impact-Problems.

UNIT – 3:

Simple Harmonic Motion (SHM) in a straight line- Geometrical representation –composition of SHM of the same period in the same line and along two perpendicular directions–problems.

UNIT – 4:

Motion under the action of central forces – velocity and acceleration in polar co-ordinates– problems.

UNIT – 5:

Differential Equation of central orbit - pedal equation of central orbit – problems to find the law of force towards the pole when the orbit is given.

Text Book:

Venkatraman, M.K.- A Text Book on Dynamics, Agasthiar Publication, Trichy,2020.

Books for Reference:

1. Narayanan, S-Dynamics, S.Chand & company, 16th Edition,1986, NewDelhi.
2. Duraipandian.P, LaxmiDuraipandian and Muthamizh Jayaprgasam-Mechanics S.Chand & Company (2003).
3. I.Rajeswari –Mechanics- Saras Publication,Nagercoil,(2016).

Semester – VI
Core –XIII
Paper – XVII (4hrs/week)
NUMERICAL METHODS (60 hours) (AMMA65)

Objectives:

- ❖ To introduce the finite differences
- ❖ To solve numerical problems by different methods

Course Learning Outcomes: It enables the students to

1. recognize numerical differentiation and integration.
2. understand the concepts of solving various numerical problems by using different methods.

UNIT – 1:

Solution of Numerical algebraic and Transcendental Equations : Bisection method– Newton's method. Criterion of order of convergence of Newton's method. Regula False method – Gauss elimination – Gauss Jacobi – Gauss Seidal method.

UNIT – 2:

Finite Difference: First and higher order differences – Forward and backward differences – Properties of Operator – Differences of a polynomial –Factorial Polynomial.

UNIT – 3:

Interpolation: Newton's Forward–backward, Gauss forward–backward interpolation formula– Bessel's formula. Divided differences – Newton's divided difference formula – Lagrange's interpolation formula.

UNIT -4:

Numerical Differentiation and Integration: Newton's forward and backward differences for differentiation – Derivatives using Bessel's formula – Trapezoidal rule, Simpson's 1/3rule & 3/8rule.

UNIT – 5:

Difference Equations: Definition – order and degree of difference equation – Linear difference equation – Finding complementary function – particular Integral – simple applications.

Text Book:

Venkatraman.M.K - Numerical methods in Science and Engineering National Publishing Company - V Edition 1998.

Books for Reference:

1. Kandasamy.P.K.Thilagavathy and K.Gunavathy, Numerical Methods, S.Chand & Company Ltd. Edn. 2006.
2. Autar Kaw and Egwwn Enc Kalu – Numerical methods with Application Abidet. Autokaw.com 2nd Edtion , 2011.
3. Dr.A.Singaravelu Statistics & Numerical Methods, Meenakshi Agency (2012).

B.Sc. Computer and Information Technology

(Choice Based Credit System)

(With effect from the academic year 2017 -2018)

Sl. No	Subject Status	Sub.Code	Subject Title
1.	Core - Major – V	SMCT41	Java Programming
	Major – VI	SMCT42	Operating System
2.	Major Practical – IV	SMCTP4	Java Programming Lab
3.	Part III - Skill Based Core Subject-II	SSCT4A	Flash
4.	Part IV - Non – Major Elective – II	SNCT4A	Basic Programming Design
5.	Allied Subject – IV	SACT41	Operations Research & Numerical Analysis
6.	Allied Practical – IV	SACTP4	Linux
7.	Common	SCDE4A	Computers for Digital Era
8.	Part V - Extension Activities	S5EA41	NCC,NSS,YRC,YWF

B.Sc. Mathematics

(Choice Based Credit System)

(with effect from the academic year 2017-2018 onwards)

Sl. No	Subject Status	Sub.Code	Subject Title
1.	Language	S1TL41	Pothu Tamil Paper IV
2.	Language	S2EN41	General English Paper IV
3.	Core	SMMA41	Abstract Algebra I
4.	Allied II	SAST21	Statistics II
5.	Skill Based Core	SSMA4A	Trigonometry Fourier Series and Laplace transforms
6.	Non- Major Elective	SNMA4A	Mathematics for Competitive Examinations II
		SNMA4B	Fundamentals of Statistics II
7.	Common	SCDE4A	Computer for Digital Era
8.	Extension Activities – -	S5EA41	NCC,NSS,YRC,YWF

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

UG COURSES – AFFILIATED COLLEGES

B.Sc. Mathematics

(Choice Based Credit System)

(with effect from the academic year 2017-2018 onwards)

Sem	Sl. No	Subject Status	Subject title	Subject Code
V	1	Core	Abstract Algebra II	SMMA51
	2	Core	Real Analysis II	SMMA52
	3	Core	Statics	SMMA53
	4	Core	Transforms and their Applications	SMMA54
	5	Major Elective –I (Any One)	Astronomy -I	SEMA5A
			Discrete Mathematics	SEMA5B ✓
			Combinatorial Mathematics	SEMA5C
	6	Major Elective-II (Any one)	Operations Research - I	SEMA5D ✓
			Stochastic Process	SEMA5E
			MS office	SEMA5F
	7	Skilled Common Based	Personality Development	SCSB5A
			Effective Communication	SCSB5B
			Youth Leadership	SCSB5C
VI	1	Core	Complex Analysis	SMMA61
	2	Core	Number Theory	SMMA62
	3	Core	Graph Theory	SMMA63
	4	Core	Dynamics	SMMA64
	5	Core	Numerical Methods	SMMA65
	6	Major Elective- III Any one	Astronomy II	SEMA6A
			Fuzzy Mathematics	SEMA6B ✓
			Mathematical Modeling	SEMA6C
	7	Major Elective- IV (Any one)	Operations Research II	SEMA6D ✓
			Coding Theory	SEMA6E
Programming in C			SEMA6F	