M.Sc., MATHEMATICS

COURSE STRUCTURE WITH SYLLABUS

PROGRAMME CODE: 2PSMAT

2025-2026

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

(Affiliated to Bharathidasan University, Tiruchirappalli)

Accredited by NAAC

SUNDARAKKOTTAI, MANNARGUDI–614016.

TAMILNADU, INDIA.

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

(Affiliated to Bharathidasan University, Tiruchirappalli)

Accredited by NAAC

SUNDARAKKOTTAI, MANNARGUDI–614016.

TAMILNADU, INDIA.

M.Sc., MATHEMATICS

CHOICE BASED CREDIT SYSTEM - LEARNINIG OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(For the candidates admitted in the academic year 2025-2026)

CHOICE BASED CREDIT SYSTEM

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a "cafeteria" type approach in which the Students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Our College has moved to CBCS and implemented the grading system.

OUTCOME-BASED EDUCATION (OBE)

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications are awarded on the basis of demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and academic standards expected of graduates of a programme of study. Learning outcomes specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study. The expected learning outcomes are used as reference points that would help to formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes which in turn will help in curriculum planning and development, and in the design, delivery and review of academic programmes. They provide general guidance for articulating the essential learnings associated with programmes of study and courses with in a programme, maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility and provide higher education institutions an important point of reference for designing teaching-learning strategies, assessing student learning levels, and periodic review of programmes and academic standards.

Some important aspects of the Outcome Based Education

Course: is defined as a theory, practical or theory cum practical subject studied in a semester.

Course Outcomes (COs): are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.

Programme: is defined as the specialization or discipline of a Degree.

Programme Outcomes (POs): Programme outcomes are narrower statements that describe what Students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.

Programme Specific Outcomes (PSOs): PSOs are what the Students should be able to do at the time of graduation with reference to a specific discipline.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC): A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Specific Elective Courses (DSE): Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

Generic Elective Courses: An elective course chosen generally from an **unrelated discipline/subject,** with an intention to seek exposure is called a Generic Elective. Generic Elective courses are designed for the Students of other disciplines. Thus, as per the CBCS policy, the Students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Non Major Elective (NME): A student shall choose at least two Non-major Elective Courses (NME) from outside his/her department.

Skill Enhancement Courses (SECs): These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the Students of any other discipline, but are highly suitable for Students pursuing their academic programme. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge**.**

Field Study/Industrial Visit/Case Study: It has to be completed during the fifth semester of the degree programme. Credit for this course will be entered in the fifth semester's marks statement.

Internship: Students must complete internship during summer holidays after the fourth semester. They have to submit a report of internship training with the necessary documents and have to appear for a viva-voce examination during fifth semester. Credit for internship will be entered in the fifth semester's mark statement.

Extra Credit Courses: In order to facilitate the Students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the Students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL etc.

Postgraduate Programme:

Programme Pattern: The Post Graduate degree programme consists of **FIVE** vital components. They are as follows:

Part –A	:	Core Course (Theory, Practicals) Core Industry Module, Core Project
Part-B (i)	:	Elective courses
Part-B (ii)	:	Non Major Elective, Skill Enhancement course, Professional Competency course
Part-B (iii)	:	Internship
Part –C	:	Extension activity

EXAMINATION

Continuous Internal Assessment (CIA):

PG - Distribution of CIA Marks

Passing Minimum: 50 %

Assignments – 3 = 30%

Tests- 2= 50%

Seminar=10 %

Attendance= 10 %

Question Paper Pattern

Part A: includes two subsections

Part A 1 (10X1=10 marks)

One word question/ Fill in /True or False/ Multiple Choice Questions Two Questions from Each unit

Part A 2(5X2=10 marks)

Short Answers / Match the following

One question from Each unit

Total Marks - 20

Part B: (5X5=25 marks)
Paragraph Answers
Either/ or type, One Question from each unit

Part C: (3X10=30)
Essay Type Answers
Answer 3 out of 5 Questions
One Question from each unit

Part A: K1 Level
Part B: K2, K3 and K4 Level
Part C: K5 and K6 Level

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

S.No.	Level	Parameter	Description
1	K1	Knowledge/Remembering	It is the ability to remember the previously Learned
2	K2	Comprehension/ Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analysing	The learner distinguishes among different parts
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis/Creating	The learner creates a new product or point of view

WEIGHTAGE of K –LEVELS IN QUESTION PAPER

(Cognitive Level) K-LEVELS →	Lower Order Thinking			Higher Order Thinking			Total
	K1	K2	K3	K4	K5	K6	
END SEMESTER EXAMINATIONS (ESE)	20	25			30		**75**
Continuous Internal Assessment (CIA)	20	25			30		**75**

QUESTION PATTERN FOR END SEMESTER EXAMINATION/ Continuous Internal Assessment

PART		MARKS
PART –A I. (No choice ,One Mark) **TWO** questions from each unit	(10x1=10)	**20**
II. (No choice, Two Mark) **ONE** question from each unit	(5x2=10)	
PART –B (Either/ or type,5-Marks) **ONE** question from each unit	(5x5=25)	**25**
PART –C (3 out of 5) (10Marks) **ONE** question from each unit	(3x10=30)	**30**
	Total	**75**

BLUE PRINT OF QUESTION PAPER FOR END SEMESTER EXAMINATION							
DURATION: 3.00 Hours.							**Max Mark :75**
K-LEVELS		**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**Total Marks**
PART								
PART –A	(One Mark, No choice) (10x1=10)	10						**10**
	(2-Marks,Nochoice) (5x2=10)	10						**10**
PART –B	(5-Marks)(Either/or type) (5x5=25)		5	10	10			**25**
PART –C	(10 Marks)(3 out of 5) (3x10=30) Courses having only **K5,K6** levels, K5 level- 3 Questions, K6 level- 2 Questions **(One K6 level question is compulsory)**					20	10	**30**
	Total	**20**	**05**	**10**	**10**	20	10	**75**

EVALUATION

GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtainedwill then be graded as per the scheme provided in Table-1.

Grade Point Average (GPA) will be calculated from the first semester onwards for all semester. From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) , respectively. These two are calculated by the following formulae:

$GPA = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{I=1}^{n} C_i}$	$WAM(\text{Weighted Average Marks}) = \frac{\sum_{i=1}^{N} C_i M_i}{\sum_{I=1}^{n} C_i}$
Where, C_i is the Credit earned for the Coursei G_i is the Grade Point obtained by the student for the Coursei M_i is the marks obtained for the coursei and n is the number of Courses **Passed** in that semester.	

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

i. The classification of final results shall be based on the CGPA, as indicated in Table-2.

ii. For the purpose of Classification of Final Results, the candidates who earn the CGPA 9.00 and above shall be declared to have qualified for the Degree as “Outstanding”. Similarly the candidates who earn the CGPA between 8.00 and 8.99, 7.00 and 7.99, 6.00 and 6.99 and 5.00 and 5.99 shall be declared to have qualified for their Degree in the respective programmes as “Excellent”, “Very Good”, “Good”, and “Above Average” respectively.

iii. Absence from an examination shall not be taken an attempt.

Table- 1: Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	**10**	**O**
80 and above and below 90	**9**	A+
70 and above and below 80	**8**	**A**
60 and above and below 70	**7**	**B+**
50 and above and below 60	**6**	**B**
Below50	**NA**	**RA**

NA- Not Applicable, RA- Reappearance

The candidates performance in every current semester is indicated by **Semester Grade Point Average (SGPA)** and from the second semester onwards, the continuous performance including previous semester/s is indicated by **Cumulative Grade Point Average (CGPA)**

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	**O**	**Outstanding**
8.00 to 8.99	A+	**Excellent**
7.00 to 7.99	**A**	**Very Good**
6.00 to 6.99	**B+**	**Good**
5.00 to 5.99	**B**	**Above Average**

***** The candidates who have passed in the first appearance and within the prescribed duration of the PG Programme are eligible. If the candidate's Grade is O/A+ with more than one attempt, the performance is fixed as "Very Good"

VISION

Promoting the arithmetic skill in the minds of the women Students who hail from the rural and economically weaker section of the society, as Mathematics is the queen of Sciences.

MISSION

- To promote the analytical thinking through logical reasoning.
- To create a mind set for quick arithmetic calculations.

PROGRAMME OUTCOMES FOR M.Sc.,DEGREE PROGRAMMES

PO.No	Programme Outcomes (*Upon completion of the M.Sc.,Degree Programme, the Post graduate will be able to)*
PO-1	**Disciplinary Knowledge**: demonstrate in-depth knowledge and understanding of theories, policies, and practices in one or more disciplines that form a part of a Post Graduate program of study in Master of Science.
PO-2	**Critical Thinking and Problem Solving**: apply analytic thought to a body of knowledge, analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence, identifyrelevant assumptions or implications, formulate coherent arguments, critically evaluate practices, policies and theories by following scientific approach to knowledge development: solve problems and extrapolate the same to real life situation
PO-3	**Information/digital literacy and Communication Skills:** use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources, and use appropriate software for analysis of data: communicate thoughts and ideas analytically and effectively in writing and orally using appropriate media, and present complex information in a clear and concise manner to different groups.
PO-4	**Research-related skills:** conduct independent inquiry in a chosen scientific discipline, demonstrate sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; plan, execute and report the results of an experiment or investigation.
PO-5	**Scientific reasoning and Reflective Thinking:** analyse, interpret and draw conclusions from quantitative/qualitative data and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective; critically and sensibly evaluate life experiences, with self awareness and reflexivity of both self and society.
PO-6	**Multidisciplinary Approach, Innovation and Entrepreneurship:** propose novel ideas of interdisciplinary approach in providing better solutions and new ideas for the sustainable developments; identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.
PO-7	**Moral and ethical awareness/reasoning:** embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work, demonstrate the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights, appreciate environmental and sustainability issues, and adopt objective, unbiased and truthful actions in all aspects of work.
PO-8	**Self directed Learning:** work independently, identify appropriate resources required for a project, and manage a project till completion.
PO-9	**Lifelong Learning:** engage in continuous learning for professional growth and development, acquire knowledge and skills, adapt to changing environment and to changing trades and demands of work place through knowledge/skill development/reskilling.
PO-10	**Multicultural Competence, Social Interaction and Effective Citizenship:** understand the values and beliefs of multiple cultures, global perspectives, engage and interact respectfully with diverse groups and elicit views of others, mediate disagreements and help reach conclusions in group settings, and demonstrate empathetic social concern and equity centered national development

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO No.	Program Specific Outcomes **(M.Sc., Mathematics)**
PSO1	Acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics.
PSO2	Understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.
PSO3	To prepare the Students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations. To encourage practices grounded in research that comply with employment laws, leading the organization towards growth and development.

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
(Affiliated to Bharathidasan University,Tiruchirappalli)
(Accredited by NAAC)
SUNDARAKKOTTAI,MANNARGUDI–614016.
TAMILNADU, INDIA.

M.Sc., MATHEMATICS
COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM - LEARNINIGOUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)
(For the candidates admitted from the academic year 2025-2026)
ELIGIBILITY: Candidates who have passed Bachelor level Examination in Mathematics.

Sem	Part	Nature of the Course	Course Code	Title of the Paper	Ins. Hours/ Week	Ins. Hours/ Week				Credit	Exam Hours	Marks		Total
						L	T	P	O/S			CIA	ESE	
I	Part A	Core Course -I	P25MA101	Algebraic Structures	6	4	1	-	1	5	3	25	75	100
		Core Course -II	P25MA102	Real Analysis I	6	4	1	-	1	4	3	25	75	100
		Core Course -III	P25MA103	Ordinary Differential Equations	6	4	1	-	1	4	3	25	75	100
	Part B (i)	Elective Course -I	P25MAE11A/ P25MAE11B/ P25MAE11C	Graph Theory and Applications / Number theory and Cryptography/Formal Languages and Automata theory	5	4	1	-	-	3	3	25	75	100
		Elective Course -II	P25MAE12A/ P25MAE12B/ P25MAE12C/	Discrete Mathematics / Analytical Number theory/Algebraic Topology	5	4	1	-	-	3	3	25	75	100
	Part B (ii)	Non Major Elective –I			2	1	1	-	-	2	3	25	75	100
					30	**21**	**6**	**-**	**3**	**21**	-	-	-	**600**
II	Part A	Core Course -IV	P25MA204	Advanced Algebra	6	4	1	-	1	5	3	25	75	100
		Core Course -V	P25MA205	Real Analysis II	6	4	1	-	1	4	3	25	75	100
		Core Course -VI	P25MA206	Partial Differential Equations	6	4	1	-	1	4	3	25	75	100
	Part B (i)	Elective Course – III	P25MAE23A/ P25MAE23B/ P25MAE23C	Algebraic Number Theory / Mathematical programming/Theory of Wavelets	5	4	1	-	-	3	3	25	75	100
		Elective Course – IV	P25MAE24A/ P25MAE24B/ P25MAE24C	Probability Theory/ programming in C++ and Numerical Methods/ statistical data Analysis using R Programming	5	4	1	-	-	3	3	25	75	100
	Part B (ii)	Non Major Elective –II			2	1	1	-	-	2	3	25	75	100
			Total		**30**	**21**	**6**	**-**	**3**	**21**	-	-	-	**600**
III	Part A	Core Course -VII	P25MA307	Complex Analysis	6	4	1	-	1	5	3	25	75	100
		Core Course -VIII	P25MA308	Optimization Techniques	5	3	1	-	1	4	3	25	75	100
		Core Course - IX	P25MA309	Topology	6	4	1	-	1	4	3	25	75	100
		Core Industry Module	P25MAI31	Probability, Random Variables and Stochastic Process	6	4	1	-	1	3	3	25	75	100
	Part B (i)	Elective Course -V	P25MAE35A/ P25MAE35B/ P25MAE35C	Fluid Dynamics / Fractal Geometry/Set Theory and Logic	5	3	1	-	1	3	3	25	75	100
	Part B (ii)	Skill Enhancement Course	P25SEMA31	Office Automation and ICT Tools	2	1	1	-	-	2	3	25	75	100
	Part B (iii)	P25MAIA31 Internship/ Industrial visit/ Field Visit			-	-	-	-	-	2	-	-	-	-
			TOTAL		**30**	**19**	**6**	**-**	**5**	**23**	-	-	-	**600**

Sem	Part	Nature of the Course	Course Code	Title of the Paper	Ins. Hours/ Week	Ins. Hours/ Week				Credit	Exam Hours	Marks		Total
						L	T	P	O/S			CIA	ESE	
IV	Part A	Core Course –X	P25MA410	Functional Analysis	6	4	1	-	1	5	3	25	75	100
		Core Course –XI	P25MA411	Differential Geometry	5	3	1	-	1	4	3	25	75	100
		Core Course –XII	P25MA412	Classical Mechanics	5	3	1	-	1	4	3	25	75	100
		Core Project	P25MAPW	Core Project with viva voce	8	-	2	6		7	3	25	75	100
	Part B (i)	Elective Course –VI Industry/ Entrepreneurship	P25MAE46A/ P25MAE46B/ P25MAE46C	Research Methodology / Mathematical Finance/Category Theory	4	3	1	-	-	3	3	25	75	100
	Part B (ii)	Professional Competency Course	P25PCMA41	Mathematics for Advanced Research Studies	2	1	1	-	-	2	3	25	75	100
	Part C	Extension	P25MAEA	Extension Activity	-	-				1	-	-	-	-
			TOTAL		**30**	**14**	**7**	**6**	**3**	**26**	-	-	-	**600**
			GRAND TOTAL		**120**	**75**	**25**	**6**	**14**	**91**	-	-	-	**2400**
Extra Credit			MOOC/SWAYAM/NPTEL(Optional)			-				2	-	-	-	-
			Value Added Courses (Atleast One Per Year)			-				2	-	-	-	-

L-Lecture **T-Tutorial** **P-Practical S-Seminar**

Credit Distribution for M.Sc., MATHEMATICS

S.No	Part	Subject	No. of Courses	Total Credits
1	A	Core Course –Theory	12	52
2		Core Project Work Viva – Voce	1	7
3		Core Industry Module	1	3
4		Elective Course	6	18
5		Non Major Elective	2	4
6	B	Skill Enhancement Course	1	2
7		Professional Competency Course	1	2
8		Internship/Industrial visit/Field Visit	1	2
9	C	Extension Activity	1	1
Total			**26**	**91**

Part A component and Part B (i) will be taken into account for CGPA calculation for the postgraduate programme and the other components of Part B and Part C have to becompleted during the duration of the programme as per the norms, to be eligible for obtaining the PG degree.

NON MAJOR ELECTIVE (NME) OFFERED BY THE DEPARTMENT

Semester	Part	Course	Course Code	Title of the Paper
I	Part B (ii)	NME-I	P25NMEMA11	Numerical Methods
II		NME-II	P25NMEMA22	Mathematics for social sciences

SEMESTER III

Semester: III- CC- VII: Complex Analysis

Ins. Hrs./Week:6 **Course Credit: 5** **Course Code:P25MA307**

UNIT-I: Cauchy's Integral Formula: **(20 Hours)**

The Index of a point with respect to a closed curve –The Integral formula – Higher derivatives -Local Properties of analytical Functions: Removable Singularities- Taylors's Theorem– Zeros and poles – The local Mapping – The Maximum Principle.

UNIT-II: The general form of Cauchy's Theorem: **(18 Hours)**

Chains and cycles- Simple Connectivity -Homology -The General statement of Cauchy's Theorem -Proof of Cauchy's theorem -Locally exact differentials- Multiply connected regions - Residue theorem - The argument principle

UNIT-III : Evaluation of Definite Integrals and Harmonic Functions **(18 Hours)**

Evaluation of definite integrals -Definition of Harmonic function and basic properties - Mean value property - Poisson formula.

UNIT-IV : Harmonic Functions and Power Series Expansions: **(18 Hours)**

Schwarz's theorem - The Reflection principle – Weierstrass's theorem –The Taylor Series – The Laurent series

UNIT-V: Partial Fractions and Entire Functions: **(16 Hours)**

Partial fractions - Infinite products – Canonical products – Gamma Function- Jensen's formula – Hadamard's Theorem

Total Lecture Hours-90

COURSEOUTCOME

The Students will be able to

1. Analyze and evaluate local properties of analytical functions and definite integrals.
2. Describe the concept of definite integral and harmonic functions.
3. Demonstrate the concept of the general form of Cauchy's theorem.
4. Develop Taylor and Laurent series.
5. Explain the infinite products ,canonical products and jensen's formula.

TEXTBOOKS

1. LarsV.Ahlfors,2021, Complex Analysis, (3rdedition) McGraw Hill Co., New York.
UNIT I : Chapter 4: Section 2: 2.1 to 2.3 & Chapter 4: Section 3 : 3.1 to 3.4
UNIT II : Chapter 4 : Section 4: 4.1 to 4.7 & Chapter 4: Section 5:5.1 and 5.2
UNIT III: Chapter 4: Section 5 : 5.3 & Chapter 4: Section 6 : 6.1 to 6.3
UNIT IV: Chapter 4: Section 6 : 6.4 and 6.5 & Chapter 5 : Section 1: 1.1 to 1.3
UNIT V : Chapter 5 : Section 2: 2.1 to 2.4 & Chapter5 : Section 3 : 3.1 and 3.2

REFERENCE BOOK(S)

1. H.A. Presfly, (2003), Introduction to complex Analysis, (Second Edition) Clarendon Press, oxford.
2. J. B. Conway,(2012), Functions of one complex variables (Second Edition), by Springer.
3. E. Hille,(2012) Analytic function Theory (2 vols.), (Second Edition), AMS Chelsea Publishing.
4. Stewart & David Tall (2024), Complex Analysis, (Second Edition), Cambridge University Press.
5. Walter Rudin (2023), Real and Complex Analysis, (3rd Edition), McGraw-Hill India.

E-RESOURCES

1. **http://mathforum.org,**
2. **http://ocw.mit.edu/ocwweb/Mathematics,**
3. **http://www.opensource.org,**
4. **http://en.wikipedia.org**

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	3	2	3	3	3	1	2	3	3	2	1
CLO2	2	1	3	1	3	3	2	3	1	1	3	2	1
CLO3	3	2	3	1	3	3	1	2	3	2	3	2	1
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	1
CLO5	3	1	2	3	3	3	1	2	3	1	3	2	1

Strong: 3 Medium: 2 Low: 1

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2025– 2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III - CC- VIII: Optimization Techniques

Ins. Hrs./Week: 5 **Course Credit: 4** **Course Code:P25MA308**

UNIT-I: Integer Programming **(15 Hours)**

Introduction - Pure and Mixed Integer Programming Problems – Gomory's all Integer Programming Problem Method – Construction of Gomory's Constraints - Fractional cut Method - All integer LPP - Mixed Integer linear Programming Problems - Branch and Bound method.

UNIT –II: Dynamic Programming **(15 Hours)**

Introduction – Principle of Optimality - The recursive Equation approach – Characteristics of dynamic Programming - Dynamic Programming algorithm - Solution of Linear Programming Problem by Dynamic Programming.

UNIT–III: Inventory Control **(15 Hours)**

Introduction – Types of inventories - Reasons for carrying inventories – The Inventory decisions – objectives of scientific Inventory control – Cost associated with inventories - Factors affecting inventory control - An inventory control problem – The Concept of EOQ - Deterministic inventory problems with no shortages - Deterministic inventory problem with shortages.

UNIT-IV: Queueing Theory **(15 Hours)**

Introduction - Queueing System - Elements of a Queueing System - Operating Characteristics of a Queueing System – Deterministic Queueing System - Probability Distributions in Queueing systems - Classification of Queueing Models – Definition of Transient and steady states - Poisson queueing Systems (Model I, III only).

UNIT-V: Non-Linear Programming **(15 Hours)**

Introduction - Formulating a Non-Linear Programming problem (NLPP) - General NLPP - Constrained Optimization with Equality Constraints - Constrained Optimization with inequality Constraints – NLP Methods Quadratic Programming - Separable Convex Programming.

Total Lecture Hours-75

COURSE OUTCOME

The Students will be able to

1. Gain knowledge about solving integer linear programming Problems.
2. Understand the concept of Dynamic Programming.
3. Analyze the concept of Inventory Models
4. Examine the concept of Queueing Theory.
5. Apply the concept of NLPP in Research.

TEXT BOOK(S)

1. Kanti Swarup, P.K. Gupta and Man Mohan. 2022, Operations Research, 20th Revised Edition. Sultan Chand & Sons, New Delhi.

UNIT-I: Chapter - 7: Sec. 7.1 to 7.7
UNIT-II: Chapter - 13: 13.1 to 13.7
UNIT-III: Chapter - 19: Sec. 19.1 to 19.11
UNIT-IV: Chapter - 21: Sec 21.1 to 21.9
UNIT-V: Chapter - 27: Sec 27.1 to 27.5
Chapter - 28: Sec 28.4 & 28.7

REFERENCE BOOK(S)

1. Eiselt H.A. and Sandblom C.L. 2010. Operations Research. Springer Verlag Berlin Heidelberg, New York.
2. Hamdy A. Taha. 2017, Operations Research, 10th Edition, Prentice Hall of India Pvt. Limited, New Delhi.
3. Prem Kumar Gupta and Hira.D. S, 2014. Operations Research, Seventh Edition. Sultan Chand, New Delhi.
4. Rama Muruthy P. 2007. Operation Research. New Age International Private Limited, Chennai.
5. Srinivasan G. 2017. Operation Research Principles and Applications, Third Edition. PHI Learning Pvt. Limited, New Delhi.

E-RESOURCES

1. https://www.bbau.ac.in/dept/UIET/EME-601%20Operation%20Research.pdf
2. https://www.google.co.in/books/edition/_/6khDDAAAQBAJ?hl=en
3. https://coral.ise.lehigh.edu/magh/present/stetson01.pdf
4. https://www.researchgate.net/publication/313880623_Introduction_to_Operations_Research Theory_ and Applications
5. http://www.ru.ac.bd/stat/wpcontent/uploads/sites/25/2019/03/405_01_Srinivasan_Operations- Research_Principles-and-Applications-Prentice-Hall-of-India-2010.pdf

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	3	2	3	3	3	1	2	3	3	2	1
CLO2	2	1	3	1	3	3	2	3	1	1	3	2	1
CLO3	3	2	3	1	3	3	1	2	3	2	3	2	1
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	1
CLO5	3	1	2	3	3	3	1	2	3	1	3	2	1

Strong: 3 Medium: 2 Low: 1

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'SCOLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2025– 2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III-CC-IX:Topology

Ins. Hrs./Week:6 **Course Credit: 4** **Course Code:P25MA309**

UNIT -I: Set Theory and Topological Spaces (20 Hours)

Fundamental Concepts of Set theory (Theorems not needed)-Topological spaces – Basis for a topology-The Order Topology-The Product topology on X xY- The Subspace Topology –Closed sets and Limit points.

UNIT –II: Continuous functions (16 Hours)

Continuous functions – The product topology – The Metric Topology-The Metric Topology Continued.

UNIT–III: Connectedness (14 Hours)

Connected spaces- connected subspaces of the Real Line-Components and local connectedness.

UNIT-IV: Compactness (20 Hours)

Compact spaces-*C*ompact subspaces of the Real line – Limit Point Compactness –Local Compactness.

UNIT-V: Countability and Separation Axioms (20 Hours)

The Countability Axioms – The Separation Axioms –Normal spaces – The Urysohn Lemma – The Urysohn Metrization Theorem – The Tietz Extension Theorem.

Total Lecture Hours - 90

COURSE OUTCOME

The Students will be able to

1. Illustrate the concept of topological spaces and the basic definitions of open sets, interior, exterior, closure and their axioms for defining topological space.
2. Understand continuity, compactness, homeomorphism and topological properties.
3. Analyze and apply the topological concepts in Functional Analysis.
4. Ability to determine that a given point in a topological space is either a limit point or not for a given subset of a topological space.
4. Develop qualitative tools to characterize connectedness, compactness, second countable A xioms.

.

TEXT BOOKS

1.James R. Munkres,2002, *Topology,*Second Edit*ion* Pearson Education Private. Ltd., Delhi

UNIT- I : Chapter 1: Sec. 1 to7,
Chapter:12 to 17
UNIT-II : Chapter 2: Sec. 18 to 21
UNIT-III : Chapter 3: Sec. 23 to 25
UNIT-IV : Chapter 3: Sec. 26 to 29
UNIT-V : Chapter 4: Sec. 30 to 35.

REFERENCE BOOK(S)

1.J. Dugundji ,*Topology,* 1975, Prentice Hall of India, New Delhi,
2.George F.Sinmons,1963, Introduction to Topology *and Modern Analysis*, McGraw Hill Book Co.,

3. J.L. Kelly, *General Topology*, Van Nostrand, Reinhold Co., New York
4. L.Steen and J.Subhash, 1970, Counter Examples in Topology, Holt, Rinehart and Winston, New York.
5. S.Willard, *General Topology*, Addison - Wesley, Mass.

E-RESOURCES

1. http://mathforum.org,
2. http://ocw.mit.edu/ocwweb/Mathematics,
3. http://www.opensource.org ,
4. http://en.wikipedia.org

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos										PSOs		
		2	3	4	5	6	7	8	9	10	1	2	3
CLO1		1	3	2	2	3	3	1	3	3	2	2	1
CLO2	2	1	3	1	1	3	1	3	1	1	3	2	1
CLO3	3	2	3	1	3	2	1	2	3	2	3	1	1
CLO4		2	3	2	3	3	1	2	3	2	3	2	1
CLO5	3	1	2	3	3	3	1	2	3	1	3	2	1

Strong:3 Medium: 2 Low:1

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI-614016

(For the Candidates admitted in the academic year 2025–2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III-Core Industry Module–Probability, Random Variables and Stochastic Process

Ins. Hrs./Week:6 **Course Credit**:3 **Course Code**: P25MA I31

UNIT-I: **(18 Hours)**

Set Theory-Probability Space-Conditional Probability-Borel–Cantelli Lemma-Related Problems.

UNIT-II: **(18 Hours)**

Introduction-Distribution and Density Functions-Properties of Distributions–Specific Random Variables- Conditional Distributions-Asymptotic Approximations for Binomial Random Variable and Related Problems.

UNIT-III: **(18 Hours)**

General Concepts-Conditional Densities, Characteristic Functions, and Normality-Mean Square Estimation-Stochastic Convergence and Limit Theorems – Random Numbers: Meaning and generation.

UNIT-IV: **(18 Hours)**

Definition-Systems with Stochastic Inputs –The Power Spectrum, Ergodicity - Spectrum Estimation– Problems.

UNIT-V: **(18 Hours)**

Random Walks-Poisson Points and Shot Noise – Modulation – Cyclostationary Processes Bandlimited Processes and sampling Theory - Problems.

Total Lecture Hours– 90

COURSE OUTCOME

The Students will be able to

1. Understand Simple probabilities using an appropriates sample space.
2. Formulate density function and binomial random variables.
3. Solve Characteristic functions, Mean square stochastic convergence and limits.
4. Solve Spectral Representation of Random Process.
5. Interpret Power Spectrum and sampling Theory.

TEXTBOOKS

1.Papoulis.A and Unni krishnan Pillai.S, 2001 "Probability, Random Variables and Stochastic Processes", Fourth Edition, McGraw Hill.

UNIT I	Chapter2	:	Full
UNIT II	Chapter4	:	Full
UNIT III	Chapter7	:	Full
UNIT IV	Chapter9	:	Sec 9.1 to 9.3,
	Chapter12	:	Sec 12.1 to 12.2
UNIT V	Chapter10	:	Sec10.1to 10.5

REFERENCE BOOK(S)

1.Scott L. Miller, Donald Childers, 2012, Probability and Random process, 2nd edition, Academic Press.

2.K.L. Chung, 2010, Introduction to Probability Theory with Stochastic Processes, 4th edition, Springer International.

3.P.G. Hoel, S.C.Port and C.J.Stone, 1971, Introduction to Probability, Houghton Mifflin.

4.P.G. Hoel, S.C.Port and C.J.Stone, 1972, Introduction to Stochastic Processes,1st edition, Houghton Mifflin.

5. James L. Melsa, Andrew P. Sage,2013"An Introduction to Probability and Stochastic Processes", Dover Publications Inc.

E-RESOURCES

1. https://www.khanacademy.org/math/probability/probability-geometry/probability-basics/a/probability-the- basics
2. https://www.khanacademy.org/math/statistics-probability/random-variables-stats-library/random-variables-discrete/v/discrete-and-continuous-random-variables
3. https://www.khanacademy.org/math/statistics-probability/random-variables-stats-library/random-variables-discrete/v/random-variables
4. https://www.edx.org/course/probability-basic-concepts-discrete-random-variables

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	3	2	3	3	3	1	3	2	3	2	1
CLO2	2	2	3	2	3	3	2	3	3	1	3	2	2
CLO3	3	2	3	1	3	3	3	2	3	1	3	2	1
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	2
CLO5	3	1	2	3	3	3	3	1	2	3	1	2	3

Strong: 3 Medium: 2 Low: 1

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614 016.

(For the Candidates admitted in the academic year 2025 – 2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III -EC- V(1): Fluid Dynamics

Ins. Hrs./Week:5 **Course Credit:3** **Course Code: P25MAE35A**

UNIT-I: Real Fluids and Ideal Fluids **(15 Hours)**

Velocity of a Fluid at a point – Streamlines and Path lines: Steady and Unsteady Flows – The Velocity potential – The Velocity vector – Local and Particle Rates of Change– The Equation of continuity–Worked examples–Acceleration of a Fluid–Conditions at a rigid boundary– General analysis of fluid motion–Pressure at a point in a Fluid at Rest– Pressure at a point in Moving Fluid–Conditions at a Boundary of Two Inviscid Immiscible Fluids – Euler's equation of motion – Bernoulli's equation – Worked examples.

UNIT –II: Impulsive Motion **(15 Hours)**

Discussions of a case of steady motion under conservative body forces – Some potential theorems–Some Flows Involving Axial Symmetry–Some special two-Dimensional Flows-Impulsive Motion. Some three-dimensional Flows: Introduction–Sources, Sinks and Doublets – Images in a Rigid infinite Plane – Axi-Symmetric Flows; Stokes stream function.

UNIT–III: Two Dimensional Flows **(15 Hours)**

Some Two- Dimensional Flows: Meaning of a Two- Dimensional Flow – Use of cylindrical polar co-ordinates – The stream function – The Complex Potential for Two-Dimensional, Irrotational, Incompressible Flow – complex velocity potentials for Standard Two Dimensional Flows – Some worked examples

UNIT-IV: Hydro dynamical Aspects **(15 Hours)**

The use of conformal transform at ion and Hydro dynamical Aspects–Vortex rows. Viscous flow Stress components in areal fluid-relations between Cartesian components of stress-Translational Motion of Fluid element–The Rate of Strain Quadric and Principle Stresses – Some further properties of the rate of strain quadric- Stress analysis in fluid motion–Relations between stress and rate of strain-

.

.UNIT-V: Viscous Flow **(15 Hours)**

Some solvable problems in viscous flow – Steady viscous flow in tubes of uniform cross section – Diffusion of vorticity – Energy Dissipation due to viscosity – Steady Flow past a Fixed Sphere– Dimensional Analysis; Reynolds Number–Prandtl's Boundary Layer.

Total Lecture Hours -75

COURSE OUTCOME

The Students will be able to

1. Understand the basic ideas of fluid velocity, stream lines and rotational and irrotational flows.
1. Understand the meanings of fundamental terms like pressure and body force.
2. Develop special mathematical methods involving images and complex variables for incompressible fluids.
3. Derive images in three dimensions.
4. Solve problems using Milne-Thomson circle theorem.

TEXT BOOK

1. Chorlton.F., Reprint 2004, "Text Book of Fluid Dynamics", CBS Publishers & Distributors, New Delhi.

UNIT–I	Chapter 2 and Chapter 3: Sections 3.1 to 3.6
UNIT–II	Chapter 3: Sections 3.7 to 3.11 Chapter 4: Sections4.1,4.2,4.3,4.5
UNIT–III	Chapter 5: Sections:5.1to5.9 except 5.7
UNIT–IV	Chapter 5: Section 5.10,5.12 and Chapter 8: Sections 8.1 to 8.9
UNIT–V	Chapter 8: Sections 8.10 to 8.16.

REFERENCE BOOK(S)

1. Anderson. J.D., Degrez. G. and Dick. E., 2009, "Computational Fluid Dynamics: An Introduction", J.F. Wendt(3rd Ed.), Springer – Verlag.
2. Anderson. J.D., 2017, "Computational Fluid Dynamics, The Basics with Applications", McGraw Hill.
3. Batchelor. G.K., 2000, "An Introduction to Fluid Dynamics", 2nd Ed., Cambridge University Press.
4. Chorin. A.J. and Marsden. A., 1993, "A Mathematical Introduction to Fluid Mechanics", 3rd Ed., Springer- Verlag, New York.
5. Yuan. S. W., 1988, "Foundations of Fluid Mechanics", (Original 1967 Edition), Prentice Hall of India Pvt. Limited, New Delhi.

E-RESOURCES

1. http://home.iitk.ac.in/~nikhilk/Book.pdf
2. http://www.issp.ac.ru/ebooks/books/open/Advanced_Fluid_Dynamics.pdf
3. **https://www.newgensearch.com/v2/?gd=AP1007639&q=fluid%20dynamics%20pdf**
4. **https://en.wikipedia.org/wiki/Fluid_dynamics#:~:text=In%20physics%2C%20physical%20chemistry%20and,study%20of%20liquids%20in%20motion).**
5. **https://byjus.com/physics/fluid-dynamics/**

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos										**PSOs**		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	3	3	2	3	3	3	3	3	2	1	2	3
CLO2	2	1	2	1	3	3	2	1	3	1	3	1	2
CLO3	3	2	3	3	2	1	3	2	3	1	1	2	3
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	1
CLO5	3	3	2	3	3	3	3	1	2	3	3	1	2

Strong: 3 Medium: 2 Low: 1

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614 016.

(For the Candidates admitted in the academic year 2025 – 2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III- -EC-V (2): Fractal Geometry

Ins. Hrs./Week:5 **Course Credit:3** **Course Code: P 25MAE35B**

UNIT-I: Introduction to Fractals and Metric Foundations (15 Hours)

Historical development of Fractal Geometry – Euclidean geometry versus Fractal geometry – Self-similarity and scaling – Iteration and recursive constructions – Metric spaces – Open and closed sets – Compactness – Contraction mappings – Banach Fixed Point Theorem – Fractal sets generated by iterated processes – Introduction to Cantor set, Koch curve and Sierpinski triangle

UNIT –II: : Dimension Theory and Classical Fractals (15 Hours)

Topological dimension – Similarity dimension – Hausdorff dimension – Box-counting dimension – Computation of dimensions for classical fractals – Cantor dust – Koch snowflake – Menger sponge – Peano and Hilbert curves – Fractal curves and surfaces – Fractal length and area – Applications of dimension theory.

UNIT–III: Iterated Function Systems and Fractal Measures (15 Hours)

Iterated Function Systems (IFS) – Attractors of IFS – Hutchinson operator Deterministic and random fractals – Construction of self-similar sets – Fractal interpolation functions – Invariant measures – Probability measures on fractals – Moran's theorem – Fractal tilings and packings – Applications in image compression and modeling.

UNIT-IV: Julia Sets, Mandelbrot Set and Complex Dynamics (15 Hours)

Complex numbers and complex mappings – Iteration of complex functions – Fixed points and periodic points – Julia sets – Filled Julia sets – Fatou sets – Mandelbrot set and its properties – Escape time algorithm – Stability regions – Visualization of fractals using computer graphics – Applications in dynamical systems-

.

UNIT-V: Viscous Flow (15 Hours)

Fractals in nature – Fractal growth models – Chaos and nonlinear dynamics – Fractal analysis in physics, biology and economics – Fractal image processing – Fractal antennas – Fractal dimension in signal analysis – Applications in computer graphics and digital art – Introduction to multifractals – Recent developments in Fractal Geometry

.

Total Lecture Hours -75

COURSE OUTCOME

The Students will be able to

1. Understand the basic ideas of fluid velocity, stream lines and rotational and irrotational flows.
2. Understand the meanings of fundamental terms like pressure and body
3. Develop special mathematical methods involving images and complex variables
4. Derive images in three dimension.
5. Solve problems using Milne-Thomson circle theorem.

TEXT BOOKS

1. Kenneth Falconer, *Fractal Geometry: Mathematical Foundations and Applications*, John Wiley & **Sons, 3rd Edition, 2014**
2. Michael F. Barnsley, *Fractals Everywhere*, Academic Press, 2nd Edition, 1993.

REFERENCE BOOK(S)

1. Benoit B. Mandelbrot, *The Fractal Geometry of Nature*, W.H. Freeman, 1982.
2. Yuval Fisher (Ed.), *Fractal Image Compression: Theory and Application*, Springer, 1995.
3. John E. Hutchinson, *Fractals and Self Similarity*, Indiana University Mathematics Journal, 1981.

Edgar, Gerald A., *Measure, Topology and Fractal Geometry*, Springer, 2nd Edition, 2008.

E-RESOURCES

1.https://www.freebookcentre.net/Mathematics/Discrete Mathematics-Books-Download.html

2..https://www.cs.yale.edu/homes/aspnes/classes/202/notes

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos										**PSOs**		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	3	3	2	3	3	3	3	3	2	1	2	3
CLO2	2	1	2	1	3	3	2	1	3	1	3	1	2
CLO3	3	2	3	3	2	1	3	2	3	1	1	2	3
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	1
CLO5	3	3	2	3	3	3	3	1	2	3	3	1	2

Strong: 3 Medium: 2 Low: 1

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614 016.

(For the Candidates admitted in the academic year 2025 – 2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III- -EC-V (3): Set Theory and Logic

Ins. Hrs./Week: 5 **Course Credit**: 3 **Course Code**: **P25MAE35C**

UNIT – I: Fundamentals of Set Theory **(15 Hours)**

Introduction to sets – Types of sets – Subsets – Power sets – Universal set – Operations on sets – Algebra of sets – Venn diagrams – Cartesian products – Relations and functions – Equivalence relations – Partially sets – Countable and uncountable sets – Schröder–Bernstein theorem – Cardinality and cardinal arithmetic.

UNIT – II: Propositional Logic **(15 Hours)**

Statements and propositions – Logical connectives – Truth tables – Tautologies and contradictions – Logical - equivalence – Laws of logic – Conditional and bi conditional statements – Normal forms – Principal - conjunctive normal form and principal disjunctive normal form – Arguments

.

UNIT – III : Predicate Logic and Quantification **(15 Hours)**

Predicates and quantifiers – Universal and existential quantifiers – Free and bound variables – Logical equivalence involving quantifiers – Negation of quantified statements – Theory of inference for predicate calculus – Methods of proof – Direct proof – Proof by contradiction – Mathematical induction – Recursive definitions and recursive functions.

UNIT – IV : Advanced Set Theory **(15 Hours)**

Axiomatic set theory – Zermelo–Fraenkel axioms – Axiom of choice – Well ordering principle - Ordinal numbers – Cardinal numbers – Transfinite induction and recursion – Zorn's lemma and applications – Russell's paradox – Cantor's theorem – Continuum hypothesis – Introduction to Boolean algebras**.**

UNIT – V : Applications of Logic and Set Theory **(15 Hours)**

Algebra of propositions – Switching circuits – Logic gates and Boolean functions – Applications in computer science – Formal languages and automata basics – Semigroups and lattices – Introduction to model theory – Consistency and completeness – Gödel's incompleteness theorem (introductory ideas) – Applications of set theory and logic in mathematics and computing.

COURSE OUTCOME

The Students will be able to

1. Understand Simple probabilities using an appropriates sample space.
2. Formulate density function and binomial random variables.
3. Solve Characteristic functions, Mean square and stochastic convergence and limits.
4. Solve Fourier series and Spectral Representation of Random Process.
5. Interpret Power Spectrum and sampling Theory.

Total Lecture Hours-75

TEXT BOOKS

1. K. H. Rosen, (2019.)*Discrete Mathematics and Its Applications*, McGraw Hill, 8th Edition.
2. Seymour Lipschutz and Marc Lipson(1988), *Set Theory and Related Topics*, Schaum's Outline Series, McGraw Hill.
3. J. L. Mott, A. Kandel and T. P. Baker(1986) *Discrete Mathematics for Computer Scientists and Mathematicians*, Prentice Hall, 2nd Edition.

REFERENCE BOOKS

1. Herbert B. Enderton (1977), *Elements of Set Theory*, Academic Press..
2. Irving M. Copi, Carl Cohen and Kenneth McMahon (2011), *Introduction to Logic*, Pearson, 14th Edition.
3. Paul R. Halmos (1974), *Naive Set Theory*, Springer..
4. E. Mendelson (1976), *Introduction to Mathematical Logic*, Chapman & Hall, 6th Edition.

E_RESOURCES :

1. **https://www.freebookcentre.net/Mathematics/Discrete**
2. **https://www.cs.yale.edu/homes/aspnes/classes/202/notes**

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	3	2	2	3	3	1	3	2	2	2	2
CLO2	2	1	3	1	1	3	1	3	1	3	3	2	1
CLO3	3	2	3	1	3	2	1	2	3	2	3	1	1
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	2
CLO5	3	1	2	3	3	3	1	2	3	1	3	2	1

***

SENGAMALATHAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI-614 016.

(For the Candidates admitted in the academic year2025 -2026)

DEPARTMENT OFMATHEMATICS

M.Sc., MATHEMATICS

Semester: III-SEC: **Office Automation and ICT Tools**

Ins. Hrs./Week:2 **Course Credit**:2 **Course Code**: **P25SEMA31**

UNIT - I: INTRODUCTION TO OFFICE AUTOMATION (6 Hours)

Computer fundamentals–Operating system–File management–Internet basics–
E-mail communication.

UNIT - II: WORD PROCESSING TOOLS (6 Hours)

Document creation and formatting – Tables and images – Page setup– Mail merge
– Academic document preparation

UNIT - III: SPREAD SHEET APPLICATIONS (6 Hours)

Worksheets and workbooks–Formulae and functions–Charts and graphs–Sorting and
Filtering data.

UNIT - IV: DIGITAL DATA MANAGEMENT AND ONLINE PRODUCTIVITY TOOLS (6 Hours)

Data storage and file sharing–Cloud-based applications–Online collaboration tools–
Digital record management – ICT applications for academic and professional use**.**

UNIT - V: ICT TOOLS AND DIGITAL APPLICATIONS (6 Hours)

Cloud storage–Online meeting tools–Google Workspace–Online forms–
Cyber security and digital ethics**.**

Total Lecture Hours-30

COURSE OUTCOME

The Students will be able to

1. Understand the fundamentals of Office Automation and ICT tools.
2. Create professional documents using word processing software.
3. Apply spread sheet applications for data handling and analysis.
4. Design effective presentations for academic and professional purposes.
5. Utilize ICT tools for communication and digital collaboration.

.

TEXT BOOK

1. Sinha P.K., Computer Fundamentals, BPB Publications.
2. Joan Lambert, Microsoft Office 365 Step by Step, Microsoft Press.

REFERENCE BOOK(S)

1. Alexis Leon, Introduction to Information Technology, Leon Publications.
2. Peter Norton, Introduction to Computers, McGraw Hill.
3. Rajaraman V, Fundamentals of Computers, PHI Learning.
4. Joan King, Microsoft Office 375 Step by Step, Microsoft Press.
5. Santhosh Baboo, Fundamentals of Information Technology, Vijay Nicole Imprints**.**

E-RESOURCES:

1. https://learn.microsoft.com
2. https://support.google.com

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	3	2	2	3	3	1	3	2	2	2	2
CLO2	2	1	3	1	1	3	1	3	1	3	3	2	1
CLO3	3	2	3	1	3	2	1	2	3	2	3	1	1
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	2
CLO5	3	1	2	3	3	3	1	2	3	1	3	2	1

Strong: 3 Medium: 2 Low: 1

SEMESTER IV

Semester: IV -CC- X: Functional Analysis

Ins. Hrs./Week: **6** **Course Credit**: **5** **Course Code**: **P25MA410**

UNIT-I: Banach Spaces: **(20 Hours)**

The definition and some examples – Continuous linear transformations – The Hahn - Banach theorem – The natural imbedding of N in N^{**}- The open mapping theorem – The conjugate of an Operator.

UNIT-II: Hilbert Spaces: **(18 Hours)**

The definition and some simple properties– Orthogonal complements–Orthonormal sets–The conjugate space H^*-The adjoint of an operator – self-adjoint operators - Normal and unitary operators – Projections.

UNIT-III: Finite-Dimensional Spectral Theory: **(18 Hours)**

Matrices – Determinants and the spectrum of an operator –The spectral theorem.

UNIT-IV : General Preliminaries on Banach Algebras: **(18 Hours)**

The definition and some examples – Regular and singular elements – Topological divisors of zero – The spectrum – The formula for the spectral radius – The radical and semi-simplicity.

UNIT-V: The Structure of Commutative Banach Algebras: **(16 Hours)**

The Gelfand mapping – Applications of the formula $r(x) = \lim \|x^n\|^{1/n}$ – Involutions in Banach algebras - The Gelfand - Neumark theorem.

Total Lecture Hours- 90

COURSE OUTCOME

The Students will be able to

1. Understand the Banach spaces and Transformations on Banach Spaces.
2. Prove Hahn Banach theorem and open mapping theorem.
3. Describe operators and fundamental theorems.
4. Validate orthogonal and orthonormal sets.
5. Analyze and establish the regular and singular elements

TEXT BOOKS

1. Simmons G.F.1963, Reprint 1983, Introduction to Topology and Modern Analysis, TATA McGraw Hill Edition (India) Private Limited, New Delhi,

UNIT I: Chapter 9:Sections 46-51
UNIT II: Chapter10:Sections 52-59
UNIT III: Chapter 11: Sections 60-62
UNIT IV: Chapter 12:Sections 64-69
UNIT V : Chapter 13: Sections 70-73

REFERENCE BOOK(S)

1. Rudin W,1973, Functional Analysis, McGraw Hill Education (India) Private Limited, New Delhi.

2. Limaye B.V.,1996, Functional Analysis, New Age International.
3. Goffman C and Pedrick G,1987, First course in Functional Analysis, Prentice Hall of India, NewDelhi.
4. Kreyszig E,1978, Introductory Functional Analysis with Applications, John Wiley & Sons, New York.
5. M. Thamban Nair,2002, Functional Analysis, A First course, Prentice Hall of India, New Delhi.

E-RESOURCES

1. http://mathforum.org
2. http://ocw.mit.edu/ocwweb/Mathematics
3. http://www.opensource.org
4. http://en.wikiepedia.org

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	3	2	3	3	3	1	2	3	3	2	1
CLO2	2	1	3	1	3	3	2	3	1	1	3	2	1
CLO3	3	2	3	1	3	3	1	2	3	2	3	2	1
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	1
CLO5	3	1	2	3	3	3	1	2	3	1	3	2	1

Strong: 3 Medium: 2 Low: 1

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2025 – 2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: IV - CC-XI: Differential Geometry

Ins. Hrs./Week:5 **Course Credit:4** **Course Code: P25MA411**

UNIT-I: Theory of space curve **(15 Hours)**

Introduction to space curve-Representation of space curves-Unique parametric representation of a space curve-Definitions and some basic examples-Arc Length-Tangent and osculating plane -Principal normal and binormal-Curvature and torsion-The Curvature and Torsion of a curve as the intersection of two surfaces-Contact between curves and surfaces.

UNIT–II: Tangent Surfaces **(15 Hours)**

Introduction to Tangent surfaces - Involutes and evolutes - Definitions and theorems- Intrinsic equations of space curves - Definition & Examples - Fundamental existence theorem for space curves – Theorems & examples - Helices-Theorem on characterizes of cylindrical helices - Spherical helix.

UNIT–III: The First Fundamental Form of a Surface **(15 Hours)**

Introduction to Metric on a surface-The First Fundamental Form–Definitions & examples-Direction coefficients on a surface – Theorems and examples -Families of curves– Orthogonal trajectories- Double family of curves-Isometric correspondence.

UNIT- IV: Geodesics on a surface **(15 Hours)**

Introduction to Geodesics -Geodesics and their differential equations-Theorems and examples-Canonical Geodesic equations - Geodesics on surface of revolution - Geodesic curvature – Definitions and theorems - Gauss- Bonnet theorem- Gaussain Curvature- Surfaces of constant curvature.

UNIT-V: The Second Fundamental Form of a Surface **(15 Hours)**

Introduction to the Second Fundamental Form-Definitions and theorems-Classification of points on a surface - Principal Curvatures-Lines of curvature - Developable surfaces - Developables associated with space curves - Developable associated with curves on surface.

Total Lecture Hours-75

COURSE OUTCOME

The Students will be able to

1. Obtain the knowledge about basic properties of arclength, principal normal.
2. Determine the intrinsic equation of space curves and helices.
3. Develop the concept of first fundamental form and orthogonal trajectories.
4. Recognize geodesics and surfaces of constant curvature.
5. Understand the concept of developable surfaces.

TEXTBOOKS

1. Somasundaram.D ,2019, Differential Geometry A First Course. Narosa Publishing house, New Delhi.

UNIT-I Chapter 1: Sec.1.1to1.7,1.9,1.10
UNIT-II Chapter 1: Sec.1.13,1.16 to 1.18
UNIT-III Chapter 2: Sec.2.9 to 2.14
UNIT-IV Chapter 3: Sec.3.2 to 3.4, 3.10 to 3.13
UNIT-V Chapter 4:Sec.4.2 to 4.5, 4.7 to 4.9

REFERENCEBOOK(S)

1. Jain.S.K. 2022, Differential geometry, Jeevansons Publications.
2. Pressley.A, 2010, Elementary Differential Geometry, 2nd edition, Springer International Edition. Verlog, London.
3. Thorpe.J.A. 2011, Elementary topics in Differential Geometry, Springer Publishers, New York.
4. Weatherbun.C.E.2016, Differential Geometry of three dimensions, Cambridge University Press, India.
5. Willmore.T.J., 2012, Introduction to Differential Geometry, Dover Publications.

E-RESOURCES

1. https://www.scribd.com/document/398285043/Differential-Geometry-A-First-Course-pdf
2. http://www.freebookcentre.net/Mathematics/Differential-Geometry-Books.html
3. https://www.mat.univie.ac.at/~michor/dgbook.pdf
4. https://people.math.ethz.ch/~salamon/PREPRINTS/diffgeo.pdf
5. http://etananyag.ttk.elte.hu/FiLeS/downloads/_01_Csikos_Differential_geometry.pdf

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	3	2	3	3	3	1	3	2	3	2	1
CLO2	2	1	3	1	3	3	2	1	3	1	3	2	1
CLO3	3	2	3	1	3	3	3	2	3	1	3	2	1
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	1
CLO5	3	1	2	3	3	3	3	1	2	3	3	2	1

Strong: 3 Medium: 2 Low: 1

`SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2025 – 2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: IV-CC-XII: Classical Mechanics

Ins. Hrs./Week:5 **Course Credit**:4 **Course Code**: **P25MA412**

UNIT -I: Survey of the Elementary principles (15 hours)

Mechanics of a Particle-Mechanics of a System of Particles-Constraints-D'Alembert's Principle and Lagrange's Equations-Velocity Dependent Potentials and the Dissipation Function-Simple Applications of the Lagrangian Formulation.

UNIT –II: Variational Principles and Lagrange's Equations (15 hours)

Hamilton's Principle-Some Techniques of the Calculus of Variations-Derivation of Lagrange's equations from Hamilton's Principle-Extending Hamilton's Principle to Systems with Constraints.

UNIT–III: The Hamilton Equations of Motion (15 hours)

Legendre's Transformations and the Hamiltonian Equations of Motion-Cyclic Coordinates and Conservation theorem-Routh's Procedure-The Hamiltonian Formulation of Relativistic Mechanics-Derivation of Hamilton's Equations from a Variational Principle-The Principle of Least Action.

UNIT-IV: Canonical Transformations (15 hours)

The Equations of Canonical Transformation-Examples of Canonical Transformations-The Harmonic Oscillator-The Symplectic Approach to Canonical Transformation.

UNIT-V: The Classical Mechanics of the Special Theory of Relativity (15 hours)

Basic Postulates of the Special Theory-Lorentz Transformations-Velocity Addition and Thomas Procession-Vectors and the Metric Tensor-The Lagrangian Formulation of Relativistic Mechanics

Total Lecture Hours – 75

COURSE OUTCOME

The Students will be able to

1. Illustrate the concept of elementary principles of a particle.
2. Understand Hamiltons equation and energy function.
3. Analyze and apply the legendre transformation
4. Ability to determine the newtons law of motion
5. Understand the principle of least action.

TEXT BOOKS

1. Herbert Goldstein, Charles P. Poole and John Safko,2011, Classical Mechanics, Third Edition
   UNIT- I Chapter 1: Sec.1.1 to 1.6
   UNIT – II Chapter 2 : Sec.2.1 to 2.4
   UNIT - III Chapter 8 : Sec.8.1 to 8.6
   UNIT - IV Chapter 9: Sec 9.1 to9.4
   UNIT – V Chapter 7: Sec. 7.1 to 7.4& 7.9

REFERENCE BOOK(S)

1. S L Kakani, C Hemrajani, Shubra kakani, Revised Edition Mechanics Viva books Private Limited.
2. Marion, Jerry, Thornton, Stephen,2020, Classical Dynamics of Particles and Systems Fifth Edition, Brooks Cole.
3. Morin, David, Introduction to Classical Mechanics: *With Problems and Solutions*. Cambridge University Press.
4. Müller-Kirsten, Harald J.W.,2008, Classical Mechanics and Relativity. World Scientific.
5. Taylor, John,2005, Classical Mechanics, University Science Books.

E-RESOURCES

1. https://www.amazon.in/Fundamental-Laws-Mechanics-I-Irodov/dp/9351448185
2. https:-principle/#:~:text=D'Alembert's principle
3. https://edu.itp.phys.ethz.ch/hs15/cm/ex11.pdf

Course Learning Outcome (for Mapping with POs and PSOs)

	Pos										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	3	2	2	3	3	1	3	3	2	2	1
CLO2	2	1	3	1	1	3	1	3	1	1	3	2	1
CLO3	3	2	3	1	3	2	1	2	3	2	3	1	1
CLO4		2	3	2	3	3	1	2	3	2	3	2	1
CLO5		1	2	3	3	3	1	2	3	1	3	2	1

Strong:3 Medium: 2 Low:1

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI-614 016.

(For the Candidates admitted in the academic year 2025– 2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: IV-EC-VI (1): Research Methodology

Ins. Hrs./Week:4 **Course Credit:3** **Course Code: P25MAE46A**

UNIT - I: Research Ethics **(12 Hours)**

Philosophy-Definition, Nature, Scope and concept, Ethics-Definition, Moral Philosophy, Nature of Moral Judgements and reactions. Ethics with respect to science and research-Scientific Misconducts-Falsification-Fabrication and Plagiarism-Use of Plagiarism Software-Turnitin, urkund and other open-source software tools, Introduction to copyediting, objectives of copyediting (correctness, consistency, coherence and clarity), editing your own paper (fixing grammar and usage errors, basic punctuation, consistent style and clear sentences), creating and using a style sheet for effective copyediting, tools available (MS Editor, Grammarly, Quillbot) - Redundant Publications-duplicate and overlapping Publication-Publication ethics-definition and importance.

UNIT - II: Introduction to Research Methodology **(12 Hours)**

Hours) Meaning of Research - Objectives of Research - Types of Research - Research Approaches - Significance of Research - Research Methods versus Methodology.

UNIT - III: Defining the Research Problem **(12 Hours)**

Research Problem - Selecting the Problem - Necessity of Defining the Problem - Technique Involved in Defining a Problem - An Illustration – Conclusion.

UNIT - IV: Data Collection **(12 Hours)**

Introduction – Experiments and Surveys - Collection of Primary Data - Difference between Questionnaire and Schedule –Guidelines for constructing Questionnaire/Schedule - Some Other Methods of Data Collection.

UNIT - V: Interpretation and Report Writing **(12 Hours)**

Meaning of Interpretation - Techniques of Interpretation - Precautions in Interpretation - Significance of Report Writing - Different Steps in Writing Report - Layout of the Research Report - Types of Reports.

Total Lecture Hours-60

COURSE OUTCOME

The Students will be able to

1. Recognize the research ethics easily.
2. Demonstrate research activities for their academic and professional levels.
3. Create novel ideas and simple techniques useful to society.
4. Acquire background knowledge in research publication and thesis writing.
5. Understand the steps in report writing.

TEXT BOOK(S)

1. Kothari,C.R., Gaurav Garg,2023, Research Methodology: Methods and Techniques (Third Edition), New Age International Publishers, New Delhi.
2. Vivek Kumar,2023, Discover the Editor in You, Saurabh Printers, Greater Noida, Uttar Pradesh.

REFERENCE BOOK(S)

1. Deepak Chawla, Neena Sondhi,2011, Research Methodology Concepts and Cases, Vikas Publishing House Pvt. Ltd, New Delhi.
2. R. Panneerselvam,2007, Research Methodology, Prentice Hall of India Private Limited, New Delhi.
3. Yogesh Kumar Singh,2006, Fundamental of Research Methodology & Statistics, New Age International Publishers.
4. Dr. Jayanta Kumar Nayak, Dr. Priyanka Singh,2015, Fundamentals of Research Methodology, SSDN Publishers & Distributors, New Delhi.
5. Ranjit Kumar,2018, Research Methodology, Sage Publishers India Pvt. Ltd.

E_RESOURCES:

1. https://www.tandfonline.com/doi/abs/10.2753/MIS0742-1222240302
2. https://www.cusb.ac.in/images/cusbfiles/2020/el/cbs/MCCOM2003C04%20(Business%20Research%20Methods)Research_Methodology_C_R_Kothari.pdf
3. http://www.ihmgwalior.net/pdf/research_methodology.pdf
4. https://collegetutor.net/notes/Research_Methodology_Notes_All_Units_-_Jatin
5. http://www.sociology.kpi.ua/wp-content/uploads/2014/06/Ranjit_Kumar-Research_Methodology_A_Step-by-Step_G.pdf

Course Learning Outcome (for Mapping with POs and PSOs)

	POs										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	3	2	3	3	3	1	2	3	3	2	1
CLO2	2	1	3	1	3	3	2	3	1	1	3	2	1
CLO3	3	2	3	1	3	3	1	2	3	2	3	2	1
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	1
CLO5	3	1	2	3	3	3	1	2	3	1	3	2	1

Strong: 3 Medium: 2 Low: 1

***

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614 016.

(For the Candidates admitted in the academic year 2025 – 2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: IV-EC-VI (2): Mathematical Finance

Ins. Hrs./Week:4 **Course Credit**:3 **Course Code**: **P25MAE46B**

UNIT – I **(12 Hours)**

Interest rates and present value analysis: rates of return and continuously varying interest rates.

UNIT – II **(12 Hours)**

General principles: derivatives and options, utility functions, risk aversion, linear pricing, portfolio choice, finite models, risk-neutral pricing.

UNIT – III **(12 Hours)**

Elementary probability: probabilities and events, conditional probability, random variables, expected value, variance, covariance, and correlation.

UNIT – IV **(12 Hours)**

Normal random variables: continuous random variables, properties of normal random variables, the Central Limit Theorem.

UNIT – V **(12 Hours)**

Fixed-income securities: value formulas, bond details, yield, duration.

Total Lecture Hours- 60

COURSE OUTCOME

The Students will be able to

1. Use of discrete processes in financial model.
2. Distinguish the relationship between stochastic and deterministic models.
3. Understand the roles of Put and Call options in risk reduction.
4. Use of continuous processes in financial modeling.
5. Understand the role of arbitrage and its absence in investments.

TEXT BOOK(S)

1. Sheldon M. Ross,1999, An Introduction to Mathematical Finance: Options and Other Topics, Cambridge University Press, Cambridge.
2. David G. Luenberger,1998, Investment Science, Oxford University Press, New York.
3. Paul Wilmott, 1995, The Mathematics of Financial Derivatives: A Student Introduction,

Sam Howison, and Jeff Dewynne, Cambridge University Press, Cambridge.

4. Robert Buchanan,2012, An Undergraduate Introduction to Financial Mathematics, 3rd edition, World Scientific Publishing Company, Hackensack, NJ USA.

REFERENCE BOOK(S)

1. J.W.S. Cassels,1981, Economics for Mathematicians, London Mathematical Societ Lecture Note Series, Number 62, Cambridge University Press, Cambridge.
2. Morton D. Davis,1999, The Math of Money: Making Mathematical Marco Avellaneda, ed., *Quantitative Analysis in Financial Markets*, World Scientific Publishing, River Edge, New Jersey.
3. Martin Baxter and Andrew Rennie,2001, Financial Calculus: An Introduction to Derivative *Pricing, Cambridge Sense of Finance, Springer-Verlag, New York.*
4. Robert J. Elliott and P. Ekkehard Kopp,1999, Mathematics of Financial Markets Springer- Verlag, New York.

E_RESOURCES

1. https://www.infobooks.org/free-pdf-books/math/mathematical-finance/
2. https://www.bing.com/search?q=e%20material%20for%20financial%20mathematics&pc=0P576&ptag=C999N3000A8DA2F19133&form=PCF565&conlogo=CT3210127

Course Learning Outcome (for Mapping with POs and PSOs)

	POs										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	3	2	3	3	3	1	2	3	3	2	1
CLO2	2	1	3	1	3	3	2	3	1	1	3	2	1
CLO3	3	2	3	1	3	3	1	2	3	2	3	2	1
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	1
CLO5	3	1	2	3	3	3	1	2	3	1	3	2	1

Strong: 3 Medium: 2 Low: 1

***

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614 016.

(For the Candidates admitted in the academic year 2025 – 2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: IV- EC-VI (3) – Category Theory

Ins. Hrs./Week:4 **Course Credit:3** **Course Code: P25MAE46C**

UNIT-I **(12 Hours)**

Theory through Differential Equations of First order: Linear Growth and Decay Models – Non-Linear Growth and Decay Models – Compartment Models – Dynamics problems – Geometrical problems

UNIT-II **(10 Hours)**

Mathematical through Systems of Ordinary Differential Equations of First Order: Population Dynamics – Epidemics – Compartment Models –Economics – Medicine, Arms Race, Battles and International Trade – Dynamics.

UNIT-III **(15 Hours)**

Mathematical through Ordinary Differential Equations of Second Order: Planetary Motions – Circular Motion and Motion of Satellites –Modeling through Linear Differential Equations of Second Order – Miscellaneous Mathematical Models.

UNIT- IV **(13 Hours)**

Mathematical through Difference Equations: Simple Models – Basic Theory of Linear Difference Equations with Constant Coefficients – Economics and Finance – Population Dynamics and Genetics – Probability Theory.

UNIT- V **(10 Hours)**

Mathematical through Graphs: Solutions that can be Modeled through Graphs– Mathematical in Terms of Directed Graphs, Signed Graphs, Weighted Digraphs and Unoriented Graphs. **Total Lecture Hours- 60**

COURSE OUTCOMES

The Students will be able to:

1. Understand the concept of a mathematical model and explain the series of steps involved in mathematical modeling.
2. Classify different classes of mathematical models.
3. Discuss features of a good model and the benefits of using a mathematical model.
4. Identify some simple real-life problems that can be solved using mathematical models.
5. Convert the physical problems as differential equations through mathematical modeling.

TEXT BOOKS:

1. Kapur.J.N.,1988, Mathematical Modeling, Wiley Eastern Limited, New Delhi.

UNIT I	- Chapter 2
UNIT II	- Chapter 3
UNIT III	- Chapter 4
UNIT IV	- Chapter 5 except 5.6
UNIT V	- Chapter 7

REFERENCE BOOKS

1. Mark M Meerschaert,2013, Mathematical Modeling", 4th Edition.
2. Frank R Giordano,2013,"A First Course Mathematical Modeling", 5th Edition.
3. " Brian Albright,2010, Mathematical Modeling With Excel", 2nd Edition.
4. Viaml K Mishra,2009, Mathematical Modeling: Application, Isssues and Analysis".
5. Jeffrey Strickland,2011," Mathematical Modeling of Warfar and Combat Phenomenon".

E-Resources

1. http..www.researchgate.net/file.differenceequations.html?id=56c4564d5cd9e3c
2. 21f8b457e&assetKey=AS:330076274085892@1455707725045
3. https://www.diffrenetial equation.net/profile/Andrei-
4. Polyanin/publication/275518932_Handbook_of_mathematical modeling_Second_
5. Edition/links/5657321b08aeafc2aac0c490/Handbook-of-difference-Equations-Second-Edition.pdf

Course Learning Outcome (for Mapping with POs and PSOs)

	POs										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	1	2	2	3	3	1	2	1	3	2	1
CLO2	2	1	3	1	3	3	3	2	1	1	2	2	1
CLO3	3	2	3	3	3	2	1	1	2	2	3	1	1
CLO4	1	2	1	2	3	2	1	2	1	3	2	1	2
CLO5	3	1	2	3	3	3	1	2	2	1	3	2	1

Strong: 3 Medium: 2 Low:1

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2025– 2026)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: IV-PCC-Mathematics for Advanced Research Studies

Ins. Hrs./Week:**2** **Course Credit**:**2** **Course Code**: **P25PCMA41**

UNIT -I: **Matchings & Factors** **(6 hours)**

Matchings and Factors-More on matchings-The Optimal Assignment Problem-The Travelling Salesman Problem.

UNIT –II: Eulerian and Hamiltonian Graphs **(6 hours)**

Eulerian and Hamiltonian Graphs-Eulerian Graphs and Digraphs-Hamiltonian graphs and Digraphs -Tournaments.

UNIT–III: Graph Embedding **(6 hours)**

Planar graphs and Duality-Hamiltonian Planar Graphs-Maximum Flow in Planar Networks-Graphs on Surfaces

UNIT-IV: Markov Chains **(6 hours)**

Definition and Examples-Transistion Matrix-Order of a Markov chain-Markov Chains as graphs-Higher Transistion Probablities. .

UNIT-V: Combinatorial Theory **(6 hours)**

Introduction to Combinatorics-Factorial Notation-Fundamentals of Principles of Counting-Rules of Sum and Products-Permutations-Combinations-Combinations with Repetition.

Total Lecture Hours –30

COURSE OUTCOME

The Students should be able to

1.Apply matchings and factors to solve optimization problems.
2.Analyze Eulerian and Hamiltonian graphs and digraphs.
3.Examine graph embeddings, planar graphs, and network flows.
4.Understand Markov chain concepts to model stochastic processes.
5.Discuss combinatorial techniques to solve counting problems.

TEXT BOOKS

1. Balakrishnan.V. K,2018, Theory and Problems of Graph Theory ,Mc Graw Hill Education India Private Limited.
2. Medhi,2012, Stochastic Processes Sixth Edition ,New Age International Publishers, New Delhi,1981.
3. H.S. Govinda Rao,2007,Combinatorics,Galgotia Publications Private limited.

Unit-I Chapter 7: Sec 7.1 to 7.3 of [1]

Unit-II Chapter 3: Sec 3.1 to 3.3 of [1]

Unit-III Chapter 8: Sec 8.1 to 8.4 of [1]

Unit IV Chapter 2: Sec 2.1:2.1.1 to 2.1.3 & 2.2 of [2]

Unit V Chapter 6:6.1,6.2 of [3]

Chapter 7:7.1,7.2,7.5 of [3]

REFERENCE BOOK(S)

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

E-RESOURCES

1. https://www.math.ucdavis.edu/~hunter/intro_analysis_pdf/ch1.pdf
2. https://www.ms.uky.edu/~droyster/courses/fall06/PDFs/Chapter06.pdf
3. https://math.libretexts.VectorSpacesandMetricSpaces/_OperationsonConvergentSequences.
4. https://home.iitm.ac.in/naru/ma1010/notes/MA1010-Note001.pdf
5. https://people.math./Lectures/MetricSpaceLimits.html#:~:.pdf

Course Learning Outcome (for Mapping with POs and PSOs)

	POs										PSOs		
	1	2	3	4	5	6	7	8	9	10	1	2	3
CLO1	3	1	3	2	2	3	3	1	3	3	2	2	1
CLO2	2	1	3	1	1	3	1	3	1	1	3	2	1
CLO3	3	2	3	1	3	2	1	2	3	2	3	1	1
CLO4	1	2	3	2	3	3	1	2	3	2	3	2	1
CLO5	3	1	2	3	3	3	1	2	3	1	3	2	1

Strong:3 Medium: 2 Low:1