MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE

(An Autonomous College)

Affiliated to Periyar University, Salem | Accredited by **NAAC** with '**A**' Grade

Recognized by **UGC** under Section 2(f) & 12 (B)

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE (Autonomous)

A UNIT OF VANETRA GROUP

ESTD-1994

Learn. Lead

DEGREE OF MASTER OF SCIENCE

Learning Outcomes - Based Curriculum Framework

- Choice Based Credit System

Syllabus for M.Sc., Mathematics

(Semester Pattern)

(For Candidates admitted from the academic year 2023-2024 and onwards)

Regulation and Syllabus for

M.Sc. Mathematics

(With effect from the Academic Year 2023-24)

Vision:

To redefine the scope of higher education by infusing into each of our pursuits, initiatives that will encourage intellectual, emotional, social and spiritual growth, thereby nurturing a generation of committed, Knowledgeable and socially responsible citizens.

Mission:

*To Ensure State of the world learning experience

*To Espouse value based Education

*To Empower rural education

*To Instill the sprite of entrepreneurship and enterprise

*To create a resource pool of socially responsible world citizens

QUALITY POLICY

To Seek – To Strive – To Achieve greater heights in Arts and Science, Engineering, Technological and Management Education without compromising on the Quality of Education.

DEPARTMENT OF MATHEMATICS

Vision:

* To train the students through Mathematical Analysis and Research of holistic persons to promote better living conditions of the under privileged.

Mission:

* To learn Mathematical concepts and develop capability through indications.

* To instill the spirit of humanity through value based training.

PREAMBLE

Master of Science in Mathematics (M.Sc.) is a two-year postgraduate course that deals with a deeper knowledge of in Mathematics program provides a rigorous academic journey into advanced mathematical principles and their applications. It typically encompasses in-depth studies across diverse branches of mathematics such as algebra, analysis, topology, and computational mathematics. Emphasizing both theoretical foundations and practical problem-solving skills, the program often includes opportunities for specialized research projects, culminating in a thesis or dissertation. Students engage with cutting-edge theories and methodologies, preparing them for careers in academia, research institutions, or various industries where analytical and quantitative skills are highly valued. The program fosters critical thinking, mathematical reasoning, and proficiency in advanced mathematical techniques, laying a solid foundation for continued academic pursuits or professional advancement in mathematics-related fields.

PROGRAMME LEARNING OUTCOME

NATURE AND EXTENT OF THE PROGRAMME

M.Sc. mathematics program typically involves an intensive exploration of advanced mathematical theories, methods, and applications. Students engage deeply with topics such as algebra, analysis, geometry, and specialized fields like mathematical physics or cryptography. Emphasizing research, these programs often require students to conduct independent studies culminating in a thesis or dissertation, contributing new insights to the field. Opportunities for interdisciplinary collaboration, seminars, and colloquia expose students to cutting-edge research and practical applications in fields such as physics, computer science, and economics. Through advanced coursework and teaching assistantships, students develop both theoretical depth and practical skills, preparing them for careers in academia, research institutions, or industry where expertise in mathematics is valued. Professional development activities further equip students with essential skills in academic writing, presentation, and career planning, ensuring they emerge as skilled mathematicians capable of tackling complex challenges in diverse professional settings.

AIM OF THE PROGRAMME

The Master of Science (M.Sc.) in Mathematics program provides a rigorous academic journey into advanced mathematical principles and their applications. It typically encompasses in-depth studies across diverse branches of mathematics such as algebra, analysis, topology, and computational mathematics. Emphasizing both theoretical foundations

and practical problem-solving skills, the program often includes opportunities for specialized research projects, culminating in a thesis or dissertation. Students engage with cutting-edge theories and methodologies, preparing them for careers in academia, research institutions, or various industries where analytical and quantitative skills are highly valued. The program fosters critical thinking, mathematical reasoning, and proficiency in advanced mathematical techniques, laying a solid foundation for continued academic pursuits or professional advancement in mathematics-related fields.

GRADUATE ATTRIBUTES

- GA 1 Disciplinary Knowledge
- GA 2 Self-directed Learning
- GA 3 Multi-cultural Competency
- GA 4 Research-related Skill
- GA 5 Analytical Reasoning
- GA 6 Moral and Ethical Reasoning
- GA 7 Communication Skill

Disciplinary Knowledge:

a) ability to identify, speak and write about different literary genres, forms, periods and movements
b) ability to understand and engage with various literary and critical concepts and categories
c) ability to read texts closely, paying attention to themes, generic conventions, historical contexts, and linguistic and stylistic variations and innovations
d) ability to understand appreciate, analyse, and use different theoretical frameworks
e) ability to locate in and engage with relevant scholarly works in order to develop one's own critical position and present one's views coherently and persuasively
f) ability to situate one's own reading, to be aware of one's position in terms of society, religion, caste, region, gender, politics, and sexuality to be self-reflexive and self-questioning
g) ability to understand the world, to think critically and clearly about the local and the global through a reading of literatures in translation and in the original, to be a located Indian citizen of the world
h) ability to see and respect difference and to transcend binaries

Self-Directing Learning:

a) ability to work independently in terms of reading literary and critical texts
b) ability to carry out personal research, postulate questions and search for answers

Multicultural Competence:

a) ability to engage with and understand literature from various nations and reasons and languages

b) ability to respect and transcend differences

Research-Related Skills:

a) ability to problematize; to formulate hypothesis and research questions, and to identify and consult relevant sources to find answers

b) ability to plan and write a research paper

Analytical Reasoning:

a) ability to evaluate the strengths and weaknesses in scholarly texts spotting flaws in their arguments

b) ability to use critics and theorists to create a framework and to substantiate one's argument in one's reading of literary texts

Moral and Ethical Reasoning:

a) ability to interrogate one's own ethical values, and to be aware of ethical issues

b) ability to read values inherited in literary texts and criticism vis, the environment, religion and spirituality, as also structures of power

Communication Skills:

a) ability to speak and write clearly in standard, academic English

b) ability to listen to and read carefully various viewpoints and engage with them.

c) ability to use critical concepts and categories with clarity

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1 : Post Graduates will be able to promote learning environment to meet the Industry expectation

PEO2 : Post Graduates will be incorporated the critical thinking with good Communication and Leadership skills to become a self-employed

PEO3 : Post Graduates will be upholding the human values and environmental sustenance for the betterment of the society

PROGRAMME OUTCOMES (POs)

PO1 : Post graduates will attain profound proficiency and expertise

PO2 : Post graduates will be ensured with corporative self – directed learning

PO3 : Post graduates will acquire acumen to handle diverse contexts and function in domains of multiplicity

PO4 : Post graduates will exercise intelligence in research Investigations and Introducing innovations

PO5 : Post graduates will learn ethical values and commit to Professional ethics.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1 : Students are able to understand the fundamental axioms in Mathematics and capability of developing ideas based on them.

PSO2 : Students will be able to read, analyze and write logical arguments to prove Mathematical concepts and nurture problems solving skills, thinking, creativity through assignments, project works.

PSO3 : Students will be enabled to acquire employability Skills that will enable the students to explore career in Teaching and Research in Mathematics.

PSO4 : Students will acquire knowledge to develop the skill to solve problems which appear in the various examinations based on the concepts learned which in turn will hone the problem solving skills of students and help them to pass competitive examinations including CSIR-NET, SET, etc.,

PSO5 : Students shall be made to realize the importance given to applications by applying the concepts studied for designing models to solve real life problems.

REGULATIONS (2023-2024)

1. DURATION OF THE PROGRAME

1.1 Two years (Four semesters)

1.2 Each academic year shall be divided into two semesters. The odd semesters Shall consist of the period from June to November of each year and the even Semesters from December to May of each year.

1.3 There shall be not less than 90 working days for each semester.

2. ELIGIBILITY FOR ADMISSION

2.1 A candidate who (1) has passed the B.Sc. - Mathematics as the Main subject of study or (2) is a Graduate in B.Sc. Mathematics (CA) or (3) an examination of Universities accepted by the Syndicate of the Periyar University as equivalent there

to, study shall be permitted to appear and qualify for the M.Sc. Degree examination in this Branch at Muthayammal College of arts and science (Autonomous), Rasipuram.

3. CREDIT REQUIRMENTS AND ELIGIBILITY FOR AWARD OF DEGREE

3.1. A Candidate shall be eligible for the award of the Degree only if he/she has undergone the prescribed course of study in a College affiliated to the University for a period of not less than two academic years and passed the examinations of all the four Semesters prescribed earning a minimum of 91 credits as per the distribution given in Regulation fulfilled such other conditions as have been prescribed thereof.

4. COURSE OF STUDY, CREDITS AND SCHEME OF EXAMINATION

4.1 The Course Components and Credit Distribution shall consist of the following: (Minimum Number of Credits to be obtained)

S.No	Study Components	Credit Distribution
01	Core, Elective, EDC, and Project Courses	**84**
02	Internship	**02**
03	Human Rights	**02**
04	Professional Competency Skills	**02**
	Extension Activity	**01**
Total Credits		**91**

4.1.1 Extension Activity:

Students shall be awarded a maximum of 1 Credit for Compulsory Extension Service. All the Students shall have to enroll for clubs / NSO (Sports & Games) Retract / Youth Red Cross or any other Service Organizations in the College and shall have to put in compulsory minimum attendance of 40 hours which shall be duly certified by the Principal of the College before 31st March in a year. If a student lacks 40 hours attendance in the first year, he or she shall have to compensate the same during the subsequent years.

Those students who complete minimum attendance of 40 hours in one year will get 'half-a- credit and those who complete the attendance of 80 or more hours in Two

Years will get 'one credit'. Literacy and Population Education and Field Work shall be compulsory components in the above extension service activities.

4.2 Inclusion of the Massive Open Online Courses (MOOCs) available on SWAYAM and NPTEL

4.2.1 Students can choose the MOOC Course Available on SWAYAM and NPTEL under Core, Elective or Soft skill category. He/ she will be awarded degree only after producing valid certificate of the MOOC course for credit Mobility

5. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

5.1 Eligibility: Students shall be eligible to go to subsequent semester only if they earn sufficient attendance as prescribed by the Periyar University.

5.2. Attendance: All Students must earn 75% and above of attendance for appearing for the End Semester Examination. (Theory/Practical)

5.3. Condonation of shortage of attendance: If a Student fails to earn the minimum attendance (Percentage stipulated), the Principals shall condone the shortage of attendance up to a maximum limit of 10% (i.e. between 65% and above and less than 75%) after collecting the prescribed fee for Theory/Practical examination separately, towards the condonation of shortage of attendance. Such fees collected and should be remitted to the University.

5.4. Non-eligibility for condonation of shortage of attendance: Students who have secured less than 65% but more than 50% of attendance are NOT ELIGIBLE for condonation of shortage of attendance and such Students will not be permitted to appear for the regular examination, but will be allowed to proceed to the next year/next semester of the program and they may be permitted to take next University examination by paying the prescribed condonation fee

5.5. Detained students for want of attendance: Students who have earned less than 50% of attendance shall not be permitted to proceed to the next semester and to complete the Program of study. Such Students shall have to repeat the semester, which they have missed by rejoining after completion of final semester of the course, by paying the fee for the break of study as prescribed by the College from time to time.

5.6. Condonation of shortage of attendance for married women students: In respect of married women students undergoing PG programs, the minimum attendance for condonation (Theory/Practical) shall be relaxed and prescribed as 55% instead of 65% if they conceive during their academic career. Medical certificate from the Doctor (D.G.O) from the Government Hospital and the prescribed fee along with attendance details shall be forwarded to the college to consider the condonation of attendance mentioning the category

5.7. Zero Percent (0%) Attendance: The Students, who have earned 0% of attendance, have to repeat the program (by rejoining) without proceeding to succeeding semester and they have to obtain prior permission from the College/University immediately to rejoin the program.

5.8. Transfer of Students and Credits: The strength of the credits system is that it permits inter Institutional transfer of students. By providing mobility, it enables individual students to develop their capabilities fully by permitting them to move from one Institution to another in accordance with their aptitude and abilities by obtaining necessary permission from the university.

5.8.1. Transfer of Students is permitted from one Institution to another Institution for the same program with same nomenclature.

Provided, there is a vacancy in the respective program of Study in the Institution where the transfer is requested.

Provided the Student should have passed all the courses in the Institution from where the transfer is requested.

5.8.2 The marks obtained in the courses will be converted and grades will be assigned as per the College norms.

5.8.3 The transfer students are eligible for classification.

5.8.4 The transfer students are not eligible for Ranking, Prizes and Medals.

5.8.5 Students who want to go to foreign Universities up to two semesters or Project Work with the prior approval of the Departmental/College Committee are allowed to get transfer of credits and marks which will be converted in to Grades as per the University norms and are eligible to get CGPA and Classification; they are not eligible for Ranking, Prizes and Medals.

5.9. Students are exempted from attendance requirements for online courses of the College and MOOC's.

6. EXAMINATION AND EVALUATION

6.1. Register for all subjects: Students shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examination. For this purpose, Students shall register for all the arrear subjects of earlier semesters along with the current (subsequent) Semester Subjects.

6.2. Marks for Internal and End Semester Examinations

Category	Theory	Practical
Internal Assessment	25	**40**
End semester Examination	**75**	**60**

6.3 Procedure for Awarding Internal Marks Internal Examination Marks – Theory

Components	Marks
CIA I&II	**10**
Attendance	**5**
Assignment/Quiz	**5**
Seminar	**5**
Total	**25**

6.4. Awarding Marks for Attendance (out of 5)

Percentage of Attendance	Marks
Below 60%	0 marks
60% to 75%	3 marks
75% to 90%	4 marks
Above 90%	5 marks

6.5. Components for Practical CIA.

Components	Marks
CIA -I	15
CIA - II	15
Observation Note	05
Attendance	5
Total	40

6.6. Components for Practical ESE.

Components	Marks
Completion of Experiments	50
Record	05
Viva voce	05
Total	60

6.7. Internship/ Industrial Training, Mini Project and Major Project Work

Internship/Industrial Training		Project Work		
	Marks	Components		Marks
CIA*1		CIA		
Work Diary	25	a) Attendance	20 Marks	50
Report	50	b) Review / Work Diary*1	30 Marks	
Viva-voce	25			
Examination				
Total	100	ESE*2		
		a) Final Report	120 Marks	150
		b) Viva-voce	30 Marks	
		Total		200

*1 Evaluation of report and conduct of viva voce will be done jointly by Internal and External Examiners

6.8. Guidelines for Professional Competency Skill- Online Mode - Online Exam 3 hours

Components	Marks
100 Objective Type Questions 100*1=100 Marks	**100**

Objective type Questions from Question Bank.

- The passing minimum for this paper is 50%
- In case, the candidate fails to secure 50% passing minimum, he/ she may have to reappear for the same in the subsequent semesters.

6.9 Components for Human Rights Course (CIA Only)

The Course Human Rights is to be treated as 100% C I A course which is offered in II Semester for I year PG students.

Total Marks for the Course =100

Components	Marks
Two Tests	75
Assignments	25
Total	**100**

- In case the candidate fails to secure 50 marks, which is the passing minimum, he/she may have to reappear for the same in the subsequent semesters

QUESTION PAPER PATTERN FOR CIA I, II AND ESE	
(3 HOURS)	MAXIMUM:75Marks
SECTION-A (Objective Type) Answer ALL Questions **ALL Questions Carry EQUAL Marks**	**(10 x1=10 marks)**
SECTION-B (Analytical Type) Answer any THREE Questions out of FIVE Questions **ALL Questions Carry EQUAL Marks**	**(3 x 5 = 15 marks)**
SECTION-C (Either or Type) Answer ALL Questions **ALL Questions Carry EQUAL Marks**	**(5 x 10 = 50 marks)**

(Syllabus for CIA-I 2.5 Unit ,Syllabus for CIA-II All 5 Unit)

6.10 PASSING MINIMUM

6.10.1 There shall be no passing minimum for Internal.

6.10.2 For external examination, passing minimum shall be 50% [Fifty Percentage] of the maximum marks prescribed for the course for each Course/Practical/Project and Viva-Voce.

6.10.3 In the aggregate [External/Internal] the passing minimum shall be of 50%.

6.10.4 He / She shall be declared to have passed the whole examination, if he/she passes in all the Courses and Practical wherever prescribed as per the scheme of the examinations by earning 90 CREDITS. He/she shall also fulfill the extension activities prescribed earning a minimum of 1 credit to qualify for the Degree.

6.11 SUPPLIMENTARY EXAMINATION:

Supplementary Examinations is conducted for the students who appeared in the final semester examinations. Eligible criteria for appearing in the Supplementary Examinations are as follows:

6.11.1 Eligibility: A Student who is having arrear of only one theory course in any of the semester or two theory course in the Final semester of the PG degree programme alone is eligible for Supplementary Examinations.

6.11.2 Non-eligibility for those completed the program: Students who have completed their Program duration but having arrears are not eligible to appear for Supplementary Examinations.

6.12. RETOTALLING, REVALUATION AND PHOTOCOPY OF THE ANSWER SCRIPTS:

6.12.1 Re-totaling: All UG Students who appeared for their Semester Examinations are eligible for applying for re-totaling of their answer scripts.

6.12.2Revaluation: All current batch Students who have appeared for their Semester Examinations are eligible for Revaluation of their answer scripts. Passed out candidates are not eligible for Revaluation.

6.12.3 Photo copy of the answer scripts: Students who have applied for revaluation can apply for the Photocopy of answer scripts by paying prescribed fee.

7. CLASSIFICATION OF SUCCESSFUL STUDENTS

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
00-49	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

7.1. Computation of Grade Point Average (GPA) in a Semester, Cumulative Grade Point Average(CGPA) and Classification

GPA for a Semester: = ∑iCiGi ,∑iCi

That is, GPA is the sum of the multiplication of grade points by the credits of the courses divided by the sum of the credits of the courses in a semester.

CGPA for the entire programme: = ∑n∑iCniGni ,∑n∑iCni That is, CGPA is the sum of the multiplication of grade points by the credits of the entire programme divided by the sum of the credits of the courses of the entire programme

Where,

Ci= Credits earned for course I in any semester,

Gi=GradePointsobtainedforcourseiinanysemestern=Semesterinwhichsuchcourseswere credited.

7.2 Letter Grade and Classification

CGPA	GRAD E	CLASSIFICATION OF FINAL RESULT
9.5-10.0	O+	First Class -Exemplary*
9.0 and above but below9.5	O	
8.5 and above but below 9.0	D++	
8.0 and above but below 8.5	D+	First Class with Distinction*
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	
6.5 and above but below 7.0	A+	First Class
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
0.0 and above but below 5.0	U	Re-appear

*The Students who have passed in the first appearance and within the prescribed semester of the PG Program are eligible.

8. RANKING

Students who pass all the examinations prescribed for the Program in the FIRST APPEARANCE ITSELF ALONE are eligible for Ranking I, II and III.

9. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAM TO QUALIFY FOR A DEGREE

9.1. A Student who for whatever reasons is not able to complete the program within the normal period (N) or the Minimum duration prescribed for the programme, may be allowed two years period beyond the normal period to clear the backlog to be qualified for the degree. (Time Span =N+2years for the completion of programme.)

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M.Sc., MATHEMATICS Abstract under LOCF-CBCS Pattern with effect from 2023-2024 Onwards
Structure of Credit Distribution as per the TANSCHE / UGC Guidelines

S.No	Study Components	Sem I		Sem II		Sem III		Sem IV		No. of Cours	Total Credit
		No.of Cours	Credit	No.of Cours	Credit	No.of Cours	Credit	No.of Cours	Credit		
1	DISCIPLINE SPECIFIC CORESES(DSC) - THEORY	3	14	3	14	4	19	2	10	12	57
2	DISCIPLINE SPECIFIC ELECTIVE COURSES(DSE)	2	6	2	6	1	3	1	3	6	18
3	PROJECT WORK							1	5	1	5
4	INTERNSHIP					1	2			1	2
5	GENERIC ELECTIVE COURSES(GEC)-EDC					1	2			1	2
6	SKILL ENHANCEMENT COURSES(SEC)							1	2	1	2
7	HUMAN RIGHTS			1	2					1	2
8	ONLINE - COMPETITIVE EXAMINATION							1	2	1	2
9	EXTENSION ACTIVITY							1	1	1	1
	Cumulative Credits	5	20	6	22	7	26	7	23	25	91

Total No. of Subjects	25
Marks	2500

TOTAL CREDIT	91
Extra Credit	4
Total Credits	95

S.No	STUDY COMPONENTS	COURSE CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX.MARKS		
				Lect	Lab		CIA	ESE	TOTAL
SEMESTER - I									
1	DSC THEORY - I	23M1PMAC01	ALGEBRAIC STRUCTURE	6	-	5	25	75	100
2	DSC THEORY - II	23M1PMAC02	REAL ANALYSIS - I	6	-	5	25	75	100
3	DSC THEORY - III	23M1PMAC03	ORDINARY DIFFERENTIAL EQUATIONS	6	-	4	25	75	100
4	DSE THEORY - I	23M1PMAE02	GRAPH THEORY AND APPLICATIONS	6	-	3	25	75	100
5	DSE THEORY - II	23M1PMAE08	DISCRETE MATHEMATICS	6	-	3	25	75	100
			TOTAL	**30**	**-**	**20**	**125**	**375**	**500**
SEMESTER - II									
1	DSC THEORY - IV	23M2PMAC04	ADVANCED ALGEBRA	6	-	5	25	75	100
2	DSC THEORY - V	23M2PMAC05	REAL ANALYSIS - II	6	-	5	25	75	100
3	DSC THEORY - VI	23M2PMAC06	PARTIAL DIFFERENTIAL EQUATIONS	6	-	4	25	75	100
4	DSE THEORY - III	23M2PMAE10	MATHEMATICAL STATISTICS	5	-	3	25	75	100
5	DSE THEORY - IV	23M2PMAE14	MODELING AND SIMULATION WITH EXCEL	5	-	3	25	75	100
6	HUMAN RIGHTS	23M2PHUR01	HUMAN RIGHTS	2	-	2	100	-	100
			TOTAL	**30**	**-**	**22**	**225**	**375**	**600**
SEMESTER - III									
1	DSC THEORY - VII	23M3PMAC07	COMPLEX ANALYSIS	5	-	5	25	75	100

2	DSC THEORY - VIII	23M3PMAC08	PROBABILITY THEORY	6	-	5	25	75	100
3	DSC THEORY - IX	23M3PMAC09	TOPOLOGY	6	-	5	25	75	100
4	DSC THEORY - X	23M3PMAC10	CORE INDUSTRY MODULE	5	-	4	25	75	100
5	DSE THEORY - V		ELECTIVE - V	5	-	3	25	75	100
6	INTERNSHIP	23M3PMAIS1	INTERNSHIP	-	-	2	100	-	100
7	EDC		EDC	3	-	2	25	75	100
			TOTAL	**30**	**-**	**26**	**250**	**450**	**700**
SEMESTER - IV									
1	DSC THEORY - XI	23M4PMAC11	FUNCTIONAL ANALYSIS	6	-	5	25	75	100
2	DSC THEORY - XII	23M4PMAC12	DIFFERENTIAL GEOMETRY	6	-	5	25	75	100
3	DSE THEORY - VI		ELECTIVE - VI	6	-	3	25	75	100
4	PROJECT	23M4PMAPR1	PROJECT WORK	8	-	5	50	150	200
5	SEC THEORY - I		SEC THEORY - I	4	-	2	25	75	100
6	ONLINE - COMPETITIVE EXAMINATION	23M4PMAOE1	MATHEMATICS FOR COMPETITIVE EXAMINATION	-	-	2	100	-	100
7	EXTENSION ACTIVITY	23M4PEXA01	EXTENSION ACTIVITY	-	-	1	-	-	-
			TOTAL	30	-	23	150	450	700
			OVERALL TOTAL	120	-	91	750	1650	2500
	EXTRA CREDIT COURSE	21M4PMAEC1	MOOC Courses offered in SWAYAM / NPTEL	-	-	2	-	-	-

HOD **MEMBER SECRETARYACADEMIC COUNCIL** **PRINCIPAL**

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAC01	ALGEBRAIC STRUCTURE	DSC THEORY - I	I	6	4	2	-	5
Objective	To introduce the concepts and to develop working knowledge on class equation, solvability of groups, finite abelian groups, linear transformations, real quadratic forms.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Another Counting Principle: Class equation for finite groups and its applications - Sylow's theorems (For theorem 2.12.1, First proof only). Chapter 2: Sections 2.11 and 2.12 (Omit Lemma 2.12.5)	K1	15
II	Solvable groups: Direct products - Finite abelian groups- Modules Chapter 5 : Section 5.7 (Lemma 5.7.1, Lemma 5.7.2, Theorem 5.7.1) Chapter 2 : Section 2.13 and 2.14 (Theorem 2.14.1 only) Chapter 4: Section 4.5	K2	15
III	Linear Transformations: Canonical forms –Triangular form - Nilpotent transformations. Chapter 6: Sections 6.4, 6.5	K3	14
IV	Linear Transformations: Jordan form - rational canonical form. Chapter 6 : Sections 6.6 and 6.7	K4	14
V	Linear Transformations: Trace and transpose - Hermitian, unitary, normal transformations -Real quadratic forms Chapter 6 : Sections 6.8, 6.10 and 6.11 (Omit 6.9)	K5	14
Course Outcome	**CO1:** Recall basic counting principle, class equations to solve problems, explain Sylow's theorems and apply the theorem to find number of Sylow subgroups.	K1	
	CO2: Connect Solvable groups with direct products, examine the properties of finite abelian groups and modules	K2	
	CO3: Compose similar Transformations and invariant subspace, explore the properties of triangular matrix, to find the index of nilpotence to decompose a space into invariant subspaces.	K3	
	CO4: Bring out insight into Jordan, canonical form, Jordan blocks and rational canonical form, apply the concepts to find characteristic polynomial of linear transformation.	K4	

	CO5: Demonstrate the knowledge about trace, define transpose of a matrix, explain the properties of trace and transpose. Also in normal transformations and to verify whether the transformation in Hermitian, unitary and normal	K5

Learning Resources	
Text Books	1. I.N. Herstein, Topics in Algebra (II Edition) Wiley Eastern Limited, New Delhi, 1975.
Reference Books	1. M.Artin, Algebra, Prentice Hall of India, 1991. 2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, Basic Abstract Algebra (II Edition) Cambridge University Press, 1997. (Indian Edition) 3. I.S.Luther and I.B.S.Passi, Algebra, Vol. I –Groups(1996); Vol. II Rings, Narosa Publishing House , New Delhi, 1999 4. D.S.Malik, J.N. Mordeson and M.K.Sen, Fundamental of Abstract Algebra, McGraw Hill (International Edition), New York. 1997. 5. N.Jacobson, Basic Algebra, Vol. I & II W.H.Freeman (1980); also published by Hindustan Publishing Company, New Delhi.
Website Link	1. http://mathforum.org 2. http://ocw.mit.edu/ocwweb/Mathematics 3. http://www.opensource.org 4. www.algebra.com

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M1PMAC01	ALGEBRAIC STRUCTURE	DSC THEORY - I	I	6	4	2	-	5	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S	S	S	S	M	M
CO2	S	S	S	M	S	S	S	S	M	M
CO3	S	S	S	M	S	S	S	S	M	M
CO4	S	S	S	M	S	S	S	S	M	M
CO5	S	S	S	M	S	S	S	S	M	M

Level of Correlation Between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
Dr.K.LOGAARASI	Dr.K.LOGAARASI	Head CDC

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAC02	REAL ANALYSIS - I	DSC THEORY – II	I	6	4	2	-	5
Objective	To work comfortably with functions of bounded variation, Riemann-Stieltjes Integration, convergence of infinite series, infinite product and uniform convergence and its interplay between various limiting operations.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Functions of Bounded Variation:**Introduction -Properties of monotonic functions - Functions of bounded variation - Total variation - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of two increasing functions –Continuous functions of bounded variation. **Infinite Series:** Absolute and conditional convergence - Dirichlet's test and Abel's test - Rearrangement of series - Riemann's theorem on conditionally convergent series. Chapter 6: Sections 6.1 – 6.8 Chapter 8: Sections 8.8, 8.15, 8.17, 8.18	K1,K2	15
II	**The Riemann-Stieltjes Integral:** Introduction – Notation - The definition of the Riemann-Stieltjes integral - Linear Properties - Integration by parts- Change of variable in a Riemann-Stieltjes integral - Reduction to a Riemann Integral – Step functions as integrators – Reduction of Riemann-Stieltjes integral to a finite sum - Euler's summation formula - Monotonically increasing integrators, Upper and lower integrals - Additive and linearity properties of upper and lower integrals - Riemann's condition - Comparison theorems Chapter 7: Sections 7.1 – 7.14	K2,K3	15
III	**The Riemann-Stieltjes Integral:** Integrators of bounded variation - Sufficient conditions for existence of Riemann-Stieltjes integrals - Necessary conditions for existence of Riemann-Stieltjes integrals – Mean value theorems for Riemann-Stieltjes integrals – The integral as a function of the interval – Second fundamental theorem of integral calculus - Change of variable in Riemann integral – Second Mean Value Theorem for Riemann integrals- Riemann-Stieltjes integrals depending	K3	14

	on a parameter- Differentiation under the integral sign – Interchanging the order of integration - Lebesgue's criterion for existence of Riemann integrals Chapter 7: Sections 7.15 – 7.26		
IV	**Infinite Series and Infinite Products**: Double sequences - Double series - Rearrangement theorem for double series – A sufficient condition for equality of iterated series - Multiplication of series – Cesarosummability - Infinite products. **Power Series:** Power series - Multiplication of power series - The Taylor's series generated by a function - Bernstein's theorem - Abel's limit theorem - Tauber's theorem Chapter 8: Sections 8.20 – 8.26 Chapter 9: Sections 9.14, 9.15,9.19,9.20, 9.22,9.23	K4	14
V	**Sequences of Functions:** Pointwise convergence of sequences of functions - Examples of sequences of real-valued functions – Definition of Uniform convergence - Uniform convergence and continuity – The Cauchy condition for uniform convergence - Uniform convergence of infinite series of functions – Uniform convergence and Riemann-Stieltjes integration – Nonuniformly Convergent sequences that can be integrated term by term - Uniform convergence and differentiation - Sufficient conditions for uniform convergence of a series - Mean convergence. Chapter 9: Sections 9.1 – 9.6, 9.8 – 9.11, 9.13	K5	14
Course Outcome	**CO1:** Understand functions of bounded variation and Rectifiable Curves.	K1	
	CO2: Apply the concept of Riemann-Stieltjes integral and its properties.	K2	
	CO3: Demonstrate the concept of step function, upper function, Lebesgue function and their integrals.	K3	
	CO4: Construct various mathematical proofs using the properties of Lebesgue integrals and establish the Levi monotone convergence theorem	K4	
	CO5: Formulate the concept and properties of inner products, norms and measurable functions	K5	
Learning Resources			
Text Books	1.Tom M.Apostol, Mathematical Analysis, 2nd Edition, Addison-Wesley Publishing Company Inc. New York, 1974.		

Reference Books	1.Bartle, R.G. Real Analysis, John Wiley and Sons Inc., 1976. 2.Rudin,W. Principles of Mathematical Analysis, 3rd Edition., McGraw Hill Company, New York, 1976. 3.Malik,S.C. and SavitaArora. Mathematical Anslysis, Wiley Eastern Limited.New Delhi, 1991. 4.SanjayArora and BansiLal, Introduction to Real Analysis, SatyaPrakashan, New Delhi, 1991. 5.Gelbaum, B.R. and J. Olmsted, Counter Examples in Analysis, Holden day, San Francisco, 1964. 6.A.L.Gupta and N.R.Gupta, Principles of Real Analysis, Pearson Education, (Indian print) 2003.			
Website Link	1.http://www.mathforum.org/ 2.http://ocw.mit.edu/ocwweb/Mathematics 3.http://www.opensource.org/ 4.http://www.mathpages.com/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M1PMAC02	REAL ANALYSIS - I	DSC THEORY – II	I	6	4	2	-	5	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation Between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
K.DHINESHKUMAR	Dr.K.LOGAARASI	Head CDC

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAC03	ORDINARY DIFFERENTIAL EQUATIONS	DSC THEORY - III	I	6	4	2	-	4
Objective	To develop strong back ground on finding solutions to linear differential equations with constant and variable coefficients and also with singular points, to study existence and uniqueness of the solutions of first order differential equations.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Linear equations with constant coefficients:** Second order homogeneous equations-Initial value problems-Linear dependence and independence – Wronskian and a formula for Wronskian -Non-homogeneous equation of order two. Chapter2: Sections 1 to 6	K1,K2	15
II	**Linear equations with constant coefficients:** Homogeneous and non-homogeneous equation of order n–Initial value problems- Annihilator method to solve non-homogeneous equation- Algebra of constant coefficient operators. Chapter 2 : Sections 7 to 12.	K2	15
III	**Linear equation with variable coefficients:** Initial value problems-Existence and uniqueness theorems–Solutions to solve a non- homogeneous equation– Wronskian and linear dependence– reduction of the order of a homogeneous equation– homogeneous equation with analytic coefficients- he Legendre equation. Chapter: 3 Sections 1to 8 (Omit section 9)	K3,K4	14
IV	**Linear equation with regular singular points:** Euler equation –Second order equations with regular singular points–Exceptional cases – Bessel Function. Chapter4:Sections 1 to 4 and6 to 8(Omit sections 5 and 9)	K4	14
V	**Existence and uniqueness of solutions to first order equations:** Equation with variable separated – Exact equation–method of successive approximations –the Lipschitz condition – convergence of the successive approximations and the existence theorem. Chapter5 :Sections 1 to 6 (Omit Sections 7 to 9)	K5	14
	CO1: Establish the qualitative behavior of solutions of systems of differential equations.	K1	

Course Outcome	**CO2:** Recognize the physical phenomena modeled by differential equations and dynamical systems.	K2
	CO3: Analyze solutions using appropriate methods and give examples.	K3
	CO4: Formulate Green's function for boundary value problems	K4
	CO5: Understand and use various theoretical ideas and results that Underlie the mathematics in this course.	K5

Learning Resources

Text Books	1. E.A.Coddington, An introduction to ordinary differential equations (3rd Printing) Prentice-HallofIndiaLtd.,NewDelhi,1987
Reference Books	1. Williams E. Boyce and Richard C. DI Prima, Elementary differential equations and boundary value problems, John Wiley and sons, New York, 1967. 2. George FSimmons , Differential equations with applications and historical notes, Tata McGrawHill, New Delhi,1974. 3. N.N. Lebedev, Special functions and their applications, Prentice Hallof India, New Delhi, 1965. 4. W.T. Reid. Ordinary Differential Equations, John Wiley and Sons, NewYork, 1971 5. M.D.Raisinghania, Advanced Differential Equations, S.Chand & Company Ltd. New Delhi 2001 6. B.Rai,D.P.Choudary and H.I.Freedman, A Course in Ordinary Differential Equations, Narosa Publishing House, NewDelhi,2002
Website Link	1. http://mathforum.org, 2. http://ocw.mit.edu/ocwweb/Mathematics 3. http://www.opensource.org, 4. www.mathpages.com

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**			**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAC03	ORDINARY DIFFERENTIAL EQUATIONS			DSC THEORY – III		I	6	4	2	-	4
CO-PO Mapping											
CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	S	S	S	M	S	S	S	S	S	S	
CO2	S	S	S	S	S	S	M	S	S	S	
CO3	S	M	S	S	S	S	S	M	S	S	
CO4	S	M	S	S	S	S	S	S	M	S	
CO5	S	S	S	M	S	S	S	S	S	S	
Level of Correlation Between CO and PO	L-LOW					M-MEDIUM			S-STRONG		
Tutorial Schedule	Problem solving session, Seminar and Group Discussion										
Teaching and Learning Methods	Lecture, Smart class presentation										
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE										
Designed By	**Verified By**							**Approved By**			
Mrs.R.PARVATHA	Dr.K.LOGAARASI							Head CDC			

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAC04	ADVANCED ALGEBRA	DSC THEORY - IV	II	6	4	2	-	5
Objective	To study field extension, roots of polynomials, Galois Theory, finite fields, division rings, solvability by radicals and to develop computational skill in abstract algebra.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Extension fields – The Transcendence of e. Chapter 5: Section 5.1 and 5.2	K1	15
II	Roots of Polynomials- More about roots Chapter 5: Sections 5.3 and 5.5	K2	15
III	The Elements of Galois theory. Chapter 5 : Section 5.6	K3	14
IV	Finite fields - Wedderburn's theorem on finite division rings. Chapter 7: Sections 7.1 and 7.2 (Theorem 7.2.1 only)	K4	14
V	Solvability by radicals - A theorem of Frobenius - Integral Quaternions and the Four - Square theorem. Chapter 5: Section 5.7 (omit Lemma 5.7.1, Lemma 5.7.2 and Theorem 5.7.1) Chapter 7 : Sections 7.3 and 7.4	K5	14
Course Outcome	**CO1:** Prove theorems applying algebraic ways of thinking.	K1	
	CO2: Connect groups with graphs and understanding about Hamiltonian graphs.	K2	
	CO3: Compose clear and accurate proofs using the concepts of Galois Theory.	K3	
	CO4: Bring out insight into Abstract Algebra with focus on axiomatic theories.	K4	

	CO5: Demonstrate knowledge and understanding of fundamental concepts including extension fields, Algebraic extensions, Finite fields, Class equations and Sylow's theorem.	K5	

Learning Resources				
Text Books	1. I.N. Herstein. Topics in Algebra (II Edition) Wiley EasternLimited, New Delhi, 1975.			
Reference Books	1. M.Artin, Algebra, Prentice Hall of India, 1991. 2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, Basic Abstract Algebra (II Edition) Cambridge University Press, 1997. (Indian Edition) 3. I.S.Luther and I.B.S.Passi, Algebra, Vol. I –Groups(1996); Vol. II Rings,Narosa Publishing House , New Delhi, 1999 4. D.S.Malik, J.N. Mordeson and M.K.Sen, Fundamental of Abstract Algebra, McGraw Hill (International Edition), New York. 1997. 5. N.Jacobson, Basic Algebra, Vol. I & II Hindustan Publishing Company, New Delhi.			
Website Link	1. http://mathforum.org 2. http://ocw.mit.edu/ocwweb/Mathematics 3. http://www.opensource.org 4. www.algebra.com			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M2PMAC04	ADVANCED ALGEBRA	DSC THEORY – IV	II	6	4	2	-	5	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S	S	S	S	M	M
CO2	S	S	S	M	S	S	S	S	M	M
CO3	S	S	S	M	S	S	S	S	M	M
CO4	S	S	S	M	S	S	S	S	M	M
CO5	S	S	S	M	S	S	S	S	M	M

Level of Correlation Between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
Dr.K.LOGAARASI	Dr.K.LOGAARASI	Head CDC

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAC05	REAL ANALYSIS - II	DSC THEORY – V	II	6	4	2	-	5

Objective	To introduce measure on the real line, Lebesgue measurability and integrability, Fourier Series and Integrals, in-depth study in multivariable calculus.		
Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Measure on the Real line:** Lebesgue Outer Measure - Measurable sets - Regularity - Measurable Functions - Borel and Lebesgue Measurability Chapter 2: Sections 2.1 – 2.5	K1,K2	15
II	**Integration of Functions of a Real variable:** Integration of Non-negative functions - The General Integral - Riemann and Lebesgue Integrals Chapter 3: Sections 3.1, 3.2, 3.4	K2	15
III	**Fourier Series and Fourier Integrals**: Introduction - Orthogonal systems of functions - The theorem on best approximation - The Fourier series of a function relative to an orthonormal system - Properties of Fourier Coefficients - The Riesz-Fischer Theorem – The convergence and representation problems for trigonometric series - The Riemann-Lebesgue Lemma - The Dirichlet Integrals – An integral representation for the partial sums of Fourier series - Riemann's localization theorem – Sufficient conditions for convergence of a Fourier series at a particular point – Cesaro summability of Fourier series - Consequences of Fejer's theorem - The Weierstrass approximation theorem. Chapter 11: Sections 11.1 - 11.15	K3	14
IV	**Multivariable Differential Calculus**: Introduction – The directional derivative - Directional derivatives and continuity – The total derivative - The total derivative expressed in terms of partial derivatives – An application to Complex valued functions - The matrix of linear function - The Jacobian matrix – The chain rule - Matrix form of the chain rule - The mean value theorem for differentiable functions - A sufficient condition for differentiability - A sufficient condition for equality of mixed partial derivatives - Taylor's theorem for functions of R^n to R^1 Chapter 12: Sections 12.1 – 12.14	K4	14

V	**Implicit Functions and Extremum Problems:** Introduction – Functions with nonzero Jacobian determinant – The inverse function theorem - The Implicit function theorem - Extrema of real valued functions of one variable - Extrema of real valued functions of severable variables - Extremum problems with side conditions. Chapter 13: Sections 13.1 – 13.7	K4, K5	14
Course Outcome	**CO1:** Understand and describe the basic concepts of Fourier series and Fourier integrals with respect to orthogonal system.	K1	
	CO2: Analyze the representation and convergence problems of Fourier series.	K2	
	CO3: Analyze and evaluate the difference between transforms of various functions.	K3	
	CO4: Formulate and evaluate complex contour integrals directly and by the fundamental theorem.	K4	
	CO5: Apply the Cauchy integral theorem in its various versions to compute contour integration.	K5	

Learning Resources	
Text Books	1.G. de Barra, Measure Theory and Integration, Wiley Eastern Ltd., New Delhi, 1981. (for Units I and II) 2.Tom M.Apostol, Mathematical Analysis, 2nd Edition, Addison-Wesley Publishing Company Inc. New York, 1974. (for Units III, IV and V)
Reference Books	1.Burkill, J.C. The Lebesgue Integral, Cambridge University Press, 1951. 2.Munroe, M.E., Measure and Integration. Addison-Wesley, Mass.1971. 3.Roydon, H.L. Real Analysis, Macmillan Pub. Company, New York, 1988. 4.Rudin, W. Principles of Mathematical Analysis, 3rd Edition., McGraw Hill Company, New York, 1976. 5.Malik,S.C. and Savita Arora, Mathematical Anslysis, Wiley Eastern Limited, New Delhi, 1991. 6.Sanjay Arora and Bansi Lal, Introduction to Real Analysis, Satya Prakashan, New Delhi, 1991
Website Link	1.http://www.mathforum.org/ 2.http://ocw.mit.edu/ocwweb/Mathematics 3.http://www.opensource.org/

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAC05	REAL ANALYSIS - II	DSC THEORY – V	II	6	4	2	-	5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
Mr.K.DHINESHKUMAR	Dr.K.LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAC06	PARTIAL DIFFERENTIAL EQUATIONS	DSC THEORY - VI	II	6	4	2	-	4
Objective	To classify the second order partial differential equations and to study Cauchy problem, method of separation of variables, boundary value problems.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Mathematical Models and Classification of second order equation:** Classical equations –Vibrating string–Vibrating membrane –waves in elastic medium–Conduction of heat in solids–Gravitational potential – Second order equations in two independent variables – canonical forms – equations with constant coefficients – general solution Chapter2 : Sections2.1 to 2.6 Chapter3: Sections3.1 to3.4 (Omit3.5)	K1,K2	15
II	**Cauchy Problem:** The Cauchy problem–Cauchy-Kowalewsky theorem–Homogeneous wave equation–Initial Boundary value problem- Non-homogeneous boundary conditions –Finite string with fixed ends – Non-homogeneous wave equation –cylindrical wave equation. Chapter4 : Sections 4.1 to 4.7 & 4.11	K2	15
III	**Method of separation of variables:** Separation of variable-Vibrating string problem–Existence and uniqueness of solution of vibrating string problem-Heat conduction problem–Existence and uniqueness of solution of heat conduction problem –Laplace and beam equations Chapter6 :Sections6.1 to6.6 (Omit section 6.7)	K3,K4	14
IV	**Boundary Value Problems:** Boundary value problems– Maximum and minimum principles – Uniqueness and continuity theorem–Dirichlet Problem for a circle, a circular annulus, a rectangle – Dirichlet problem involving Poisson equation – Neumann problem for a circle and a rectangle. Chapter8 : Sections8.1 to 8.9	K4	14
V	**Green's Function:** The Delta function–Green's function – Method of Green's function – Dirichlet Problem for the Laplace and Helmholtz operators– Higher dimensional problem – Neumann Problem. Chapter 10 :Section 10.1 to 10.5 & 10.8,10.9	K5	14

Course Outcome	**CO1:** Understand and classify second order equations and find general solutions	K1	
	CO2: Analyze and solve wave equations in different polar coordinates	K2	
	CO3: Solve Vibrating string problem, Heat conduction problem, to identify and solve Laplace and beam equations	K3	
	CO4: Apply maximum and minimum principle's and solve Dirichlet, Neumann problems for various boundary conditions.	K4	
	CO5: Evaluate the Green's function and solve Dirichlet, Laplace problems, to apply Helmholtz operation and to solve Higher dimensional problem.	K5	

Learning Resources

Text Books	1. Tyn Myint-U and Lokenath Debnath, Partial Differential Equations for Scientists and Engineers (Third Edition), North Hollan,NewYork,1987.
Reference Books	1. M.M.Smirnov, Second Order partial Differential Equations, Lenin grad, 1964. 2. I.N.Sneddon, Elements of Partial Differential Equations, McGraw Hill, New Delhi, 1983. 3. R. Dennemeyer, Introduction to Partial Differential Equations and Boundary Value Problems, Mc Graw Hill, NewYork,1968. 4. M.D.Raisinghania, Advanced Differential Equations, S Chand & Company Ltd., New Delhi, 2001. 5. S. Sankar Rao, Partial Differential Equations, 2nd Edition, Prentice Hall of India, New Delhi. 2004
Website Link	1. http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics, 2. http://www.opensource.org, 3. www.mathpages.com

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**			**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAC06	PARTIAL DIFFERENTIAL EQUATIONS			DSC THEORY - VI	II	6	4	2	-	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	M	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	S	M	S
CO5	S	S	S	M	S	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
R.PARVATHA	Dr. K. LOGAARASI	**Head CDC**

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAC07	COMPLEX ANALYSIS	DSC THEORY - VII	III	5	5	-	-	5
Objective	Students can understand about the Cauchy integral formula, local properties of analytic functions, general form of Cauchy's theorem and evaluation of definite integral and harmonic functions.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Cauchy's Integral Formula:** 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. Chapter 4 : Section 2 : 2.1 to 2.3 Chapter 4 : Section 3 : 3.1 to 3.4	K1	12
II	**The general form of Cauchy's Theorem:** Chains and cycles - Simple Connectivity - Homology - The General statement of Cauchy's Theorem - Proof of Cauchy's theorem - Locally exact differentials - Multiply connected regions **The Calculus of Residues:** The Residue theorem - The argument principle. Chapter 4 : Section 4 : 4.1 to 4.7 Chapter 4 : Section 5: 5.1 to 5.2	K2	12
III	**The Calculus of Residues:** Evaluation of Definite Integrals **Harmonic Functions:** Definition and basic properties – The Mean value property – Poisson's formula. Chapter 4 : Section 5 : 5.3 Chapter 4 : Sections 6 : 6.1 to 6.3	K3	12
IV	**Harmonic Functions:** Schwarz's theorem - The reflection principle. **Power Series Expansions:** Weierstrass's Theorem – The Taylor Series –The Laurent series. Chapter 4 : Section 6 : 6.4 to 6.5 Chapter 5 : Section 1 : 1.1 to 1.3	K4	12

V	**Partial Fractions and Factorization:** Partial fractions - Infinite products – Canonical products – Gamma Function **Entire Functions:** Jensen's formula – Hadamard's Theorem Chapter 5 : Section 2 : 2.1 to 2.4 Chapter 5 : Section 3 : 3.1 and 3.2 **Current Trend -*Applications of Cauchy's Theorem.***	K5	12
	* Self Study.		
Course Outcome	**CO1:** Recall the local properties of analytical functions and definite integrals.	K1	
	CO2: Understand the concept of definite integral and harmonic functions	K2	
	CO3: Apply the concept of the general form of Cauchy's theorem	K3	
	CO4: Analyze the Taylor and Laurent series.	K4	
	CO5: Evaluate the infinite products, canonical products and jensen's formula	K5	

Learning Resources	
Text Books	1. Lars V.Ahlfors, Complex Analysis, 3rd edition, McGraw Hill Co., New York, 1979
Reference Books	1. H.A. Presfly, Introduction to complex Analysis, Clarendon Press, oxford, 1990. 2. J.B. Conway, Functions of one complex variables, Springer - Verlag, International student Edition, Naroser Publishing Co., 1978. 3. M.Heins, Complex function Theory, Academic Press, New York, 1968.
Website Link	1.https://youtu.be/xLVLDzqzK8U 2.https://youtu.be/cUuDcIWuKkI 3.https://youtu.be/dp4jVPDyIHI
Self-Study Material	1.https://link.springer.com/chapter/10.1007/978-0-8176-4513-7_8

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAC07	COMPLEX ANALYSIS	DSC THEORY - VII	III	5	5	-	-	5

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S	S	S	S	S	S
CO2	S	M	M	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	M	S	S	S	S	S	M	S
CO5	S	S	S	M	S	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	-
Teaching and Learning Methods	Lecture, Smart class presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
SELVI G	Dr.K.LOGAARASI	Member Secretary

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAC08	PROBABILITY THEORY	DSC THEORY – VIII	III	6	4	2	-	5

Objective	Students can able to study some statistical characteristics, discrete and continuous distribution functions and their properties.		
Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Random Events:** Random events – Probability axioms – Combinatorial formulae – conditional probability – Bayes Theorem – Independent events. Chapter 1: Sections 1.1 – 1.7	K1	15
II	**Random Variables**: Distribution Function – Joint Distribution – Marginal Distribution – Conditional Distribution – Independent random variables – Functions of multi dimensional random variables. Chapter 2: Sections 2.1 – 2.9	K2	15
III	**Parameters of the Distribution:** Expectation- Moments –The Chebyshev Inequality – Absolute moments – Order parameters – Moments of random vectors –Regression of the first and second types. Chapter 3 : Sections 3.1 – 3.8	K3	14
IV	**Characteristic Functions:** Properties of characteristic functions – Characteristic functions and moments – semi invariants – characteristic function of the sum of the independent random variables– Determination of distribution function by the Characteristic. Chapter 4 : Sections 4.1 – 4.5	K5	14
V	**Some Probability Distributions:** One point , two point ,Binomial – Polya – Hypergeometric – Poisson (discrete) distributions – Uniform – normal gamma – Beta – Cauchy and Laplace (Continuous) distributions. Chapter 5 : Section 5.1– 5.10 **Current Trends - *Spaces of Measures***	K6	14
	*Self Study.		
Course	**CO1:** Identify Random Events to describe Probability, to apply	K1	

Outcome	Bayes, to define Distribution Function.		
	CO2: Interpret Joint Distribution, Marginal Distribution and Independent random variables.	K2	
	CO3: Classify Expectation, Moments and Chebyshev Inequality, to solve Regression of the first and second types.	K3	
	CO4: Execute Characteristic functions, to define distribution functions.	K5	
	CO5: Construct One point, two-point, Binomial distributions, to solve problems of Hypergeometric and Poisson distributions.	K6	

Learning Resources	
Text Books	1. M. Fisz, Probability Theory and Mathematical Statistics, John Wiley and Sons, New York, 1963.
Reference Books	1. R.Durrett, Probability : Theory and Examples, 2nd Edition Duxbury Press, New York, 1996. 2. V.K.Rohatgi An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi, 1988,3rd Print. 3. S.I.Resnick, A Probability Path, Birhauser, Berlin, 1999. 4. B.R.Bhat , Modern Probability Theory,3rd Edition, New Age International (P)Ltd, New Delhi, 1999
Website Link	1. https://www.statisticshowto.com/markovs-inequality/ 2. https://www.investopedia.com/terms/r/regression.asp 3. https://youtu.be/CfZa1daLjwo?si=bwP35fYllTmxNNxf 4. https://youtu.be/4iiLAADVm64?si=BlfEp2vPLOUA4Con
Self-Study Material	1. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=928950

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAC08	PROBABILITY THEORY	DSC THEORY – VIII	III	6	4	2	-	5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO 2	PSO3	PSO 4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
Mrs.P.SUBHA	Dr.K.LOGAARASI	Member Secretary

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAC09	TOPOLOGY	DSC THEORY – IX	III	6	4	2	-	5
Objective	To provide students with a strong foundation in topological spaces, continuous functions, connectedness, compactness, countability and separation axioms.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Topological Spaces:** Topological spaces – Basis for a topology– topology – The order topology – The product topology on X x Y - The subspace topology – Closed sets and limit points. Chapter 2 : Sections 12 to 17	K1	15
II	**Continuous functions:** Continuous functions – the product topology – The metric topology. Chapter 2 : Sections 18 to 21 (Omit Section 22)	K2	15
III	**Connectedness:** Connected spaces- connected subspaces of the Real line – Components and local connectedness. Chapter 3 : Sections 23 to 25.	K3	14
IV	**Compactness:** Compact spaces – compact subspaces of the Real line – Limit Point Compactness – Local Compactness. Chapter 3 : Sections 26 to 29.	K4	14
V	**Countability and Separation Axiom**: The Countability Axioms – The Separation Axioms – Normal Spaces – The Urysohn Lemma – The Urysohn metrization Theorem – The Tietz extension theorem. Chapter 4 : Sections 30 to 35. **Current Trends-*Topological Structures in Digital Images***	K5,K6	14
	* Self Study		

Course Outcome	**CO1**: To identify the concept of topological spaces and the basic definitions of open sets, neighbourhood, interior, exterior, closure and their axioms for defining topological space	K1	
	CO2: To relating the concepts of compactness, connectedness, homeomorphism and topological properties	K2	
	CO3: To determine the topological concepts in Functional Analysis.	K3	
	CO4: To categorize a topological space is either a limit point or not for a given subset of a topological space.	K4	
	CO5: To comment about the connectedness, compactness, second countable, Hausdorff and develop tools to identify when two are equivalent(homeomorphic). Solve the problems for example of normal space	K5,K6	

Learning Resources	
Text Books	1. James R. Munkres, Topology (2nd Edition) Pearson Education Pve. Ltd., Delhi, 2002.
Reference Books	1. J. Dugundji, Topology, Prentice Hall of India, New Delhi, 1975. 2. George F.Sinmons, Introduction to Topology and Modern Analysis, McGraw Hill Book Co., 1963. 3. L.Steen and J.Subhash, Counter Examples in Topology, Holt, Rinehart and Winston, New York, 1970.
Website Link	1. https://www.youtube.com/watch?v=VDqhDsT40wU 2. https://www.youtube.com/watch?v=8nXBfjPAzf8 3. https://www.youtube.com/watch?v=2OMPmrHEO2M 4. https://www.youtube.com/watch?v=GMyQRRmUSWY
Self-Study Material	1. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=1168156

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc. -Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M3PMAC09	TOPOLOGY	DSC THEORY – IX	III	6	4	2	-	5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO 4	PSO5
CO1	M	S	M	S	S	S	M	S	S	S
CO2	S	M	S	M	S	S	M	S	M	S
CO3	S	S	S	S	S	M	S	M	M	S
CO4	S	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	CIA-I, CIA-II, Seminar and ESE

Designed By	Verified By	Approved By
Dr.K.LOGAARASI	Dr.K.LOGAARASI	Member Secretary

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAC10	CORE INDUSTRY MODULE	DSC THEORY - X	III	5	3	2	-	4
Objective	To provide the students about a knowledge of Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferable Skill.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Machine Learning :** Introduction -Definition –Types of Machine Learning -Supervised , Unsupervised ,Reinforcement Learning- Algorithms for Machine Learning – problems solved by Machine Learning – Tools for Machine Learning – Applications	K1	12
II	**Robotic Process Automation(RPA):**Introduction to RPA –Need for automation programming constructs in RPA- Robots and Softbots – RPA architecture and process methodologies –Industries best suited for RPA.	K2	12
III	**Cloud Computing :** Need-Definition –Types of Cloud -Types of services –Saas	K3	12
IV	**Cyber Security:** Cyber Crime and Information security – Classification of Cyber Crime Types.	K4	12
V	**Virtual Reality:** Definition- Types of Head Mounted Displays-Tools for Reality. **Current Trends-* Advanced Machine Learning Technologies and Applications***	K5	12
	* Self Study.		

Course Outcome	**CO1:** Develop an appreciation for what is involved in learning models from data.	K1	
	CO2: Construct a wide variety of learning algorithms	K2	
	CO3: Utilize the structured thinking to unstructured problems	K3	
	CO4: Inspect the algorithmic topics of machine learning and mathematically deep enough to introduce the required theory	K4	
	CO5: Explain the machine and deep learning algorithms	K5	

Learning Resources	
Text Books	1. P. Kaliraj and T.Devi, Higher Education for Industry 4.0 and Transformation to Education 5.0, 2023
Reference Books	-
Website Link	1.https://youtu.be/h0e2HAPTGF41. 2.https://youtu.be/aBZ3uEqFwBk 3.https://youtu.be/RWgW-CgdIk0.
Self-Study Material	1.https://link.springer.com/book/10.1007/978-3-642-35326-0.

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAC10	CORE INDUSTRY MODULE	DSC THEORY – X	III	5	3	2	-	4

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S	S	S	S	S	S
CO2	S	M	M	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	M	S	S	S	S	S	M	S
CO5	S	S	S	M	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
SELVI G	Dr.K.LOGAARASI	Member Secretary

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAC11	FUNCTIONAL ANALYSIS	DSC THEORY – XI	IV	6	4	2	-	5
Objective	To provide students with a strong foundation in functional analysis, focusing on spaces, operators and fundamental theorems.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Banach Spaces:** 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. Chapter 9 : Sections 46-51	K1	15
II	**Hilbert Spaces:** The definition and some simple properties– Orthogonal complements – Ortho normal sets –The conjugate space H*- The adjoint of an operator – Self-adjoint operators - Normal and unitary operators – Projections. Chapter10 : Sections 52-59	K2	15
III	**Finite-Dimensional Spectral Theory:** Matrices – Determinants and the spectrum of an operator – The spectral theorem. Chapter 11: Sections 60-62	K3	14
IV	**General Preliminaries on Banach Algebras:** 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. Chapter 12 : Sections 64 – 69	K4	14
V	**The Structure of Commutative Banach Algebras:** The Gelfand mapping – Application of the formula $r(x) = lim \|x^n\|^{\frac{1}{n}}$ – Involutions in Banach algebras - The Gelfand-Neumark theorem. Chapter 13 : Sections 70 - 73 **Current Trends - *Singular value decomposition***	K5,K6	14

	* Self Study		
Course Outcome	**CO1:** To identify the Banach spaces and Transformations on Banach Spaces.	K1	
	CO2: To relate the Hahn Banach theorem and open mapping theorem.	K2	
	CO3: To determine the operators and fundamental theorems.	K3	
	CO4: To categorize the orthogonal and orthonormal sets.	K4	
	CO5: To Analyze and establish the regular and singular elements.	K5, K6	

Learning Resources	
Text Books	1. G.F.Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Education (India) Private Limited, New Delhi, 1963.
Reference Books	1. W.Rudin, Functional Analysis, McGraw Hill Education (India) Private Limited, New Delhi, 1973. 2. C. Goffman and G. Pedrick, First course in Functional Analysis, Prentice Hall of India, NewDelhi, 1987. 3. M. Thamban Nair, Functional Analysis, A First course, Prentice Hall of India, New Delhi, 2002.
Website Link	1. https://www.youtube.com/watch?v=pd3jUcTA5pA 2. https://www.youtube.com/watch?v=AqkxBvfysT0 3. https://www.youtube.com/watch?v=0LnL9kE-6us 4. https://www.youtube.com/watch?v=SW-GuE0waxM
Self-Study Material	1. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=3035869

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc. -Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAC11	FUNCTIONAL ANALYSIS	DSC THEORY – XI	IV	6	4	2	-	5

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	M	M	S	S	S
CO2	S	M	S	S	M	S	M	S	M	S
CO3	S	S	S	S	M	S	S	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion, Quiz program, Model preparation
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	CIA-I, CIA-II, Seminar and ESE

Designed By	Verified By	Approved By
Dr.K.LOGAARASI	Dr.K.LOGAARASI	Member Secretary

M.Sc – Mathematics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAC12	DIFFERENTIAL GEOMETRY	DSC THEORY –XII	IV	6	4	2	-	5
Objective	Students understand the concept of space curves and their intrinsic properties of a surface and geodesics.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Space curves:** Definition of a space curve – Arc length – tangent – normal and bi normal – curvature and torsion of a curve given as the intersection of two surfaces– contact between curves and surfaces- tangent surface- involutes and evolutes- Intrinsic equations – Fundamental Existence Theorem for space curves- Helies Chapter I : Sections 1 to 9	K1	15
II	**Local Intrinsic properties of a surface:** Definition of a surface – curves on a surface – Surface of revolution – Helicoids – Metric- Direction coefficients – families of curves- Isometric correspondence- Intrinsic properties Chapter II: Sections 1 to 9	K2	15
III	**Geodesics:** Geodesics – Canonical geodesic equations – Normal property of geodesics- Existence Theorems – Geodesic parallels – Geodesics curvature- Gauss- Bonnet Theorem – Gaussian curvature- surface of constant curvature Chapter II: Sections 10 to 18	K3	14
IV	**Local Non Intrinsic properties of a surface:** The second fundamental form- Principle curvatures – Lines of curvature – Developable - Developable associated with space curves and with curves on surface - Minimal surfaces – Ruled surfaces Chapter III: Sections 1 to 8	K4	14

V	**Differential Geometry of Surfaces:**Compact surfaces whose points are umblics- Hilbert's lemma – Compact surface of constant Gaussian or mean curvature – Complete surface and their characterization – Hilbert's Theorem – Conjugate points on geodesics. Chapter IV : Sections 1 to 8. **Current Trends-*Surfaces in Space ***	K5	14
	* Self Study.		
Course Outcome	**CO1:** Identify the concept of the space curves, Curves between surfaces, metrics on a surface and Geodesics	K1	
	CO2: Interpret the Intrinsic properties.	K2	
	CO3: Sketch the normal property of geodesics.	K3	
	CO4: Analyze Non Intrinsic properties of a surface.	K4	
	CO5: Explain compact surface of constant Gaussian and mean curvature.	K5	

Learning Resources

Text Books	1. T.J.Willmore, An Introduction to Differential Geometry, Oxford University Press, (Eighteenth Impression) New Delhi 2004. (Indian Print)
Reference Books	1. D.Somasundaram, Differential Geometry A First Course, Narosa Publishing House Pvt. Ltd, 2008. 2. Kobayashi. S. and Nomizu. K. Foundations of Differential Geometry, Inter science Publishers, 1963. 3.Wilhelm Klingenberg: A course in Differential Geometry, Graduate Texts in Mathematics, Springer-Verlag 1978.
Website Link	1.https://youtu.be/uK7OEARSWvA 2.https://youtu.be/EkcUjqo4pEg 3. https://youtu.be/HzHR7tVRdwg
Self-Study Material	1.https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=4070787&ppg=9

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc – Mathematics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAC12	DIFFERENTIAL GEOMETRY	DSC THEORY -XII	IV	6	4	2	-	5

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	M	S
CO3	S	M	S	S	M	S	S	S	S	M
CO4	S	M	M	S	S	M	S	S	S	S
CO5	S	S	S	M	S	S	S	M	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem Solving Session, Seminar and Group Discussion
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
R. Malathi	Dr.K.LOGAARASI	Member Secretary

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE (Autonomous) | Learn. Lead
A UNIT OF VANETRA GROUP

List of Elective Course (DSE) Details for M.Sc.,Mathematics SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 onwards

S.No.	SEM	COURSE_CODE	LIST OF ELECTIVE	TITLE OF THE COURSE
1	I	23M1PMAE01	ELECTIVE I	NUMBER THEORY AND CRYPTOGRAPHY
2		23M1PMAE02		GRAPH THEORY AND APPLICATIONS
3		23M1PMAE03		FORMAL LANGUAGES AND AUTOMATA THEORY
4		23M1PMAE04		PROGRAMMING IN C++ AND NUMERICAL METHODS
5	I	23M1PMAE05	ELECTIVE II	LIE GROUPS AND LIE ALGEBRAS
6		23M1PMAE06		MATHEMATICAL PROGRAMMING
7		23M1PMAE07		FUZZY SETS AND THEIR APPLICATIONS
8		23M1PMAE08		DISCRETE MATHEMATICS
9	II	23M2PMAE09	ELECTIVE III	ALGEBRAIC TOPOLOGY
10		23M2PMAE10		MATHEMATICAL STATISTICS
11		23M2PMAE11		STATISTICAL DATA ANALYSIS USING R PROGRAMMING
12		23M2PMAE12		TENSOR ANALYSIS AND RELATIVITY THEORY
13	II	23M2PMAE13	ELECTIVE IV	WAVELETS
14		23M2PMAE14		MODELING AND SIMULATION WITH EXCEL
15		23M2PMAE15		MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE
16		23M2PMAE16		NEURAL NETWORKS
17	III	23M3PMAE17	ELECTIVE V	ALGEBRAIC NUMBER THEORY
18		23M3PMAE18		FLUID DYNAMICS
19		23M3PMAE19		STOCHASTIC PROCESSES
20		23M3PMAE20		MATHEMATICAL PYTHON
21	IV	23M4PMAE21	ELECTIVE VI	ALGEBRAIC GEOMETRY
22		23M4PMAE22		FINANCIAL MATHEMATICS
23		23M4PMAE23		RESOURCE MANAGEMENT TECHNIQUES
24		23M4PMAE24		CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE01	NUMBER THEORY AND CRYPTOGRAPHY	DSE THEORY -I	I	6	3	3	-	3
Objective	To understand fundamental number-theoretic algorithms such as the Euclidean algorithm, the Chinese Remainder algorithm, binary powering, and algorithms for integer arithmetic.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Elementary Number Theory**: Time Estimates for doing arithmetic – divisibility and Euclidean algorithm – Congruences – Application to factoring. Chapter 1	K1	15
II	Introduction to Classical Crypto systems – Some simple crypto systems – Enciphering matrices DES. Chapter 3	K2,K3	15
III	Finite Fields, Quadratic Residues and Reciprocity. Chapter 2	K3	14
IV	Public Key Cryptography Chapter 4	K3,K4	14
V	Primality, Factoring, Elliptic curves and Elliptic curve crypto systems Chapter 5: sections 1,2,3 &5 (omit section 4), Chapter 6: sections 1& 2 only	K5	14
Course Outcome	**CO1:** Illustrate the implications of properties of divisibility and Primes		
	CO2: Distinguish the DES and the AES		
	CO3: Understanding the Law of Quadratic Reciprocity & Quadratic residues		
	CO4: Define the fundamentals of cryptography, such as encryption, authentication and digital signature		

	CO5: Explain how elliptic curves are used in certain Crypto-graphic algorithms.		

Learning Resources				
Text Books	1.Neal Koblitz, A Course in Number Theory and Cryptography, Springer-Verlag, New York, 1987.			
Reference Books	1. I.Niven and H.S.Zuckermann, An Introduction to Theory of Numbers (Edn. 3), Wiley Eastern Ltd., New Delhi, 1976. 2. David M.Burton, Elementary Number Theory, Brown Publishers, Iowa,1989 3. K.Ireland and M.Rosen, A Classical Introduction to Modern Number Theory, Springer Verlag, 1972. 4. N.Koblitz, Algebraic Aspects of Cryptography, Springer 1998.			
Website Link	1. https://nptel.ac.in/courses/111101137 2. https://archive.nptel.ac.in/courses/106/103/106103015/ 3. https://onlinecourses-archive.nptel.ac.in/noc17_cs36/preview			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE01	NUMBER THEORY AND CRYPTOGRAPHY	DSE THEORY -I	I	6	3	3	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion	
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation	
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE	
Designed By	**Verified By**	**Approved By**
Mrs.A.SUGANYA	Dr.K.LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE02	GRAPH THEORY AND APPLICATIONS	DSE THEORY - II	I	6	3	3	-	3
Objective	To understand the concepts of Graph theory and to know the applications of graphs in other disciplines.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Basic Results:** Introduction - Basic Concepts - Subgraphs - Degrees of Vertices - Paths and Connectedness - Automorphism of a Simple Graph. **Directed Graphs:** Introduction - Basic Concepts - Tournaments. (Chapter1: Sections1.1-1.6). (Chapter2: Sections2.1-2.3).	K1	14
II	**Connectivity:** Introduction – Vertex cuts and Edge Cuts - Connectivity and Edge Connectivity. **Trees:** Introduction - Definition, Characterization and Simple Properties - Centers and Centroids - Counting the Number of Spanning Trees - Cayley's Formula. (Chapter3: Sections 3.1- 3.3). (Chapter4:Sections4.1-4.5).	K2	14
III	**Independent Sets and Matchings**: Introduction-Vertex-Independent Sets and Vertex Coverings-Edge-Independent sets - Matchings and Factors-Matchings in Bipartite Graphs. **Eulerian Graphs and Hamiltonian Graphs**: Introduction-Eulerian Graphs-Hamiltonian Graphs. (Chapter 5: Sections 5.1- 5.5). (Chapter6: Sections 6.1-6.3).	K2,K3	16
IV	**Graph Colorings:** Introduction-Vertex colorings-Critical Graphs-Edge colorings of Graphs-Kirkman's Schoolgirl Problem-Chromatic Polynomials. (Chapter7: Sections 7.1, 7.2, 7.3, 7.6, 7.8 and 7.9).	K3,K4	14
V	**Planarity:** Introduction- Planar and Non planar Graphs - Euler Formula and its Consequences-K_5 and $K_{3,3}$ are Non planar Graphs– Dual of a Plane Graph- The Four-Color Theorem and the Heawood Five-Color Theorem-Hamiltonian Plane Graphs-Tait Coloring. (Chapter8: Sections 8.1-8.6, 8.8 and 8.9).	K5	14
	CO1: Acquire in depth knowledge on vital concepts in graph theory.	K1	
	CO2: Understand the Counting the Number of Spanning Trees	K2	

Course Outcome	**CO3:** Apply the imbibed knowledge on the concepts to categorize graphs.	K3
	CO4: Analyze and infer properties of graphs and its associated concepts.	K4
	CO5: Evaluate connectivity, Chromatic numbers etc, and construct graphs with specific properties.	K5

Learning Resources	
Text Books	1. R. Balakrishnan and K. Ranganathan, Text Book of Graph Theory, (2ndEdition), Springer, NewYork, 2019.
Reference Books	1. J.A.Bondy and U.S.R. Murty, Graph Theory with Applications, North Holland, New York, 1982. 2. NarasingDeo,GraphTheorywithApplicationtoEngineeringandComputerScience, PrenticeHall of India, New Delhi. 2003. 3. F.Harary, GraphTheory, Addison–WeselyPub.Co.TheMass.1969. 4. L.R.Foulds, Graph Theory Application, Narosa Publ. House, Chennai, 1933.
Website Link	1. https://youtu.be/mXoiHgH4mEE 2. https://youtu.be/mNzg7CoF3r0 3. https://youtu.be/7UZGUiG-Ucw 4. https://youtu.be/3VeQhNF5-rE 5. https://youtu.be/ZR-OJM3NETw

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**		**Course Type**		**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE02	GRAPH THEORY AND APPLICATIONS		DSE THEORY - II		I	6	3	3	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	M	M
CO2	S	M	M	L	M	S	M	M	M	M
CO3	S	S	S	M	S	S	S	M	M	M
CO4	S	L	S	S	S	S	S	M	S	S
CO5	S	M	S	S	S	M	M	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
Mrs.R.MALATHI	Dr.K.LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE03	FORMAL LANGUAGES AND AUTOMATA THEORY	DSE THEORY-III	I	6	3	3	-	3
Objective	To teach the student to identify different formal language classes and their relationships. To teach the student the theoretical foundation for designing compilers. To teach the student to use the ability of applying logical skills. Teach the student to prove or disprove theorems in automata theory using its properties							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Fundamentals**: Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, FA, transition diagrams and Language recognizers. **Finite Automata**: Deterministic finite automaton, Non deterministic finite automaton and NFA with Є transitions - Significance, acceptance of languages. **Conversions and Equivalence :** Equivalence between NFA with and without Є transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSMs, Finite Automata with output- Moore and Melay machines.	K1,K2	15
II	**Regular Languages**: Regular sets, regular expressions, identity rules, Conversion finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).	K2,K3	15
III	**Grammar Formalism**: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings. **Context Free Grammars**: Ambiguity in context free grammars. Minimisation of Context Free Grammars. Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted).	K3	14

IV	**Push Down Automata**: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA. **LINEAR BOUNDED AUTOMATA(LBA):** LBA, context sensitive grammars, CS languages	K4	14
V	**Turing Machine**: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines (proofs not required). **Computability Theory**: Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR(0) grammar, decidability of problems, Universal Turing Machine, undecidability of posts. Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.	K5	14
Course Outcome	**CO1:** Illustrate the Deterministic finite automaton, Non deterministic finite automaton and NFA with Є transitions	K1	
	CO2: Distinguish the Conversion of Finite Automata to Regulr expressions	K2	
	CO3: Understanding the Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages	K3	
	CO4: Define the Push down automata, definition, model, acceptance of CFL	K4	
	CO5: Explain the NP complete and NP hard problems	K5	

Learning Resources	
Text Books	1. Hopcroft H.E. and Ullman J. D, ''Introduction to Automata Theory Languages and Computatio'', Pearson Education. 2. Sipser and Thomson ,Introduction to Theory of Computation - 2nd edition
Reference Books	1. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley. 2. Introduction to languages and the Theory of Computation ,John C Martin, TMH 3. ''Elements of Theory of Computation'', Lewis H.P. & Papadimition C.H. Pearson /PHI. 4. Theory of Computer Science and Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI. 5. Theory of Computation, By K.V.N. Sunitha and N.Kalyani

Website Link	1. http://mathforum.org, 2. http://ocw.mit.edu/ocwweb/Mathematics, 3.http://www.opensource.org, 4.www.mathpages.com			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE03	FORMAL LANGUAGES AND AUTOMATA THEORY	DSE THEORY-III	I	6	3	3	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
Mrs.A.SUGANYA	Dr.K.LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE04	PROGRAMMING IN C++ AND NUMERICAL ANALYSIS	DSE THEORY-IV	I	6	3	3	-	3
Objective	This courses introduces a higher level language C++ and numerical methods for hands-on experience on computers. Stress is also given on the error analysis							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Principles of OOP-Tokens-Expressions, Control Structures-Functions-Classes and Objects-constructors and destructors. Chapter 1 to 6	K1	15
II	Operator Overloading and type Conversions - Inheritance - Pointers, Virtual Functions and Polymorphism-Managing Console I/O Operations-Working with Files. Chapter 7 to 11	K2	15
III	**Finite Digit Arithmetic and Errors** Floating point arithmetic - Propagated Error - Generated Error - Error in Evaluation of a function f(x). - Non-linear Equations: Bisection method- Secant Method - Regula Falsi Method - Newton‘s method - Muller‘s method - Fixed Point method Chapters 1,2 : Only 2.1 to 2.6	K3	15
IV	**System of Linear Equations** Gauss- Elimination Method - Crout‘s method - Inverse of a matrix - Condition numbers and errors - Jacobi‘s method - Gauss-Seidel Method - Relaxation method. Numerical Differentiation and Integration: Numerical Differentiation - Numerical Integration - Newton-Cotes Formulas - Gaussian Quadrature - Double Integral Chapter 3 and 5 : 5.1 to 5.5 and 5.7 (omit 5.6)	K4	15
V	**Ordinary Differential Equations:** Difference equation - Differential Equations:Single Step method-Runge-Kutta Method-Multi-step methods Chapter 6: 6.1 to 6.4 (omit 6.5**)**	K5	12
	CO1: Create basic programming concepts and OOP C ++ token programs, expressions and control structures in the systematic	K1	
	CO2: Apply fundamental algorithmic problems including *type*.	K2	
	CO3: Derive numerical methods for approximating the solution of problems of continuous mathematics	K3	

Course Outcome	**CO4:** Solving Equations Learning Outcomes Manipulate and simplify simple expressions including removal of brackets Solve linear equations, with or without.	K4
	CO5: Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.	K5

Learning Resources				
Text Books	1. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill, New Delhi, 1999. 2. Devi Prasad, An Introduction to Numerical Analysis (3rd edn) Narosa Publishing House, New Delhi, 2006.			
Reference Books	1. D. Ravichandran, Programming with C++, Tata McGraw Hill, New Delhi, 1996 2. Conte and de Boor, Numerical Analysis, McGraw Hill, New York, 1990 3. John H.Mathews, Numerical Methods for Mathematics, Science and Engineering (2nd Edn.), Prentice Hall, New Delhi, 2000			
Website Link	1. http://mathforum.org, 2. http://ocw.mit.edu/ocwweb/Mathematics, 3. http://www.opensource.org, 4. www.mathpages.com			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE04	PROGRAMMING IN C++ AND NUMERICAL ANALYSIS	DSE THEORY-IV	I	6	3	3	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	M
CO2	M	S	S	S	M	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	M	M	S	S	S	S	M	S	S
CO5	S	S	S	S	S	M	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
Mrs.A.MENAKA	Dr.K.LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE05	LIE GROUPS AND LIE ALGEBRAS	DSE THEORY-V	I	6	3	3	-	3

Objective	To know about the Lie groups appear as symmetry groups of physical systems, and their Lie algebras (tangent vectors near the identity) may be thought of as infinitesimal symmetry motions.

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	Matrix Lie Groups Chapter 1	K1	15
II	The Matrix Exponential Chapter 2	K2	15
III	Lie Algebras Chapter 3	K3	15
IV	Basic Representation Theory Chapter 4	K4	15
V	Semi simple Lie Algebras Chapter 7	K5	12
Course Outcome	**CO1:** Understand systematic understanding of key aspects of Matrix Lie Groups and Lie groups	K1	
	CO2: Determine the exponential of a matrix.	K2	
	CO3: Differentiate Lie groups and Lie Algebras	K3	
	CO4: Find the representation of S_1 (2 ; C).	K4	
	CO5: Evaluate the reductive Lie algebra	K5	

Learning Resources	
Text Books	1. Brain Hall, Lie Groups, Lie Algebras and Representations: An Elementary Introduction (Second Edition), Springer, USA, 2015.

Reference Books	1. V. S. Varadarajan, Lie groups, Lie algebras and their representations, Springer 1984. 2. Brian Hall, Lie groups, Lie algebras and representations, Springer 2003. 3. Barry Simon, Representations of finite and compact groups, AMS 1996. 4. A. W. Knapp, Representation theory of semi simple Lie groups. An overview based on examples, Princeton university press 2002. 5. S. Kumaresan S, A course in differential geometry and Lie groups, Texts and Readings in Mathematics, 22. Hindustan Book Agency, New Delhi, 2002.			
Website Link	1.https://archive.nptel.ac.in/courses/111/108/111108134/ 2.https://www.digimat.in/nptel/courses/video/111108134/L42.html 3.https://www.math.stonybrook.edu/~kirillov/mat552/liegroups.pdf			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE05	LIE GROUPS AND LIE ALGEBRAS	DSE THEORY-V	I	6	3	3	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	M
CO2	M	M	S	S	S	S	S	M	S	S
CO3	S	S	S	M	S	M	S	S	M	M
CO4	S	S	M	S	S	S	S	M	S	S
CO5	S	S	S	S	S	M	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
Mrs.A.MENAKA	Dr.K.LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF- CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE06	MATHEMATICAL PROGRAMMING	DSE THEORY- VI	I	6	3	3	-	3
Objective	This course introduces advanced topics in Linear and non-linear Programming							

Unit	Course Content	Knowledge Levels	Sessions
I	**INTEGER LINEAR PROGRAMMING:** Types of Integer Linear Programming Problems - Enumeration and Cutting Plane solution concept– Gomory's All Integer Cutting Plane Method - Gomory's mixed-Integer Cutting Plane method - Branch and Bound Method. Application of Zero-One Integer Programming. **Dynamic programming:** Characteristics of Dynamic Programming Problem - Developing Optimal Decision Policy - Dynamic Programming Under Certainty - DP approach for solving LPP. Chapter-7: 7.1 - 7.7,Chapter-22: 22.1 - 22.5	K1	12
II	**CLASSICAL OPTIMIZATION METHODS:** Unconstrained Optimization - Constrained Multi-variable Optimization with Equality Constraints - Constrained Multi-variable Optimization with inequality. **Non-linear Programming Methods:** Examples of NLPP - General NLPP - Graphical solution Method- Quadratic Programming - Wolfe's modified Simplex Methods - Beale's Method Chapter-23: 23.1 -23.4,Chapter-24: 24.1 - 24.4	K2	12
III	**THEORY OF SIMPLEX METHOD:** Canonical and Standard form of LP problem - Slack and Surplus Variables - Reduction of any Feasible solution to a Basic Feasible solution - Alternative Optimal solutions- Unbounded solution - Optimality condition - Some complications and their resolutions - Degeneracy and its resolution. Chapter-25: 25.1-25.4, 25.6-25.9.	K3	12
IV	**REVISED SIMPLEX METHOD:** Standard forms for Revised simplex Method - Computational procedure for Standard form I - comparison of simplex method and Revised simplex Method. **Bounded Variables LP problem:** The simplex Algorithm. Chapter-26: 26.1 - 26.4,Chapter-28: 28.1, 28.2	K4	12
V	**PARAMETRIC LINEAR PROGRAMMING:** Variation in the Objective function coefficients, Variations in the Availability of Resources (RHS Values).		12

	Goal Programming: Difference between LP and GP approach - Concept of Goal Programming - Goal Programming Model formulation - Graphical Solution Method of Goal Programming - Modified Simplex method of Goal Programming. Chapter-29: 29.1 - 29.3,Chapter-8:8.1-8.6	K5	
Course Outcome	**CO1:**Determine the concepts of the cutting plane and solving of the dynamic programming problem.	K1	
	CO2 :: Evaluate Unconstrained and Constrained multi variable optimization with inequality.	K2	
	CO3: Explain Canonical and standard from of LP and simple algorithm	K3	
	CO4: Explain standard forms for revised simplex method and Solve bounded variables LP problems	K4	
	CO5: Evaluate variations in the parametric linear programming	K5	

Learning Resources	
Text Books	1.J.K.Sharma, Operations Research, Theory and Applications, Third Edition (2007) Macmillan India Ltd.
Reference Books	1. Hamdy A. Taha, Operations Research, (seventh edition) Prentice - Hall of India Private Limited, New Delhi, 1997. 2. F.S. Hillier & J.Lieberman Introduction to Operation Research (7th Edition) TataMcGraw Hill company, New Delhi, 2001. 3. Beightler. C, D.Phillips, B. Wilde ,Foundations of Optimization (2nd Edition) Prentice Hall Pvt Ltd., New York, 1979 4. S.S. Rao - Optimization Theory and Applications, Wiley Eastern Ltd. New Delhi. 1990
Website Link	https://www.researchgate.net/publication/266066764_A_parametric_mathematical_programming_approach_to_the_estimation_of_the_coefficients_of_the_linear_regression_model https://web.eng.fiu.edu/arleon/courses/Optimization/Lectures/Classical_Optimization.pdf

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE06	MATHEMATICAL PROGRAMMING	DSE THEORY-VI	I	6	3	3	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	M
CO2	M	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	S	S	S	S
CO4	S	M	M	S	S	S	S	M	S	S
CO5	S	S	S	S	S	M	S	S	S	M
Level of Correlation Between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
Mrs.B.MOHANAPRIYA	Dr.K.LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE07	FUZZY SETS AND THEIR APPLICATIONS	DSE THEORY- VII	I	6	3	3	-	3
Objective	This course introduces advanced topics in linear and non linear programming. The fuzzy set could have the ability to handle a wide range of problems, for instance, decision making, intelligent data analysis, processing information, pattern recognition, and optimization.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Fuzzy sets:** Fuzzy sets – Basic types – Basic concepts - Characteristics – Significance of the paradigm shift – Additional properties of α - Cuts (Chapter 1: Sections 1.3 to 1.5 and Chapter 2: Sections 2.1)	K1	15
II	**Fuzzy Sets Versus CRISP Sets:** Representation of Fuzzy sets – Extension principle of Fuzzy sets – Operation on Fuzzy Sets – Types of Operation – Fuzzy complements. (Chapter 2: Sections 2.2 to 2.3 and Chapter 3: Sections 3.1 to 3.2)	K2,K3	15
III	**Operations on Fuzzy Sets:** Fuzzy intersection – t-norms, Fuzzy unions – tconorms – Combinations of operations – Aggregation operations. (Chapter 3: Sections 3.3 to 3.6)	K3	14
IV	**Fuzzy Arithmetic:** Fuzzy numbers – Linguistic variables – Arithmetic operation on intervals – Lattice of Fuzzy numbers. (Chapter 4: Sections 4.1 to 4.4)	K4	14
V	**Constructing Fuzzy Sets:** Methods of construction: An overview – Direct methods with one expert – Direct method with multiple experts – indirect method with multiple experts and one expert – Construction from sample data. (Chapter 10: Sections 10.1 to 10.7)	K5	14

Course Outcome	**CO1**: Know the fuzzy set theory on the statistical method which is given.	K1	
	CO2: Understand the statistical data by using fuzzy logic methods.	K2	
	CO3: Apply the main subject of fuzzy sets.	K3	
	CO4: Analyze fuzzy logic fuzzy inference systems.	K4	
	CO5: Evaluate the fuzzy statistics by applications**.**	K5	

Learning Resources				
Text Books	1. G.J. Klir, and Bo Yuan, Fuzzy Sets and fuzzy Logic: Theory and Applications, Prentice Hall of India Ltd., New Delhi, 2005.			
Reference Books	1. H.J. Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers, Chennai, 1996. 2. A.Kaufman, Introduction to the Theory of Fuzzy Subsets, Academic Press, New York, 1975. 3. V.Novak, Fuzzy Sets and Their Applications, Adam Hilger, Bristol, 1969.			
Website Link	1.http://mathforum.org, 2. http://ocw.mit.edu/ocwweb/Mathematics, 3. http://www.opensource.org, 4. www.mathpages.com			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE07	FUZZY SETS AND THEIR APPLICATIONS	DSE THEORY- VII	I	6	3	3	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
Mrs.G.SELVI	Dr.K.LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PMAE08	DISCRETE MATHEMATICS	DSE THEORY- VIII	I	6	3	3	-	3

Objective	Understand the basic ideas of logic, proof methods and strategy. Apply Boolean algebra to circuits and getting networks. Use finite state machines to model computer operations. Ability the permutations and combinations

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**The Foundations: Logic and Proofs**: Propositional logic - Applications of Propositional logic -Propositional Equivalences - Predicates and Quantifiers. (Chapter 1: Sections 1.1 - 1.4). **Algorithms**: The Growth of Functions. (Chapter 3: Section 3.2).	K1	15
II	**Counting:** The Basics of Counting- The Pigeonhole Principle - Permutations and Combinations - Generalized Permutations and Combinations - Generating Permutations and Combinations. (Chapter 6: Sections 6.1- 6.3, 6.5 and 6.6).	K2	15
III	**Advanced Counting Techniques:** Applications of Recurrence Relations - Solving Linear Recurrence Relations Generating Functions. (Chapter 8: Sections 8.1, 8.2 and 8.4).	K3	14
IV	**Boolean Algebra:** Boolean Functions- Representing Boolean Functions - Logic Gates - Minimization of Circuits. (Chapter 12: Sections 12.1 -12.4).	K4	14
V	**Modeling Computation:** Finite-State machines with Output Finite-State machines with No Output-Turing Machines. (Chapter 13: Sections 13.2, 13.3 and 13.5).	K5	14
Course outcome	**CO1:** Express a logic sentence interms of predicates, quantifiers and logical connectives	K1	
	CO2: Have knowledge of pigeonhole principal, permutations and combinations	K2	
	CO3: Apply the properties of relations, identify equivalence and partial order relations, sketch relations.	K3	

	CO4: Analyze the rules of Boolean algebra and Boolean functions	K4
	CO5: Evaluate the finite state machines with output and no output	K5

Learning Resources				
Text Books	1. Kenneth H. Rosen, Discrete Mathematics and Its Applications, 7th Edition, WCB / McGraw Hill Education, New York, 2008.			
Reference Books	1. J.P. Trembley and R. Manohar, Discrete Mathematical Structures applications to Computer Science, Tata McGraw Hills, New Delhi. 2. T. Veerarajan, Discrete Mathematics with Graph Theory and Combinatorics, Tata McGraw Hills Publishing Company Limited, 7th Reprint, 2008.			
Website Link	1.http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics, 2. http://www.opensource.org, www.mathpages.com			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram-637408

M.Sc-Mathematics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M1PMAE08	DISCRETE MATHEMATICS	DSE THEORY- VIII	I	6	3	3	-	3	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation Between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
Mrs.G.SELVI	Dr. K. LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE09	ALGEBRAIC TOPOLOGY	DSE THEORY - IX	II	5	3	2	-	3
Objective	To introduce the ideas of algebraic topology to other branches of Mathematics							

Unit	Course Content	Knowledge Levels	Sessions
I	**CALCULUS IN THE PLANE: PATH INTEGRALS:** Angles and Deformations - Differential forms and path Integrals - Independence of Path - Criterion for exactness. Angles and Deformations: Angle functions and Winding numbers - Reparametrizing and Deforming the Paths. Winding Numbers. Definition - Homotopy and Reparametrization - Varying the Point- Degrees and Local Degrees. Chapter 1 : (a) to (c); Chapter 2: only (a) and (b) Chapter 3 : (a) to (d)	K1	12
II	**COHOMOLOGY AND HOMOLOGY:** De Rham Cohomology and the Jordan Curve Theorem. Definition of the De Rham Graphs - The Coboundary map - the Jordon Curve Theorem - Applications and Variations. Homology: Chains, Cycles, and H0U - Boundaries, H1U , and Winding Numbers - Chains on Grids - Maps and Homology - The First Homology Group for General Spaces. Chapter 5: (a) to (d) Chapter 6: (a) to (e)	K2,K3	12
III	**HOLES AND INTEGRALS:** Multiply connected regions - Integrations over continuous Paths and Chains - Periods of Integrals - Complex Integration Mayer-Victoris: The Boundary map - Mayer-Victoris for Homology - Variations and applications - Mayer-Victoris for Cohomology Chapter 9: (a) to (d) Chapter 10: (a) to (d)	K3	12
IV	**COVERING SPACES AND FUNDAMENTAL GROUPS:** Covering Spaces: Definition - Lifting paths and Homotopies - G-coverings - Covering Transformations. The Fundamental Groups: Definitions and Basic Properties - Homotopy - Fundamental Group and Homology. Fundamental Groups and Covering Spaces: Fundamental Group and Coverings - Automorphisms of Coverings - The Universal Covering - Coverings and Subgroups of the Fundamental Group Chapter 11 : (a) to (d) Chapter 12 : (a) to (c) Chapter 13: (a) to (d)	K3,K4	12

V	**THE VAN KAMPEN THEOREM:** G-Coverings from the Universal Covering - Patching Coverings together - The Van Kampen Theorem Cohomology: Patching Coverings and Cech cohomology - Cech Cohomology and Homology - De Rham Cohomology and Homology - Proof of Mayer - Victoris for De Rham Cohomology. Chapter 14 : (a) to (d) ; Chapter 15: (a) to (d)	K5	12
Course Outcome	**CO1:** Explain the local properties of analytical functions and definite integrals.	K1	
	CO2: Describe the concept of definite integral and harmonic functions	K2	
	CO3: Demonstrate the concept of the general form of Cauchy's theorem	K3	
	CO4: Develop Taylor and Laurent series.	K4	
	CO5: Analyze and evaluate the infinite products, canonical products and jensen's formula	K5	

Learning Resources

Text Books	1. William Fulton, Algebraic Topology - A First Course, Springer-Verlag, New York, 1995
Reference Books	1. M.K.Agoston, Algebraic topology- A First Course, Marcel Dekker, 1962 Satya Deo, Algebraic Topology, Hindustan Book Agency, New Delhi , 2003. 2. M.Greenberg and Harper, Algebraic Topology - A First course, Benjamin /Cummings, 1981. 3. C.F. Maunder, Algebraic topology, Van Nastrand, New York, 1970 5. J.R. 4. Mukres, Topology, Prentica Hall of India, New Delhi, 2002 (3rd Indian Print)
Website Link	1. http://mathforum.org, 2. http://ocw.mit.edu/ocwweb/Mathematics, 3. http://www.opensource.org, 4. www.mathpages.com

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE09	ALGEBRAIC TOPOLOGY	DSE THEORY - IX	II	5	3	2	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S	S	M	S	M	S
CO2	S	M	M	S	S	M	S	S	S	M
CO3	S	M	S	S	S	S	S	M	S	S
CO4	M	S	M	S	M	S	M	S	M	S
CO5	S	S	S	M	S	S	S	M	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
Mrs.R.PARVATHA	Dr. K. LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE10	MATHEMATICAL STATISTICS	DSE THEORY – X	II	5	3	2	-	3
Objective	To work comfortably with Probability Axioms, Conditional Probability, Random variables, Generating Functions, Some special distributions, Central limit theorem.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Probability:** Probability Axioms – Combinatorics – Probability on Finite Sample Spaces – Conditional probability and Bayes Theorem – Independence of Events **Random Variables and their Probability Distributions:** Random variables – Probability Distribution of a random variable – Discrete and continuous random variables – Functions of random variable. Chapter 1: Sections 1.3 – 1.6 Chapter 2: Sections 2.2 – 2.5	K1,K2	12
II	**Moments and Generating Functions:** Moments of a Distribution Function – Generating Functions – Some Moment inequalities Chapter 3: Sections 3.2 - 3.4	K2, K3	12
III	**Multiple Random Variables**: Multiple Random Variables - Independent Random Variables – Functions of Several Random Variables Chapter 4: Sections 4.2 – 4.4	K3	12
IV	**Multiple Random Variables**: Covariance, Correlation, and Moments – Conditional Expectation **Some Special Distributions**: Some Discrete Distributions – Some continuous Distributions Chapter 4: Sections 4.5 – 4.6 Chapter 5: Sections 5.2 – 5.3	K4	12
V	**Limit Theorems:** Modes of Convergence – Weak Law of Large Numbers – Strong Law of Large Numbers – Central Limit Theorem. Chapter 6: Sections 6.2, 6.3, 6.4 and 6.6	K5	12
Course Outcome	**CO1:** Understand and describe the probability axioms	K1	
	CO2: Analyze the Generating functions	K2	
	CO3: Analyse and evaluate multiple random variables	K3	
	CO4: Formulate and evaluate Some special distributions	K4	

	CO5: Apply the concept of central limit theorem.	K5	

Learning Resources				
Text Books	1. Vijay K. Rohatgi and A.K.Md. Ehsanes Salah, An Introduction to Probability and Statistics, John Wiley Pvt, Singapore, 2001			
Reference Books	1.G.G. Roussas, A First Course in Mathematical Statistics, Addition Wesley Publ. Co. Mass, 1973. 2.2.M. Fisz, Probability Theory and Mathematical Statistics, John Wiley, New York, 1963. 3.E.J. Dudewisg and S.N. Mishra, Modern Mathematical Statistics, John Wiley, New York, 1988.			
Website Link	1.http://www.mathforum.org/ 2.http://ocw.mit.edu/ocwweb/Mathematics 3.http://www.opensource.org/ 4.http://www.mathpages.com/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE10	MATHEMATICAL STATISTICS	DSE THEORY – X	II	5	3	2	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion	
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation	
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE	
Designed By	**Verified By**	**Approved By**
Mr.K.DHINESHKUMAR	Dr.K.LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE11	STATISTICAL DATA ANALYSIS USING R- PROGRAMMING	DSE THEORY- XI	II	5	3	2	-	3
Objective	Introduce participants to R as a quantitative data analysis tool. Enable learner master R software and R-studio as a user interface.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Introduction to R programming:** What is R? - Installing R and R Studio – R Studio Overview - Working in the Console - Arithmetic Operators – Logical Operations - Using Functions - Getting Help in R and Quitting R Studio- Installing and loading packages. Data structures, variables, and data types in R: Creating Variables - Numeric, Character and Logical Data - Vectors - Data Frames - Factors -Sorting Numeric, Character, and Factor Vectors - Special Values.	K1	12
II	**Data Visualization using R**: Scatter Plots - Box Plots - Scatter Plots and Box- and-Whisker Plots Together -Customize plot axes, labels, add legends, and add colours.	K2	12
III	**Descriptive statistics in R:** Measures of central tendency - Measures of variability - Skewness and kurtosis - Summary functions, describe functions, and descriptive statistics by group.	K3	12
IV	**Testing of Hypothesis using R:** T-test, Paired Test, correlation, Chi Square test, Analysis of Variance and Correlation.	K4	12
V	**Predictive Analytics:** linear Regression model, Non-Linear Least Square, multiple regression analysis, Logistic Regression, Panel Regression Analysis, ARCH Model, GARCH models, VIF model.	K5	12
Course Outcome	**CO1:** Write simple pseudo code and create simple flow charts.	K1	
	CO2: Use file management and version control tools.	K2	
	CO3: Perform simple arithmetic and statistical operations in R.	K3	

	CO4: Create loops for iteration (e.g. for loop)	K4
	CO5: Calculate the measures of the spread of data: variance, standard deviation, and range.	K5

Learning Resources				
Text Books	1. Crawley, M. J. (2006), —Statistics - An introduction using R, John Wiley, London 32. 2. Purohit, S.G.; Gore, S.D. and Deshmukh, S.R. (2015), —Statistics using R, second edition. Narosa Publishing House, New Delhi. 3. Shahababa B. (2011), —Biostatistics with R, Springer, New York. 4. Braun & Murdoch (2007), —A first course in statistical programming with R, Cambridge University Press, New Delhi.			
Reference Books	-			
Website Link	1. https://cran.r-project.org/doc/contrib/Owen-TheRGuide.pdf 2. https://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/R/R-Manual/RManual2.html 3. https://smac-group.github.io/ds/ 4. https://www.geeksforgeeks.org/predictive- analysis-in-r			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards							
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE11	STATISTICAL DATA ANALYSIS USING R- PROGRAMMING	DSE THEORY- XI	II	5	3	2	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation Between CO and PO	L-LOW			M-MEDIUM				S-STRONG		

Tutorial Schedule	Problem solving session, Seminar and Group Discussion		
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation		
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE		
Designed By	**Verified By**	**ApprovedBy**	
Mrs.G.SELVI	Dr. K. LOGAARASI	Head CDC	

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE12	TENSOR ANALYSIS AND RELATIVITY THEORY	DSE THEORY - XII	II	5	3	2	-	3
Objective	The course aims to introduce vector algebra and vector calculus and special relativity and relativistic kinematics, dynamics and accelerated systems.							

Unit	Course Content	Knowledge Levels	Sessions
I	**TENSOR ALGEBRA:** Systems of Different orders - Summation Convention - Kronecker Symbols - Transformation of coordinates in Sn - Invariants - Covariant and Contravariant vectors - Tensors of Second Order - Mixed Tensors - Zero Tensor - Tensor Field - Algebra of Tensors - Equality of Tensors - Symmetric and Skew –symmetric tensors - Outer multiplication, Contraction and Inner Multiplication - Quotient Law of Tensors - Reciprocal Tensor of Tensor - Relative Tensor - Cross Product of Vectors. Chapter I : I.1 - I.3, I.7 and I.8 and Chapter II : II.1 - II.19	K1	12
II	**TENSOR CALCULUS :** Riemannian Space - Christoffel Symbols and their properties Chapter III: III.1 and III.2	K2	12
III	**TENSOR CALCULUS (CONTD):** Covariant Differentiation of Tensors - Riemann - Christoffel Curvature Tensor - Intrinsic Differentiation. Chapter III: III.3 - III.5	K2,K3	12
IV	**SPECIAL THEORY OF RELATIVITY:**Galilean Transformation - Maxwell's equations - The ether Theory - The Principle of Relativity. Relativistic Kinematics : Lorentz Transformation equations - Events and simultaneity - Example - Einstein Train - Time dilation - Longitudinal Contraction - Invariant Interval - Proper time and Proper distance - World line - Example - twin paradox - addition of velocities - Relativistic Doppler effect. Chapter 7 : Sections 7.1 and 7.2	K4	12

V	**RELATIVISTIC DYNAMICS:** Momentum - Energy -Momentum - energy four vector - Force - Conservation of Energy -Mass and energy - Example - inelastic collision - Principle of equivalence - Lagrangian and Hamiltonian formulations. Accelerated Systems : Rocket with constant acceleration - example - Rocket with constant thrust. Chapter 7 : Sections 7.3 and 7.4	K4,K5	12
Course Outcome	**CO1:** Know about basic concepts of Tensors of Second Order	K1	
	CO2: Understand the concept of Riemannian Space	K2	
	CO3: Apply the Christoffel Curvature Tensor	K3	
	CO4: Analyze the Lorentz Transformation equations	K4	
	CO5: Evaluate the Rocket with constant thrust	K5	

Learning Resources

Text Books	1.U.C. De, Absos Ali Shaikh and Joydeep Sen gupta, Tensor Calculus, Narosa Publishing House, New Delhi, 2004. 2. D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985.
Reference Books	1. J.L.Synge and A.Schild, Tensor Calculus, Toronto, 1949. 2. A.S.Eddington. The Mathematical Theory of Relativity, Cambridge University Press, 1930. 3. P.G.Bergman, An Introduction to Theory of Relativity, New York, 1942 4. C.E.Weatherburn, Riemannian Geometry and the Tensor Calculus, Cambridge, 1938.
Website Link	1.https://swayam.gov.in/nd1_noc20_me74/. 2.http://nptel.ac.in. 3.https://www.youtube.com/watch?v=kGXr1SF3WmA

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE12	TENSOR ANALYSIS AND RELATIVITY THEORY	DSE THEORY - XII	II	5	3	2	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S	S	S	S	M	M
CO2	S	S	S	S	S	S	M	S	S	M
CO3	S	S	S	M	S	S	S	S	M	M
CO4	S	S	S	S	M	S	S	S	S	M
CO5	S	S	S	M	S	S	S	S	M	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
Mrs.P.SUBHA	Dr.K.LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE13	WAVELETS	DSE THEORY -XIII	II	5	3	2	-	3
Objective	To establish the theory necessary to understand and use wavelets and related constructions.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Signals and Systems:** Basic concepts of signals and systems, Frequency spectrum of signals **Classification of signals:** Discrete time signals and continuous time signals, periodic and non-periodic signals **Classification of systems:** Linear, nonlinear, time-variant, time-invariant, stable and unstable systems.	K1	12
II	**Haar Scaling Function and Wavelet :**Time-Frequency Analysis Orthogonal functions, Orthonormal functions, Function spaces, Orthogonal basis functions, Haar scaling function, **Haar spaces:** Haar space, general Haar space V□; Haar wavelet, **Haar wavelet spaces:** Haar wavelet space general Haar wavelet space ; Decomposition and reconstruction, Time-frequency analysis, Orthogonal and orthonormal bases	K2	12
III	**Fourier Transforms and Wavelets:** Discrete Fourier transform of a digital signal, Complex form of a Fourier series, Inverse discrete Fourier transform, Window Fourier transform, short time Fourier transform, Admissibility condition for a wavelet. **Classes of wavelets:** Haar, Morlet, Maxican hat, Meyer and Daubechies wavelets; Wavelets with compact support.	K2,K3	12
IV	**Discrete Wavelet Transforms:** Stationary and non-stationary signals, Haar transform, 1-level Haar transform, Multi-level Haar transform, Conservation and compaction of energy, Multiresolution analysis, Decomposition and reconstruction of signals using discrete wavelet transform (DWT).	K3	12
V	**Applications:** Wavelet series expansion using Haar and other wavelets, Applications in signal compression, Analysis and classification of audio signals using DWT, **Signal de-noising:** Image and ECG signals	K4,K5	12

Course Outcome	**CO1:** Know basic concepts of signals and systems.	K1	
	CO2: Understand the concept of Haar spaces.	K2	
	CO3: Learn Fourier transform and wavelet transform of digital signals.	K3	
	CO4: Learn applications of wavelets to the real-world problems.	K4	
	CO5: Apply wavelets in signal processing and image processing.	K5	

Learning Resources

Text Books	1. Charles K. Chui, An Introduction to Wavelets, Academic Press, 1992.
Reference Books	1. Ingrid Daubechies, Ten Lectures on Wavelets. SIAM, 1999. 2. Michael W. Frazier, An Introduction to Wavelets Through Linear Algebra. Springer-Verlag, 1999. 3. Stéphane Mallat, A Wavelet Tour of Signal Processing (3rd edition). Academic Press, 2008. 4. M.J. Roberts, Signals and Systems: Analysis Using Transform Methods and MATLAB. McGraw-Hill Education, 2004 5. David K. Ruch & Patrick J. Van Fleet, Wavelet Theory: An Elementary Approach with Applications. John Wiley & Sons, 2009 6. James S. Walker, A Primer on Wavelets and Their Scientific Applications (2nd edition). Chapman & Hall/CRC, Taylor & Francis, 2008.
Website Link	1. https://archive.nptel.ac.in/courses/108/101/108101093/ 2. https://onlinecourses.nptel.ac.in/noc23_ee32/preview 3. https://youtu.be/WJgloJ7zeZk

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE13	WAVELETS	DSE THEORY -XIII	II	5	3	2	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	M	S	S	S	S
CO2	M	S	S	S	M	S	M	S	M	S
CO3	M	S	S	S	M	M	S	S	S	S
CO4	M	S	S	M	S	S	S	M	M	S
CO5	S	S	S	S	M	S	M	S	S	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
Mrs.A.SUGANYA	Dr.K.LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE14	MODELING AND SIMULATION WITH EXCEL	DSC THEORY -XIV	II	5	3	2	-	3
Objective	This course introduces Deterministic Modeling, Basic Model, Sensitivity Analysis, VLOOKUP and HLOOKUP Functions, Status of Autohaus Model and York River Archaeology Budgeting.							

Unit	Course Content	Knowledge Levels	Sessions
I	Introduction- How Do We Classify Models? - An Example of Deterministic Modeling -Understanding the Important Elements of a Model	K1	12
II	Model Building with Excel - Basic Model - Sensitivity Analysis - Controls from the Forms Control Tools- Scroll Bars	K2,K3	12
III	Modeling and Simulation: Types of Simulation and Uncertainty - Incorporating Uncertain Processes in Models -The Monte Carlo Sampling Methodology-Implementing Monte Carlo Simulation Methods-A Word About Probability Distributions -Modeling Arrivals with the Poisson Distribution-VLOOKUP and HLOOKUP Functions	K3	12
IV	A Financial Example—Income Statement -An Operations Example—Autohaus -Status of Autohaus Model -Building the Brain Worksheet - Building the Calculation Worksheet-Variation in Approaches to Poisson Arrivals—Consideration of Modeling Accuracy	K4	12
V	Sufficient Sample Size - Building the Data Collection Worksheet -Solver—Constrained Optimization -Example—York River Archaeology Budgeting –Scenarios	K5	12
Course Outcome	**CO1:** Knowledge gain in the important elements of a model	K1	
	CO2: Understanding model building with excel and basic model	K2	
	CO3: Applying modeling and simulation types of simulation and uncertainty	K3	
	CO4: Analyze the status of Autohaus model and building the brain worksheet	K4	

	CO5: Evaluate of building the Data collection worksheet		K5	

Learning Resources				
Text Books	1. Hector Guerrero, Excel Data Analysis - Modeling and Simulation, Springer Heidelberg Dordrecht, London, New York, 2010.			
Reference Books	-			
Website Link	1. http://mathforum.org, 2. http://ocw.mit.edu/ocwweb/Mathematics, 3. http://www.opensource.org, 4. www.mathpages.com			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M2PMAE14	MODELING AND SIMULATION WITH EXCEL	DSC THEORY -XIV	II	5	3	2	-	3	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	M	S
CO3	S	M	S	S	M	S	S	S	S	M
CO4	S	M	M	S	S	M	S	S	S	S
CO5	S	S	S	M	S	S	S	M	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
Mr.R.MOHAN RAM	Dr. K. LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE15	MACHINE LEARNING AND ARTIFICAL INTELLIGENCE	DSE THEORY - XV	II	5	3	2	-	3
Objective	Learn about Machine Intelligence and Machine Learning applications. To implement and apply machine learning algorithms to real-world applications.							

Unit	Course Content	Knowledge Levels	Sessions
I	**INTRODUCTION :** Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.	K1	12
II	**NEURAL NETWORKS AND GENETIC ALGORITHMS:** Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms– Hypothesis Space Search – Genetic programming –Models of Evaluation and Learning .	K2	12
III	**BAYESIAN AND COMPUTATIONAL LEARNING:** Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier –Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity –Finite and Infinite Hypothesis Spaces – Mistake Bound Model .	K3	12
IV	Introduction - Intelligent Agents- Problem Solving - by Searching - Informed Search Strategies-Optimization Problems - Adversarial Search-Knowledge and Reasoning - Logical Agents - First-Order Logic - Inference in First-Order Logic - Knowledge Representation.	K4	12
V	Planning – Planning and Acting in the Real World - Uncertain knowledge and reasoning - Uncertainty - Probabilistic Reasoning - Probabilistic Reasoning over Time - Making Simple Decisions - Making Complex Decisions.	K5	12

Course Outcome	**CO1: CO1:** Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc	K1	
	CO2: Have an understanding of the strengths and weaknesses of many popular machine learning approaches.	K2	
	CO3: Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and unsupervised learning	K3	
	CO4: Be able to design and implement various machine learning algorithms in a range of real-world applications Understand the computation intelligence.	K4	
	CO5: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.	K5	

Learning Resources	
Text Books	1.Tom M. Mitchell—Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. 2. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach," Third Edition, Prentice Hall of India, New Delhi, 2010.
Reference Books	1. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004. 2. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press, 2009. 3. Michael Affenzeller, Stephan Winkler, Stefan Wagner, Andreas Beham, Genetic Algorithms and Genetic Programming, CRC Press Taylor and Francis Group. 4. Elaine Rich, Kevin Knight, B. Nair, "Artificial Intelligence," Third Edition, Tata McGraw-Hill, New Delhi, 2017. 5. Eugene Charniak, Drew McDermott, "Introduction to Artificial Intelligence," Pearson, 2002.
Website Link	1. http://mathforum.org, 2. http://ocw.mit.edu/ocwweb/Mathematics, 3. http://www.opensource.org, 4. www.mathpages.com 5. https://en.wikipedia.org/wiki/Artificial intelligence

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE15	MACHINE LEARNING AND ARTIFICAL INTELLIGENCE	DSE THEORY - XV	II	5	3	2	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	M	S	S	S	M	S	M	S	M	S
CO4	M	S	M	S	S	S	S	M	S	S
CO5	S	M	S	S	S	M	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
Mrs.A.MENAKA	Dr. K. LOGAARASI	Head CDC

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE16	NEURAL NETWORKS	DSE THEORY - XVI	II	5	3	2	-	3
Objective	Enable students to understand important concepts and theories ofartificial neural networks (ANNs). Enable students to understand how ANNs can be designed and trained enable students to calculate simple examples of ANNs							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Introductory Concepts:** Neurons and their basic function- Math review- Mathematical Machinery and Review- How and Why Perceptron‘sCan Compute Logic Statements- Training Perceptron‘s Using Supervised Learning Techniques- Training Multi-layer.	K1	12
II	**Neural Networks Using Supervised Learning Techniques:** Recurrent Neural Networks and Unsupervised Learning: Optimization Techniques- Implementation and Performance Considerations-Variations on the Hopfield Network-A Stochastic Version of the Hopfield Network:	K2	12
III	**The Boltzmann Machine-A Stochastic Version of the Binary Associative Memory:** Restricted Boltzmann Machines-Competitive Learningand Self-Organizing Maps-Neural Network Modifications and Applications- Cellular Neural Networks and the Future of Massively Parallel Computation	K3	12
IV	**Introduction to Machine Learning Techniques:** Types of learning, hypothesis space and inductive bias, evaluation, cross-validation. Linear regression, Decision trees, overfitting.	K4	12
V	**Support Vector Machine, Kernel function and Kernel SVM Neural network:** Perceptron, multilayer network, back propagation, introduction to deep neural network.	K5	12
Course Outcome	**CO1:** Learn different types of neural networks and different types of learning models	K1	
	CO2: Determine the mathematical foundations of neural network models	K2	
	CO3: Implement of neural networks using training algorithms such as the feed-forward, back-propagation algorithm	K3	
	CO4: Design neural networks for practical purposes	K4	
	CO5: Build neural networks for practical purposes	K5	

Learning Resources				
Text Books	1. Raul Rojas, Neural Networks - A Systematic Introduction, Springer-Verlag, Berlin, NewYork, 1996. 2. Koch, Christof, Biophysics of Computation: Information Processing in Single Neurons, Oxford University Press, 2004.			
Reference Books	1. G. Dreyfus, Neural Networks Methodology and Applications,Springer, Berlin, Heidelberg, 2004. 2. James A. Freeman David M. Skapura, Neural Networks Algorithms,Applications, and Programming Techniques, Addison-Wesley Publishing Company, New York, 1991.			
Website Link	1. https://nptel.ac.in/courses/117105084 2.https://www.digimat.in/nptel/courses/video/127105006/L01 3.https://www.youtube.com/watch?v=NeMAxhDvSak&list=PLgMDNELGJ1CZn1399dV7_U4VBNJflRsua 4.https://www.youtube.com/watch?v=QlhHqMnd9Wo			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PMAE16	NEURAL NETWORKS	DSE THEORY - XVI	II	5	3	2	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S	S	M	S	M	S
CO2	S	M	M	S	M	M	S	S	S	M
CO3	M	M	S	S	S	S	S	M	S	M
CO4	M	S	M	S	M	S	M	S	M	S
CO5	S	S	S	M	S	S	S	M	S	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
Mrs.R.PARVATHA	Dr. K. LOGAARASI	Head CDC

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAE17	ALGEBRAIC NUMBER THEORY	DSE THEORY – XVII	III	5	3	2	-	3
Objective	Students can study about modules over rings, finite fields, algebraic extensions, number fields and cyclotomic fields, Noetherian rings and modules and Dedekind rings.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Algebraic Background:** Rings and Fields - Factorization of Polynomials - Field Extensions - Symmetric Polynomials - Modules - Free Abelian Groups. Chapter 1: Sections 1.1 - 1.6	K1	12
II	**Algebraic Numbers:** Algebraic numbers - Conjugates and Discriminants - Algebraic Integers - Integral Bases - Norms and Traces - Rings of Integers. Chapters 2: Sections 2.1 - 2.6	K2	12
III	**Quadratic fields and Cyclotomic fields:** Quadratic fields - Cyclotomic fields **Factorization into Irreducibles:** Trivial factorization - Factorization into irreducibles - Examples of non-unique factorization into irreducibles. Chapter 3: Sections 3.1 - 3.2 Chapter 4: Sections 4.2 - 4.4	K3	12
IV	**Factorization into Irreducibles:** Prime Factorization - Euclidean Domains - Euclidean Quadratic fields - Consequences of unique factorization - The Ramanujan -Nagell Theorem Chapter 4: Sections 4.5 - 4.9	K4	12

V	**Ideals:** Prime Factorization of Ideals - The norms of an Ideal - Non-unique Factorization in Cyclotomic Fields Chapter 5: Sections 5.2 – 5.4 **Current Trends-*Prime Decompositions in Extensions***	K5	12
	*Self Study.		
Course Outcome	**CO1:** Remember the basic concepts of Rings and Fields.	K1	
	CO2: Understand the Algebraic numbers.	K2	
	CO3: Relate the Quadratic fields and Cyclotomic fields.	K3	
	CO4: Analyze the prime factorizations.	K4	
	CO5: Create the problems under the concept of prime factorization	K5	

Learning Resources	
Text Books	1. I. Stewart and D.Tall. Algebraic Number Theory and Fermat's Last Theorem (3rd Edition) A.K.Peters Ltd., Natrick, Mass. 2002.
Reference Books	1. Z.I.Bosevic and I.R.Safarevic, Number Theory, Academic Press, New York, 1966. 2. J.W.S.Cassels and A.Frohlich, Algebraic Number Theory, Academic Press, New York, 1967. 3. P.Ribenboim, Algebraic Numbers, Wiley, New York, 1972. 4. P. Samuel, Algebraic Theory of Numbers, Houghton Mifflin Company, Boston, 1970. 5. A.Weil. Basic Number Theory, Springer, New York, 1967.
Website Link	1.https://www.youtube.com/watch?v=JMBNY01vpyM&list=PLB9ZOuiho-g80BM2h7kxSed-_aFavOXXa
Self-Study Material	1.https://ebookcentral.proquest.com/lib/inflibnet-ebooks/detail.action?docID=5150788

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M3PMAE17	ALGEBRAIC NUMBER THEORY	DSE THEORY – XVII	III	5	3	2	-	3	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	**Verified By**	**Approved By**
MOHANAPRIYA B	Dr. K.LOGAARASI	Member Secretary

M.Sc - Mathematics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAE18	FLUID DYNAMICS	DSE THEORY – XVIII	III	5	3	2	-	3
Objective	Students are able to understand the properties of fluids and fluid statics and To derive the equation of conservation of mass and its application.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Kinematics of Fluids in Motion:** Real fluids and Ideal fluids - Velocity of a fluid at a point – Stream lines and path lines - Steady and Unsteady flows - The Velocity Potential - The Vorticity Vector - Local and Particle Rates of Change - The Equation of Continuity - Worked Examples. Chapter 2: Sections 2.1 - 2.8	K1	12
II	**Equations of Motion of a Fluid:** Pressure at a point in a fluid at rest - Pressure at a point in a moving fluid - Euler's equations of Motion - Bernoulli's equation - Worked Examples - Discussion of the case of steady motion under Conservative Body Forces - Some flows involving axial symmetry (Examples 1 and 2 only). Chapter 3: Sections 3.1, 3.2, 3.4 - 3.7, 3.9	K2	12
III	**Some Three-Dimensional Flows:** Introduction - Sources, Sinks and Doublets -Images in rigid infinite plane - Images in solid spheres. Chapter 4: Sections 4.1 - 4.4	K3	12
IV	**Some Two-Dimensional Flows:** The Stream Function - The Complex velocity Potential for Two Dimensional Irrotational, Incompressible Flow - Complex Velocity Potentials for Standard Two Dimensional Flows - Some Worked Examples - Two Dimensional Image Systems - The Milne-Thomson Circle Theorem. Chapter 5: Sections 5.3 - 5.8	K4	12

V	**Viscous Fluid:** Stress components in a real fluid - Relation between Cartesian Components of Stress - Translational motion of fluid element – The Coefficient of Viscosity and Laminar flow - The Navier-Stokes equation of motion of a viscous fluid - Some solvable problems in viscous flow - Steady motion between parallel planes only. Chapter 8: Sections 8.1 - 8.3, 8.8, 8.9 – 8.10.1. **Current Trends-* Biological Fluid Dynamics ***	K5	12
	* Self Study.		
Course Outcome	**CO1:** Identify simple hydraulic and energy gradient lines.	K1	
	CO2: Understand the various properties of fluids and their influence on fluid motion	K2	
	CO3: **:** Determine the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces.	K3	
	CO4: Illustrate a variety of problems in fluid statics and dynamics.	K4	
	CO5: Evaluate the forces that act on submerged planes and curves	K5	

Learning Resources				
Text Books	1. Frank Chorlton, Textbook of Fluid Dynamics, CBS Publishers & Distributors, 2004.			
Reference Books	1. L.M. Milne-Thomson, Theoretical Hydrodynamics, Macmillan, London, 1955. 2. G.K. Batchelor, An Introduction to Fluid Dynamics Cambridge Mathematical Library, 2000.			
Website Link	1.https://www.youtube.com/watch?v=4xTA5MfZRU0 2.https://www.youtube.com/watch?v=iia-8X2C7j8 3.https://www.youtube.com/watch?v=-Eas42UZ32s			
Self-Study Material	1.https://nlist.inflibnet.ac.in/search/Record/EBC1681190			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc. - Mathematics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M3PMAE18	FLUID DYNAMICS	DSC THEORY-XVIII	III	5	3	2	-	3	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	S	M	S	M	S
CO2	S	M	M	S	S	S	M	S	M	S
CO3	S	S	M	S	M	S	M	S	M	S
CO4	S	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, smart class presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
SUGANYA A	Dr.K.LOGAARASI	Member Secretary

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAE19	STOCHASTIC PROCESSES	DSE THEORY - XIX	III	5	3	2	-	3
Objective	Students can understand the stochastic process, it is an interesting and challenging area of probability and statistics that is widely used in the applied sciences.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Random Variables and Stochastic Processes :** Generating Function: **I**ntroduction -Probability Generating Function: Mean and VarianceSum of (a fixed number of) Random Variables -Sum of Random number of Discrete Random Variables (Stochastic sum) - Generating Function of Bivariate Distribution .**Laplace Transform:** Introduction - Some important Properties of Laplace Transform - Inverse Laplace Transform. Chapter 1.1 : Sections : 1.1.1 - 1.1.5 Chapter 1.2 : Sections : 1.2.1 - 1.2.3	K1	12
II	**Renewal Process and Theory** Renewal Process in Discrete Time -Relation between F(x) and P(x) - Renewal interval- Generalized Form Delayed Recurrent Event - Renewal Theory in Discrete Time. **Renewal Processes in Continuous Time :** Renewal Functions and Renewal Density Renewal Equation. Chapter 6.1 : Sections : 6.1.1 - 6.1.5 Chapter 6.2 : Sections : 6.2.1 , Chapter 6.3	K2	12
III	**Markov Renewal and Semi- Markov Processes:** **I**ntroduction-Definitions and Preliminary Results -Waiting Times - Markov Renewal equation -Interval Transition Probability Matrix (L.T.P.M) -Limiting Behaviour -Limiting Distribution of s-M-P and Recurrence times -First Passage Time. Chapter 7.1 Chapter 7.2 : Sections : 7.2.1 Chapter 7.3 : Sections : 7.3.1 Chapter 7.4 : Sections : 7.4.1 Chapter 7.5	K3	12

IV	**Stationary process and Time series:** Stationary processes-Second order Process - Stationarity Gaussian processes-**Time series:** Introduction Purely Random Process -First order Markov process -moving Average (MA) Process -Autoregressive Process - Autoregressive Process of order two - Autoregressive Moving Average Process. Chapter 8.1 : Sections : 8.1.1-8.1.3 Chapter 8.2 : Sections : 8.2.1 -8.2.6	K4	12
V	**Branching Processes :** **I**ntroduction- Properties of Generating Functions of Branching Processes -Moments of X_n-Probability of Extinction -Asymptotic Distribution of Xn Examples -Distribution of the Total Number of Progeny- Conditional Limit Laws -CriticaL Processes - Subcritical Processes. Chapter 9.1 Chapter 9.2 : Sections : 9.2.1 Chapter 9.3 : Sections : 9.3.1&9.3.2 Chapter 9.4 Chapter 9.5 : Sections : 9.5.1&9.5.2 **Current Trends-* Probability and stochastic processes with applications***	K5	12
	* Self Study.		
Course Outcome	**CO1:** Recall the concept of random variables.	K1	
	CO2: Predict the Renewal Process.	K2	
	CO3: Complete the recurrence times and first passage time.	K3	
	CO4: Categories the wide sense and strict sense stationary processes.	K4	
	CO5: Justify the Branching Process and its properties.	K5	

Learning Resources	
Text Books	1. Medhi.J, Stochastic process, Wiley Eastern, 2017.
Reference Books	1. Ross. S.M. Stochastic Process, Wiley, New York. 1983 2. Karlin and First course in Stochastic Process-Vol. I &II, Academic Press. Taylor.H.M. 1975 3. Basu. A.K. Introduction to stochastic processes, News Publishing House 2003
Website Link	1. https://youtu.be/KUDhXlnr-gU 2. https://youtu.be/oY-j2Wof51c 3. .https://youtu.be/Iv4x_AO4uUo
Self-Study Material	1.https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=861716&ppg=5

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAE19	STOCHASTIC PROCESSES	DSE THEORY - XIX	III	5	3	2	-	3

CO-PO Mapping

CO Number	PO1	PO 2	PO 3	PO4	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	M	S	M	M	L	M	M	S	M	S
CO3	S	S	S	S	M	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S
CO5	M	S	M	S	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation
Assessment Methods	CIA-I, CIA-II , Assignment , Seminar and ESE

Designed By	**Verified By**	**Approved By**
R.PARVATHA	Dr.K.LOGAARASI	Member Secretary

M.Sc Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAE20	MATHEMATICAL PYTHON	DSE THEORY -XX	III	5	3	2	-	3
Objective	Students will be able to know about python coding to implement algorithms for Mathematical problems.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Introduction to Python:** Basic syntax, variable types, basic operators, numbers, strings, lists, tuples, functions and input/output statements. Some simple programs to understand the relational, conditional and logical operators. Compare two numbers (less than, greater than) using the if statement. Sum of natural numbers using while loop; Finding the factors of a number using for loop; To check the given number is prime or not (use if... else statement); Find the factorial of a number (use if...if...else).; Simple programs to illustrate logical operators (and, or, not).	K1	12
II	**Matrices, Differential Calculus & Analytical Geometry of Three Dimensions:** Python commands to reduce a given matrix to echelon form and normal form with examples. Python program/command to establish the consistency or otherwise and solving system of linear equations. Python command to find the nth derivatives. Python program to find nth derivative with and without Leibnitz rule. Obtaining partial derivatives of some standard functions Verification of Euler's theorem, its extension and Jacobean. Python program for reduction formula with or without limits. Python program to find	K2	12

	equation and plot sphere, cone, cylinder.		
III	**Roots of High-Degree Equations- Systems of Linear Equations**: Introduction, Simple Iterations Method - Finite Differences Method, Gauss Elimination Method: Algorithm, Gauss Elimination Method, Jacobi's Method, Gauss - Seidel's Method.	K3	12
IV	**Numerical differentiation, Integration and Ordinary Differential Equations:** Introduction & Euler's Method, Second Order Runge-Kutta's Method, Fourth Order Runge-Kutta's Method, Fourth Order Runge-Kutta's Method: Plot Numerical and Exact Solutions.	K4	12
V	**Two-Point Boundary Value Problems Introduction to two point boundary value Problems:** second order differential equations - Higher order differential equations - solution of second order differential equation using Finite Difference Method. **Current Trends-*Creating a matrix from other matrices***	K5	12
	* Self Study.		
Course Outcome	**CO1:** Know the basic concepts of python	K1	
	CO2: Understand the concepts of Python commands to reduce given matrix to echelon form and normal form	K2	
	CO3: Solve the system of linear equations	K3	
	CO4: Analyze Numerical differentiation and integration	K4	
	CO5: Evaluate the second order differential equation using finite difference method in Python	K5	

Learning Resources				
Text Books	1. www.python.org 2. www.rosettacode.org 3. http://faculty.msmary.edu/heinold/python.html 4. J. Kiusalaas, Numerical methods in engineering with Python 3. Cambridge University Press, 2013. 5. H. P. Langtangen, Solving PDEs in Python: the FEniCS tutorial I. Springer Open, 2016.			
Reference Books	1.Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython, O'Reilly, 2nd Edition, 2018. 2. Jake VanderPlas, Python Data Science Hand Book: Essential Tools for working with Data, O'Reilly, 2017. 3. Wesley J. Chun, Core Python Programming, Prentice Hall, 2006. 4. N.Safina Devi and C.Devamanoharan, Algorithmic Problem Solving and Python- A Beginner's Guide, Francidev Publications, 2023.			
Website Link	1.https://www.youtube.com/watch?v=BpIQurDHEzE&list=PLn0OLiymPak0YDIaJP6Mi7pThplgSKhoY			
Self-Study Material	1. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/detail.action?docID=1192635			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M3PMAE20	MATHEMATICAL PYTHON	DSE THEORY -XX	III	5	3	2	-	3	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	M
CO2	S	S	M	S	M	S	M	S	M	S
CO3	S	M	S	S	S	S	M	S	M	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Seminar, ESE

Designed By	Verified By	Approved By
MENAKA A	Dr. K.LOGAARASI	Member Secretary

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAE21	ALGEBRAIC GEOMETRY	DSE THEORY - XXI	IV	6	3	3	-	3
Objective	This course introduces students to affine spaces and algebraic sets, projective spaces, sheaves of affine varieties, prime spectrums of rings, Hilbert's Nullstellensatz and its applications.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Affine algebraic sets:** Affine spaces and algebraic sets, Noetherian rings, Hilbert basis theorem, affine algebraic sets as finite intersection of hyper surfaces; Ideal of a set of points, coordinate ring, morphism between algebraic sets, isomorphism. Integral extensions, Noether's normalization lemma.	K1	15
II	**Hilbert's Nullstellensatz and applications:** Correspondence between radical ideals and algebraic sets, prime ideals and irreducible algebraic sets, maximal ideals and points, contrapositive equivalence between affine algebras with algebra homomorphisms and algebraic sets with morphisms, between affine domains and irreducible algebraic sets, decomposition of an algebraic set into irreducible components. Zariski topology on affine spaces, algebraic subsets of the plane.	K2	15
III	**Projective spaces:** Homogeneous coordinates, hyperplane at infinity, projective algebraic sets, homogeneous ideals and projective Nullstellensatz; Zariski topology on projective spaces. Twisted cubic in P_3 (k). Local properties of plane curves: multiple points and tangent lines, multiplicity and local rings, intersection numbers; projective plane curves: Linear systems of curves, intersections of projective curves: Bezout's theorem and applications; group structure on a cubic.	K3	14
IV	**Introduction to sheaves of affine varieties** Examples of presheaves and sheaves, stalks, sheafification of a presheaf, sections, structure sheaf, generic stalk and function fields, rational functions and local rings, Affine tangent spaces; Projective varieties and morphisms; Hausdorff axiom	K4	14

V	**Prime spectrum of a ring:** Zariski topology, structure sheaf, affine schemes, morphism of affine schemes. Elementary Dimension Theory, Fibres of a morphism, complete varieties, nonsingularity and regular local rings, Jacobian criterion, nonsingular curves and DVR's **Current Trends-* Emerging Applications of Algebraic Geometry***	K5	14
	* Self Study.		
Course Outcome	**CO1:** Know the Affine algebraic sets and the Hilbert basis theorem.	K1	
	CO2: Outline Hilbert's Nullstellensatz and applications.	K2	
	CO3: Apply Bezout's theorem and applications; group structure on a cubic.	K3	
	CO4: Explain presheaves and sheaves, stalks, sheafification of a presheaf, sections, and structure of the sheaf.	K4	
	CO5: Rate the Elementary Dimension Theory, fibres of a morphism, complete varieties, non-singularity, and regular local rings.	K5	

Learning Resources	
Text Books	1. W.Fulton Algebraic Curves: An introduction to algebraic geometry, 1939 2. C. G. Gibson – Elementary Geometry of Algebraic Curves, CUP, 3. D. S. Dummitt and R. M. Foote – Abstract Algebra, Wiley, Ch. 15
Reference Books	1. J.Harris Algebraic Geometry, A first course, Springer, 1992. 2. M. Reid Undergraduate algebraic geometry, LMS 12, CUP,October 20, 2013 3. K. Kendig – Elementary Algebraic Geometry, Springer 4. D. Mumford – The Red Book of Varieties and Schemes, Springer 5. I. R. Shafarevich – Basic Algebraic Geometry, Springer June 1977
Website Link	1.https://youtu.be/OJS_bj_GNXo 2. https://youtu.be/MnRN8-M0sTs 3. https://youtu.be/e5CMyyba9GU?t=5
Self-Study Material	1.https://link.springer.com/chapter/10.1007/978-0-387-09686-5_2

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAE21	ALGEBRAIC GEOMETRY	DSE THEORY - XXI	IV	6	3	3	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	M	S	S	S	S
CO4	S	S	M	M	S	S	M	S	S	S
CO5	S	S	S	S	M	S	S	S	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation
Assessment Methods	CIA-I, CIA-II , Assignment , Seminar and ESE

Designed By	Verified By	Approved By
R.PARVATHA	Dr.K.LOGAARASI	Member Secretary

M.Sc. – Mathematics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAE22	FINANCIAL MATHEMATICS	DSE THEORY - XXII	IV	6	3	3	-	3
Objective	Students are exposed to the basic concepts of Probability theory, the Central limit theorem and Geometric Brownian motion, Option pricing.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Stochastic Order Relations:** First-Order Stochastic Dominance -Using Coupling to Show Stochastic Dominance - Likelihood Ratio Ordering - A Single-Period Investment Problem - Second-Order Dominance - Problems Chapter 10 : Sections 10.1 to 10.6	K1	15
II	**Optimization Models:** Introduction - A Deterministic Optimization Model - Probabilistic Optimization Problems - Problems Chapter 11 : Sections 11.1 to 11.4	K2	15
III	**Stochastic Dynamic Programming:** The Stochastic Dynamic Programming Problem - Infinite Time Models - Optimal Stopping Problems - Problems Chapter 12 : Sections 12.1 to 12.4	K3	12
IV	**Exotic Options:** Introduction - Barrier Options - Asian and Lookback Options - Monte Carlo Simulation - Pricing Exotic Options by Simulation - More Efficient Simulation Estimators – Problems Chapter 13 : Sections 13.1 to 13.6	K4	15
V	**Beyond Geometric Brownian Motion Models:** Introduction - Crude Oil Data - Models for the Crude Oil Data - Final Comments – Problems. Chapter 14 : Sections 14.1 to 14.4 **Current Trends-*Applications of Simulations***	K5	15

	* Self Study.		
Course Outcome	**CO1:** Know the problem of consistency of risk measures with respect to usual Stochastic order and convex order.	K1	
	CO2: Understand the fundamental knowledge of Linear Programming and Dynamic.	K2	
	CO3: Apply the String and mathematical algorithms for problem solving.	K3	
	CO4: Analyze the behavior and characteristics of options.	K4	
	CO5: Evaluate Geometric Brownian motion is the standard model used in finance to describe the random fluctuations.	K5	

Text Books	1. Sheldon M.Ross, An Elementary Introduction to Mathematical Finance, Third Edition, Cambridge University press, 2011.
Reference Books	1. S.M.Ross, A First Course in Probability, Englewood cliffs Prentice Hall 2002. 2. J.Cox M.Rubinstein, Option Market, Englewood cliffs Prentice Hall 1985. 3. J.E.Ingersoll, Theory of Financial Decision Making , Lanjarn MD Rowerman of Little Fields 1987.
Website Link	1.https://www.youtube.com/watch?v=TuTmC8aOQJE&list=PLCRPN3Z81LCIZ7543AvRjWfzSC15K7l-X&index=4 2.https://www.youtube.com/watch?v=WLZEXm5cUIA 3.https://www.youtube.com/watch?v=nel-SIQSXgU
Self-Study Material	1https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=821759

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc. - Mathematics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAE22	FINANCIAL MATHEMATICS	DSE THEORY -XXII	IV	6	3	3	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	S	M
CO2	S	M	M	S	M	S	S	M	S	S
CO3	S	S	S	S	M	M	S	S	M	S
CO4	S	S	S	M	S	S	S	M	S	M
CO5	S	M	M	S	S	M	S	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session and Group Discussion
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	CIA-I, CIA-II, Seminar and ESE

Designed By	Verified By	Approved By
A.Menaka	Dr.K.LOGAARASI	Member Secretary

M.Sc - Mathematics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAE23	RESOURCE MANAGEMENT TECHNIQUES	DSE THEORY – XXIII	IV	6	3	3	-	3
Objective	Students can understand the resource management techniques through linear programming, integer programming and scheduling methods							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**Linear Programming:** Principal components of decision problem – Modeling phases – LP Formulation and graphic solution – Resource allocation problems – Simplex method – Sensitivity analysis.	K1	15
II	**Duality And Networks:** Definition of dual problem – Primal – Dual relationships – Dual simplex methods – Post optimality analysis – Transportation and assignment model - Shortest route problem.	K2	15
III	**Integer Programming:** Cutting plan algorithm – Branch and bound methods, Multistage (Dynamic) programming.	K3	14
IV	**Classical Optimisation Theory:** Unconstrained external problems, Newton – Ralphson method – Equality constraints – Jacobean methods – Lagrangian method – Kuhn–Tucker conditions – Simple problems.	K4	14
V	**Object Scheduling:** Network diagram representation – Critical path method – Time charts and resource leveling – PERT. **Current Trends-* Work on Improving Collaboration ***	K5	14
	* Self Study.		

Course Outcome	**CO1:** Name the principal problem of decision problems	K1	
	CO2: Classify the problems with dual simplex methods and shortest route problem	K2	
	CO3: Implement the cutting plan algorithm	K3	
	CO4: Outline the revised simplex methods and simple problems	K4	
	CO5: Check the critical path for scheduling	K5	

Learning Resources	
Text Books	1. H.A. Taha, "Operation Research", Prentice Hall of India, 2002.
Reference Books	1. Paneer Selvam, Operations Research', Prentice Hall of India, 2002 2. Anderson "Quantitative Methods for Business', 8th Edition, Thomson Learning, 2002. 3. Winston "Operation Research', Thomson Learning, 2003. 4. Vohra, "Quantitative Techniques in Management', Tata Mc Graw Hill, 2002. 5. Anand Sarma, "Operation Research', Himalaya Publishing House, 2003.
Website Link	1.https://www.youtube.com/watch?v=S7mZ7M_rKwU 2.https://www.youtube.com/watch?v=BzfVw9614ZQ 3.http://www.opensource.org, 4. https://www.youtube.com/watch?v=Bzzqx1F23a8
Self-Study Material	1.https://nlist.inflibnet.ac.in/search/Author/Home?author=Bentham%2C+Susan%2C+1958-

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc. – Mathematics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAE23	RESOURCE MANAGEMENT TECHNIQUES	DSE THEORY – XXIII	IV	6	3	3	-	3

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	M
CO2	M	S	S	S	M	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	M	M	S	S	S	S	M	S	S
CO5	S	S	S	S	S	M	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
SUGANYA A	Dr.K.LOGAARASI	Member Secretary

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAE24	CALCULUS OF VARIATIONS AND INTEGRALEQUATIONS	DSE THEORY - XXIV	IV	6	3	3	-	3
Objective	Students can understand the idea of Fredholm and Volterra integral equations and clarify the distinction between variational problems with fixed borders.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Variational Problems with Fixed Boundaries:**The concept of variation and its properties – Euler's Equation -Variational Problems for Functionals of the form –Functionals dependent on Higher – Order Derivatives - Functionals dependent on functions of several Independent variables Variational problems in Parametric form. Chapter I : Sections 1.1 – 1.6 of (1)	K1	15
II	**Variational Problems with moving Boundaries:** Functionals of the form $I[y(X)] = \int_{x_1}^{x_2} F(x, y, y')dx$ – Variational problems with a Movable boundary for a Functional Dependant on Two Functions –One sided Variations – Reflection and Refraction of Extremals- Diffraction of Light rays. Chapter II : Section 2.1 – 2.5 of (1)	K2	15
III	**INTEGRAL EQUATIONS: Preliminary concepts :** Introduction –Abel's Problem – Integral equations definition – Linear and non-linear Integral equations - Fredholm Integral Equation - Volterra Integral Equation – Singular Integral Equation – Special kinds of kernels - Integral equations of convolution type – Integro-differential equation – Iterated kernels or functions– Resolvent kernel or reciprocal kernel- Eigen Values (or characteristic values or characteristic numbers) and Eigen Functions (or characteristic functions or fundamental functions) – Leibinitz rule of differentiation under Integral sign – An important formula for converting a multiple integral into single ordinary integral – Regularity condition – The Inner or scalar product of two functions - Solution of an integral Equation – Problems. Chapter I : Sections 1.1 – 1.19 of (2).	K3	14
IV	**Conversion of ordinary differential equations into Integral Equation :** Introduction – Initial value problem(or simply IVP) – Method of converting an Initial value problem into a Volterra Integral equation – Alternative method of converting an Initial value problem into a	K4	14

	Volterra Integral equation – Boundary value problem(or simply BVP) – Method of converting a boundary value problem into a Fredholm Integral equation. Chapter II : Sections 2.1 – 2.7of (2)		
V	**Homogeneous Fredholm Integral equations of the second kind with separable kernel:** Characteristic values(or characteristic numbers or characteristic or eigen values) , Characteristic functions(or eigen functions)– Solution of homogeneous Fredholm Integral equation of second kind with separable (or degenerate)kernels– Solved examples. Chapter III: Sections 3.1 – 3.4 of (2) **Current Trends-*The calculus of variations ***	K5	14
	* Self Study.		
Course Outcome	**CO1:** Recall the concepts of variations, functionals, integral equations, and integral transformation.	K1	
	CO2: Identify the various methods in variations, integral equations, and integral transforms.	K2	
	CO3: Solve real-life problems and find solutions by applying suitable methods.	K3	
	CO4: Examine the existence of a solution to a problem.	K4	
	CO5: Formulate a variational problem relevant to a real-life situation.	K5	

Learning Resources

Text Books	1. A.S Gupta, Calculus of Variations with Applications, Prentice Hall of India, New Delhi, 2015. (Unit -I and Unit -II) 2. Dr.M.D.Raisinghania, Integral Equations and Boundary Value Problems, S. Chand & Company Pvt ltd, New Delhi,Tenth edition, 2022.(Unit -III, Unit -IV and Unit -V)
Reference Books	1. F.B. Hildebrand, Methods of Applied Mathematics, Prentice – Hall of India Pvt. New Delhi, 1968. 2. R.P.Kanwal, Linear Integral Equations,Theory and Techniques, Academic Press, New York, 1971. 3. L. Elsgolts, Differential Equations and Calculus of Variations, Mir Publishers, Moscow, 1973.
Website Link	1.https://youtu.be/_iGiRs-NGSY 2. https://youtu.be/VGnx0NbK3w8 3. https://youtu.be/jFa81XkK5i0
Self-Study Material	1.https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=1223606&ppg=7

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAE24	CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS	DSE THEORY - XXIV	IV	6	3	3	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	M
CO2	S	S	S	S	M	S	S	S	S	M
CO3	S	S	S	S	M	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S
CO5	S	S	S	S	M	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation, Chalk and Talk method
Assessment Methods	CIA-I, CIA-II , Assignment , Seminar and ESE

Designed By	Verified By	Approved By
R.PARVATHA	Dr.K.LOGAARASI	Member Secretary

List of Skill Based Elective Course (SEC) for
M.Sc.,Mathematics SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

S.No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	IV	23M4PMAS01	MATHEMATICAL COMPUTATION WITH SAGEMATH
2	IV	23M4PMAS02	ADVANCED LATEX
3	IV	23M4PMAS03	OFFICE AUTOMATION AND ICT TOOLS
4	IV	23M4PMAS04	NUMERICAL ANALYSIS USING SCILAB
5	IV	23M4PMAS05	DIFFERENTIAL EQUATIONS USING SCILAB
6	IV	23M4PMAS06	INDUSTRIAL MATHEMATICS
7	IV	23M4PMAS07	RESEARCH TOOLS AND TECHNIQUES

Skill Based Elective Course (SEC) for M.Sc., Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M4PMAS01	MATHEMATICAL COMPUTATION WITH SAGEMATH	SEC THEORY – I	IV	4	2	2	-	2

Objective	To equip students with the knowledge and skills necessary to proficiently use SageMath for mathematical computation, analysis, visualization, and programming.

Unit	Course Content	Knowledge Levels	Sessions
I	**First Steps:** The Sage Program - Sage as a Calculator Chapter 1: Sections 1.1 - 1.2	K1	9
II	**Analysis and Algebra:** Symbolic Expressions and Simplification – Equations – Analysis - Basic Linear Algebra Chapter 2: Sections 2.1 to 2.4	K2	10
III	**Programming and Data Structures:** Syntax – Algorithmics - Lists and Other Data Structures Chapter 3: Sections 3.1 to 3.3	K3	10
IV	**Graphics:** 2D Graphics - 3D Graphics Chapter 4: Sections 4.1 to 4.2	K4	9
V	**Computational Domains:** Sage is object-Oriented-Elements, Parents, Categories-Domains with a Normal Form-Expressions vs Computational Domains. Chapter 5: Section 5.1 to 5.4 **Current Trends-*History of algorithms***	K5	10
	*Self Study.		
	CO1: Relate the concepts in Calculus, Applied Linear Algebra, Numerical Methods and basic Linear Programming Problems	K1	

Course Outcome	**CO2**: Understand the algebra and analysis	K2	
	CO3: Build the Programming using Data Structure	K3	
	CO4: Analyze the 2D Graphics and 3D Curves	K4	
	CO5: Determine Computational Domains	K5	

Learning Resources

Text Books	1. Paul Zimmermann, Alexandre Casamayou, Computational Mathematics with SageMath, Society for Industrial and Applied Mathematics Philadelphia, 2018.
Reference Books	1. Uri M. Ascher and Linda R. Petzold, Computer Methods for Ordinary Differential Equations and Differential-Algebraic Equations, Society for Industrial and Applied Mathematics, 1998, ISBN 0898714128. 2. Noga Alon and Joel H. Spencer, The Probabilistic Method, WileyInterscience, 2000, ISBN 0471370460. 3. Bernard Beauzamy, Robust mathematical methods for extremely rare events, On-line,2009.
Website Link	1.https://youtu.be/DJ6YwBN7Ya8 2.https://www.youtube.com/live/wRqY6rxctYg?si=8KMVUGdqkhBrUeSR 3.https://youtu.be/BBpAmxU_NQo?si=lY6y82TyDGlgdbDp
Self-Study Material	1. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=5121294&ppg=13

	L-Lecture	T-Tutorial	P-Practical	C-Credit

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram - 637408.

Skill Based Elective Course (SEC) for M.Sc., Mathematics
SYLLABUS - LOCF - CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M4PMAS01	MATHEMATICAL COMPUTATION WITH SAGEMATH	SEC THEORY – I	IV	4	2	2	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	M	S	S	S	M	S	M	S	M	S
CO4	M	S	M	S	S	S	S	M	S	S
CO5	S	M	S	S	S	M	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session and Group Discussion.
Teaching and Learning Methods	Lecture, Smart class presentation, Chalk and talk method
Assessment Methods	CIA-I, CIA-II, Seminar and ESE.

Designed By	Verified By	Approved By
MOHANAPRIYA B	Dr.K.LOGAARASI	Member Secretary

Skill Based Elective Course (SEC) for M.Sc.,Mathematics SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAS02	ADVANCED LATEX	SEC THEORY-II	IV	4	2	2	-	2
Objective	Students can learn about LaTeX, learn how to typeset common mathematical papers in the article style, identify LaTeX mistakes, download and use packages, and make basic diagrams.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Introduction and the Structure of a LaTeX Document:** Installation of the software LaTeX - Environments and commands - Classes and packages – Errors - Files created - How to use LATEX at CUED - Document Classes – Arara - Counters and Length parameters – Document and page organization – Page breaks, footnotes. Environments, Matrix-like environments. Chapter - 1 and 2 in I & Chapter - 1 in II Chapter - 4 in I & Chapter – 5 in II Chapter - 8 (Section 8.3) in III	K2	10
II	**Display and alignment structures:** Display and alignment structures for equations Comparison with standard LaTeX - A single equation on one line - A single equation on several lines: no alignment - A Single equation on several lines: with alignment - Equation groups without alignment - Equation groups with simple alignment- Multiple alignments: align and flalign - Display environments as mini-pages- Interrupting displays, Variable symbol commands - Symbols in formulas Chapter - 8 (Section 8.2, 8.5, 8.6 and 8.9) in III	K3	10
III	**Figures Directly in LaTex:** Inserting Images, Positioning Images, List of Figures, Drawing diagrams directly in LaTex, TikZ package, Graphics and PSTricks Pictures and graphics in LaTeX, simple pictures using PSTricks, Plotting of functions.	K4	10
IV	**Presentations (The beamer Class):** Overlays -Themes Assignments and Examinations - The exam Class - The exsheets Package - The probsoln Package - Using the data tool Package for Exams or Assignment Sheets - Random Numbers. Charts - Flow Charts - Pie	K5	9

	Charts - The datapie Package - The pgf-pie Package - Bar Charts - The bchart Package - The databar Package - Gantt Charts - Plots. Chapter - 8, 9 and 12 in II.		
V	**Structuring Your Document:** Author and Title Information, Abstract, Chapters, Sections, Subsections, Creating a Table of Contents, Cross-Referencing, Creating a Bibliography, Page Styles and Page Numbering, Multi-Lingual Support: using the babel package. (5.1-5.7) **Current Trends-* The Structure of a document - Coordinate Labels***	K6	9
	* Self Study.		
Course Outcome	**CO1:** Illustrate the installation of software LaTex	K2	
	CO2: Apply the standard LaTex	K3	
	CO3: Examine the insertion of the images and PSTricks	K4	
	CO4: Evaluate the different types of the chart and package	K5	
	CO5: Create the document structuring problems	K6	

Learning Resources

Text Books	1.Nicola L. C. Talbot,LaTeX for Administrative Work , Dickimaw Books, 2015http://www.dickimaw-books.com/latex/admin/ 2. Nicola L. C. Talbot,LATEX for Complete Novices ,Version 1.4, Dickimaw Books http://www.dickimaw-books.com/2012
Reference Books	1.Bindner, Donald & Erickson, Martin,A Student's Guide to the Study, Practice, and Tools of Modern Mathematics. CRC Press, Taylor & Francis Group, LLC,2011 2.George Gratzer, More Math into LATEX, 4th Edition, 2007 Springer Science 3. Frank Mittelbach, Michel Goossens, The LaTex Companion, Second Edition, Addision-Wesley, 2004.
Website Link	1. https://youtu.be/gqvLCj9pQzY?feature=shared 2. https://youtu.be/TlA-OXYikqc?feature=shared 3. https://youtu.be/pXfNK7ajVpQ?feature=shared
Self-Study Material	1. https://link.springer.com/chapter/10.1007/978-0-387-68852-7_10#preview 2. https://link.springer.com/chapter/10.1007/978-3-642-23816-1_5#preview

	L-Lecture	T-Tutorial	P-Practical	C-Credit

Skill Based Elective Course (SEC) for M.Sc., Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M4PMAS02	ADVANCED LATEX	SEC THEORY-II	IV	4	2	2	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	M
CO2	M	S	S	S	M	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	M	M	S	S	S	S	M	S	S
CO5	S	S	S	S	S	M	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session and Group Discussion.
Teaching and Learning Methods	Lecture, Smart class presentation, Chalk and talk method.
Assessment Methods	CIA I,CIA II, Seminar and ESE

Designed By	Verified By	Approved By
MOTHIDHRSHAA D	Dr.K.LOGAARASI	Member Secretary

Skill Based Elective Course (SEC) for M.Sc.,Mathematics SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAS03	OFFICE AUTOMATION AND ICT TOOLS	SEC THEORY - III	IV	4	2	2	-	2
Objective	Students can develop the relevant skills in related to computer application, office management practices and office automation techniques.							

Unit	Course Content	Knowledge Levels	Sessions
I	Office Automation - Office and Office Automation	K2	10
II	Computer Mail Systems - Telecommunication and Word Processor	K3	10
III	WP Hardware Configuration	K4	10
IV	Reprographics-Electronic Mail and Electronic-Filing	K5	9
V	Facsimile Transmission and Micrographics -Voice Technology **Current Trends - * Working as part of a virtual team***	K6	9
	*Self Study.		

Course Outcome	**CO1:** Remember the concepts of MS-Office.	K2	
	CO2: Express the globalization and growth of the economy as well as making communications.	K3	
	CO3: Gain the knowledge of hardware skills and techniques.	K4	
	CO4: Analyze to design and improve the workflow in a office automation	K5	
	CO5: Appraise the graphics and transmission process in various fields.	K6	

Learning Resources	
Text Books	1. Office Automation Tools and Technology (Unit I & Unit-II) 2. Yatendra kumar & suithavarshney, Office Automation Tools,Naveen prakashan pvt .Ltd
Reference Books	1. Dr.Rizwan Ahmed , Office Automation Tools ,Naveen prakashan pvt .Ltd 2. Dr.Babasaheb Ambedkar, Office Automation Tools.
Website Link	1. http://ocw.mit.edu/ocwweb/Mathematics 2. http://www.opensource.org 3. www.mathpages.com
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=5114546

	L-Lecture	T-Tutorial	P-Practical	C-Credit

Skill Based Elective Course (SEC) for M.Sc., Mathematics SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M4PMAS03	OFFICE AUTOMATION AND ICT TOOLS	SEC THEORY - III	IV	4	2	2	-	2	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	M	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	M	S	S	S	S	S	S	M
CO4	S	S	S	M	S	M	S	S	S	S
CO5	S	S	S	S	S	S	S	M	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
Mrs.P.SUBHA	Dr.K.LOGAARASI	Member Secretary

Skill Based Elective Course (SEC) for M.Sc., Mathematics SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAS04	NUMERICAL ANALYSIS USING SCILAB	SEC THEORY - IV	IV	4	2	2	-	2
Objective	Students will be able to understand the Numerical methods are a mathematical tool designed to solve numerical problems.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Transcendental and Polynomial Equations :** Introduction - Bisection Method - Iteration Methods Based on First Degree Equation - Iteration Methods Based on Second Degree Equation - Rate of Convergence - Iterative Methods - Methods for Complex Roots - Polynomial Equations - Model problems - Choice of an Iterative Method and Implementation - Problems. Chapter : 2.1 - 2.10	K2	10
II	**System of Linear Algebraic Equations and Eigenvalue Problems :** Introduction - Direct Methods - Error Analysis - Iteration Methods - Eigenvalues and Eigenvectors - Model Problems - Choice of a Method - Problems. Chapter : 3.1- 3.7	K3	10
III	**Interpolation and Approximation :** Introduction - Lagrange and Newton Interpolations - Finite Difference Operators - Interpolating Polynomials using Finite Differences - Hermite Interpolations - Piecewise and Spline Interpolation - Bivariate Interpolation - Approximation - Least Squares Approximation - Uniform Approximation - Rational Approximation - Model Problems - Choice of the Method - Problems. Chapter: 4.1 - 4.13	K4	10
IV	**Differentiation and Integration :** Introduction - Numerical Differentiation - Optimum Choice of Step-Length - Extrapolation Methods - Partial Differentiation - Numerical	K5	9

	Integration - Methods Based on Interpolation - Methods Based on Undetermined Coefficients - Composite Integration Methods - Romberg Integration - Double Integration - Model Problems - Problems. Chapter: 5.1 - 5.12		
V	**Ordinary Differential Equations Initial Value Problems :** Introduction - Numerical Method - Singlestep Methods - Multistep Methods - Predictor-Corrector Methods - Stability Analysis - Stiff System - Boundary Value Problems - Initial Value Methods - Finite Difference Methods - Model Problems - Problems. Chapter: 6.1 - 6.11 **Current Trends-* Polynomial Matrices - Error Estimates***	K6	9
	*Self Study.		
Course Outcome	**CO1:** Understand the depth knowledge on the roots of a polynomial equation.	K2	
	CO2: Relate the concepts of eigenvalues and eigenvectors.	K3	
	CO3: Diagnose the Lagrange and Newton Interpolations.	K4	
	CO4: Estimate the Numerical differentiation and integration	K5	
	CO5: Build the Ordinary Differential Equations and Initial Value Problems.	K6	

Learning Resources				
Text Books	1. M. K. Jain, S. R. K. Iyengar and R. K. Jain,Numerical Methods For Scientific And Engineering Computation,New Age International (P) Ltd, 3rd Edition,Reprint 2000.			
Reference Books	1. Numerical Methods and principles analysis and algorithms ,S.Pal ,Oxford University Press			
Website Link	1. https://youtu.be/KBUDrR8M-Jk?feature=shared 2. https://youtu.be/bHVOPECO8-o?feature=shared 3. https://youtu.be/tpVoFcIEKHI?feature=shared			
Self-Study Material	1.https://link.springer.com/chapter/10.1007/0-387-30486-X_2#preview 2.https://ebookcentral.proquest.com/lib/inflibnetebooks/reader.action?docID=221072&ppg=7			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

Skill Based Elective Course (SEC) for M.Sc., Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M4PMAS04	NUMERICAL ANALYSIS USING SCILAB	SEC THEORY - IV	IV	4	2	2	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	M	M
CO2	S	M	M	L	M	S	M	M	M	M
CO3	M	S	S	M	S	S	S	M	M	M
CO4	S	L	S	S	S	S	L	M	S	L
CO5	S	M	S	S	S	M	M	S	S	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation, Chalk and talk method.
Assessment Methods	CIA I,CIA II, Seminar and ESE

Designed By	Verified By	Approved By
MOTHIDHRSHAA D	Dr.K.LOGAARASI	Member Secretary

Skill Based Elective Course (SEC) for M.Sc.,Mathematics SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAS05	DIFFERENTIAL EQUATIONS USING SCILAB	SEC THEORY - V	IV	4	2	2	-	2
Objective	The language provides students with an interpreted programming environment with matrices. as the main data type. To students By using matrix-based computation, dynamic typing, and Many numerical problems may be expressed in a reduced number of code lines.							
Unit	**Course Content**						**Knowledge Levels**	**Sessions**
I	An Introduction to Scilab – Matrices Chapter 1 and 2						K1,K2	10
II	Scilab Programming Chapter 3						K2	10
III	Functions – Plotting Chapter 4 and 5						K4	10
IV	Solving Ordinary Differential Equations Chapter 6						K4	9
V	Polynomials in Scilab Chapter 7 **Current Trends-* An Introduction to Scilab***						K5	9

	* Self Study.		
Course Outcome	**CO1:** Repeat the basic concepts of Scilab.	K1	
	CO2: Tag the Basic Concepts programme.	K2	
	CO3: Act out the mathematical modelling in Scilab.	K3	
	CO4: Inspire the first- and second-order differential equations.	K4	
	CO5: Depend on the polynomials in Scilab.	K5	

Learning Resources	
Text Books	1. Akhilesh Kumar, Programming Using Scilabsriomprakashshastri and smt.Promilashastri 2022
Reference Books	1. Gilberto E.Urroz, Ordinary Differential Equations with Scilab
Website Link	1.https://youtu.be/ZvIlkjqdZOM 2.https://youtu.be/2-dUHLHeyTY 3.https://youtu.be/BjvkBLfvkqY
Self-Study Material	1.https://link.springer.com/chapter/10.1007/978-1-4419-5527-2_2

	L-Lecture	T-Tutorial	P-Practical	C-Credit

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram-637408

Skill Based Elective Course (SEC) for M.Sc., Mathematics SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAS05	DIFFERENTIAL EQUATIONS USING SCILAB	SEC THEORY - V	IV	4	2	2	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	M
CO2	M	S	S	M	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S	S	M	S
CO4	S	S	S	S	S	M	S	S	S	M
CO5	S	S	S	S	M	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation
Assessment Methods	CIA-I, CIA-II , Assignment , Seminar and ESE

Designed By	Verified By	Approved By
R.PARVATHA	Dr.K.LOGAARASI	Member Secretary

Skill Based Elective Course (SEC) for M.Sc., Mathematics SYLLABUS - LOCF- CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAS06	INDUSTRIAL MATHEMATICS	SEC THEORY- VI	IV	4	2	2	-	2
Objective	Students are able to understand the concepts regarding industry through mathematics, Boundary conditions, continuous casting and method of perturbations in industrial mathematics.							

Unit	Course Content	Knowledge Levels	Sessions
I	Mathematics in industry - Overview of the case studies - Units and dimensions - Diffusion equations - Heat conduction equations	K1	10
II	Boundary conditions - Solving the heat/diffusion equation - Scaling equations - Dimensional analysis	K2	10
III	Continuous Casting - Introduction to the case study problem - The Boltzmann similarity solution- A moving boundary problem - The pseudo-steady-state approximate solution - Solving the continuous casting case study	K3	10
IV	Water Filtration - Introduction to the case study problem - Stretching transformations - Diffusion from a point source - Solving the water filtration case study	K4	9

V	Laser Drilling -Introduction to the case study problem - Method of perturbations -Boundary perturbations - Solving the laser drilling case study **Current Trends:**Income Statement ***	K5	9
	*Self Study		
Course Outcome	**CO1:** Understand the Mathematics in industry	K1	
	CO2: Apply the heat/diffusion equation and Dimensional analysis	K2	
	CO3: Solve the moving boundary problem and continuous casting	K3	
	CO4: Analyze Water Filtration in diffusion from a point source	K4	
	CO5: Evaluate Laser Drilling and method of perturbations	K5	

Learning Resources	
Text Books	1. Glenn R. Fulford, Philip Broadbridge , Industrial Mathematics Case Studies in the Diffusion of Heat and Matter , Cambridge University Press, 2002
Reference Books	-
Website Link	1.https://youtu.be/l6spigOZCOs?feature=shared 2.https://youtu.be/tQ1lVb3Nhw8?feature=shared
Self-Study Material	1.https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=4655704&query=INDUSTRIAL+MATHEMATICS

	L-Lecture	T-Tutorial	P-Practical	C-Credit

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram - 637408.

Skill Based Elective Course (SEC) for M.Sc., Mathematics
SYLLABUS - LOCF - CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M4PMAS06	INDUSTRIAL MATHEMATICS	SEC THEORY- VI	IV	4	2	2	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	M	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation, Chalk and talk method
Assessment Methods	CIA-I, CIA-II, Seminar and ESE

Designed By	Verified By	Approved By
R.MOHAN RAM	Dr.K.LOGAARASI	Member Secretary

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram - 637408.

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M4PMAS07	RESEARCH TOOLS AND TECHNIQUES	SEC THEORY - VII	IV	4	2	2	-	2
Objective	Students can able to understand the means to effectively gather, analyze, and interpret data in order to address research questions or hypotheses.							

Unit	Course Content	Knowledge Levels	Sessions
I	Process Research - Research Design Chapter 2 and 3	K1	10
II	Research Problem - Variables and Their Types Chapter 4 and 5	K2	10
III	Formulation of Hypothesis – Sampling - Tools of Data Collection Chapter 6, 7 and 8	K3	10
IV	Data Analysis- Interpretation of Data Chapter 9 and 10	K4	10
V	Research Methods - Descriptive or Survey Method - Experimental Method Chapter 11, 12 and 13 **Current Trends - *Modeling and Simulation Applications in Drug Development Process***	K6	8
	*Self Study.		

Course Outcome	**CO1:** Recall the observable and measurable terms what a student is able to do as a result of completing a learning experience.	K1	
	CO2: Illustrate the limitations of particular research methods.	K2	
	CO3: Demonstrate the skills in qualitative and quantitative data analysis and presentation	K3	
	CO4: Analyze the advanced critical thinking skills.	K4	
	CO5: Estimate the ability to choose methods appropriate to research aims and objectives.	K6	

Learning Resources	
Text Books	1. Dr.Prabhat Pandey, Dr. Meenu Mishra Pandey, Research Methodology: Tools and Techniques, Bridge Center, 2015
Reference Books	1. Ackoff, Russell L.The Design of Social Research, University of Chicago Press: Chicago 1961. 2. Allen, T. Harrell,. New Methods in Social Research, Praeger Publication: New York,1978. 3. Baker R.P. & Howell A.C. The Preparation of Reports, Ronald Press: New York,1958.
Website Link	1. https://www.evalcommunity.com/career-center/research-tools/ 2. https://www.scribbr.com/category/methodology/ 3. https://www.voxco.com/blog/descriptive-survey-design/
Self-Study Material	https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=4179487

	L-Lecture	T-Tutorial	P-Practical	C-Credit

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Rasipuram - 637408.

Skill Based Elective Course (SEC) for M.Sc.,Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M4PMAS07	RESEARCH TOOLS AND TECHNIQUES	SEC THEORY -VII	IV	4	2	2	-	2

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	M	M	S	S	S
CO2	S	M	S	M	S	S	M	S	M	S
CO3	S	S	M	M	S	S	S	M	M	S
CO4	M	S	S	S	S	S	M	S	M	S
CO5	S	S	S	S	M	S	M	M	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
Mrs.P.SUBHA	Dr.K.LOGAARASI	Member Secretary

List of Extra Disciplinary Course(EDC) Details
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

S.No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	III	23M3PMAED1	MATHEMATICS FOR LIFE SCIENCES
2	III	23M3PMAED2	MATHEMATICS FOR SOCIAL SCIENCES
3	III	23M3PMAED3	STATISTICS FOR LIFE AND SOCIAL SCIENCES
4	III	23M3PMAED4	GAME THEORY AND STRATEGY
5	III	23M3PMAED5	HISTORY OF MATHEMATICS

Extra Disciplinary Course (EDC) Subjects for M.Sc. Students offered by the Department of Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M3PMAED1	MATHEMATICS FOR LIFE SCIENCES	EDC THEORY - I	III	3	2	1	-	2

Objective	Students know that the focus of the course is on the scientific study of normal functions in living systems.

Unit	Course Content	Knowledge Levels	Sessions
I	Cell Growth-Exponential growth and Decay – Determination of growth or decay rates- The method of least squares – Nutrient Uptake by a cell – Inhomogeneous Differential equations	K1	8
II	Growth of a Microbial colony – Growth in a Chemo stat – Interacting Populations – Mutation and Reversion in Bacterial growth.	K2	7
III	Enzyme Kinematics: The Michaelis – Menton Theory – Enzyme Substrate – Inhibitor system – Cooperative dimmer – Allosteric enzymes – Other alloseteric theories.	K3	8
IV	The Cooperative dimmer – Allosteric enzymes – Other alloseteric theories.	K4	6
V	Hemoglobin – Graph theory and Steady state Enzyme Kinetics – Enzyme – Substrate – Modifier system – Enzyme Substrate – Activator system. **Current Trends-* Curve fitting and Time series***	K5	7
	* Self Study.		

Course Outcome	**CO1:** Define the interpretation of bio mathematical models such as population growth, cell division, and predator-prey models.	K1	
	CO2: Summarize the basic concepts of probability to molecular evolution and genetics.	K2	
	CO3: Demonstrate the Enzyme Kinematics	K3	
	CO4: Illustrate the Allosteric enzymes.	K4	
	CO5: Evaluate the translate a real-world problem into a mathematical problem	K5	

Learning Resources	
Text Books	1. S. I. Rubinow, Introduction Mathematical Biology, Dover publications, New York, 1975. Chapter I and Chapter 2 (Sections 2.1, 2.3, to 2.11).
Reference Books	1. Dr. Anjali Naithani, Surbhi Gupta, VandaniVerma, Mathematics for Life Sciences I, Himalaya Publishing House.
Website Link	1. https://www.youtube.com/watch?v=e5nwJKUc3bA 2. https://www.youtube.com/watch?v=8PWF5OeB7Ec 3. https://youtu.be/wiIUS2LDCl8
Self-Study Material	1. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=1595319&ppg=5

	L-Lecture	T-Tutorial	P-Practical	C-Credit

Extra Disciplinary Course (EDC) Subjects for M.Sc. Students offered by the Department of Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M3PMAED1	MATHEMATICS FOR LIFE SCIENCES	EDC THEORY - I	III	3	2	1	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	M	M	M	M	L	M	M
CO2	M	L	M	S	M	L	S	M	L	M
CO3	M	M	S	L	M	L	M	L	M	M
CO4	M	M	M	M	M	S	M	L	L	M
CO5	M	L	M	M	M	M	S	M	L	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem Solving Session, Seminar and Group Discussion
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
R. Malathi	Dr. K.LOGAARASI	Member Secretary

Extra Disciplinary Course (EDC) Subjects for M.Sc. Students offered by the Department of Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M3PMAED2	MATHEMATICS FOR SOCIAL SCIENCES	EDC THEORY - II	III	3	2	1	-	2

Objective	Students are able to understand functions, matrices and determinants.

Unit	Course Content	Knowledge Levels	Sessions
I	**Propositional Logic and set Theory:** Propositional Logic - Open propositions and quantifiers - Arguments and Validity - Set Theory Chapter 1: Sections 1.1 – 1.4	K1	8
II	**Functions:** The real number system - Solving equations and inequalities; linear and quadratic equations - Review of relations and functions Chapter 2: Sections 2.1 – 2.3	K2	7
III	**Functions:** Real valued functions and their properties -Types of functions and inverse of a function - Polynomials, zeros of polynomials, rational functions and their graphs Chapter 2: Sections 2.4 – 2.6	K3	7
IV	**Functions:** Definition and basic properties of logarithmic, exponential, trigonometric functions and their graph Chapter 2: Sections 2.7	K4	7
V	**Matrices and determinant:** Definition of a matrix - Matrix Algebra -Types of matrices - Elementary row operations - Row echelon form and reduced row echelon form of a matrix Chapter 3: Sections 3.1 – 3.5 **Current Trends-*Satisfaction Approval Voting***	K5	7
	* Self Study.		

Course Outcome	**CO1:** Label the basic concepts of Propositional logic	K1	
	CO2: Explain the concept of functions and Solving equations and inequality.	K2	
	CO3: Analyze real valued functions.	K3	
	CO4: Classify properties of logarithmic, exponential, trigonometric functions.	K4	
	CO5: Evaluate the types of matrices and Elementary row operations.	K5	

Learning Resources				
Text Books	1. Dr. BerhanuBekele, Mathematics for Social Sciences,AtoMulugetaNaizghi, 2019.			
Reference Books	1.Lorenzo Peccati, Mauro D'Amico, MargheritaCigola, Maths for Social Sciences, Springer International Publishing, 2018.			
Website Link	1. https://www.youtube.com/live/6THvCC2wLJ8?si=D3q8Au0EmMs-VYR_ 2. https://youtu.be/oqHJ5xQYTEI 3. https://youtu.be/S2y4EiICN3Q			
Self-Study Material	1. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=1895662&ppg=14			
	L-Lecture	T-Tutorial	P-Practical	C-Credit
Extra Disciplinary Course (EDC) Subjects for M.Sc. Students offered by the				

Department of Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M3PMAED2	MATHEMATICS FOR SOCIAL SCIENCES	EDC THEORY - II	III	3	2	1	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	M	S	S	S	S
CO2	M	S	S	M	M	S	M	S	M	S
CO3	M	S	S	M	S	M	S	S	S	S
CO4	M	S	M	M	S	S	S	S	M	S
CO5	S	M	S	S	M	S	M	M	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem Solving Session, Seminar and Group Discussion.
Teaching and Learning Methods	Audio Video lecture, Chalk and Board class, Assignment, PPT Presentation and Video presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
R. Malathi	Dr.K.LOGAARASI	Member Secretary

Extra Disciplinary Course (EDC) Subjects for M.Sc. Students offered by the Department of Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M3PMAED3	STATISTICS FOR LIFE AND SOCIAL SCIENCES	EDC THEORY - III	III	3	2	1	-	2

Objective	This course introduces to students about Scope of Statistics, Diagrammatic Presentation of Data, Permutation Theorem, Combination and Binomial Distribution.

Unit	Course Content	Knowledge Levels	Sessions
I	Definitions, and Scope of Statistics -Approach to Data Collection - Introduction to Set Theory I & II -Concepts of Logic.	K1	8
II	Diagrammatic Presentation of Data -Frequency Distribution - Graphical Presentation of Data - Measures of Central Tendency.	K2	7
III	Probability Theory I&II - Permutation Theorem -Combination - Binomial Distribution	K3	7
IV	Nature and Importance of Statistical Inquiries - Basic Research Methodology I & II	K4	7
V	Nature of Science -Some Basic Concepts in Social Statistics **Current Trends-*Social Network Analysis with applications ***	K5	7
	* Self Study.		
Course Outcome	**CO1:** Memorize the concept of Scope of Statistics and Concepts of Logic	K1	
	CO2: Estimate the concept of Frequency Distribution and Graphical Presentation of Data	K2	

	CO3: Execute the Permutation Theorem ,Combination and Binomial Distribution	K3	
	CO4: Illustrate the Nature and Importance of Statistical Inquiries	K4	
	CO5: Test the Some Basic Concepts in Social Statistics	K5	

Learning Resources	
Text Books	1.Dr. Moses Etila Shaibu (Course Editor), Dr. Henry Obasogie (Course Reviewer), Basic statistics for social sciences -NOUN press,2020.
Reference Books	1. Osuala, E.C, Introduction to Research Methodology. Awka Rd Onitsha, Nigeria Africana-Fep Publisher Limited, 1982. 2. Holt, Rinehart and Winton. Whitney, Foundations of Behavioural Research. New York,F.L. 1968. 3. The Elements of Research. New York: Prentice- Hall.
Website Link	1. https://youtu.be/WcIKlHkZSWM 2. https://youtu.be/uYMhGcZlOpc. 3. https://youtu.be/uYMhGcZlOpc. 4. https://youtu.be/NXLrcqOUZZg.
Self-Study Material	1.https://ebookcentral.proquest.com/lib/inflibnet-ebooks/detail.action?docID=1211931

	L-Lecture	T-Tutorial	P-Practical	C-Credit

Extra Disciplinary Course (EDC) Subjects for M.Sc. Students offered by the Department of Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M3PMAED3	STATISTICS FOR LIFE AND SOCIAL SCIENCES	EDC THEORY -III	III	3	2	1	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	M	S
CO3	S	M	S	S	M	S	S	S	S	M
CO4	S	M	M	S	S	M	S	S	S	S
CO5	S	S	S	M	S	S	S	M	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Smart class presentation, Seminar, Assignment
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
SELVI G	Dr.K.LOGAARASI	Member Secretary

Extra Disciplinary Course (EDC) Subjects for M.Sc. Students offered by the Department of Mathematics SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAED4	GAME THEORY AND STRATEGY	EDC THEORY - IV	III	3	2	1	-	2
Objective	Students know about the fundamentals of game theory including basic concepts and techniques, various ways of describing and solving games.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Game, Strategy and Saddle Point:** Introduction - Description of a game of strategy – Illustrative Examples - Relations among expectations - Saddle points -Game with perfect information Chapter 1: Sections 1 to 6	K1	7
II	**The Fundamental Theorem:** Game without saddle points - mixed strategies - Graphical representation of mixed strategies – the minimax theorem – optimal mixed strategy – graphical representation of minimax theorem - Proof of minimax theorem Chapter 2: Sections 1 to 8	K2	8
III	**Properties of Optimal Strategies**: Many optimal strategies – Some properties of optimal strategies – Convex set of optimal strategies - Operation on games – Dominated strategies – All strategies active. Chapter 3: Section 1 to 6	K3	7
IV	**Method of Solving games**: Solving for optimal strategies – Guess and verify – Examination of submatrices – Successive approximations – Graphical solutions of 3 x 3 games. Chapter 5: Section 1 to 5	K4	7
V	**Method of Solving games**: Mapping method for solving games with constraints – Mapping method for solving games – solution of reconnaissance game by mapping method. Chapter 5: Section 6 to 8 **Current Trends-*Game theory - Using Excel ***	K5	7
	*Self Study.		

Course Outcome	**CO1:** Distinguish a game situation from a pure individual's decision problem	K1	
	CO2: Understand the graphical representation of mixed strategies.	K2	
	CO3: Apply the concepts of dominant, dominated, and rationalizable strategies, pure and mixed strategies, and best responses	K3	
	CO4: Analyze the economic situations using game theoretic techniques	K4	
	CO5: Solve simple games using a mapping method.	K5	

Learning Resources	
Text Books	1. Melvin Dresher, Game of Strategy - Theory and Application, Prentice-Hall Inc., USA, 1961
Reference Books	1. Kanti Swarup, P.K.Gupta and Man Mohan, —Operations Research, Eighth Edition, Sultan Chand & Sons, New Delhi, 1999. 2. S.Hillier and J.Liebermann, Operations Research, Sixth Edition, Mc Graw Hill Company, 1995. 3. J. K. Sharma, Operations Research problems and solution, Third edition, Mackmillan Publishers India Ltd, India, 2012. 4. Guillermo Owen, Game Theory, 2nd edition, Academic Press, 1982. 5. Philip D. Straffin, Game Theory and Strategy, The Mathematical Association of America, USA, 1993.
Website Link	1.https://www.youtube.com/watch?v=bxIrKkGRpBY&list=PLKI1h_nAkaQoDzI4xDIXzx6U2ergFmedo&index=22
Self-Study Material	1. https://ebookcentral.proquest.com/lib/inflibnet-ebooks/detail.action?docID=3330479

	L-Lecture	T-Tutorial	P-Practical	C-Credit

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Extra Disciplinary Course (EDC) Subjects for M.Sc. Students offered by the Department of Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M3PMAED4	GAME THEORY AND STRATEGY	EDC THEORY - IV	III	3	2	1	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	M	S	S	M
CO2	M	M	M	S	M	S	S	M	S	S
CO3	S	M	M	S	M	M	S	S	S	S
CO4	M	M	S	M	S	S	S	S	S	M
CO5	S	M	M	S	S	M	S	S	S	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Problem solving session, Seminar and Group Discussion
Teaching and Learning Methods	Lecture, Chalk and Board, Smart Class Presentation
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
MALATHI R	Dr. K.LOGAARASI	Member Secretary

Extra Disciplinary Course (EDC) Subjects for M.Sc. Students offered by the Department of Mathematics SYLLABUS - LOCF-CBCS Pattern EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAED5	HISTORY OF MATHEMATICS	EDC THEORY - V	III	3	2	1	-	2
Objective	Students can understand the early number systems and history of Greek mathematics.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Early Number Systems and Symbols:** Primitive Counting - Number Recording of the Egyptians and Greeks - Number Recording of the Babylonians. Chapter 1: Sections 1.1-1.3	K1	8
II	**Mathematics in Early Civilizations:** The Rhind Papyrus - Egyptian Arithmetic - Four Problems from the Rhind Papyrus - Egyptian Geometry - Babylonian Mathematics – Plimpton. Chapter 2: Sections 2.1-2.6	K2	7
III	**The Beginnings of Greek Mathematics:** The Geometrical Discoveries of Thales - Pythagorean Mathematics - The Pythagorean Problem - Three Construction Problems of Antiquity - The Quadratrix of Hippias. Chapter 3: Sections 3.1-3.5	K3	7
IV	**The Alexandrian School: Euclid** Euclid and the elements - Euclidean Geometry - Euclid's Number Theory - Eratosthenes, the Wise Man of Alexandria – Archimedes. Chapter 4: Sections 4.1- 4.5	K4	7
V	**The Twilight of Greek Mathematics: Diophantus** The Decline of Alexandrian Mathematics – The Arithmetica - Diophantine Equations in Greece, India, and China - The Later Commentators - Mathematics in the Near and Far East.	K5	7

	Chapter 5: Sections 5.1-5.5. **Current Trends-* Mathematics and Empire ***		
	* Self Study.		
Course Outcome	**CO1:** Describe the early number system and symbols	K1	
	CO2: Classify the mathematics in early civilizations	K2	
	CO3: Apply the beginnings of Greek mathematics	K3	
	CO4: Organize the Alexandrian school	K4	
	CO5: Check the Twilight of Greek mathematics	K5	

Learning Resources	
Text Books	1. David M. Burton, The History of Mathematics, Seventh Edition University of New Hampshire.
Reference Books	1. Aczel, Amer. The Artist and the Mathematician: The Story of Nicolas Bourbaki, the Genius Mathematician Who Never Existed. New York: Thunder's Mouth Press, 2006. 2. Appel, Kenneth, and Haken, Wolfgang."Every Planar Map Is Four Colorable."Journal of Recreational Mathematics 9 (1976–1977): 161–169.
Website Link	1.https://www.youtube.com/watch?v=cZH0YnFpjwU 2.https://www.youtube.com/watch?v=5cpH4ErtPjo 3.https://www.youtube.com/watch?v=h0bmDcbJ9Ky
Self-Study Material	1.https://nlist.inflibnet.ac.in/search/Author/Home?author=Filloy%2C+Eugenio.

	L-Lecture	T-Tutorial	P-Practical	C-Credit

Extra Disciplinary Course (EDC) Subjects for M.Sc. Students offered by the Department of Mathematics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M3PMAED5	HISTORY OF MATHEMATICS	EDC THEORY -V	III	3	2	1	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	M
CO2	M	S	S	S	M	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	M	M	S	S	S	S	M	S	S
CO5	S	S	S	S	S	M	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session and Group Discussion.
Teaching and Learning Methods	Lecture, Smart class presentation, Chalk and talk method.
Assessment Methods	CIA-I, CIA-II, Assignment, Seminar and ESE

Designed By	Verified By	Approved By
SUGANYA A	Dr.K.LOGAARASI	Member Secretary

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAIS1	INTERNSHIP	INTERNSHIP	III	-	-	-	-	2
Objective	To give the students to optimum exposure on the practical aspects of mathematics in Industries							

Course Content	**Knowledge Levels**	**Sessions**
1. Duration of the internship training is 15 days during the Vacation which falls at the end of the 3rd Semester. 2. The departments concerned will prepare on exhaustive panel of Institutions, Industries and practitioners. 3. The individual student has to identify the institution / industry / practitioners of their choice and inform the same to the HOD / Staff-in-charge. 4. The students hereafter will be called Trainees should maintain a work diary in which the daily work done should be entered and the same should be attested by the Section in-charge. 5. The departments should prepare an outline of the job to be done, Sections in which they have to be attached both in the office as well as in the field. 6. The trainees should strictly adhere to the rules and regulations and office	K2	

timings of the institutions to which they are attached. 7. The trainees have to obtain a certificate on successful completion of the internship from the Chief Executive of the organization. 8. A Staff member of a Department (Guide) will be monitoring the performance of the Candidate. 9. Schedule of visit to be made by the staff is to be prepared by the HOD / Staff-in-charge. 10. Report writing manual and format should be prepared by the respective departments. 11. All model forms are to be attached wherever it is necessary. 12. Report evaluation: External Viva-Voce examination will be conducted and the maximum mark is 100. 13. Report should be properly submitted after the completion of internship training.			
Course Outcome	**CO1:** Able to understand the practical knowledge of working in Institution/Industry.	K2	
Learning Resources			
Website Link	-		
Self-Study Material	-		

	L-Lecture	T-Tutorial	P-Practical	C-Credit

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M.Sc. -Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards							
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PMAIS1	INTERNSHIP	INTERNSHIP	III	-	-	-	-	2

CO-PO Mapping

CO Number	**P01**	**P02**	**P03**	**P04**	**P05**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	S	S	S	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	-
Teaching and Learning Methods	-
Assessment Methods	CIA -100 % 1. Work Diary – 25% 2. Training Report and Viva-voce – 75%

Designed By	**Verified By**	**Approved By**
Dr.K.LOGAARASI	Dr.K.LOGAARASI	Member Secretary

M.Sc.-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAPR1	PROJECT WORK	PROJECT	IV	8	-	-	8	5

Objective	Students can apply relevant concepts to formation of problems. . Apply scientific principles and investigations of Research Methodology to offer solutions to the problems. . Understand live organisational situations. . The primary objective of the full semester project is to provide an opportunity to our students to format the problem from the real life situation and find the solution to the problem by using analytical and problem solving skills. Project Period: The project commences from IV semester.

Details	**Course Content**	**Knowledge Levels**	**Sessions**
Format for the preparation of Project Report:	The final stage of work consists of the 1. Title Page 2. Bonafide Certificate 3. Acknowledgement/Preface 4. Table of contents 5. Main Chapter 6. List of table, diagram and charts 7. Conclusion 8. References		
Text of the Project	The following structure of project work should be followed to maintain the uniformity in preparation and presentation. **Chapter 1 - Introduction** In this chapter Selection and relevance problem, historical background of the problem, definitions of related aspects, characteristics, different concepts pertaining to the problem etc can be covered by the candidate. **Chapter 2 - Research Methodology** This chapter will include Objectives, Hypothesis, Scope of the study, Selection of the problem, Data collection, Tabulation of data, Techniques and tools to be used, limitations of the study, significance of the study etc. **Chapter 3 - Literature Review** This chapter will provide information about studies done on the respective issue. This would assist students to undertake further study on the same issue. **Chapter 4 - Data Presentation and Data Analysis** This chapter is the core part of the study. The analysis pertaining to collecting data will be done by the students. The application of selected	K5	

	tools or techniques will be used to arrive at findings. In this table of information, presentation of graphs etc. should be provided by the students. **Chapter 5- Conclusion** In this unit, findings of work will be covered by the candidate and suggestions will be mentioned by the candidate to validate the objectives and hypotheses. **If required, more chapters of data analysis could be added.** **6. Bibliography** **7. Appendix** **Typing Instruction:** **Paper :** 8 ½ * 11 inches in size. Only one side of the sheet should be typed. **Margin:** The left side margin should not be less than 1.5 inches (or 40 mm) the right, top and Bottom Margin one inch (or 25 mm). **Font :** Times New Roman, subject matter -12 font size in running format, Heading and Section headings should be capitalized – 14 font size.		
Headings and Titles:	1. Heading and Section headings should be capitalized and centred– 14 font sizes with Bold. 2. Subdivision headings should be typed from the left hand margin sentence case -12 font sizes with Bold. 3. Paragraphs should be indented seven spaces for pica type and nine for elite type.	K4	
Tables, Graphs and Diagrams:	**1.** The table number (Example: TABLE 1.5) typed in capitals, should be separated from the text by two or three spaces. 2. If an explanatory note to a time is necessary, an asterisk should be used. 3. The note should be placed immediately below the table.	K3	
	Line Spacing: The text of the thesis should be 1.5 lines spacing **Pagination:** Pages of the text are numbered continuously in Arabic numerals.	K2	
	Foot note: Footnote citation is indicated by placing an index number i.e. a superscript or numeral. The superscript numeral must appear at the top of the line both in the text and in a footnote. Footnotes are single spaced, with double spacing between two consecutive citations. Footnote is numbered consecutively within each chapter or throughout the entire report. **Basic Format:** Author's name, title of the work, Place of publication: Publisher's name, year, Page no, (s). Note of punctuations. Page number to be preceded by "p" if single or "pp" if two or more pages. Title to be underlined.		
	Bibliography:	K1	

	The format for bibliographical listing for books, reports, articles are the same for footnotes also. Books and articles can be arranged either chronological order or year wise. **For citing Books:** Mann, R.S Social Change and Social Research, New Delhi: Concept Publishing Company, 2018, p.27 **Publication of Government and Public Organization:** Government of India, India 2016: A Reference Annual, New Delhi: Publication Division, 201, p.127 **Quoting from Secondary Sources:** Gand, William. S., "Foreign Aid: What it is; how it works; why we provide it", Department of State Bulletin, 59, No.1537, 1958, quoted in Todaro, Michael P., Economic Development in the Third world, New York, Longman, 1981, p.40. **Citing Journal:** GoelRanjan, "Achievement through Human Engineering", Indian Management, 28, No.8, July, 2016, pp.14-16 **Citing Thesis or Dissertation:** Ganapathy , A study of organizational and Individual Characteristics in R & D Organizations, unpublished Ph.D Thesis, Bangalore: Indian Institute of Science, 2016. **For Citing Seminar Paper:** Krishnaswami O.R., "Towards Excellence in Cooperative Management" (Paper Presented at a Seminar on "Excellence in Management", Cooperative Training College, Bangalore, July 2019).		
SCHEDULE	**IV Semester:** 1. December -Identification of problem & Selection of topic 2. January - Review of Literature & Finalization of Questionnaire 3. February - Data collection & Analysis and preparation of Project report. 4. March - First & Second draft and Final draft Correction. 5. April - Review Presentation & Submission of Project.		
Course Outcome	**CO1:** Define the problem.	K1	
	CO2: Interpret the Hypothesis and Objectives.	K2	
	CO3: Make use of the literature review based on the research problem.	K3	
	CO4: Classify the data collection.	K4	
	CO5: Conclude the Project report.	K5	

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc. -Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAPR1	PROJECT WORK	PROJECT	IV	8	-	-	8	5

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M	M	M	M	S	S
CO2	S	M	M	M	S	M	M	M	S	S
CO3	S	M	S	M	M	M	M	M	S	S
CO4	S	M	M	M	M	M	M	M	S	S
CO5	S	M	M	M	M	M	M	M	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	-
Assessment Methods	Internal Evaluation – 40 Marks External Evaluation – 60 Marks

Designed By	Verified By	Approved By
MOHANAPRIYA B	Dr.K.LOGAARASI	Member Secretary

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAOE1	Mathematics for Competitive Examination	Self study Online - Competitive Examination	IV	-	-	-	-	2
Objective	Creating the awareness of competitive examination among students. Imparting knowledge about appearing for Competitive Examination and it impacts and develops an attitude of appearing for such exams.							

Unit	Course Content	Knowledge Levels	Sessions
	Assemblage of different topics related to Mathematics in particular, Linear Algebra, Algebra, Analysis, Differential Equations, Topology, Graph Theory, Number Theory, Probability Theory etc. Major emphasis has been put forth to include recent developments in the subjects. This course aims to give a holistic view of all the topics which comprised of some factual text points, multiple choice questions (MCQ), it is extremely suitable for students pursuing their higher degree in University/institute for their entrance exams, students preparing for various national and state level competitive entrance exams such as ICAR-JRF/SRF/NET/ARS, IARI/NDRI Ph.D., SAUs; CSIR/UGC-NET/JRF/SRF; ICMR, DBT, GATE, BARC, IISc, JNU, BHU, etc. to get admission in Ph.D. in Mathematics. In addition, it is also useful for UPSC and state PSC. **Rules for creating MCQ pattern.** 1. Objective type online examination will be conducted at the end of 4^{th} semester. 2. Questions must be taken from all previous question papers of CSIR-NET, SET, NEET, UPSC, IBPS and Common Entrance Test for Ph.D. 3. **Test critical thinking** : Multiple choice questions to test the superficial knowledge. Learners to interpret facts, evaluate situations, explain cause and effect, make inferences, and predict results. 4. **Emphasize Higher-Level Thinking :** Use memory-plus application oriented questions. These questions require students to recall	K1-K6	

	principles, rules or facts in a real life context. Eg.1 : Ability to Justify Methods and Procedures Which one of the following is true if o(G)=49? a. G is abelian group b. G is non-abelian group c. G is infinite group d. G is a finite abelian group. Eg.2 : Ability to Interpret Cause-and-Effect Relationships When the inverse of the matrix is possible ? a. Singular Matrix. b. Zero Matrix. c. Symmetric Matrix. d. Non-singular Matrix. 5. Mix up the order of the correct answers Keep correct answers in random positions and don't let them fall into a pattern that can be detected 6. **Use a Question Format** Multiple-choice items to be prepared as questions (rather than incomplete statements) Incomplete Statement Format: The capital of California is in Direct Question Format------ Less effective.		

	In which of the following cities is the capital of California? -This is Best format. 7. **Keep Option Lengths Similar** Avoid making your correct answer the long or short answer 8. **Avoid the "All the Above" and "None of the Above" Options** Students merely need to recognize two correct options to get the answer correct 9. HOD's instruct the faculty to prepare a minimum 500 questions booklet (cumulatively for each programme) with solutions and circulate among the students. 10. Each Department prepares the Questions (MCQ pattern with four answers) and submit them to ICT.		
Course Outcome	**CO1:** Able to attend competitive Examinations		
	CO2: Able to attend Computer Based Examinations		
	CO3: Understand the UGC CSIR Syllabus and Question Patterns		
	CO4: Analyze the all concepts in one examination		
	CO5: Evaluate andCreate the Problems with UGC CSIR Level		

Learning Resources	
Learning Resources	1.Pawan Sharma, Neha Sharma, Suraj Singh - UGC CSIR NET/SET (JRF & LS) Mathematical Sciences, Arihant Publications
Website Link	1. https://onlinecourses.nptel.ac.in/noc23_ma17/preview 2. https://onlinecourses.nptel.ac.in/noc23_ma08/preview 3. https://onlinecourses.nptel.ac.in/noc23_ma06/preview

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Mathematics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PMAOE1	Mathematics for Competitive Examination	Self study Online - Competitive Examination	IV	-	-	-	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M	M	S	M	M	M
CO2	S	M	M	M	M	M	S	M	M	M
CO3	S	M	M	M	M	M	S	M	M	M
CO4	S	M	M	M	M	M	S	M	M	M
CO5	S	M	M	M	M	M	S	M	M	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	NET/SET/GATE/CET/TRB /NEET Old question papers –solutions –online mock test
Teaching and Learning Methods	Self study, Group discussion, Chalk and Talk, Audio-Video Learning, learning through mock test
Assessment Methods	100 multiple choice questions through computer based online examinations passing minimum is 50%

Designed By	Verified By	Approved By
MOTHIDHRSHAA D	Dr.K.LOGAARASI	Member Secretary