MAHENDRA ARTS & SCIENCE COLLEGE

(AUTONOMOUS)

(Affiliated to Periyar University)

[Accredited by NAAC "A++" Grade & Recognized u/s 2(f) and 12(B) of the UGC act 1956]

KALIPPATTI- 637501.

BACHELOR OF SCIENCE

SYLLABUS FOR B.Sc. MATHEMATICS

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

FOR THE STUDENTS ADMITTED FROM
THE ACADEMIC YEAR 2023 – 2024 ONWARDS

MAHENDRA ARTS & SCIENCE COLLEGE
(Autonomous)
(Affiliated to Periyar University)

Department of Mathematics

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(Effective from the academic year 2023-2024)

I - PREAMBLE

The undergraduate Mathematics Programme is engaged in the historic development of the field establishing its connection to Science and Technology. The technical background of the programme has endowed with a thorough understanding of today's modern society. The heart of the programme consists of fundamental courses in the main areas of mathematics together with a variety of specialized, elective courses. It is complemented by supportive courses from other departments, in addition to the University's general education requirements.

II - GRADUATES ATTRIBUTES

- ***In-depth knowledge and understanding of major concepts:*** Understanding of theoretical principles and experimental findings in different sub-areas available in respective disciplines
- ***Creative and Critical thinking:*** The capability of using creative and critical thinking in respective areas
- ***Analytical ability:*** The ability to analyze issues and problems in all the disciplines
- ***Problem-solving skills:*** The capability towards solving problems
- ***Entrepreneur skills:*** The inclusion of leadership, business management, time management skills
- ***Communication skills:*** The ability to transfer complicated/technical information in a precise manner
- ***Mutual and multidisciplinary competence:*** The ability of teamwork in interdisciplinary fields
- ***Digital literacy:*** The capability of utilizing modern digital tools to carry out the simulation process
- ***Moral and ethical awareness:*** Ability to adopt moral ethics
- ***Social responsibility:*** Creating socially responsible citizens

III - PROGRAMME EDUCATIONAL OBJECTIVES:

- Graduates will have successful careers in Mathematics fields or will be able to successfully pursue higher studies.
- Graduates will apply their technical knowledge and skills to develop and implement solutions for the problems that accomplish goals to the industry, academic, government or research area.
- Contribute effectively to the Mathematics Profession by fostering effective interaction, ethical practices and communication skills, while pursuing education through lifelong learning.

IV - PROGRAMME OUTCOMES:

- Acquire scientific knowledge leading to creative thinking and research motivations.
- Internalize the learned concepts and that will enable them to become skilled professionals.
- Develop a sense of an interdisciplinary approach to identify and resolve issues through the project, seminars, fieldwork, internships, and industrial visits.
- Become empowered individuals who will emerge as entrepreneurs or be employed in industry, academia, and Government sectors.
- Establish a self-sustained environment for a healthy society.

V - PROGRAMME SPECIFIC OUTCOMES (PSO):

- Understand and apply mathematical concepts in various contexts related to science, technology, business, and industry.
- Acquire the knowledge to apply analytical and theoretical skills to model and solve mathematical problems.
- Formulate and develop mathematical arguments in a logical manner.
- Apply the critical thinking ability to carry out extended investigation and innovation of mathematical formulations.
- Induce the interest to communicate Mathematics effectively and precisely using technology.

VI – REGULATIONS:

These regulations shall take effect from the academic year 2023-2024, i.e., for students who are to be admitted to the first year of the programme during the academic year 2023-24 and thereafter.

1. **Eligibility for Admission:**

   A Pass in the Higher Secondary Examination of Tamil Nadu Higher Secondary Board or some other Board accepted by the Syndicate as equivalent thereto with Mathematics (other than Business mathematics) as one of the subjects

2. **Duration of the Course:**

   The candidates shall complete all the courses of the programme in 3 years from the date of admission. The programme of study shall consist of six semesters and a total period of three years with a minimum of **142** credits. The programme of study will comprise the course according to the syllabus.

3. **Programme of Study:**

   The course of study for the UG degree has been divided into the following five categories:

   Part I :   Tamil / Other Languages.

   Part II: English Language.

   Part III: Core Courses, Generic Elective Courses, Discipline Elective Courses.

   Part IV: Skill Enhancement Courses, Foundation Course, Professional Competency Skill

   Part V: Extension Activity.

4. Extension Activity:

Every student shall participate compulsorily for period of not less than three years (6 semesters) in any one of the following programmes. NSS/ Sports/YRC/Other Extra-curricular and Co-curricular activities (Club/IIC/EDC). The student's performance shall be examined by the staff in-charge of extension activities along with the Head of the respective department and a senior member of the Department on the following parameters.

The marks shall be sent to the Controller of Examinations before the commencement of the final semester examinations.

20% of marks for Regularity of attendance.

60% of marks for Active Participation in classes/ camps/ games/ special Camps/ programmes in the college/ District/ State/ University activities.

10% of marks for Exemplary awards/ Certificates/ Prizes.

10% of marks for Other Social components such as Blood Donations, Fine Arts, etc.

The above activities shall be conducted outside the regular working hours of the college. The mark sheet shall carry the gradation relevant to the marks awarded to the candidates.

A - Exemplary - 80 and above

B - Very good - 70-79

C - Good - 60-69

D - Fair - 50-59

E - Satisfactory - 40 – 49

This grading shall be incorporated in the mark sheet to be issued at the end of the semester. (Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above fields and be graded and certified accordingly).

5. Examinations:

The course of study shall be based on semester pattern with Internal Assessment under Choice Based Credit System.

The examinations for all the papers consist of both Internal (Continuous Internal Assessment - CIA) and External (End Semester) theory examinations. The theory examinations shall be conducted for three hours duration at the end of each semester. The candidates failing in any subjects(s) will be permitted to appear for the same in the subsequent semester examinations.

VII. Structure of the Programme:

SEMESTER: I

Part	Course Category	Title of the Course	Course Code	Hrs / Week L	Hrs / Week P	No. of Credits	Max. Mark Int.	Max. Mark Ext.	Max. Mark Total
I	LANGUAGE COURSE-I	TAMIL – I / FRENCH – I / HINDI – I	M23UFTA01/ M23UFFR01/ M23UFHI01	6	-	3	25	75	100
II	LANGUAGE COURSE-II	ENGLISH- I	M23UFEN01	6	-	3	25	75	100
III	CORE COURSE-I	CLASSICAL ALGEBRA AND TRIGONOMETRY	M23UMA01	5	-	5	25	75	100
III	CORE COURSE-II	DIFFERENTIAL CALCULUS	M23UMA02	5	-	5	25	75	100
III	GENERIC ELECTIVE-I	ELECTIVE – I - GENERIC ELECTIVE - MATHEMATICAL STATISTICS	M23USTGE1	4	-	3	25	75	100
IV	SEC-I	NME -I	-	2	-	2	25	75	100
IV	FOUNDATION COURSE	FOUNDATION COURSE -VEDIC MATHEMATICS	M23UMAFC1	2	-	2	25	75	100
		Total		30	-	23	175	525	700

SEMESTER: II

Part	Course Category	Title of the Course	Course Code	Hrs / Week L	Hrs / Week P	No. of Credits	Max. Mark Int.	Max. Mark Ext.	Max. Mark Total
I	LANGUAGE COURSE-I	TAMIL – II / FRENCH – II / HINDI – II	M23UFTA02/ M23UFFR02/ M23UFHI02	6	-	3	25	75	100
II	LANGUAGE COURSE-II	ENGLISH- II	M23UFEN02	6	-	3	25	75	100
III	CORE COURSE-III	ANALYTICAL GEOMETRY 2D & 3D	M23UMA03	4	-	4	25	75	100
III	CORE COURSE- IV	INTEGRAL CALCULUS	M23UMA04	4	-	4	25	75	100
III	GENERIC ELECTIVE-II	ELECTIVE – II - GENERIC ELECTIVE - STATISTICAL INFERENCE	M23USTGE2	4	-	3	25	75	100
III	GENERIC ELECTIVE-PRACTICAL	ELECTIVE – I - GENERIC ELECTIVE PRACTICAL - STATISTICS PRACTICAL	M23USTGEP1	-	2	2	40	60	100
IV	SEC-II	NME-II	-	2	-	2	25	75	100
IV	SEC-III	SEC-III-MATHEMATICS FOR COMPETITIVE EXAMINATIONS - I	M23UMAS01	2	-	2	25	75	100
		Total		28	2	23	215	585	800

SEMESTER: III

Part	Course Category	Title of the Course	Course Code	Hrs / Week		No. of Credits	Max. Mark		
				L	P		Int.	Ext.	Total
I	LANGUAGE COURSE-I	TAMIL – III / FRENCH – III/ HINDI – III	M23UFTA03/ M23UFFR03/ M23UFHI03	6	-	3	25	75	100
II	LANGUAGE COURSE-II	ENGLISH- III	M23UFEN03	6	-	3	25	75	100
III	CORE COURSE-V	VECTOR ANALYSIS	M23UMA05	6	-	5	25	75	100
III	CORE COURSE-VI	DIFFERENTIAL EQUATIONS	M23UMA06	6	-	5	25	75	100
III	GENERIC ELECTIVE-III	ELECTIVE – III - GENERIC ELECTIVE - PHYSICS – I	M23UPHGE1	4	-	3	25	75	100
IV	SEC-IV	SEC-IV- MATHEMATICS FOR COMPETITIVE EXAMINATIONS – II	M23UMAS02	2	-	2	25	75	100
		Total		30	-	21	150	450	600

SEMESTER: IV

Part	Course Category	Title of the Course	Course Code	Hrs / Week		No. of Credits	Max. Mark		
				L	P		Int.	Ext.	Total
I	LANGUAGE COURSE-I	TAMIL – IV / FRENCH – IV / HINDI – IV	M23UFTA04/ M23UFFR04/ M23UFHI04	6	-	3	25	75	100
II	LANGUAGE COURSE-II	ENGLISH – IV	M23UFEN04	6	-	3	25	75	100
III	CORE COURSE-VII	TRANSFORM TECHNIQUES	M23UMA07	4	-	4	25	75	100
III	CORE COURSE-VIII	ELEMENTS OF MATHEMATICAL ANALYSIS	M23UMA08	4	-	4	25	75	100
III	GENERIC ELECTIVE-IV	ELECTIVE – IV - GENERIC ELECTIVE - PHYSICS – II	M23UPHGE2	4	-	3	25	75	100
III	GENERIC ELECTIVE-PRACTICAL	ELECTIVE – II - GENERIC ELECTIVE PRACTICAL - PHYSICS PRACTICAL	M23UPHGEP1	-	2	2	40	60	100
IV	SEC-V	SEC - V - MATHEMATICS FOR COMPETITIVE EXAMINATIONS - III	M23UMAS03	2	-	2	25	75	100
IV	ENHANCEMENT COMPULSORY COURSE – I	ENVIRONMENTAL STUDIES	M23UES01	2	-	2	25	75	100
		Total		28	2	23	215	585	800

Part	Course Category	Title of the Course	Course Code	Hrs / Week		No. of Credits	Max. Mark		
				L	P		Int.	Ext.	Total
III	CORE COURSE-IX	ABSTRACT ALGEBRA	M23UMA09	5	-	5	25	75	100
III	CORE COURSE-X	REAL ANALYSIS	M23UMA10	5	-	5	25	75	100
III	CORE COURSE-XI	MATHEMATICAL MODELING	M23UMA11	5	-	4	25	75	100
III	DISCIPLINE SPECIFIC ELECTIVE-I	DISCIPLINE SPECIFIC ELECTIVE - I – OPERATION RESEARCH	M23UMADSE1	5	-	3	25	75	100
		DISCIPLINE SPECIFIC ELECTIVE - I – NUMBER THEORY	M23UMADSE2						
		DISCIPLINE SPECIFIC ELECTIVE - I – ASTRONOMY	M23UMADSE3						
III	DISCIPLINE SPECIFIC ELECTIVE-II	DISCIPLINE SPECIFIC ELECTIVE - II – NUMERICAL METHODS	M23UMADSE4	5	-	3	25	75	100
		DISCIPLINE SPECIFIC ELECTIVE - II - MATHEMATICAL STATISTICS	M23UMADSE5						
		DISCIPLINE SPECIFIC ELECTIVE - II – DIFFERENCE EQUATIONS WITH APPLICATIONS	M23UMADSE6						
IV	SEC-VI	SEC-VI-BUSINESS OPTMIZATION TECHNIQUES	M23UMAS04	3	-	2	25	75	100
IV	INTERNSHIP	INTERNSHIP	M23UMAIS01	-	-	2	40	60	100
IV	ENHANCEMENT COMPULSORY COURSE – II	VALUE EDUCATION - YOGA	M23UVE01	2	-	2	25	75	100
			Total	30	-	26	215	585	800

SEMESTER: VI

Part	Course Category	Title of the Course	Course Code	Hrs / Week		No. of Credits	Max. Mark		
				L	P		Int.	Ext.	Total
III	CORE COURSE-XIII	LINEAR ALGEBRA	M23UMA12	5	-	5	25	75	100
III	CORE COURSE-XIV	COMPLEX ANALYSIS	M23UMA13	5	-	4	25	75	100
III	CORE COURSE-XV	MECHANICS	M23UMA14	5	-	4	25	75	100
III	DISCIPLINE SPECIFIC ELECTIVE-III	DISCIPLINE SPECIFIC ELECTIVE - III - GRAPH THEORY	M23UMADSE7	5	-	3	25	75	100
		DISCIPLINE SPECIFIC ELECTIVE - III - STOCHASTIC PROCESS	M23UMADSE8						
		DISCIPLINE SPECIFIC ELECTIVE - III - COMBINOTORIAL MATHEMATICS	M23UMADSE9						
III	DISCIPLINE SPECIFIC ELECTIVE-IV	DISCIPLINE SPECIFIC ELECTIVE - IV – DISCRETE MATHEMATICS	M23UMADSE10	4	-	3	25	75	100
		DISCIPLINE SPECIFIC ELECTIVE - IV – FUZZY SETS AND APPLICATIONS	M23UMADSE11						
		DISCIPLINE SPECIFIC ELECTIVE - IV – INTRODUCTION TO RESEARCH METHODOLOGY	M23UMADSE12						
III	CORE PROJECT	PROJECT	M23UMAPR1	4	-	4	40	60	100
IV	PCS	PCS-NON VERBAL REASONING	M23UMAPCS1	2	-	2	25	75	100
V	EXTENSION ACTIVITIES	EXTENSION ACTIVITIES	M23UEX01	-	-	1	-	-	-
*Additional Credit for online courses (SWAYAM/MOOC)/Value-Added				-	-	-	-	-	-
			Total	30	-	26	190	510	700
			GRAND TOTAL	172	08	142	1160	3240	4400

* Equal credits will be transferred by completing online courses such as MOOC/SWAYAM/NPTEL.

* On successful completion of Value Added course, the students will gain one extra credit.

GENERIC ELECTIVE SUBJECTS OFFERED FOR OTHER MAJOR STUDENTS:
(For B.Sc. Chemistry and Physics)

Semester	Course Title	Course Code
I	ELECTIVE – I - GENERIC ELECTIVE - MATHEMATICS - I	M23UMAGE1
II	ELECTIVE – II - GENERIC ELECTIVE - MATHEMATICS – II	M23UMAGE3
	GENERIC ELECTIVE – PRACTICAL - I - MATHEMATICS PRACTICAL	M23UMAGEP1

GENERIC ELECTIVE SUBJECTS OFFERED FOR OTHER MAJOR STUDENTS:
(For B.Sc. Statistics)

Semester	Course Title	Course Code
I	ELECTIVE – I - GENERIC ELECTIVE - MATHEMATICS FOR STATISTICS	M23UMAGE8
II	ELECTIVE – II - GENERIC ELECTIVE - REAL ANALYSIS	M23UMAGE9

[For B.Sc. (Computer Science, Information Technology, Artificial Intelligence and Data Science & AI &ML) &BCA]

Semester	Course Title	Course Code
I	ELECTIVE – I - GENERIC ELECTIVE - DISCRETE MATHEMATICS – I	M23UMAGE2
II	ELECTIVE – II - GENERIC ELECTIVE - DISCRETE MATHEMATICS – II	M23UMAGE4
For B.Sc. (Computer Science, Information Technology & AIDS)		
III	ELECTIVE – III - GENERIC ELECTIVE - NUMERICAL METHODS	M23UMAGE5
IV	ELECTIVE – IV - GENERIC ELECTIVE - OPTIMIZATION TECHNIQUES	M23UMAGE7
For BCA		
III	ELECTIVE – III - GENERIC ELECTIVE - OPTIMIZATION TECHNIQUES	M23UMAGE6

GENERIC ELECTIVE SUBJECTS FOR B.Sc. MATHEMATICS STUDENTS:
(Students can choose any one of course from the given list)

Semester	GENERIC ELECTIVE – I	
	Course Title	**Course Code**
I	ELECTIVE – I - GENERIC ELECTIVE - MATHEMATICAL STATISTICS	M23USTGE1
GENERIC ELECTIVE – II		
	Course Title	**Course Code**
II	ELECTIVE – II - GENERIC ELECTIVE - STATISTICAL INFERENCE	M23USTGE2
	ELECTIVE – I -GENERIC ELECTIVE PRACTICAL - STATISTICS PRACTICAL	M23USTGEP1
GENERIC ELECTIVE – III		
III	**Course Title**	**Course Code**
	ELECTIVE – III - GENERIC ELECTIVE - PHYSICS – I	M23UPHGE1
GENERIC ELECTIVE – IV		
IV	**Course Title**	**Course Code**
	ELECTIVE – IV - GENERIC ELECTIVE - PHYSICS – II	M23UPHGE2
	ELECTIVE – II -GENERIC ELECTIVE PRACTICAL - PHYSICS PRACTICAL	M23UPHGEP1
DISCIPLINE SPECIFIC ELECTIVE - I		
	Course Title	**Course Code**
V	DISCIPLINE SPECIFIC ELECTIVE - I – OPERATION RESEARCH	M23UMADSE1
	DISCIPLINE SPECIFIC ELECTIVE - I – NUMBER THEORY	M23UMADSE2
	DISCIPLINE SPECIFIC ELECTIVE - I – ASTRONOMY	M23UMADSE3
DISCIPLINE SPECIFIC ELECTIVE - II		
	Course Title	**Course Code**
V	DISCIPLINE SPECIFIC ELECTIVE - II – NUMERICAL METHODS	M23UMADSE4
	DISCIPLINE SPECIFIC ELECTIVE - II -MATHEMATICAL STATISTICS	M23UMADSE5
	DISCIPLINE SPECIFIC ELECTIVE - II – DIFFERENCE EQUATIONS WITH APPLICATIONS	M23UMADSE6
DISCIPLINE SPECIFIC ELECTIVE - III		
	Course Title	**Course Code**
VI	DISCIPLINE SPECIFIC ELECTIVE - III - GRAPH THEORY	M23UMADSE7
	DISCIPLINE SPECIFIC ELECTIVE - III - STOCHASTIC PROCESS	M23UMADSE8
	DISCIPLINE SPECIFIC ELECTIVE - III - COMBINOTORIAL MATHEMATICS	M23UMADSE9
DISCIPLINE SPECIFIC ELECTIVE - IV		
	Course Title	**Course Code**
VI	DISCIPLINE SPECIFIC ELECTIVE - IV – DISCRETE MATHEMATICS	M23UMADSE10
	DISCIPLINE SPECIFIC ELECTIVE - IV – FUZZY SETS AND APPLICATIONS	M23UMADSE11
	DISCIPLINE SPECIFIC ELECTIVE - IV – INTRODUCTION TO RESEARCH METHODOLOGY	M23UMADSE12

SKILL ENHANCEMENT COURSES:

Semester	Course Title	Course Code
I	SEC-I[NME- I]	-
II	SEC-II[NME –II]	-
	SEC-III- MATHEMATICS FOR COMPETITIVE EXAMINATIONS - I	M23UMAS01
III	SEC-IV-MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II	M23UMAS02
IV	SEC-V-MATHEMATICS FOR COMPETITIVE EXAMINATIONS - III	M23UMAS03
V	SEC-VI-BUSINESS OPTMIZATION TECHNIQUES	M23UMAS04

PROFESSIONAL COMPETENCY SKILL:

Semester	Course Title	Course Code
VI	PCS- NON VERBAL REASONING	M23UMAPCS1

SKILL ENHANCEMENT COURSE [FOR OTHER DEPARTMENTS-NMEC]:

Semester	Course Title	Course Code
I	SEC - I - APTITUDE FOR COMPETITIVE EXAMINATIONS - I	M23UMAN01
	SEC - I - MATRIX ALGEBRA	M23UMAN02
II	SEC - II - APTITUDE FOR COMPETITIVE EXAMINATIONS - II	M23UMAN03
	SEC - II - APPLIED NUMERICAL METHODS	M23UMAN04

Summary of Credits, Hours and Mark Distribution:

Part	Course Name	No. of Credits						Total Credits	Total Hours	No. of Courses	Max. Marks
		I	II	III	IV	V	VI				
I	Language – I	3	3	3	3	-	-	12	24	4	400
II	Language – II	3	3	3	3	-	-	12	24	4	400
III	Core Course	10	8	10	8	14	13	63	68	14	1400
	Generic Elective Course	3	3	3	3	-	-	12	16	4	400
	Discipline Specific Elective	-	-	-	-	6	6	12	19	4	400
	Generic Elective Practical	-	2	-	2	-	-	4	4	2	200
	Project	-	-	-	-	-	4	4	4	1	100
IV	Skill Enhanced course	2	4	2	2	2	-	12	13	6	600
	Professional Competency Skill	-	-	-	-	-	2	2	2	1	100
	Enhancement Compulsory Course	-	-	-	2	2	-	4	4	2	200
	Foundation course	2	-	-	-	-	-	2	2	1	100
	Internship	-	-	-	-	2	-	2	-	1	100
V	Extension Activities	-	-	-	-	-	1	1	-	-	-
	Total	**23**	**23**	**21**	**23**	**26**	**26**	**142**	**180**	**44**	**4400**

*The students will gain extra credits for successful completion of online courses from SWAYAM / MOOC.

* On successful completion of Value Added course, the students will gain one extra credit.

VII. SCHEME OF EXAMINATION:

1. Question Paper Pattern for Theory Examination

Time: Three Hours   **Maximum Marks:** 75

Knowledge Level	Sections		Marks	Total Marks	Meaning of K's
K1	**Part - A** 10 Questions - Objectives type *1 Marks (No Choice)	Two Questions from each unit	**10**		K1- Memory Level K2 - Understanding Level K3 - Application Level K4 - Analytical Level
K1, K2	**Part - B** 5 Questions *2 Marks (No Choice)	One Question from each unit	**10**	**75**	
K2, K3	**Part - C** 5 Questions (either or type) * 5 Marks	One Question from each unit	**25**		
K2, K3, K4	**Part - D** 3 out of 5 Questions *10 Marks	One Question from each unit	**30**		

2. Question Paper Pattern for Practical Papers:

EXTERNAL MARK: 60   **INTERNAL MARK: 40**

QUESTION PATTERN

Answer all Questions (5x12 =60)

Questions from each Unit (either or choice)

Mark Allotment:
> **External - 60**
> **Internal - 40**

3. Distribution of Marks:

The following are the distribution of marks for external and internal for End Semester Examinations and continuous internal assessment and passing minimum marks for Theory / Practical / Project papers of UG programmes.

ESE	CIA Total	EA Total	Total Marks Allotted	Passing Minimum for EA	Passing Minimum (ESE)
Theory	25	75	100	30	40
Practical	40	60	100	24	40
Project	40	60	100	24	40
Internship	40	60	100	24	40

The following are the Distribution of marks for the Continuous Internal Assessment in Theory / Practical papers of UG programmes.

THEORY

EVALUATION OF INTERNAL ASSESSMENT
```
      Test        : 15 Marks
      Assignment : 05 Marks
      Attendance : 05 Marks
                   -------------
          Total  : 25 Marks
                   -------------
```

PRACTICAL

EVALUATION OF INTERNAL ASSESSMENT
```
      Test        :  20 Marks
      Attendance :  10 Marks
      Observation:  10 Marks
                    ------------
      Total       :  40 Marks
                    ------------
```

PROJECT

EVALUATION OF INTERNAL ASSESSMENT
```
      Review 1   :  10 Marks
      Review 2   :  10 Marks
      Review 3   :  10 Marks
      Pre-Viva   :  10 Marks
                    ------------
      Total      :  40 Marks
                    ------------
```

4. Passing Minimum:

The Candidates shall be declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Theory Exam mark) with minimum of 30 marks (out of 75 marks) in the End Semester Theory Examinations.

The Candidates shall be declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Practical Exam mark) with minimum of 24 marks (out of 60 marks) in the End Semester Practical Examinations.

5. Submission of Record Note Books for Practical Examinations:

Candidates appearing for practical examinations should submit a bonafide record note books prescribed for practical examinations. The candidates failed to submit the record book shall not be permitted to appear for the practical examinations.

6. Internship/Project:

Internship

Internship training (Minimum two weeks period) is mandatory for all the UG programmes during Second year vacation period.

The Internship training should be valued for 60 marks by an external examiner; however the Viva-Voce examination should be conducted by the internal examiner / faculty concerned.

1. The Internship training Report may consist of minimum of 30 pages.
2. The candidate has to submit the Internship training Report 20 days before the commencement of the V Semester Examinations.

Project

The following guidelines to be followed for the Project with Viva-voce:

The project should be valued for 60 marks by an external examiner; however the Viva-Voce examination should be conducted by both the external examiner appointed by the College and the internal examiner / guide/ teacher concerned.

1. The Project Report may consist of minimum of 60 pages.

2. The candidate has to submit the Project Report 10 days before the commencement of the VI Semester Examinations.

3. A candidate who fails in the Project/Dissertation or is absent may resubmit the report, on the same topic, with necessary modification / correction / improvements in the subsequent Even Semester Examinations for evaluation and shall undergo viva-voce Examination.

7. Note:

a) SWAYAM / MOOC – Free Online Education:

SWAYAM / MOOC is an instrument for self-actualisation providing opportunities for a life-long learning. Here the student can choose from hundreds of courses, virtually every course taught at the college level, offered by the best teachers in India and elsewhere.

The students can choose an online SWAYAM / MOOC course during their period of study which will earn an extra credit and it will be transferred to the academic records of the students.

b) Value Added Courses

Students are provided with additional courses during their course of study. Students are free to choose the courses. On successful completion of each course, the students will gain one extra credit.

CORE: I	B.Sc. MATHEMATICS	Credits:5
Course Code: M23UMA01	CLASSICAL ALGEBRA AND TRIGONOMETRY	Contact Hour Per Week: 5

OBJECTIVES:

To focuses on basic analytical concepts and to develop an idea of algebra and trigonometry. The main objective is to impart the knowledge on fundamental topics such as

- Formation of equations & Relation between roots and coefficients
- To increase or decrease the roots of a given equation by a given quantity
- Descarte's rule of signs
- Biquadratic Equations
- Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of θ
- Hyperbolic and inverse hyperbolic functions

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course , students will be able to

COs	Statement	Knowledge Level
CO1	Define the formation of equation, Reciprocal Equations and Standard form	K1
CO2	Classify Relation between roots and coefficients of equations, Removal of terms, Multiple Roots, $\sin^n \theta$, inverse hyperbolic functions.	K2
CO3	Apply the Theory of equations and Hyperbolic functions Descarte's rule of signs, cardon's Method, Logarithm of a complex number.	K3
CO4	Analyze the idea about, theory of equation , trigonometry.	K4
CO5	Show the Relation between roots and coefficients, Descarte's rule of signs, Biquadratic Equations , $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, inverse hyperbolic functions.	K4

UNIT I: **(15 Hours)**

Reciprocal Equations-Standard form–Increasing or decreasing the roots of a given equation- Removal of terms, Approximate solutions of roots of polynomials by Horner's method – related problems.

(Book1 – Chapter6: Sections 16,17,19,30).

UNIT II: **(15 Hours)**

Summation of Series: Binomial– Exponential –Logarithmic series (Theorems without proof) – Approximations - related problems.

(Book1 – Chapter3: Sections 10,14; Chapter4: Sections-1,2,3,5,7,8,9. 11).

UNIT III: **(15 Hours)**

Inverse of a square matrix up to order 3, Characteristic equation – Eigen values and Eigen Vectors-Similar matrices - Cayley – Hamilton Theorem (Statement only) - Finding powers of square matrix, Diagonalization of square matrices - related problems.

(Book2 – Chapter2: Sections -8,16).

UNIT IV: **(15 Hours)**

Expansions of $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$ - Expansion of $\tan n\theta$ in terms of $\tan\theta$, Expansions of $\cos^n\theta$, $\sin^n\theta$, $\cos^m\theta \sin^n\theta$ – Expansions of $\tan(\theta_1+\theta_2+,\dots,+\theta_n)$-Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of θ - related problems.

(Book3 - Chapter3: Sections 1 to 5).

UNIT V: **(15 Hours)**

Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series - related problems.

(Book3 - Chapter4; Chapter5; Chapter6: Sections 1,3,3.1 Related problems.)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments.

TEXT BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Algebra Vol-I,	Manickavasagam Pillai, T.K., T. Natarajan and Ganapathy KS	Viswanathan Publishers and Printers Pvt Ltd.,	2008.
2.	Algebra Vol-II,	Manickavasagam Pillai, T.K., T. Natarajan and Ganapathy KS	Viswanathan Publishers and Printers Pvt Ltd.,	2008.
3.	Trigonometry	Manickavasagam Pillai, T.K., T. Natarajan and Ganapathy KS	Viswanathan Publishers and Printers Pvt Ltd.,	2013.

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Linear Algebra and its Applications,	David C. Lay,	Pearson Education Asia.	2007
2.	Calculus	G.B. Thomas and R.L. Finney	Pearson Education, Delhi	2005
3.	Algebra and Trigonometry	J.Stewart L.Redlin,and S.Watson	Cengage Learning	2012
4.	Trigonomentry	Pillal.Tkm; Narayana	S.Viswanathan & Co	1997
5.	A Text Book Of Morden Algbra	Balakrishnan; Ramab	Vikas Publishing House	1999

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	M
CO2	M	S	S	M	S
CO3	S	M	S	M	S
CO4	S	S	M	S	M
CO5	M	S	S	M	S

S- Strong; **M**-Medium.

CORE: II	B.Sc. MATHEMATICS	Credits: 5
Course Code: M23UMA02	DIFFERENTIAL CALCULUS	Contact Hour Per Week: 5

OBJECTIVES:

To focuses on basic technical concepts and to develop an idea of Differential calculus. The main objective is to impart the knowledge on fundamental topics such as

- nth derivatives.

- Trigonometric transformations.

- Radius of curvature in Cartesian and polar forms.

- Centre of curvature

- Envelope

- Maxima and Minima of function of two variables

- Jacobians.

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Explain the logic behind the differentiation	K1
CO2	Solve the Differentiation of implicit function and related problems.	K2
CO3	Analyze the concepts nth derivatives and Leibnitz theorem	K3
CO4	Simplify the Tangent and normal – Polar curves- *p-r* equations- Curvature.	K4
CO5	Distinguish of Evolute – Envelope – Maxima and Minima of function.	K4

UNIT I: Successive Differentiation: **(15 Hours)**

Introduction (Review of basic concepts) – The nth derivative – Standard results – Fractional expressions – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the nth derivative of a product – Feynman's method of differentiation.

(Chapter3: Sections 1.1 to 1.6 and 2.1, Related problems.)

UNIT II: Partial Differentiation: **(15 Hours)**

Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions. (Chapter8: Sections 1.1 to 1.5.)

UNIT III: Partial Differentiation (Continued):   **(15 Hours)**

Homogeneous functions – Partial derivatives of a function of two variables – Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers.

(Chapter8: Sections 1.6, 1.7 and Sections 4, 5.)

UNIT IV: Envelope: **(15 Hours)**

Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter.

(Chapter10: Sections 1.1 to 1.4.)

UNIT V: Curvature: **(15 Hours)**

Definition of Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutes – Radius of Curvature in Polar Co-ordinates.

(Chapter10: Sections 2.1 to 2.6)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Calculus-Volume I,	S. Narayanan and T.K. Manicavachagom Pillay,	S. Viswananthan Printers Pvt. Ltd.	2004

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1	Calculus	H. Anton, I. Birens and S. Davis	John Wiley and Sons, Inc., Newyork.	2002.
2	Calculus	G.B. Thomas and R.L. Finney	Pearson Education,	2010
3	Calculus	M.J. Strauss, G.L. Bradley and K. J. Smith,	Dorling Kindersley (India) P. Ltd. (Pearson Education Delhi.	2007
4	Introduction to Calculus and Analysis (Volumes I & II)	R. Courant and F. John	Springer- Verlag, New York, Inc.	1989
5.	Calculus	Pillai T.K.M; Narayan S	S.Viswanathan & Co	1997

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	M
CO2	M	M	S	S	M
CO3	S	M	S	M	S
CO4	M	S	S	M	M
CO5	M	S	M	S	S

S- Strong; **M**-Medium.

SEMESTER – I
FOUNDATION COURSE

FC	B.Sc. MATHEMATICS	Credits: 2
Course Code: M23UMAFC1	VEDIC MATHEMATICS	Contact Hour Per Week: 2

OBJECTIVES:

To focuses on basic theoretical concepts and to develop an idea of Vedic Mathematics. The main objective is to impart the knowledge on fundamental topics such as

- Miscellaneous simple method
- Criss-cross system of multiplication
- Base of squaring
- General Equations

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge level
CO1	Remembering various techniques in Vedic Mathematics	K1
CO2	Understanding the steps involved in each technique	K2
CO3	Solving general equations	K3
CO4	Analyzing the different methods available for effective calculation	K4
CO5	Exploring the Vedic sutras in arithmetic.	K4

UNIT I   **(6 hours)**

Basic Level; Miscellaneous simple method.
(Chapter 1-Pg no.13-33)

UNIT II   **(6 hours)**

Criss-cross system of multiplication- squaring numbers.
(Chapter2-Pg no.35-43 & Chapter 3 - Pg no.50-56)

UNIT III   **(6 hours)**

Base method of multiplication –Base of squaring.
(Chapter 6-Pg no.81-103& Chapter 7- Pg no.104-109)

UNIT IV (6 hours)

*Magic squares –Dates and calendars.
(Chapter 9-Pg no .120-131& Chapter 10-Pg no .132-144)

UNIT V (6 hours)

General Equations –Tips for competitive exams.

(Chapter 11-Pg no.145-147)& Special Section- Pg no.205-212
*denotes self study – Questions may be asked from these portions also

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Vedic Mathematics Made easy	Dhaval Bathia	Jaico Publications 8th Edition- Mumbai -400 001	2017

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1	Vedic Mathematics	V.S. Agrawal	Motilal Banarsidass Publisher.1st Edition	2014
2	Vedic Mathematics Made Easy	Pandit Ramnandan	Arihant Publications,Meerut	2011
3	Puzzles In Math Logic	Aarom J Friendlard	Dover Publications	2007
4	Mathematical Quickers	Charles W Trigg	Dover Publications	2007

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	M
CO2	S	S	S	M	S
CO3	M	M	S	M	S
CO4	S	S	S	M	S
CO5	S	M	M	S	M

S- Strong; **M**-Medium.

CORE: III	B.Sc. MATHEMATICS	Credits: 4
Course Code: M23UMA03	ANALYTICAL GEOMETRY 2D & 3D	Contact Hour Per Week: 4

OBJECTIVES:

      To focuses on basic analytical concepts and to develop an idea of analytical geometry. The main objective is to impart the knowledge on fundamental topics such as

- Analytical geometry of 2D, Straight line
- Polar coordinates, Polar Equation of a conic
- Analytical Geometry 3D
- Straight lines, Co planarity of straight line
- Sphere, Tangent plane
- Cone and cylinder, Equation of Cone

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES :

  On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Find the logic behind the straight lines , Polar coordinates , Analytical Geometry 3D,Sphere,Cone and cylinder.	K1
CO2	Give Example of Straight line, polar co ordinates, Co planarity of straight line, Tangent plane ,Equation of Cone.	K2
CO3	Analyze the concept of straight lines in 2D & 3D, co planarity and shortest distance between two lines.	K3
CO4	Calculate the Simple problems, Polar Equation of a conic, Equation of S.D between two lines, Tangency of Spheres, Quadric Cone with the vertex at the origin.	K4
CO5	Analyze the cone and cylinder concepts to the 2D&3D problems.	K4

UNIT I   **(12 Hours)**

Pole, Polar - conjugate points and conjugate lines – diameters – conjugate diameters of an ellipse - semi diameters- conjugate diameters of hyperbola. (Book1: Chapter 9, 10)

UNIT II   **(12 Hours)**

Polar coordinates: General polar equation of straight line – Polar equation of a circle given a diameter, Equation of a straight line, circle, conic – Equation of chord, tangent, normal. Equations of the asymptotes of a hyperbola. (Book2: Chapter9)

UNIT III   **(12 Hours)**

System of Planes-Length of the perpendicular–Orthogonal projection. (Book3: Chapter2:Sections 2.5,2.7,2.9)

UNIT IV   **(12 Hours)**

Representation of line–angle between a line and a plane – co – planar lines–shortest distance between two skew lines –length of the perpendicular–intersection of three planes.
(Book3:Chapter3:Sections 3.1, 3.2, 3.4, 3.6, 3.7, 3.8)

UNIT V   **(12 Hours)**

Equation of a sphere-general equation-section of a sphere by a plane-equation of the circle- tangent plane- angle of intersection of two spheres- condition for the orthogonality- radical plane. (Book3: Chapter6:Sections 6.1, 6.2, 6.3, 6.4, 6.6, 6.7, 6.8)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Algebra, Analytical Geometry & Trignometry	Vittal P.R. and Malini V	Margam Publications, India.	2018
2.	A Text book of Analytical Geometry Part I-Two Dimensions	Manicavachagom Pillay T.K.and Natarajan T	Divya Subramanian for Ananda Book Depot.	1996
3.	Analytical Solid Geometry	Shanti Narayan and Mittal P.K	S Chand Publishing.	2021

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Plane and Solid Analytic Geometry,	William F. Osgood and William C. Graustein,	Macmillan Company, NewYork.	2016
2.	Calculus and Analytical Geometry,	G.B. Thomas and R. L. Finny	Pearson Publication, 9th Edition	2010
3.	Analytic Geometry with Calculus,	Robert C. Yates,	Prentice Hall, Inc., New York.	1961

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	M
CO2	S	S	S	M	S
CO3	M	M	S	M	S
CO4	S	S	S	M	S
CO5	S	M	M	S	M

S- Strong; **M**-Medium.

CORE - IV	B.Sc Mathematics	Credits: 4
Course Code: M23UMA04	INTEGRAL CALCULUS	Contact Hour Per Week: 4

OBJECTIVES:

To focuses on basic technical concepts and to develop an idea of Integral calculus. The main objective is to impart the knowledge on fundamental topics such as

- Integration by parts Definite integral
- Bernoulli formula
- Multiple Integral
- Application of Beta and Gamma Functions

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Explain the logic behind the concept of Integration	K1
CO2	Solve the Definite Integral and Integration by Parts Problems.	K2
CO3	Analyze the Reduction formula	K4
CO4	Simplify the multiple integrals and its problems.	K4
CO5	Distinguish of Beta and Gamma Functions in evaluation of Double and Triple Integrals.	K3

UNIT I **(12 Hours)**

Reduction formulae -Types, integration of product of powers of algebraic and trigonometric functions, integration of product of powers of algebraic and logarithmic functions - Bernoulli's formula.

(Chapter1: Sections 13 and 14)

UNIT II **(12 Hours)**

Multiple Integrals - definition of double integrals - evaluation of double integrals – double integrals in polar coordinates - Change of order of integration.(Chapter5: Sections 1, 2.1, 2.2 and 3.1)

UNIT III   **(12 Hours)**

Triple integrals –applications of multiple integrals - volumes of solids of revolution - areas of curved surfaces–change of variables - Jacobian.(Chapter5: Sections 4, 5.1, 5.2, 5.3, 6.1,7 and Chapter6: 1.1,1.2)

UNIT IV   **(12 Hours)**

Beta and Gamma functions – infinite integral - definitions–recurrence formula of Gamma functions – properties of Beta and Gamma functions- relation between Beta and Gamma functions - Applications. (Chapter7: Sections 2.1,2.2,2.3, 3, 4, and 6.)

UNIT V   **(12 Hours)**

Geometric Applications of Integration – Areas under plane curves: Cartesian coordinates-Area of a closed curve – Areas in polar coordinates-Trapezoidal rule – Simpson's rule and Physical Applications of Integral calculus – Centroid – Centre of mass of an arc- Centre of mass of a plane area- Centroid of a solid of revolution – Centroid of a surface of revolution . (Chapter2: Sections 1.1 to 1.4 , 2.1,2.2 and Chapter3: 1.1 to 1.5 Simple Applications)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Calculus-Volume II	Narayanan S and Manicavachagom Pillay T.K.	S. Viswananthan Printers Pvt. Ltd.	2006

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1	Integral Calculus and Differential Equations	D. Chatterjee	Tata-McGraw Hill Publishing Company Ltd.	1999
2	Calculus	H. Anton, I. Birens and S. Davis	John Wiley and Sons, Inc.	2002
3	Calculus	G.B. Thomas and R.L. Finney	Pearson Education	2007

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	M
CO2	M	M	S	S	M
CO3	S	M	S	M	S
CO4	M	S	S	M	M
CO5	M	S	M	S	S

S- Strong; **M**-Medium.

SKILL ENHANCEMENT COURSE – III

SEC-III	B.Sc. MATHEMATICS	Credits: 2
Course Code: M23UMAS01	**SEC - III - MATHEMATICS FOR COMPETITIVE EXAMINATIONS - I**	**Contact Hour Per Week: 2**

OBJECTIVES:

To focuses on basic technical concepts and to develop an idea of aptitude examination. The main objective is to impart the knowledge on fundamental topics such as

- Partnership, Chain Rule,Time and Work
- Simplification , Square roots and Cube roots, Average
- Problems on Numbers, Problems on Ages, Surds & Indices
- Percentage, Profit and Loss, Ration and Proportions
- Numbers, H.C.F & L.C.M of Numbers

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Identify the logic behind Numbers , Simplification , Problems on Numbers, Percentage ,Partnership.	K1
CO2	Give Example H.C.F & L.C.M of Numbers ,Square roots and Cube roots,Problems on A ges,Profit and Loss, Chain Rule.	K2
CO3	Discover the problems on Decimal Fractions, Average, Surds & Indices, Ration and Proportions, Time and Work .	K3
CO4	Simplify Develop the problems on Percentage , Profit and Loss , Ration and Proportions and its problem.	K4
CO5	Show the Numbers ,Square roots and Cube roots, Problems on Numbers, Ration and Proportions, Chain Rule Problems.	K4

UNIT I (6 Hours)

Numbers ,H.C.F & L.C.M of Numbers ,Decimal Fractions.(Section-I: 1-3)

UNIT II (6 Hours)

Simplification , Square roots and Cube roots, Average .(Section-I: 4-6)

UNIT III (6 Hours)

Problems on Numbers, Problems on Ages, Surds & Indices.(Section-I: 7-9)

UNIT IV (6 Hours)

Percentage , Profit and Loss , Ration and Proportions.(Section-I:10-12)

UNIT V (6 Hours)

Partnership , Chain Rule ,Time and Work (Section-I: 13-15)

TEACHING METHODS:
Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Name of the Book	Author	Publisher	Year Of Publications
1.	Quantitative Aptitude for competitive Examinations	R.S.Aggarwal	S.Chand Co Ltd, 152, Annasalai, Chennai.	2001

REFERENCE BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Wiley's Quantitative Aptitude	P.A. Anand	Wiley's Publications	2015 First Edition

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M
CO2	S	M	S	M	S
CO3	M	S	M	S	M
CO4	S	M	S	M	M
CO5	S	S	M	S	S

S- Strong; **M**-Medium.

CORE - V	B.Sc. MATHEMATICS	Credits: 5
Course Code: M23UMA05	VECTOR ANALYSIS	Contact Hour Per Week: 6

OBJECTIVES:

To focuses on basic analytical concepts and to develop an idea of vector analysis. The main objective is to impart the knowledge on fundamental topics such as

- Vector Point function, scalar point function, Gradient of a scalar point functions
- Solenoidal and irrotational functions
- Line Integral ,Surface integral, Volume Integral
- Stoke's Theorem, Gauss-Divergence Theorem, Green's Theorem in two dimension

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES :

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Define Vector Point function, Line Integral, Dirichlet's Conditions	K1
CO2	Classify scalar point function, Surface integral, General	K2
CO3	Apply the Derivative of sum of vectors ,Volume Integral.	K3
CO4	Analyze the derivative of scalar Product ,Stoke's Theorem,	K4
CO5	Show the Solenoidal and irrational functions, Green's Theorem in two dimension.	K4

UNIT I: Vector differentiation   **(18 Hours)**

Vector differentiation- Limit of a vector function –continuity of vector function –some standard results-geometrical and physical application of vector- Partial derivative of vector function- simple problems.

UNIT II: Vector differentiation (Continued)   **(18 Hours)**

scalar point function - Vector Point function – level surface- Gradient of a scalar point functions- directional derivatives of a scalar point function- equation of tangent plane and normal line to a level surface –simple problems .

UNIT III: Vector differentiation (Continued)　　　　　**(18 Hours)**

　　　　Divergence and curl of a vector point function- Solenoidal and irrational functions –vector identities –simple problems .

UNIT IV: Vector integration　　　　　　　　　　　**(18 Hours)**

　　　　Definition- Line Integral –Surface integral –Volume Integral- (Statement only) – Problems.

UNIT V: Vector integration (Continued)　　　　　**(18 Hours)**

　　　　Stoke's Theorem- Gauss-Divergence Theorem- Green's Theorem in two dimension (Statement only) – Problems.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments.

TEXT BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1	Vector Analysis	Dr.P. R. Vittal and V. Malini,	Margham Publications, Chennai,	2006.

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Vector Calculus	Paul C. Matthews	Springer	2005 Seventh Edition

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M
CO2	S	S	M	M	S
CO3	S	M	M	S	M
CO4	S	M	S	M	S
CO5	S	M	M	S	S

S- Strong; **M**-Medium.

CORE - VI	B.Sc. MATHEMATICS	Credits: 5
Course Code: M23UMA06	DIFFERENTIAL EQUATIONS	Contact Hour Per Week: 6

OBJECTIVES:

To focuses on basic analytical concepts and to develop an idea of differential equations. The main objective is to impart the knowledge on fundamental topics such as

- Second order Linear Differential Equations with constant co-efficient
- Special methods of finding particular integral
- Clairaut's form , Simultaneous Differential Equation
- Partial differential equations
- Elimination of arbitrary constants, arbitrary functions
- Definitions of general, particular & Complete

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Identify the first order differential equation and its solutions.	K1
CO2	Illustrate the standard form of differential equations	K3
CO3	Idea behind the Homogenous equations and Lagrange equations.	K2
CO4	Formulate the Partial differential equations and Derivation of partial differential equations by elimination of constants, arbitrary functions.	K4
CO5	Execute the standard type of Partial differential equations.	K4

UNIT I: Differential Equations   **(18 Hours)**

Differential equation first order and Higher degree –Equation solvable for p, Equation solvable for y, Equation solvable for x – Clairaut's equation . Exact Differential equation.

UNIT II: Differential Equations (Continued)   **(18 Hours)**

Second order differential equation with constant coefficients – Standard types- $e^{ax}, sinax$ or $cosax, x^n, e^{ax} V$, Where V is a $sinax$ or $cosax, x^n$.

UNIT III: Differential Equations (Continued)   **(18 Hours)**

Method of variation of parameters-Linear Homogenous equation-Lagrange Linear equation-Simple problems.

UNIT IV: Partial Differential Equation   **(18 Hours)**

Partial differential equations - Derivation of partial differential equations by elimination of constants, arbitrary functions – Definitions of general ,particular & Complete Solutions of P.D.E.

UNIT V: Partial Differential Equation (Continued)   **(18 Hours)**

Standard types of first order equations – Solving Standard forms 1.f(p,q)=0 2.f(x,p,q)=0 , f(y,p,q)=0 ,f(z,p,q)=0 3.f(x,p)=f(y,p) 4.z=px+qy+f(p,q). Lagrange's Differential equations Pp+Qq=R – Charpit's Methods - Equations reducible to the standard forms.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Differential Equations and Laplace Transforms	P. R. Vittal	Margham Publications	2004

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Differential Equations and Integral Transforms	S. Sudha	Emerald Publishers	2003
2.	Calculus Volume III	S. Narayanan & T. K. Manicka vasagam Pillay	S. Viswanathan Pvt. Ltd.	2008
3.	Calculus	Pillai T.K.M; Narayan S	S.Viswanathan & Co	1997

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	M	S
CO2	M	S	S	M	S
CO3	M	S	M	M	S
CO4	S	M	M	S	S
CO5	S	M	S	M	S

S- Strong; **M**-Medium.

SEMESTER –III
SKILL ENHANCEMENT COURSE-IV

SEC - IV	B.Sc. MATHEMATICS	Credits: 2
Course Code: M23UMAS02	**SEC - IV - MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II**	**Contact Hour Per Week: 2**

OBJECTIVES:

To focuses on basic technical concepts and to develop an idea of aptitude examination. The main objective is to impart the knowledge on fundamental topics such as

- Pipes and Cisterns , Time and Distance
- Problems on Trains.Boats and Streams
- Alligation or mixture, Simple Interest,Compound Interest
- Logarithms, Area,Volume and Surface
- Clock and Calender.Permutation and Combination
- Probability , Odd man out Series

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	State the Pipes and Cisterns ,Boats and Streams, Compound Interest, Volume and Surface,.	K1
CO2	Illustrate the Time and Distance, Alligation or mixture,Logarithms ,Clock and Calender, Probability	K2
CO3	Solve the Problems on Trains, Simple Interest, Area,.	K3
CO4	Apply the Boats and Streams, Alligation or mixture,Simple Interest.	K4
CO5	Show the Area **,** Volume and Surface Area	K4

UNIT I **(6 Hours)**

Pipes and Cisterns , Time and Distance, (Section-I: 16-17)

UNIT II **(6 Hours)**

Problems on Trains, Boats and Streams, Alligation or mixture.

(Section-I: 18-20)

UNIT III   **(6 Hours)**

Simple Interest ,Compound Interest, Logarithms ,. (Section-I: 21-23)

UNIT IV   **(6 Hours)**

Area **,** Volume and Surface Area . (Section-I: 24,25,)

UNIT V   **(6 Hours)**

Calender and Clocks, (Section-I: 27,28).

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Name of the Book	Author	Publisher	Year Of Publications
1.	Quantitative Aptitude for competitive Examinations	R.S.Aggarwal	S.Chand Co Ltd, 152, Annasalai, Chennai.	2001

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Wiley's Quantitative Aptitude	P.A. Anand	Wiley's Publications	2015 First Edition

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M
CO2	S	M	S	M	S
CO3	M	S	M	S	M
CO4	S	M	S	M	S
CO5	S	M	M	S	S

S- Strong; **M**-Medium.

SEMESTER – IV

CORE - VII	B.Sc. MATHEMATICS	Credits: 4
Course Code: M23UMA07	TRANSFORMS TECHNIQUES	Contact Hour Per Week: 4

OBJECTIVES:

To focuses on basic analytical concepts and to develop an idea of Transforms Techniques. The main objective is to impart the knowledge on fundamental topics such as
- Laplace Transform
- Z- Transform

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES :

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Define Laplace Transform and its properties	K1
CO2	Classify the idea of the inverse Laplace transform and its applications.	K2
CO3	Apply the Fourier Transform and related problems.	K3
CO4	Analyze the Parsevals identies and the boundary value problem	K4
CO5	Show the Condition for Z – Transform and its problems.	K4

UNIT I: (Laplace Transforms)   **(12 Hours)**

Introduction – Definition – Transforms of Elementary functions – Properties of Laplace Transforms- Transform of periodic functions – Evaluation of integrals by Laplace Transforms – Problems.

UNIT II:(Inverse Laplace Transforms)   **(12 Hours)**

Method of partial fractions – other methods of finding inverse Transforms convolution Theorem- Application of differential equations – properties.

UNIT III: (Fourier Transforms)   **(12 Hours)**

Introduction : Definition – fourier integrals theorem- - Fourier transforms – properties of fouier Transform –Fourier sine and cosine Transforms-Problems.

UNIT IV: (Fourier Transforms continued)   **(12 Hours)**

Convolution, Parsevals identies for Fourtransforms – Application of Transforms to boundary value problems – Problems.

UNIT V: (Z - Transforms)   **(12 Hours)**

Definition – Some Standard Z-Transforms - Linearity properties –Damping rule- Some standard results- multiplication by n- Two basic theorem- Convolution theorem- convergence of Z-Transforms Evaluation of Inverse Z-Transforms - Application to difference Equations

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments.

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1	Higher Engineering Mathematics	Dr.B.S.Grewal	Khanna Publishers	2012

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Higher Engineering Mathematics	John Birds	Elviser	2010 6th Edition
2.	Vector Analysis, Analytical Solid Geometry & Sequences And Series	Vittal P R	Margham Publications	1999

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M
CO2	S	S	M	M	S
CO3	S	M	M	S	M
CO4	S	M	S	M	S
CO5	S	M	M	S	S

S- Strong; **M**-Medium.

CORE - VIII	B.Sc. MATHEMATICS	Credits: 4
Course Code: M23UMA08	ELEMENTS OF MATHEMATICAL ANALYSIS	Contact Hour Per Week: 4

OBJECTIVES

To focuses on basic analytical concepts and to develop an idea of real analysis. The main objective is to impart the knowledge on fundamental topics such as

- Functions, Sequence, Series
- Metric space and Continuous
- convergence and divergence
- Rearrangement of series
- Bounded sets and Totally Bounded sets

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

CO. Number	Statement	Knowledge level
CO1	Define Functions, Bounded sequences , Series of real numbers , Limits and Metric spaces , Open sets and closed sets.	K1
CO2	Demonstrate the Real Valued functions, Monotonic sequences , convergence and divergence , metric spaces limits in metric spaces, Discontinuous functions on R'.	K2
CO3	Examine Countablity, operations on convergent sequences, alternating series , Continuous functions on metric spaces, Connected sets.	K3
CO4	Differentiate the Convergent sequences and Divergent Sequences, Cauchy sequences, Rearrangement of series , Reformulation, Bounded sets and Totally Bounded sets.	K4
CO5	Analyze the Convergent sequences and Divergent Sequences, Cauchy sequences, Rearrangement of series , Reformulation, Bounded sets and Totally Bounded sets.	K4

UNIT I: **(12 Hours)**

Functions – Real Valued functions – Equivalence – Countablity – Real Numbers – Least upper bounds. Sequence of real numbers – Definition of sequence and subsequence – Limit of a sequence – Convergent sequences – Divergent Sequences.
(Chapter 1: Section: 1.3 to 1.7 Chapter 2: Section :2.1-2.4)

UNIT II: **(12 Hours)**

Bounded sequences – Monotonic sequences – operations on convergent sequences – operations on Divergent sequences – Limit superior and limit inferior – Cauchy sequences. (Chapter 2: Section: 2.5 to 2.10)

UNIT III: **(12 Hours)**

Series of real numbers – convergence and divergence – series with non negative terms – alternating series – conditional convergence and absolute convergence – Rearrangement of series – Test for absolute convergence – series whose terms form a non increasing sequence.
(Chapter 3: Section: 3.1 to 3.7)

UNIT IV: **(12 Hours)**

Limits and Metric spaces – limit of a function on the real line – metric spaces limits in metric spaces. Continuous functions on metric spaces- Functions continuous at a point on the real line – Reformulation – functions continuous on a metric space
 (Chapter 4: Section: 4.1 to 4.3 Chapter 5, Section :5.1 to 5.3)

UNIT V: **(12 Hours)**

Open sets – closed sets – Discontinuous functions on R'. More about open sets – Connected sets –Bounded sets and Totally Bounded sets.
(Chapter 5: Section: 5.4 to 5.6 , Chapter 6 , Section : 6.1to 6.3)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Methods of Real Analysis	Richard R. Goldberg .	Oxford & IBH Publishing Co.Pvt.Ltd.	1970

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	A First course in Real Analysis .	Sterling K . Barberian.	Springer (India) Private Limited, New Delhi.	2004
2.	Mathematical Analysis	Tom M. Apostel	Narosa Publications, NewDelhi	2002
3.	Real Analysis	M.S.Rangachari	New Century Book House, chennai.	1996

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M
CO2	M	M	S	M	S
CO3	M	S	M	S	M
CO4	S	M	M	S	S
CO5	S	S	S	S	S

S- Strong; **M**-Medium.

SEC-V	B.Sc. MATHEMATICS	Credits: 2
Course Code: M23UMAS03	**SEC - V - MATHEMATICS FOR COMPETITIVE EXAMINATIONS - III**	**Contact Hour Per Week: 2**

OBJECTIVES:

To focuses on basic technical concepts and to develop an idea of aptitude examination. The main objective is to impart the knowledge on fundamental topics such as
- Races and games of skills
- Stocks and Shares
- Permutation and combination.
- True discount and Bankers Discount
- Clock and Calender.
- Probability , Odd Man Out Series

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	State the Races and games of skills and Stocks and Shares .	K1
CO2	Illustrate the Permutation and combination, Probability	K2
CO3	Solve the Problems on True discount and Bankers Discount.	K3
CO4	Apply the Heights and Distances, Odd Man Out and series.	K4
CO5	Show the Tabulation , Bar Graphs.	K4

UNIT I: **(6 Hours)**

Races and games of skills, Stocks and Shares.

(Section-I: 26 ,29)

UNIT II: **(6 Hours)**

Permutation and combination, Probability.

(Section-I: 30 ,31)

UNIT III: (6 Hours)

True discount and Bankers Discount. (Section-I: 32-33)

UNIT IV: (6 Hours)

Heights and Distances, Odd Man Out and series. (Section-I:34,35)

UNIT V: (6 Hours)

Tabulation , Bar Graphs (Section-II: 36,37)

TEXT BOOK:

S. No	Name of the Book	Author	Publisher	Year Of Publications
1.	Quantitative Aptitude for competitive Examinations	R.S.Aggarwal	S.Chand Co Ltd, 152, Annasalai, Chennai.	2001

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Wiley's Quantitative Aptitude	P.A. Anand	Wiley's Publications	2015 First Edition

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M
CO2	S	M	S	M	S
CO3	M	S	M	S	M
CO4	S	M	S	M	S
CO5	S	M	M	S	S

S- Strong; **M**-Medium.

ECC-I	**B.Sc. MATHEMATICS**	**Credits: 2**
Course Code: M23UES01	**ENVIRONMENTAL STUDIES**	**Contact Hour Per Week: 2**

OBJECTIVES

To provide basic knowledge on the environment, ecosystem, natural resources, biodiversity and conservation, pollution, environmental policy awareness, and management. This course is also describes the population explosions and disaster management.

UNIT-I FUNDAMENTALS   **[6 Hours]**

Environment – definition – scope. Ecosystem- Types- Terrestrial and Aquatic ecosystem, structure and function of ecosystems- producers, consumers and decomposers - energy flow in the ecosystem - ecological succession – food chain, food webs and ecological pyramids.

UNIT-II NATURAL RESOURCES   **[6 Hours]**

Renewable Resources - air, water, soil, forest and wildlife resources. Non-renewable – minerals coal, oil and gas. Environmental problems related to the extraction and use of natural resources.

UNIT-III BIODIVERSITY   **[6 Hours]**

Definition – values – consumption use, productive social, ethical, aesthetic and option values threats to bio diversity – hotspots of biodiversity, *In situ, ex situ* conservation.

UNIT-IV ENVIRONMENTAL POLLUTION   **[6 Hours]**

Definition – causes, effects and mitigation measures – air pollution, water pollution, soil pollution noise pollution, thermal pollution – nuclear hazards– solid wastes, acid rain – climate change, ozone depletion and global warming. Environmental laws and regulations in India.

UNIT – V POPULATION AND ENVIRONMENT   **[6 Hours]**

Population explosion – Environment and human health – HIV/ AIDS – women and child welfare – resettlement and rehabilitation of people, Environmental Disaster Management.

TEXT BOOKS:

S. No.	Title of the Book	Author	Publishing Company	Year of Publication
1.	Textbook for Environmental Studies for Undergraduate Courses of all branches of higher education	Erach Bharucha	University Grants Commission and Bharatividya peeth Institute of Environment Education and Research, Pune.	2004
2.	Environmental Studies	Anubha Kaushik	New Age International Publishers, NewDelhi	2012
3.	Environmental Studies for Undergraduate Courses - As Per UGC Notified Syllabus	Sushmita Baskar and R. Baskar	Unicorn Books Publishers	2007
4.	Textbook of Environmental Studies for Undergraduate Courses	Erach Bharucha	Second Edition Orient Black Swan Publishers	2013

REFERENCE BOOKS:

S. No.	Title of the Book	Author	Publishing Company	Year
1	Environmental Pollution: Causes, Effects and Control	K.C.Agarwal	Nidhi Publishers (India), Bikanir.	2001
2	Essentials of Ecology and Environmental Sciences	S.V.S.Rana	PrenticeHall of India Private Limited, New Delhi, India.	2005
3	Modern Concepts of Ecology	H.D.Kumar	Vikas Publishing House Private Ltd.	1982
4	Environmental Studies	Sanjay Kumar Batra,KanchanBatra, HarpreetKaur andParul Pant	Taxmans Publication.	2018
5	Ecology: From Individuals to Ecosystems	Michael Begon, olin R. Townsend and John L. Harper	Blackwell Publishing Company.	2006

CORE- IX	B.Sc. MATHEMATICS	Credits: 5
Course Code: M23UMA09	**ABSTRACT ALGEBRA**	**Contact Hour Per Week: 5**

OBJECTIVES

To focuses on basic analytical concepts and to develop an idea of modern algebra. The main objective is to impart the knowledge on fundamental topics such as

- Groups, cyclic groups
- Normal groups, homomorphism, Automorphism
- Rings, integral domain
- Quotient Rings – Maximum and Prime Ideals
- Field and Principal ideal Ring

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Define Groups, Normal Subgroups , Rings, Sub Rings ,Integral Domain .	K1
CO2	Give Example of Subgroups, Quotient groups **,**Elementary Properties of Rings ,Ideals, Order Integral Domain.	K2
CO3	Apply the Cyclic groups, Isomorphism, Types of Rings ,Maximum and Prime Ideals , Euclidean Domain .	K3
CO4	Analyze Order of an elements, Permutation groups, Characteristic of a Ring, Homomorphism of Rings , Every P.I.D is a U.F.D, Cosets and Lagrange's Theorem,Unique factorization Domain .	K4
CO5	Differentiate the Order of an elements, Permutation groups, Characteristic of a Ring, Homomorphism of Rings , Every P.I.D is a U.F.D, Cosets and Lagrange's Theorem,Unique factorization Domain .	K4

UNIT I: (15 Hours)

Groups (Binary Operations)-Subgroups –Cyclic groups –Order of an elements- Cosets and Lagrange's Theorem.
Chapter : 3 Section 3.5 – 3.8

UNIT II: (15 Hours)

Normal Subgroups and Quotient groups **–** Isomorphism **–** Homomorphism , Permutation groups.
Chapter: 3 Section 3.9 - 3.11

UNIT III: (15 Hours)

Rings Definitions and Examples - Elementary Properties of Rings – Isomorphism - Types of Rings - Characteristic of a Ring.
Chapter : 4 Section 4.1 -4.5

UNIT IV: (15 Hours)

Sub Rings – Ideals – Quotient Rings – Maximum and Prime Ideals - Homomorphism of Rings .
Chapter : 4 Section 4.6-4.10

UNIT V: (15 Hours)

The Field of Quotient of an Integral Domain – Order Integral Domain- Unique factorization Domain - Euclidean Domain – Every P.I.D is a U.F.D.
Chapter : 4 Section 4.11-4.15

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Modern Algebra	Arumugam. S & Isaac.A.T.	Scitech Publications PVT LTD Chennai.	July 2008

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	A first course in modern algebra	A.R.Vasistha	Krishna PrekasanMandhir, 9, Shivaji Road, Meerut(UP)	1983
2.	Modern Algebra	M.L.Santiago	Tata McGraw Hill, New Delhi.	1994
3.	Modern Algebra	K.Viswanatha Naik	Emerald Publishers, 135, Anna Salai, Chennai.	1988
4.	Topics in Algebra	I.N.Herstein.	John Wiley, Newyork.	1975

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S
CO2	S	S	M	M	S
CO3	S	S	M	S	S
CO4	M	S	M	S	S
CO5	S	M	M	S	S

S- Strong; **M**-Medium.

SEMESTER – V

CORE- X	B.Sc. MATHEMATICS	Credits: 5
Course Code: M23UMA10	REAL ANALYSIS	Contact Hour Per Week: 5

OBJECTIVES

To focuses on basic analytical concepts and to develop an idea of real analysis. The main objective is to impart the knowledge on fundamental topics such as

- Complete metric spaces and Compact metric spaces
- Continuous functions
- Sets of measure zero
- Existence of Riemann integrals
- Rolle's theorem and Law of Mean
- uniform convergence of sequence of functions
- Hyperbolic Functions
- The Exponential Function Logarithmic Function
- Trigonometric Function –Taylors Theorem
- The Binomial Theorem
- Theorems on Improper integrals

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Define Complete metric spaces , Sets of measure zero , Rolle's theorem , Hyperbolic Functions , The Binomial Theorem .	K1
CO2	Express the Compact metric spaces ,Riemann integral , Law of Mean, The Exponential Function Logarithmic Function, L'Hospital Rule .	K2
CO3	Apply the Continuous functions on Compact Metric spaces, Existence of Riemann integrals, Improper integrals ,Trigonometric Function, uniform , convergence of sequence of functions.	K3
CO4	Analyze the Continuity of the inverse functions – Uniform continuity . Properties of Riemann integrals ,Theorems on Improper integrals, Taylors Theorem , consequences of uniform convergences.	K4
CO5	Discover the Complete metric spaces, Existence of Riemann integrals , Derivatives, Uniform continuity.	K4

UNIT I: (15 Hours)

Complete metric spaces - Compact metric spaces – Continuous functions on Compact Metric spaces – Continuity of the inverse functions – Uniform continuity .

(Chapter 6 . Section: 6.4-6.8)

UNIT II: (15 Hours)

Sets of measure zero - Definition of the Riemann integral – Existence of Riemann integrals – Properties of Riemann integrals – Derivatives

(Chapter 7 ,Section7.1 -7.5).

UNIT III: (15 Hours)

Rolle's theorem – Law of Mean – Fundamental theorem of calculus – Improper integrals – Theorems on Improper integrals

(Chapter 7 ,Section 7.6 to 7.10).

UNIT IV: (15 Hours)

Hyperbolic Functions –The Exponential Function Logarithmic   Function-The Trigonometric   Function –Taylors Theorem

(Chapter 8 , Section 8.1-8.5)

UNIT V: (15 Hours)

The Binomial Theorem –L'Hospital Rule -Point wise convergence of sequence of functions – uniform convergence of sequence of functions – consequences of uniform convergences

(Chapter 8 Section 8.6 to 8.7 ,Chapter 9.   9.1 to 9.3)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No.	Title of the Book	Author	Publisher	Year of Publication
1.	Methods of Real Analysis.	Richard R. Goldberg.	IBM Publishing New Delhi.	1970

REFERENCE BOOKS:

S. No.	Title of the Book	Author	Publisher	Year of Publication
1.	A First course in Real Analysis.	Sterling K Barberian.	Springer (India) Private Limited, New Delhi.	2004
2.	Mathematical Analysis	Tom M. Apostal	Narosa Publications, NewDelhi	2002
3.	Real Analysis	M.S.Rangachari	New Century Book House, Chennai.	1996

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M
CO2	S	S	M	S	S
CO3	S	M	M	S	M
CO4	S	M	M	M	S
CO5	M	S	M	S	S

S- Strong; **M**-Medium.

CORE- XI	B.Sc. MATHEMATICS	Credits: 4
Course Code: M23UMA11	MATHEMATICAL MODELING	Contact Hour Per Week: 5

OBJECTIVES

To focuses on basic technical concepts and to develop an idea of mathematical modeling. The main objective is to impart the knowledge on fundamental topics such as

- Linear growth model
- Non-linear growth and decay models
- Modeling in population dynamics
- Modeling of epidemics
- Modeling in second order O.D. E.
- Elliptic motion of a satellites
- Modeling through difference equations
- Harrod model
- Modeling through graphs
- Communication network and Detection of clique

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Find the Ordinary differential equation ,Modeling in population dynamics , Modeling in second order O.D.E. Modeling through difference equations ,Modeling through graphs .	K1
CO2	Give Example Linear growth model , Prey-predator models , Modeling of planetary motion ,Linear difference equation , representing results of tournament .	K2
CO3	Generlize the Non-linear growth and decay models ,Multi-species models , Circular motion , Harrod model , Food web – Communication network .	K3
CO4	Analyze the Diffusion of glucose or a medicine in the bloodstream, A model for diabetic-mellitus, Elliptic motion of a satellites , Applications of Actuarial science, Terms of signed graph.	K4
CO5	Sketch out the Diffusion of glucose or a medicine in the bloodstream, A model for diabetic-mellitus, Elliptic motion of a satellites , Detection of clique , Terms of signed graph.	K4

UNIT I: (15 Hours)

Ordinary differential equation – Linear growth model – Growth of science and scientists – Non-linear growth and decay models – Diffusion of glucose or a medicine in the bloodstream. Chapter 2: 2.1 – 2.3 , 2.4.2

UNIT II: **(15 Hours)**

Modeling in population dynamics – Prey-predator models – Competition models – Multi-species models – Modeling of epidemics – Simple epidemic models – A model for diabetic-mellitus.
Chapter 3: 3.1.1 – 3.1.3, 3.2.1 & 3.5.1

UNIT III: **(15 Hours)**

Modeling in second order O.D.E. – Modeling of planetary motion – Motion under central force – Circular motion – Elliptic motion of a satellites – Rectilinear motion. Chapter 4: 4.1.1 – 4.3.1

UNIT IV: **(15 Hours)**

Modeling through difference equations – Linear difference equation – Obtaining complementary function by use of matrices – Harrod model – cob-web model – Applications of Actuarial science.
Chapter 5: 5.2.1 – 5.2.6, 5.3.1, 5.3.2 & 5.3.4

UNIT V: **(15 Hours)**

Modeling through graphs – seven bridge problem – representing results of tournament – Genetic graph – Food web – Communication network – Matrices associated with a directed graph – Detection of clique – Terms of signed graph. Chapter 7: 7.1.2 – 7.3.1

TEACHING METHODS:
Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Mathematical Modeling	J. N. Kapur	Wiley Eastern Limited, New Age International Pvt. Ltd.,	2013

REFERENCE BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Mathematical Models in Biology and Medicine	J. N. Kapur	Wiley Eastern Limited, New Age International Pvt. Ltd.,	1985

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S
CO2	M	M	S	S	M
CO3	S	S	S	M	S
CO4	M	S	M	M	S
CO5	S	S	M	M	S

S- Strong; **M**-Medium.

SEMESTER – V
DISCIPLINE SPECIFIC ELECTIVE – I

DSE-I	B.Sc. MATHEMATICS	Credits: 3
Course Code: **M23UMADSE1**	**DISCIPLINE SPECIFIC ELECTIVE - I –** **OPERATIONS RESEARCH**	**Contact Hour** **Per Week: 5**

OBJECTIVES

To focuses on basic technical concepts and to develop an idea of operation research. The main objective is to impart the knowledge on fundamental topics such as

- Formulation of Linear Programming Problems
- Simplex Algorithm
- Big M Method
- Two Phase Simplex Method
- Formation of Dual Problem
- Dual Simplex Method
- Stepping Stone Problem
- Transportation Problem
- Assignment Problem
- Maximization Assignment Problem
- Assignment Problem
- Hungarian Method

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

COs	Statement	Knowledge level
CO1	Recognize the Scope of Operations Research ,Simplex Algorithm , Formation of Dual Problem, Mathematical Formulation , Transportation Problem .	K1
CO2	Classify the Phases of Operation Research, Big M Method ,Dual Problem, Optimal Solution , Assignment Problem .	K2
CO3	Apply the Models in Operation Research ,Big M Method , Important Results in Duality ,Optimality Test ,Hungarian Method Procedure.	K3

CO4	Analyze Formulation of Linear Programming Problems, Two Phase Simplex Method ,Dual Simplex Method, Stepping Stone Problem Unbalanced Assignment Problem.	K4
CO5	Solve the Graphical Methods , Two Phase Simplex Method , Dual Simplex Method, Optimal Solution ,Maximization Assignment Problem.	K4

UNIT I: (15 Hours)

Introduction- Scope of Operations Research –Phases of Operation Research- Models in Operation Research – Uses and limitation of Operation Research – Formulation of Linear Programming Problems - Graphical Methods .[Chap -1- Section 1.1-1.4 and 1.6, Chapter 2 : Section 2.2, Chapter 3:Section 3.1 -3.4)

UNIT II: (15 Hours)

Introduction-Simplex Algorithm –Big M Method –Two Phase Simplex Method . [Chap-4- Section 4.1-4.2 ,Chapter 5,Section 5.1-5.3]

UNIT III: (15 Hours)

Introduction- Formation of Dual Problem Definition of Dual Problem-Important Results in Duality -Dual Simplex Method [Chap-6 .Section 6.1-6.5]

UNIT IV: (15 Hours)

Introduction-Mathematical Formulation Definitions – Optimal Solution – Optimality Test – Stepping Stone Problem.

[Chap-8 –Section 8.1-8.6]

UNIT V: (15 Hours)

Introduction – Transportation Problem – Assignment Problem – Hungarian   Method   Procedure-Unbalanced   Assignment   Problem-Maximization Assignment Problem.

[Chap -9 ,Section 9.1-9.6]

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Name of the Book	Author	Publisher	Year of Publication
1.	Operations Research, Second Edition	S.Kalavathy	Vikas Publishing House, New Delhi	2013

REFERENCE BOOKS:

S. No	Name of the Book	Author	Publisher	Year of Publication
1.	Operations Research 15th Edition	KantiSwarup, P.K.Guptaand Manmohan	Sultan Chand & Sons, Chennai.	2010
2.	Operations Research Principles & Practice	Ravindran A	John Wiley	2005
3.	Operations Research An Introduction	Hamdy A.Taha	Prentice Hall Of India	2005

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	S
CO2	M	M	S	S	M
CO3	S	S	S	M	S
CO4	M	M	M	M	S
CO5	S	S	M	M	S

S- Strong; **M**-Medium.

DSE-I	B.Sc. MATHEMATICS	Credits: 3
Course Code: M23UMADSE2	DISCIPLINE SPECIFIC ELECTIVE - I – NUMBER THEORY	Contact Hour Per Week: 5

OBJECTIVES

To focuses on basic analytical concepts and to develop an idea of number theory. The main objective is to impart the knowledge on fundamental topics such as

- Divisibility of integers-Division algorithm
- Euclidean algorithm, Prime and Composite numbers
- Divisors of an integer-Arithmetic functions
- Perfect numbers, Euler function, Congruence's
- Mersenne numbers , Gap Theorem- infinitude of primes
- Factor theorem for polynomials
- Number of solutions
- Congruence's of prime modulii

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Identify the Peano's axioms, Coprime, Euler function ,residue classes, polynomials.	K1
CO2	Classify the mathematical induction, Sieve of Eratosthenes , greatest integer function,complete and least residue system, Number of solutions.	K2
CO3	Analyze the trichotomy law ,absolute value , Binomial Theorem, fundamental theorem of Arithmetic, Euclid's Theorem on perfect number, multiple roots-Linear Diophantine Equation.	K3
CO4	Discover the Division algorithm – G.C.D (HCF)-Euclidean algorithm ,perfect numbers ,Euclid's Theorem on perfect number , Mersenne numbers , Wolstenholme theorem,L.D.E of three of more variables.	K4
CO5	Sketch out the Division algorithm – G.C.D (HCF)-Euclidean algorithm ,perfect numbers ,Euclid's Theorem on perfect number , Mersenne numbers ,Wilson theorem and its converse, Lagrange's Theorem-Wolstenholme theorem,L.D.E of three of more variables.	K4

UNIT I: **(15 Hours)**

Peano's axioms – mathematical induction – addition and multiplication – order relation – principal of well ordering-Addition and multiplication- Positive and negative inegers- trichotomy law –absolute value – Binomial Theorem-Associates- Division algorithm – gcd(HCF)-Euclidean algorithm – L.C.M.   (Pages: 1-59)

UNIT II: **(15 Hours)**

Coprime -Sieve of Eratosthenes – Euclid's Theorem- unique factorization - fundamental theorem of Arithmetic- positional representation of integer- number of divisors- sum of divisors- symbol $d(n)$, $\sigma(n)$-Arithmetic functions – perfect numbers – Euclid's Theorem on perfect number – Amicable numbers.   (Pages : 60-92)

UNIT III: **(15 Hours)**

Euler function $\varphi(n)$-greatest integer function –Mobious function $\mu(n)$ -inverse formula and uts cinverse- Fibonacci number-Generating function –Lucas numbers-General discussion –Fermat's conjecture –Fermat numbers- Gold Bach's conjecture –Mersenne numbers – Gap Theorem-ifinitude of primes.   (Pages93-162)

UNIT IV: **(15 Hours)**

Definition- residue classes- complete and least residue system-reduced systems- casting out 9 –magic numbers-Divisibility tests-lineat congruences – solution of congruences- Chinese remainder theorem-Little Fermat's Theorem- Euler's extension-inverse modulo- Wilson theorem and its converse-Lagrange's Theorem-Wolstenholme theorem.   (Pages:163-244)

UNIT V: **(15 Hours)**

Factor theorem for polynomials- Number of solutions-congruences of prime modulii- composite modulii- identical congruences – conditional congruences – multiple roots-Linear Diophantine Equation –solutions-positive solution –L.D.E of three of more variables-simultaneous Diophantine Equations.   (Pages:245-442)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Elements of Number theory	S. Kumaravelu and Susheela Kumaravelu	SKV publication	2002

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Elements of Number theory	David M.Burton	Tata Mc-Graw Hill publication	2010
2.	An Introduction to Theory of Numbers	Ivan Niven and H. Zuckerman	John wiley and sons	2008
3.	Number Theory	Shailesh Shirail	Indian Acadamy	2003

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	M
CO2	S	M	S	M	S
CO3	S	M	S	S	M
CO4	M	M	S	M	S
CO5	S	M	S	M	S

S- Strong; **M**-Medium.

DSE-I	B.Sc. MATHEMATICS	Credits: 3
Course Code: **M23UMADSE3**	**DISCIPLINE SPECIFIC ELECTIVE - I – ASTRONOMY**	**Contact Hour Per Week: 5**

OBJECTIVES

To focuses on basic analytical concepts and to develop an idea of astronomy. The main objective is to impart the knowledge on fundamental topics such as

- Standard formulae in Spherical Trigonometry
- Diurnal motion Astronomical Refraction.
- Geocentric parallax
- Kepler's laws of planetary motion
- Fixing the position of the First point of Aries
- Eclipses
- General description of solar system and Stellar universe

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Identify the Standard formulae in Spherical Trigonometry , Astronomical Refraction, Kepler's laws of planetary motion, Fixing the Ecliptic ,Eclipses.	K1
CO2	Demonstrate the Celestial sphere, Tangent and Cassini's formulae ,Newton's deductions from Kepler's Laws ,the position of the First point of Aries Lunar eclipses .	K2
CO3	Explain the Celestial co-ordinates and their conversions ,Geocentric parallax Equation of Time, The Moon , Different phases ,Stellar universe .	K3
CO4	Calculate the Zones of Earth - Dip , Twilight, Heliocentric parallax , Conversion of time ,Metonic cycle , Tides , Stellar universe .	K4
CO5	Analyze the Zones of Earth - Dip , Twilight, Heliocentric parallax , Conversion of time ,Metonic cycle , Tides , Stellar universe .	K4

UNIT I: (15 Hours)

Standard formulae in Spherical Trigonometry – Statements only – Celestial sphere – Celestial co-ordinates and their conversions – Diurnal motion - Problems connected with Diurnal Motion - Zones of Earth - Dip – Twilight – Problems.

UNIT II: (15 Hours)

Astronomical Refraction – Tangent and Cassini's formulae – Geocentric parallax – Heliocentric parallax – problems.

UNIT III: (15 Hours)

Kepler's laws of planetary motion – Newton's deductions from Kepler's Laws -Equation of Time – Seasons – Calender – Conversion of time – problems.

UNIT IV: (15 Hours)

Fixing the Ecliptic – Fixing the position of the First point of Aries (Flamsteed's method) - The Moon – Different phases - Metonic cycle – Tides – problems .

UNIT V: (15 Hours)

Eclipses – solar eclipses - Lunar eclipses – General description of solar system and Stellar universe – problems.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Astronomy	Kumaravelu and Susila Kumaravelu	S.Kumaravelu, MurugaBhavanam, Chidambara Nagar, Nagarkoil-2.	1984

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Astronomy	Andrew Fraknoi, David Morrison, Sidney C. Wolff	Samurai Media Limited	2017
2.	Indian Mathematics And Astronomy	S Balachandra Rao	Indian Acadamy	1994

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	M
CO2	S	M	S	M	S
CO3	S	S	S	S	M
CO4	M	M	S	M	S
CO5	S	M	S	M	S

S- Strong; **M**-Medium.

DSE-II	B.Sc. MATHEMATICS	Credits: 3
Course Code: M23UMADSE4	**DISCIPLINE SPECIFIC ELECTIVE - II – NUMERICAL METHODS**	**Contact Hour Per Week: 5**

OBJECTIVES:

To introduces fundamental concepts of Numerical methods. It covers concepts such as

- Bisection method, Iteration method, Regular Falsi method, Newton-Raphson method, Direct methods,
- Gauss elimination method , Gauss-Jordan method, Iterative methods , Jacobi method, Gauss-Seidal method, Gregory-Newton interpolation formulae , Interpolation with unequal intervals,
- Lagrange's interpolation formula , Inverse interpolation, Trapezoidal rule, Simpson's one third rule, Simpson's three-eighth rule,
- Taylor series method, Euler's method,
- Runge- Kutta methods-2nd Order, Runge- Kutta methods-3rd Order, Runge- Kutta methods-4th Order.

It provides technical skills to understand and study various concepts in Numerical analysis.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge Level
CO1	Acquiring knowledge of basic idea of the solution of algebraic and transcendental equations.	K1
CO2	Understand the Solution of simultaneous linear algebraic equations.	K2
CO3	Demonstrate understanding of the importance of interpolation	K2
CO4	Develop the idea about the Numerical differentiation and integration .	K4
CO5	Understanding the Numerical solution of ordinary differential equation	K3

UNIT I: **(15 Hours)**
Introduction to numerical analysis - The solution of algebraic and transcendental equations – Bisection method – Iteration method – Regular Falsi method, Newton-Raphson method.

UNIT II: **(15 Hours)**
Solution of simultaneous linear algebraic equations – Direct methods – Gauss elimination method – Gauss-Jordan method – Iterative methods – Jacobi method – Gauss-Seidal method.

UNIT III: **(15 Hours)**
Finite differences - Interpolation for equal intervals – Gregory Newton interpolation formulae – Interpolation with unequal intervals – Lagrange's interpolation formula – Inverse interpolation.

UNIT IV: **(15 Hours)**
Numerical differentiation and integration – Newton's formulae to compute the derivative – Numerical integration – A general quadrature formula – Trapezoidal rule - Simpson's one third rule – Simpson's three-eighth rule.

UNIT V: **(15 Hours)**
Numerical solution of ordinary differential equation – Taylor series method – Euler's method – Runge- Kutta methods-2nd Order - Runge- Kutta methods-3rd Order – Runge- Kutta methods-4th Order -Predictor corrector methods.

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1.	Numerical Methods	P.Kandasamy, K.Thilagavath, K.Gunavathy	Chand & Company limited, NewDelhi	2009

Unit I - Chapter 3: 3.1, 3.1.1, 3.2, 3.2.1, 3.2.2, 3.3, 3.3.1, 3.4, 3.4.1, 3.4.3, 3.4.4.
Unit II - Chapter 4: 4.1, 4.2, 4.2.1, 4.7, 4.8, 4.9.

Unit III - Chapter 5: 5.1, 5.2, Chapter 6: 6.1, 6.2, 6.3, Chapter 8: 8.7, 8.8.

Unit IV- Chapter 9: 9.1, 9.2, 9.3, 9.7, 9.8, 9.9, 9.10, 9.13, 9.14.

Unit V - Chapter 11: 11.5, 11.9, 11.12, 11.13, 11.16, 11.17.

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1.	Introducing methods of Numerical analysis	S. S. Sastry	Prentice Hall of India private limited, New Delhi	3rd Edition 2002
2	Numerical Methods	Vedamurthy V.N; Iyengar S.N	Vikas Publishing House	2008
3	Elementary Numerical Analysis	Samuel D.Conte; Carl De Boor	Narosa Publishing House	1981
4	Numerical Analysis	Richard Bronson	Thomson India Limited	2002

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	M
CO2	M	M	S	S	M
CO3	S	S	S	M	S
CO4	M	S	S	M	M
CO5	M	S	M	S	S

S- Strong; **M**-Medium.

DISCIPLINE SPECIFIC ELECTIVE – II

DSE-II	B.Sc. MATHEMATICS	Credits: 3
Course Code: M23UMADSE5	DISCIPLINE SPECIFIC ELECTIVE - II – MATHEMATICAL STATISTICS	Contact Hour Per Week: 5

OBJECTIVES

To focuses on basic analytical concepts and to develop an idea of probability theory. The main objective is to impart the knowledge on fundamental topics such as

- Probability Axioms, conditional probability
- Probability distribution
- Discrete and continuous Random variables
- Binomial, Poisson, Gamma, Normal distribution
- Functions of a random variable
- Regression model

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Identify the probability Axioms ,Random variable ,Expected value ,Two point distribution ,Regression model .	K1
CO2	Classify the conditional probability ,probability distribution of a random variable Functions of a random variable ,Binomial distribution ,one way analysis of variance .	K2
CO3	Apply the Baye's theorem, Discrete and continuous variables , Moment generating functions ,Normal distribution , Two way analysis of variance .	K3
CO4	Calculate the independent events ,Discrete and continuous variables , Moment generating function, Chebychev's inequality ,one way analysis of variance .	K4
CO5	Examine the independent events ,Discrete and continuous variables , Moment generating function, Chebychev's inequality ,one way analysis of variance .	K4

UNIT I: **(15 Hours)**

Introduction – probability Axioms – conditional probability – Baye's theorem – independent events – problems.

UNIT II: **(15 Hours)**

Random variable – probability distribution of a random variable – Discrete and continuous variables – problems.

UNIT III: **(15 Hours)**

Expected value – Functions of a random variable – Moment generating functions – problems.

UNIT IV: **(15 Hours)**

Two point distribution – Binomial distribution – Poisson distribution – Gamma distribution – Normal distribution – Chebychev's inequality – problems.

UNIT V: **(15 Hours)**

Regression model – one way analysis of variance – Two way analysis of variance – problems.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	An Introduction to Probability Theory and Mathematical Statistics	V.K.Rokatgi	Wiley Eastern Publication, NewDelhi	1985

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Probability theory and Mathematical Statistics	Marek - Fisher	John Wiley and sons, NewYork	1956
2.	Mathematical Statistics	Kapoor J.N, Saxena H.C	S.Chand & Company	2003
3.	Elements Of Probability And Statistics	Baisnab A.P, Jas M	Tata Mcgraw Hill	2001

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	S
CO2	S	S	M	M	S
CO3	M	S	S	M	S
CO4	M	S	M	M	S
CO5	S	S	M	S	S

S- Strong; **M**-Medium.

SEMESTER – V
DISCIPLINE SPECIFIC ELECTIVE –II

DSE-II	B.Sc. MATHEMATICS	Credits: 3
Course Code: M23UMADSE6	**DISCIPLINE SPECIFIC ELECTIVE - II – DIFFERENCE EQUATIONS WITH APPLICATIONS**	**Contact Hour Per Week: 5**

OBJECTIVES:

To focuses on difference equations concepts and to develop an application in differential equation. It implements the concepts such as

- Difference Calculus, Linear Difference Equations,
- Initial value problems for linear systems,
- Stability of linear systems,
- Asymptotic analysis of sums.

In addition, it also covers the methods to process the applications of difference equations.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge Level
CO1	Define the theory of Difference Calculus for building applications.	K1
CO2	Illustrate the theory of Linear Difference Equations and its related results.	K2
CO3	Demonstrate the Linear Difference Equations and properties of difference equation.	K4
CO4	Implement method for Initial value problems for linear systems, Stability of linear systems.	K3
CO5	Apply Asymptotic analysis of sums and its applications.	K3

UNIT I: Difference Calculus: (15 Hours)
Difference operator – Summation – Generating function – Approximate summation.　(Chapter 2 Sections 2.1 to 2.3)

UNIT II: Linear Difference Equations: (15 Hours)
First order equations – General results for linear equations.
(Chapter 3 Sections 3.1 to 3.2)

UNIT III: Linear Difference Equations(Contd.): **(15 Hours)**
Equations with constant coefficients – Equations with variable coefficients – z – transform. (Chapter 3 Sections 3.3,3.5 and 3.7)

UNIT IV: **(15 Hours)**
Initial value problems for linear systems – Stability of linear systems. (Chapter 4 Sections 4.1 to 4.3)

UNIT V: **(15 Hours)**
Asymptotic analysis of sums – Linear equations
(Chapter 5 Sections 5.1 to 5.3)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Difference Equations	W.G.Kelley and A.C.Peterson	Academic press, New York	1991

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	An Introduction to Difference Equations	S.N.Elaydi	Springer – Verleg, NewYork	1990
2	Difference Equations	R.Mickens	Van Nostrand Reinhold, New York	1990
3	Difference Equations and Inequalities	R.P.Agarwal	Marcelm Dekker, New York	1992

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	S	S
CO2	M	S	S	M	M
CO3	M	S	M	S	S
CO4	S	M	S	M	S
CO5	S	S	M	S	S

S- Strong; **M**-Medium.

SKILL ENHANCEMENT COURSE- VI

SEC-VI	B.Sc. MATHEMATICS	Credits: 2
Course Code: M23UMAS04	**SEC-VI- BUSINESS OPTIMAIZATION TECHNIQUES**	**Contact Hour Per Week: 3**

OBJECTIVES:

To focuses on basic technical concepts and to develop an idea of operation research. The main objective is to impart the knowledge on fundamental topics such as

- Problems with n Jobs through Two Machines
- Processing N Jobs through three Machines
- Rules of Network Construction , Time Analysis
- Critical Path Method, Programme Evaluation and Review Technique
- Cost Consideration In PERT /CPM. Inventory Costs
- Variables in the Inventory Problem
- Other Factors Involved in Inventory Analysis
- Deterministic Inventory Model
- EOQ Problems with Price Breaks
- Queuing Theory**,** Network Routing Problems , Game Theory

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES :

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Identify the Problems with n Jobs through Two Machines ,Basic Terms , Reasons for Maintaining Inventories , Queuing System, Pay off –types of games .	K1
CO2	Classify the Processing N Jobs through three Machines A ,B,C, Common Errors , Inventory Costs , Kendall's Notation for representing Queuing Models , The Maximin – Minimax Principal.	K2
CO3	Apply the Problems with N Jobs and K Machines , Numbering the Events, Other Factors Involved in Inventory Analysis, Classification of Queuing Models , Games without Saddle Points .	K3
CO4	Analyze the Problems with 2 Jobs through K Machines , Programme Evaluation and Review Technique , Deterministic Inventory Model, Games without Saddle Points .	K4
CO5	Show the Cost Consideration In PERT /CPM , Re-order Level an Optimum Buffer Stock .	K4

UNIT I: (9 Hours)

Introduction – type -1:Problems with n Jobs through Two Machines – Type II :Processing N Jobs through three Machines A ,B,C-Type III :Problems with N Jobs and K Machines –Type IV : Problems with 2 Jobs through K Machines .Chapter 14 ,Section 14.2- 14.5

UNIT II: (9 Hours)

Introduction- Basic Terms –Common Errors –Rules of Network Construction –Numbering the Events – Time Analysis –Critical Path Method -Programme Evaluation and Review Technique – Cost Consideration In PERT /CPM.

Chapter 15 ,Section 15.1- 15.9

UNIT III: (9 Hours)

Introduction – Reasons for Maintaining Inventories – Types of Inventory – Inventory Costs – Variables in the Inventory Problem –Other Factors Involved in Inventory Analysis- Deterministic Inventory Model- Inventory Models with Probabilistic Demand –Re-order Level an Optimum Buffer Stock –EOQ Problems with Price Breaks.

(Chapter 16 ,Section 16.1- 16.10)

UNIT IV: (9 Hours)

Introduction - `Queuing System-Kendall's Notation for representing Queuing Models –Classification of Queuing Models . Chapter 18 ,Section 18.1- 18.4

UNIT V: (9 Hours)

Introduction-Pay off –types of games – The Maximin – Minimax Principal –Games without Saddle Points (Mixed Strategies).

Chapter 19 , Section 19.1- 19.5

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Name of the Book	Author	Publisher	Year of Publication
1.	Operations Research, Second Edition	S.Kalavathy	Vikas Publishing House, New Delhi	2013

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Operations Research 15th Edition	KantiSwarup, P.K.Gupta and Manmohan	Sultan Chand & Sons, Chennai.	2010
2.	Operations Research, Second Edition	P.K.Gupta and D.S.Hira	S.Chand& Co, NewDelhi	2004
3.	Operations Research	HamdyTaha	Prentice Hall Publications, NewDelhi	1996
4.	Operations Research	Nita Hshah Ravi M. GorHardiksoni	PHI, P,Ltd,	2010

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	S
CO2	S	M	S	S	M
CO3	S	S	S	M	S
CO4	M	S	M	M	S
CO5	S	S	M	M	S

S- Strong; **M**-Medium.

CORE –XIII	**B.Sc. MATHEMATICS**	Credits: 5
Course Code: M23UMA12	**LINEAR ALGEBRA**	**Contact Hour Per Week: 5**

OBJECTIVES

To focuses on basic analytical concepts and to develop an idea of modern algebra. The main objective is to impart the knowledge on fundamental topics such as

- Polynomial Rings over U.F.D
- Vector Spaces
- Subspace
- Linear Transformations
- Linear Independent
- Rank and Nullity
- Matrix of a Linear Transformations
- Inner product spaces
- Orthogonal complement
- Algebra of Matrices
- Eigen Values and Eigen Vectors

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Define Polynomial Rings over U.F.D, Span of a Set, Matrix of a Linear, Trasformation, Algebra of Matrices.	K1
CO2	Give Example Polynomial Over Q ,Linear Independent ,Inner product spaces, Types of Matrices ,Simultaneous Linear Equations .	K2
CO3	Analyze the Vector Spaces, Basis and Dimension, Orthogonality,The Inverse of a Matrix, Characteristic Equations.	K3
CO4	Classify the Subspaces, Rank and Nullity, Orthogonal complement ,Elementary Transformations, Cayley's Hamilton Theorem.	K3
CO5	Estimate the Linear Transformations, Orthogonal complement ,Eigen Values and Eigen Vectors.	K4

UNIT I: (15 Hours)

Polynomial Rings over U.F.D - Polynomial Over Q –Vector Spaces – Definitions & Examples – Subspaces – Linear Transformations.
Chapter 4: Section 4.16 -4.18 & Chapter 5: Section 5.1 -5.3

UNIT II: (15 Hours)

Span of a Set – Linear Independent – Basis and Dimension – Rank and Nullity .
Chapter 5: Section 5.4 -5.7.

UNIT III: (15 Hours)

Matrix of a Linear Transformations - Inner product spaces – Definition – Examples –Orthogonality -Orthogonal complement .
Chapter 5: Section 5.8.& Chapter 6 : Section 6.1 -6.3.

UNIT IV: (15 Hours)

Algebra of Matrices – Types of Matrices – The Inverse of a Matrix- Elementary Transformations.
Chapter 7: Section 7.1 -7.4.

UNIT V: (15 Hours)

Rank of a Matrix – Simultaneous Linear Equations – Characteristic Equations and Cayley's Hamilton Theorem – Eigen Values and Eigen Vectors

Chapter 7 : Section 7.5 -7.8.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Modern Algebra	Arumugam. S & Isaac.A.T.	Scitech Publications PVT LTD Chennai.	2005

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	A first course in modern algebra	A.R.Vasistha	Krishna PrakasanMandhir, 9, Shivaji Road, Meerut (UP)	1983
2.	Modern Algebra	ViswanathaNaik	Emerald Publishers, 135, Anna Salai, Chennai	2001
3.	Topics in Algebra- 2nd Edition	I.N.Herstein	John Wiely, NewYork	1975
4.	A Text Book Of Morden Algbra	Balakrishnan; Ramab	Vikas Publishing House	1999

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S
CO2	S	S	M	M	S
CO3	S	S	M	S	S
CO4	M	S	M	S	S
CO5	S	M	M	S	S

S- Strong; **M**-Medium.

CORE -XIV	**B.Sc. MATHEMATICS**	**Credits: 4**
Course Code: M23UMA13	**COMPLEX ANALYSIS**	**Contact Hour Per Week: 5**

OBJECTIVES

To focuses on basic analytical concepts and to develop an idea of complex analysis. The main objective is to impart the knowledge on fundamental topics such as

- Complex Numbers and Analytical Functions
- Bilinear Transformations
- Mapping By Elementary Functions
- Power Series and Series Expansions
- Complex Integration and Calculus Of Residues
- Cauchy's Residue theorem
- Evaluation of definite integrals.
- Contour integral

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Identify the Functions of a complex variable, Elementary transformations , Sequence & Series , Difinite integral ,Residues.	K1
CO2	Classify the Limits ,Bilinear transformations , Sequences and series of functions , Cauchy's theorem , Cauchy's Residue theorem .	K2
CO3	Apply the Differentiability , Fixed points of bilinear transformations , Some special bilinear transformations ,Power series ,Cauchy's integral formula , Evaluation of definite integrals .	K3
CO4	Examine the Harmonic functions , Mapping by elementary functions, Taylor's series , Contour integral, Higher derivatives.	K4
CO5	Calculate the Complex Numbers And Analytical Functions, Power Series And Series Expansions, Complex Integration, Calculus Of Residues.	K4

UNIT I: COMPLEX NUMBERS AND ANALYTICAL FUNCTIONS: (15 Hours)

Introduction – Functions of a complex variable – Limits – Theorems on limit – Continuous functions – Differentiability – The Cauchy Riemann equations – Analytic functions – Harmonic functions – Conformal mapping. Chapter 2: Sec: 2.0-2.9.

UNIT II: BILINEAR TRANSFORMATIONS AND MAPPING BY ELEMENTARY FUNCTIONS: (15 Hours)

Introduction – Elementary transformations – Bilinear transformations – Cross ratio – Fixed points of bilinear transformations – Some special bilinear transformations - Mapping by elementary functions. Chapter 3: Sec: 3.0-3.5 & Chapter 5: Sec: 5.0-5.7.

UNIT III: POWER SERIES AND SERIES EXPANSIONS: (15 Hours)

Introduction – Sequence & Series – Sequences and series of functions – Power series – Elementary functions – Taylor's series -Laurent's series – Zeros of an analytic function – Singularities.

Chapter 4: Sec: 4.0-4.4 & Chapter 7: Sec: 7.0-7.4.

UNIT IV: COMPLEX INTEGRATION: (15 Hours)

Introduction – Difinite integral – Cauchy's theorem – Cauchy's integral formula – Higher derivatives. Chapter 6: Sec: 6.0-6.4.

UNIT V: CALCULUS OF RESIDUES: (15 Hours)

Introduction – Residues – Cauchy's Residue theorem – Evaluation of definite integrals – Contour integral. Chapter 8: Sec: 8.0-8.3.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments
NOTE:

 Questions are asked for 50 % theory and 50% for problems.

TEXT BOOK:

S. No.	Title of the Book	Author	Publisher	Year of Publication
1.	Complex Analysis	S.Arumugam, A.Thangapandi Issac & A.Somasundaram	Scitech publications(I) Pvt. Ltd. T.Nagar, Chennai-600017.	2002

REFERENCE BOOKS:

S. No.	Title of the Book	Author	Publisher	Year of Publication
1.	Complex Analysis	T. K . Manica vachagampillai, S.P.Rajagopalan, R Sattanathan	S.Viswanathan (Printers and publishers) Pvt Ltd, Chennai - 600031.	2009
2.	Complex Analysis	Pillai M	S.Viswanathan & Co	1994
3	Functions Of A Complex Variable	Goyal J K; Gupta K P	Pragati Prakashan	2003
4.	Complex Analysis	Arumugham S, Thanga Pandi Dssae A, Somasundram	Sci Tech Publication	2003
5.	Complex Variables And Application	Brown J.W, Ruel V. Chuchill	Mcgraw Hill	1996

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	M	S	S	M	S
CO3	S	S	M	S	M
CO4	M	M	S	M	S
CO5	S	M	S	S	S

S- Strong; **M**-Medium.

CORE –XV	**B.Sc. MATHEMATICS**	**Credits: 4**
Course Code: M23UMA14	**MECHANICS**	**Contact Hour Per Week: 5**

OBJECTIVES

To focuses on basic analytical concepts and to develop an idea of mechanics. The main objective is to impart the knowledge on fundamental topics such as

- Forces
- Lami's theorem
- Parallel forces
- Varigon's theorem
- Friction
- Projectile
- Impact

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

Cos	Statement	Knowledge level
CO1	Define the force, law of force and lami theorem.	K1
CO2	Classify the Parallel forces and couples	K2
CO3	Apply the idea of Friction and related problems.	K3
CO4	Analyze the concept of Projectiles and its characterization	K4
CO5	Show the Direct impact and Oblique impact problems	K4

UNIT I: Forces acting on a particle   **(15 Hours)**

Forces, types of forces, triangle law of forces, equilibrium of forces acting on a particle, Lami's theorem, Polygon law of forces.

Chapter 1 of statics book Sections 2 - 4,
Chapter 2 of statics book Sections 3, 5 – 9

UNIT II: Couples and Forces acting on a Rigid body   (15 Hours)

Parallel forces, Moment of a force about a point and a line, couples Varigon's theorem, Couple – Equilibrium of two couples. Forces acting on a rigid body.

Chapter 3 of statics book Sections 2 - 4, 7, 12 and

Chapter 4 of statics book Sections 1, 2,6,7,8,9,10

Chapter 5 of statics book Sections 1,3 and 5

UNIT III: Friction   (15 Hours)

Friction – Laws of friction – Co-efficient of friction, angle and cone of friction – Equilibrium of a particle on a rough inclined plane under any forces – Problems on friction.

Chapter 7 of statics book Sections 1-8, 10 - 12 and

Chapter 6 of statics book Sections 1, 2, 3, 5 and 8

UNIT IV: Projectiles   (15 Hours)

Projectiles – Path of the projectile is a parabola – Characteristics of the motion of a projectile – Velocity of the projectile in magnitude and direction at the end of time – Range on an inclined Plane – Simple problems.

Chapter VI of Dynamics book Sections 6.2, 6.4, 6.5, 6.9 and 6.12

UNIT V: Impact   (15 Hours)

Collision of elastic bodies – Newton's experimental law – Impact of a smooth sphere on a fixed smooth plane – Direct impact of two smooth spheres – Loss of Kinetic Energy – Oblique impact of two smooth spheres and loss of Kinetic Energy – Simple problems.

Chapter VIII of Dynamics book Sections 8.3 - 8.8

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

NOTE:

Questions are asked for 50 % theory and 50% for problems.

TEXT BOOKS:

S. No	Title of the Book	Author	Publiser	Year of Publication
1.	Statics	M.K. Venkatraman	Agasthiar Publication	1999
2.	Dynamics	M. K. Venkatraman	Agasthiar Publications	1970

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Statics	Dr. M. K. Venkataraman	Agasthiar Publication S.Viswanathan Printers & Publishers Pvt. Ltd	2007
2.	Mechanics	P. Duraipandian, Laxmi Duraipandian. Muthamizh Jayapragasam	S. Chand & Company Ltd	2010

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	S	M
CO2	S	S	S	M	S
CO3	M	S	M	S	M
CO4	S	M	M	S	S
CO5	M	M	S	M	S

S- Strong; **M**-Medium.

DSE -III	B.Sc. MATHEMATICS	Credits: 3
Course Code: M23UMADSE7	DISCIPLINE SPECIFIC ELECTIVE - III - GRAPH THEORY	Contact Hour Per Week: 5

OBJECTIVES

To focuses on basic analytical concepts and to develop an idea of graph theory. The main objective is to impart the knowledge on fundamental topics such as

- Graphs, Sub graphs
- Operations on graphs
- paths, connection, blocks
- Eulerian, Hamiltonian Graphs
- Characterization of Trees , Centre of a Tree
- Characterization of Planar Graphs
- Thickness, Crossing and Outer Planarity

In addition, it also provides analytical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Define Degrees, Walks , Trails and Paths ,Eulerian Graphs ,Characterization of Trees ,Characterization of Planar Graphs.	K1
CO2	Illustrate the Sub graphs ,Connectedness, Eulerian Graphs ,Characterization of Trees ,Thickness.	K2
CO3	Discover the Operations on Graphs ,components, Hamiltonian Graphs, Center of a Tree, Crossing and Outer Planarity .	K3
CO4	Classify the Operations on Graphs, Blocks – Connectivity, Hamiltonian Graphs, Center of a Tree, Crossing and Outer Planarity .	K4
CO5	Conclude the Operations on Graphs, Blocks – Connectivity, Hamiltonian Graphs, Center of a Tree, Crossing and Outer Planarity .	K4

UNIT I :   **(15 Hours)**

Introduction – Definition and Examples – Degrees – Sub graphs – Operations on Graphs – Problems.
(Chap – II : Sec – 2.0 – 2.3 & 2.9)

UNIT II: **(15 Hours)**

Introduction – Walks , Trails and Paths – Connectedness and components – Blocks – Connectivity.
(Chap – IV : Sec – 4.0 – 4.4)

UNIT III: **(15 Hours)**

Introduction – Eulerian Graphs – Hamiltonian Graphs.
(Chap – V : Sec – 5.0 – 5.2)

UNIT IV: **(15 Hours)**

Introduction – Characterization of Trees – Center of a Tree.
(Chap – VI : Sec – 6.0 – 6.2)

UNIT V: **(15 Hours)**

Introduction – Definition and Properties – Characterization of Planar Graphs –Thickness, Crossing and Outer Planarity
(Chap – VIII : Sec – 8.0 – 8.3)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Invitation to Graph Theory	S.Arumugam, S.Ramachandran	Scitech Publications, Chennai	2001

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Basics of Graph Theory	K.R.Parthasarathy	TMH Publishing company	2001
2.	Graph theory	S.Kumaravelu and Suseela kumaravelu	SKV Printers	1996
3.	A first course in Graph theory	A.Chandran	Macmillan Publishers, Chennai	1997
4.	Introduction To Grap Theory	Dughlas West.B	Pearson Education	2003

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S
CO2	M	M	S	S	M
CO3	S	S	S	M	S
CO4	M	S	M	M	S
CO5	S	S	M	M	S

S- Strong; **M**-Medium.

DSE –III	B.Sc. MATHEMATICS	Credits: 3
Course Code: M23UMADSE8	DISCIPLINE SPECIFIC ELECTIVE - III - STOCHASTIC PROCESS	Contact Hour Per Week: 5

OBJECTIVES:

To introduces fundamental concepts in stochastic process. It covers concepts such as

- Stochastic Process, Markov Chains, classification of states and chains, Stability of Markov chain,
- Poisson process, Markov chain with discrete state space,
- Renewal process, Renewal process in continuous time ,
- Markov Renewal and semi- markov processes.

It provides technical skills to understand and develop various ideas about analysis.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge Level
CO1	Identify the logic behind the execution of Stochastic Process, Markov Chains, classification of states and chains.	K1
CO2	Understand the concepts of Stability of Markov chain, Poisson process	K2
CO3	Analyze the Markov chain with discrete state space.	K3
CO4	Develop Renewal process, Renewal process in continuous time.	K4
CO5	Apply the concepts to Markov Renewal and semi- markov processes.	K3

UNIT I: **(15 Hours)**

Stochastic Process: Introduction – Specification of Stochastic Processes, Stationary processes, Martingales, Markov Chains: Definitions and Examples, Higher transition probabilities, classification of states and chains.

UNIT II: (15 Hours)

Stability of Markov chain, Markov chains with denumerable number of states, Poisson process.

UNIT III: (15 Hours)

Poisson process and related distributions – Markov chain with discrete state space.

UNIT IV: (15 Hours)

Renewal process: Renewal process-Renewal process in continuous time – Renewal equation – Stopping time: Wald's equation – Renewal theorems.

UNIT V: (15 Hours)

Markov Renewal and semi-markov processes: Introduction – Definitions and Preliminaries results – Markov renewal equations – Limiting behaviours.

TEACHING METHODS:
Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Stochastic Processes 4th Edition	Prof. J. Medhi	New age International (P) Ltd,new delhi	2017

Unit I: Chapter2: 2.1 to 2.4; Chapter3: 3.1, 3.2, 3.4 (3.3 is not included)
Unit II: Chapter3: 3.6, 3.8, 4.1 (pages 157-169)
Unit III: Chapter4: 4.2 to 4.5 (pages 170-206)
Unit IV: Chapter6: 6.1 to 6.5 (pages 242 – 272)
Unit V: Chapter7: 7.1 to 7.4 (pages 313 – 331) (example problems only)

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Stochastic Processes	T.Veerarajan	McGraw Hill	2008
2.	Probality Theory And Random Processes	Eugene	S.Chand & Company	1998

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S
CO2	M	S	M	S	M
CO3	M	S	M	S	S
CO4	S	S	M	M	S
CO5	S	S	M	S	M

S- Strong; **M**-Medium.

DISCIPLINE SPECIFIC ELECTIVE –III

DSE -III	B.Sc. MATHEMATICS	Credits: 3
Course Code: M23UMADSE9	DISCIPLINE SPECIFIC ELECTIVE - III - COMBINATORIAL MATHEMATICS	Contact Hour Per Week: 5

OBJECTIVES

To focuses on discrete mathematics concepts and to develop an idea of combinatorics. The main objective is to impart the knowledge on fundamental topics such as

- Recurrence relation
- Permutations
- Gala's optimal assignment problem
- Fibonacci type relation
- Rook polynomial

In addition, it also provides analytical thinking to solve problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

COs	STATEMENT	KNOWLEDGE LEVEL
CO1	Identify the logic behind the Recurrence relation, Permutations, Gala's optimal assignment problem, Fibonacci type relation and Rook polynomial Recurrence relation.	K1
CO2	Demonstrate the idea about Recurrence relation, Permutations, Gala's optimal assignment problem, Fibonacci type relation and Rook polynomial Recurrence relation.	K2
CO3	Develop the concepts of Recurrence relation, Permutations, Gala's optimal assignment problem, Fibonacci type relation and Rook polynomial Recurrence relation.	K3
CO4	Analyze the idea in Recurrence relation, Permutations, Gala's optimal assignment problem, Fibonacci type relation and Rook polynomial Recurrence relation.	K4
CO5	Apply the concepts of Recurrence relation, Permutations, Gala's optimal assignment problem, Fibonacci type relation and Rook polynomial Recurrence relation.	K3

UNIT I: **(15 Hours)**

Introduction to Basic ideas – General formula for $f(n,k)$ – Recurrence Relation –boundary condition - Fibonacci sequence – generating function.

UNIT II: **(15 Hours)**

Permutation – Ordered selection – unordered selection – further remarks on Binomial theorem.

UNIT III: (15 Hours)

Passing within a set – Pairing between set and optimal assignment problem – Gala's optimal assignment problem.

UNIT IV: (15 Hours)

Fibonacci type relation – using generating function – Miscellaneous method –counting simple electrical networks.

UNIT V: (15 Hours)

The inclusion – Exclusion principle - Rook polynomial.

TEACHING METHODS:
Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	A First Course in Combinatorial Mathematics	Jan Anderson	Oxford Applied Mathematics and Computing Science Series, UK	1974

REFERENCE BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Combinatorics	V.K.Balakrishnan	Schuam Series	1996

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	M	S
CO2	S	M	S	M	M
CO3	M	M	M	S	S
CO4	S	S	M	S	M
CO5	S	M	S	M	S

S- Strong; **M**-Medium.

DSE -IV	B.Sc. MATHEMATICS	Credits: 3
Course Code: M23UMADSE10	DISCIPLINE SPECIFIC ELECTIVE - IV - DISCRETE MATHEMATICS	Contact Hour Per Week: 4

OBJECTIVES

To focuses on basic analytical concepts and to develop an idea of discrete mathematics. The main objective is to impart the knowledge on fundamental topics such as

- Mathematical Logic, Normal Forms
- Statement Calculus
- Relations, Functions
- Mathematical Induction
- Algebraic systems, homomorphism of semi groups & monoids
- Grammars
- Notions of Syntax Analysis
- Lattices as Algebraic systems and Boolean Functions

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Define Mathematical Logic , Normal Forms,Relations & Ordering,Algebraic systems,Lattices as partially ordered Sets.	K1
CO2	Classify the Statements and Notations, Disjunctive Normal Form, Relations , Semi groups ,some properties of Lattices.	K2
CO3	Apply the Connectives, Principal Disjunctive Normal Forms, Properties of binary relation in a set, homomorphism of semi groups & monoids, Lattices as Algebraic systems .	K3
CO4	Distinguish the Conditional and Biconditional, The Theory of Inference for the Statement Calculus, Inverse function, sub semi groups & sub monoids ,Boolean Algebra.	K4
CO5	Analyze the Conditional and Biconditional, The Theory of Inference for the Statement Calculus, Inverse function, sub semi groups & sub monoids ,Boolean Algebra.	K4

UNIT I: **(12 Hours)**

Mathematical Logic – Statements and Notations – Connectives – Negation -conjunction – Disjunction-Statement Formulas and Truth Table – Conditional and Biconditional – Well formed Formulas – Tautologies. (sections 1.1 , 1.2.1 – 1.2.4 , 1.2.6 –1.2.8).

UNIT II: **(12 Hours)**

Normal Forms – Disjunctive Normal Forms – Conjunctive Normal Forms -Principal Disjunctive Normal Forms – Principal Conjunctive Normal Forms - Ordering and Uniqueness of Normal Forms – The Theory of Inference for the Statement Calculus –Validity using Truth tables - Rules of Inference - Consistency of premises and indirect method of proof . (sections 1.3.1 - 1.3.5 , 1.4.1 – 1.4.3).

UNIT III: **(12 Hours)**

Relations & Ordering – Relations – Properties of binary relation in a set -Functions – Definition & Introduction – Composition of Functions – Inverse function –Binary and n - array operations – Hashing Functions – Natural numbers – Peano Axioms & Mathematical Induction – Cardinality.

UNIT IV: **(12 Hours)**

Algebraic systems – Definition & Examples – Semi groups and monoids –definition and examples – homomorphism of semi groups &monoids – sub semi groups & sub monoids – Grammars – Formal Definition of a Language – Notions of Syntax Analysis. (Sections 3.1.1, 3.1.2 , 3.2.1 , 3.2.2 , 3.2.3 , 3.3 , 3.3.2 , 3.3.3).

UNIT V: **(12 Hours)**

Lattices as partially ordered Sets: Definition and Examples – some properties of Lattices – Lattices as Algebraic systems – sub Lattices – Direct product and homomorphism. Boolean Algebra: Definition and Examples – subalgebra , Direct product and homomorphism – Boolean Functions – Boolean Forms and Free Boolean Algebras - Values of Boolean Expression and Boolean Functions (sections 4.1.1 , 4.1.2 , 4.1.3 , 4.1.4 , 4.2.1 , 4.2.2 , 4.3.1 , 4.3.2).

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Discrete mathematical structures with applications to computer science	J.P.Trembly, R.Manohar	Tata McGraw Hill, NewDelhi	2001

REFERENCE BOOKS:-

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Discrete Mathematics	Prof.V.Sundaresan, K.S.GanapathySubramaniyan, K.Ganesan	Tata McGraw Hill, New Delhi	2000
2.	Discrete Mathematics	L.Lovarz, J.Pelikan, K.Vexztergombi	Springer International Edition	2002
3.	Discrete Mathematics	N. Chandrasekaran M. Uma parvathi	PHI Learning P. Ltd.	2010
4.	Discrete Mathematics	Harikishan; Shivraj Pundir	Pragati Prakashan	2004

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	M
CO2	M	S	S	S	S
CO3	S	S	S	S	S
CO4	M	M	S	M	S
CO5	S	M	S	M	S

S- Strong; **M**-Medium.

DSE -IV	B.Sc. MATHEMATICS	Credits: 3
Course Code: M23UMADSE11	**DISCIPLINE SPECIFIC ELECTIVE - IV - FUZZY SET AND APPLICATIONS**	**Contact Hour Per Week: 4**

OBJECTIVES:

To introduces fundamental concepts in Fuzzy sets and Fuzzy logic. It covers concepts such as

- Form classical sets to fuzzy sets;
- Fuzzy sets versus crisp sets, Operations on fuzzy sets,
- Fuzzy arithmetic, Fuzzy relations and Fuzzy Logic.

It provides technical skills to understand and develop various ideas about analysis.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge Level
CO1	Identify the logic behind the execution of the form classical sets to fuzzy sets; Fuzzy sets versus crisp sets	K1
CO2	Understand the concepts of an operations on fuzzy sets.	K2
CO3	Analyze the concept of fuzzy arithmetic	K3
CO4	Develop the idea about the fuzzy relations.	K4
CO5	Apply the concepts to the fuzzy logic and its related theorems.	K3

UNIT I: Form classical sets to fuzzy sets, Fuzzy sets versus crisp sets
                                                                (12 Hours)

Introduction – Crisp sets – Fuzzy sets – Characteristics and significance of the paradigm shift – Additional properties of α – cuts – Representation of fuzzy sets – Extension principal for fuzzy sets.

UNIT II: Operations on fuzzy sets   **(12 Hours)**

Types of operations – Fuzzy complements – Fuzzy intersections: t-norms – fuzzy unions: t – conorms – Combinations of operations – Aggregation operations.

UNIT III: Fuzzy arithmetic   **(12 Hours)**

Fuzzy numbers – Linguistic variables – Arithmetic operations on intervals – Arithmetic operations on fuzzy numbers – fuzzy equations.

UNIT IV: Fuzzy relations   **(12 Hours)**

Crisp versus Fuzzy relation - projections and cylindric extensions - binary fuzzy relations - Binary Relations on a single set - Fuzzy compatibility relations - Fuzzy ordering Relations - Furry Morphisms - Sup-I compositions of Fuzzy Relations - Info compositions of Fuzzy Relations

UNIT V:Fuzzy Logic   **(12 Hours)**

Classical Logic- Multivalued Logic – Fuzzy propositions –Fuzzy propositions – Fuzzy Quantifiers –Linguistic Hedges – Inference form conditional fuzzy propositions – Inference from conditional and qualified propositions – Inference form quantified propositions.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Fuzzy sets and Fuzzy logic Theory and Applications	George J, Klir Bo Yuvan	PHI learning pvt.ltd	2009

REFERENCE BOOKS:-

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Fuzzy sets and Fuzzy logic Theory and Applications	George J.Klir	Pearson Education of india	2015
2	Fuzzy sets , Fuzzy logic and Their Applications	Michael Gr. Voskoglou	MDPI	2020
3	An Introduction To Fuzzy Control	Priankov .D; Rein Fsank Hellendron	Narosa Publishing House	1997

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S
CO2	M	S	S	S	M
CO3	S	M	M	S	M
CO4	M	S	S	M	S
CO5	S	M	S	S	M

S- Strong; **M**-Medium.

DSE -IV	**B.Sc. MATHEMATICS**	Credits: 3
Course Code: M23UMADSE12	**DISCIPLINE SPECIFIC ELECTIVE - IV - INTRODUCTION TO RESEARCH METHODOLOGY**	**Contact Hour Per Week: 4**

OBJECTIVES:

To introduces fundamental concepts in Research Methodology. It covers concepts such as

- Meaning of Research , objectives of Research
- Selecting the problem, Necessity of Defining the problem
- Features of a Good Design
- sample Design- Steps in Sampling Design
- Measurement and Scaling Techniques

It provides technical skills to understand and develop various ideas about analysis.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge Level
CO1	Identify the logic behind the Meaning of Research	K1
CO2	Understand the concepts of a Defining the problem	K2
CO3	Analyze the concept of Design	K3
CO4	Develop the idea about the sampling procedure	K4
CO5	Apply the concepts to the Measurement and Scaling Techniques	K3

UNIT –I   **(12 Hours)**

Research Methodology : Meaning of Research , objectives of Research , Motivation in Research , Types of Research , Research Approaches, Significance of Research. Chapter- 1

UNIT II   **(12 Hours)**

Defining the Research Problem-: What is a Research Problem?- Selecting the problem, Necessity of Defining the problem- Technique involved in Defining a problem. Chapter-2

UNIT III   **(12 Hours)**

Research Design-: Meaning of Research Design – Need for Research Design- Features of a Good Design – Important concepts relating to Research Design-Different Research Designs. Chapter-3

UNIT IV   **(12 Hours)**

Sampling Design : Census and Sample Survey-Implications of a sample Design- Steps in Sampling Design- Criteria of selecting a sampling procedure-Characteristics of a good sample Design.Chapter-4

UNIT V   **(12 Hours)**

Measurement and Scaling Techniques: Measurement in Research – measurement Scales- Sources of Error in Measurement – Tests of sound Measurement – Technique of developing Measurement Tools. Chapter-5

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S.No	Title of the Book	Author	Publisher	Year of Publication
1	Research Methodology (methods & Techniques)	C.R.Kothari	New Age International Publishers,Second edition	2004

REFERENCE BOOK:-

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Research Methodology	Gauray Garg C.R.Kothari	New Age International Publishers,Second edition	2019

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S
CO2	M	S	S	S	M
CO3	S	M	M	S	M
CO4	M	S	S	M	S
CO5	S	M	S	S	M

S- Strong; **M**-Medium.

PCS	B.Sc. MATHEMATICS	Credits: 2
Course Code: M23UMAPCS1	**PCS – NON VERBAL REASONING**	**Contact Hour Per Week: 2**

OBJECTIVES

To focuses on basic technical concepts and to develop an idea of non verbal reasoning. The main objective is to impart the knowledge on fundamental topics such as

- Series
- Analogy,Classification
- Analytical reasoning
- Mirror Images & WaterImages
- Completion of Incomplete Pattern, Figure Matrix

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Memorize the Series, Analogy, Classification, Analytical , reasoning, Mirror – Images & Water – Images, Completion of Incomplete Pattern, Figure Matrix	K1
CO2	Classify the Series, Analogy, Classification, Analytical , reasoning, Mirror – Images & Water – Images, Completion of Incomplete Pattern, Figure Matrix	K2
CO3	Apply the Series, Analogy, Classification, Analytical , reasoning, Mirror – Images & Water – Images, Completion of Incomplete Pattern, Figure Matrix	K3
CO4	Calculate the Series, Analogy, Classification, Analytical , reasoning, Mirror – Images & Water – Images,Completion of Incomplete Pattern, Figure Matrix .	K4
CO5	Simplify the Series, Analogy, Classification, Analytical , reasoning, Mirror – Images & Water – Images,Completion of Incomplete Pattern, Figure Matrix .	K4

UNIT I: **(6 Hours)**

Series.   (PART -II: 1)

UNIT II: **(6 Hours)**

Analogy.   (PART -II: 2)

UNIT III: **(6 Hours)**

Classification, Analytical reasoning.   (PART -II: 3 ,4)

UNIT IV: **(6 Hours)**

Mirror – Images & Water – Images.   (PART -II: 5,6)

UNIT V: **(6 Hours)**

Completion of Incomplete Pattern, Figure Matrix .   (PART -II: 8,9)

TEACHING METHODS:
Chalk and Talk / PowerPoint presentation/ Quiz / Discussion / Assignments

TEXT BOOK:

S.No	Name of the Book	Author	Publisher	Year Of Publications
1.	A Modern Approach to Verbal & Non- Verbal Reasoning .	R.S.Aggarwal	S.Chand Co Ltd, 152, Annasalai, Chennai.	2001

REFERENCE BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	A Modern Approach to non Verbal Reasoning	R.S.Aggarwal	S.Chand Co Ltd,	2018 Second Edition

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M
CO2	S	M	S	M	S
CO3	M	S	M	S	S
CO4	S	M	S	M	S
CO5	S	M	M	S	S

S- Strong; **M**-Medium.

GEC-I	B.Sc. MATHEMATICS	Credits: 3
Course Code: M23UMAGE1	ELECTIVE – I - GENERIC ELECTIVE - MATHEMATICS - I	Contact Hour Per Week: 5

OBJECTIVES:

To focuses on basic mathematics concepts and to develop an idea of allied mathematics. The main objective is to impart the knowledge on fundamental topics such as

- Addition ,Subtraction , Multiplication of Matrices
- Adjoint , Inverse of the Matrix
- Eigen Values and Eigen Vectors
- Polynomial Equations
- Successive Differentiation
- Radius of curvature in Cartesian and polar co-ordinates
- Integral Calculus, Integration by Parts
- Definite integrals and its properties

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Define Matrix,Transpose of a Matrix , Adjoint of a Matrix ,Polynomial Equations ,Radius of Curvature ,Integration by Parts .	K1
CO2	Give Example Addition ,Subtraction , Multiplication of Matrices,Imaginary and Irrational roots ,Successive Differentiation ,polar coordinates ,Integral Calculus .	K2
CO3	Solve the Adjoint of a Matrix – Inverse of the Matrix,Transformation of Equation ,Leibnitz Theorem ,Pedal Equation of a curve , Reduction formula.	K3
CO4	Simplify the Eigen Values and Eigen Vectors ,Transformation of Equation ,n^{th} Derivative ,Radius of curvature in Polar Coordinates $\int \cos^n x dx, \int \sin^n x dx, \int_0^{\frac{\pi}{2}} \sin^n x\, dx, \int_0^{\frac{\pi}{2}} \cos^n x\, dx.$	K4
CO5	Classify the Cayley Hamilton ,Descarte's rule of signs ,Leibnitz Theorem , Radius of curvature in Polar Coordinates,Reduction formula .	K4

UNIT I: (15 Hours)

Definition of Matrix – Addition ,Subtraction , Multiplication of Matrices. Transpose of a Matrix – Adjoint of a Matrix – Inverse of the Matrix. Characteristic Equation – Eigen Values and Eigen Vectors – Cayley Hamilton Theorem (Statement only)

UNIT II: (15 Hours)

Polynomial Equations – Imaginary and Irrational roots – Transformation of Equation – Descarte's rule of signs – Problems.

UNIT III: (15 Hours)

Successive Differentiation – n^{th} Derivative – Leibnitz Theorem – Simple Problem Only.

UNIT IV: (15 Hours)

Radius of Curvature in Cartesian and polar coordinates – Pedal Equation of a curve – Radius of curvature in Polar Coordinates.

UNIT V: (15 Hours)

Integral Calculus – Integration by Parts — Reduction formula for $\int\cos^n x dx$, $\int\sin^n x dx$, $\int_0^{\frac{\pi}{2}} sin^n\ xdx$, $\int_0^{\frac{\pi}{2}} cos^n\ xdx$, $\int x^n e^{ax}\ dx$, $\int_0^{\infty} e^{-x} x^n dx$ Problems.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Algebra Volume-II	T.K.Manicka vasagamPillai and S.Narayanan.	Vijay Nicole Imprints Pvt Ltd, # C-7 Nelson Chmbers. 115,NelsonManicka m Road, Chennai – 600029.	2004
2.	Algebra Calculus and Trigonometry	Dr.P.R.Vittal .	Margham Publications, 24, RameswaramRoad ,T.Nager, Chennai - 600017.	2000

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Calculus	N.P. Bali	Krishna PrakasanMandhir, 9, Shivaji Road, Meerut (UP).	1994
2.	Calculus	D. Sudha	Emerald Publishers, 135, Anna Salai, Chennai – 600002.	1988

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	M
CO2	S	S	S	M	S
CO3	M	S	S	M	M
CO4	M	S	S	M	S
CO5	S	S	S	M	S

S- Strong; **M**-Medium.

GEC-I	FOR B.Sc. STATISTICS	Credits: 3
Course Code: M23UMAGE8	**ELECTIVE – I - GENERIC ELECTIVE - MATHEMATICS FOR STATISTICS**	**Contact Hour Per Week: 5**

OBJECTIVES:

- To the overall objective of the study is to create deep interest in learning mathematics which develop broad and balance knowledge and understanding definitions, concepts, principles and theorems.
- It helps the students to enhance the ability of learners to apply the knowledge and skill acquired by them to solve specific theoretical and applied problems in mathematics.
- It also encourages the students to develop a range of generic skill helpful in employment, internships in social activities.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge Level
CO1	Distinguish between proper and improper fractions. Express an algebraic fraction as the sum of its partial fractions	K1
CO2	Demonstrate the knowledge to determine the sums, expansion and approximation of series including binomial, exponential, logarithmic and fourier.	K2
CO3	Solve problems about polynomials with real coefficients, imaginary and irrational roots. Explain the relationship between the derivative of a function as a function and the notion of the derivative.	K3
CO4	Calculate limits of a function	K4
CO5	Obtain the nth derivative in successive differentiation. Apply Euler's theorem on homogenous function	K3

UNIT-I   **(15 hours)**

Rational fractions: Proper and improper rational fractions. Partial fractions: Forms of partial fractions.

UNIT-II   **(15 hours)**

Series: Summation and approximations related to Binomial, Exponential and Logarithmic series -Taylor's series, Fourier series for even and odd functions.

UNIT-III   **(15 hours)**

Theory of equations: Polynomial equations with real coefficients-imaginary and irrational roots-solving equations with related roots-equation with given numbers as roots-equation whose roots are symmetric functions of roots.

UNIT-IV   **(15 hours)**

Differential calculus: Functions – Different types – simple valued and many valued – Implicit and Explicit functions, Odd and even functions, periodic functions, algebraic and transcendental functions. Inverse functions, Limit of a function – Some standard limit (without proof) Differentiation of standard functions- standard rules of differentiation-Addition, subtraction, multiplication and quotient rules – function of function rule.

UNIT-V   **(15 hours)**

Successive differentiation: Leibnitz's theorem, nth derivatives of standard functions – simple problems. Partial differentiation: Successive partial differentiation. Maxima and Minima for two variable functions. Homogenous function – Euler's theorem on homogenous function.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Allied Mathematics, Vol. – I&II	Duraipandian, P. and Udaya Baskaran, S.	S.Chand & Company Pvt. Ltd.	2014
2.	Allied Mathematics	Vittal, P.R	Margham Publications.	2012
3.	Ancillary Mathematics, Book II (Containing Differential Calculus)	Narayanan,S ManickavachagamPillai	S. Viswanathan Pvt, Ltd .	1993

REFERENCE BOOKS:-

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Ancillary Mathematics (Vol. II,Part I) : (Containing Trignometry)	Narayanan, S and Manickavac hagamPillai	S. ViswanathanPvt. Ltd .	1993
2.	Ancillary Mathematics , Book I : (Containing Algebra)	Narayanan, S and Manickavac hagamPillai	S. Viswanathan Pvt.Ltd	1993
3.	Algebra	S.J.Venkate san (2019)	Krishna Publications ,Chennai-77	

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	M
CO2	S	S	S	S	M
CO3	S	S	S	M	S
CO4	S	S	S	M	S
CO5	S	S	M	M	M

S- Strong; **M**-Medium

SEMESTER – I

GENERIC ELECTIVE COURSE-I

GEC-I	For other Department. (B.Sc. Computer Science , BCA, IT ,AIDS & AI&ML)	Credits: 3
Course Code: **M23UMAGE2**	**ELECTIVE – I - GENERIC ELECTIVE – DISCRETE MATHEMATICS - I**	**Contact Hour Per Week: 5**

OBJECTIVES:

To focuses on basic mathematics concepts and to develop an idea of Discrete mathematics. The main objective is to impart the knowledge on fundamental topics such as

- Logic and Proofs
- Graphs

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge level
CO1	Define the Logical connectives, Propositional Equivalences and related Ideas.	K1
CO2	Demonstrate the and Rules of Inference.	K2
CO3	Solve the special types of Rules of Inference and its related problems	K3
CO4	Differentiate the Graphs and its Characterization	K4
CO5	Classify the Idea of Connectivity and its properties.	K4

UNIT I: Logic and Proofs   **(15 Hours)**

Introduction- Propositions- Logical connectives-Truth Table - Propositional Equivalences-Logical Equivalences- Simple Problems.

(Page number : 1.1-1.52)

UNIT II: Logic and Proofs (continued...)   **(15 Hours)**

Tautological Implications – The other Connectives- Normal forms- Simple Problems. (Page number : 1.52-1.58 & 1.60-1.87)

UNIT III: Logic and Proofs (continued...)   **(15 Hours)**

Rules of Inference- Rules for Inference theory - Rules of inference for quantifiers - Simple Problems. (Page number : 1.122 -1.151)

UNIT IV: Graphs

Graphs - Definitions- Graph models- Graph terminology and special types of graphs- Simple Problems. (Page number : 3.1-3.40)

UNIT V: Graphs (continued...)   **(15 Hours)**

Matrix Representation of graphs – graph isomorphism- Connectivity- Simple Problems.(Page number:3.47-3.80)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Discrete Mathematics	Dr. G. Balaji	G. Balaji Publishers, chennai	2022

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Discrete Mathematics	Dr. A. Singaravelu & Dr. M.P. Jeyaraman	Meenakshi Agency, chennai	2010
2.	Discrete Mathematics with Graph Theory and Combinatorics	T . Veerarajan	Tata McGraw-Hill, New Delhi	2009

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	M
CO2	S	S	S	M	S
CO3	M	S	S	M	M
CO4	M	S	S	M	S
CO5	S	S	S	M	S

S- Strong; **M**-Medium.

SEMESTER – I
SKILL ENHANCEMENT COURSE- I

SEC-I (NME-I)	For Other Department (NME)	Credits:2
Course Code: M23UMAN01	SEC - I - NME – I - APTITUDE FOR COMPETITIVE EXAMINATIONS - I	Contact Hour Per Week: 2

OBJECTIVES:

To focuses on basic technical concepts and to develop an idea of aptitude examination. The main objective is to impart the knowledge on fundamental topics such as

- HCF and LCM of Number
- Square Roots and Cube Roots
- Problems on Numbers
- Percentages
- Profit and loss

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course , students will be able to

CO. Number	Statement	Knowledge level
CO1	Memorize the H.C.F. and L.C.M of Numbers, Square Roots and Cube Roots , Problems on Numbers, Percentages, Profit and Loss.	K1
CO2	Give Example of H.C.F. and L.C.M of Numbers, Square Roots and Cube Roots , Problems on Numbers, Percentages,Profit and Loss.	K2
CO3	Apply the H.C.F. and L.C.M of Numbers, Square Roots and Cube Roots , Problems on Numbers, Percentages,Profit and Loss.	K3
CO4	Analyze the H.C.F. and L.C.M of Numbers, Square Roots and Cube Roots , Problems on Numbers, Percentages,Profit and Loss.	K4
CO5	Estimate the H.C.F. and L.C.M of Numbers, Square Roots and Cube Roots , Problems on Numbers, Percentages,Profit and Loss.	K4

UNIT I: **(6 Hours)**

H.C.F. and L.C.M of Numbers. (Section-I: 2)

UNIT II: **(6 Hours)**

Square Roots and Cube Roots. (Section-I: 5)

UNIT III: **(6 Hours)**

Problems on Numbers. (Section-I: 7)

UNIT IV: **(6 Hours)**

Percentages. (Section-I: 10)

UNIT V: **(6 Hours)**

Profit and Loss. (Section-I: 11)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Name of the Book	Author	Publisher	Year Of Publication.
1.	Quantitative Aptitude For Competitive Examinations	R. S. Aggarwal	S.Chand & Co Ltd,152, Annasalai, Chennai.	2001

REFERENCE BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Wiley's Quantitative Aptitude	P.A. Anand	Wiley's Publications	2015 First Edition

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M
CO2	S	M	M	M	S
CO3	M	S	M	S	S
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S- Strong; **M**-Medium.

SKILL ENHANCEMENT COURSE- I

SEC – I (NME – I)	For Other Department (NME)	Credits:2
Course Code: M23UMAN02	SEC - I -NME –I - MATRIX ALGEBRA	Contact Hour Per Week: 2

OBJECTIVES:

To focuses on basic technical concepts and to develop an idea of matrix algebra. The main objective is to impart the knowledge on fundamental topics such as

- Matrix , Subtraction, Multiplication, Transpose of a Matrix, adjoint of a Matrix
- Inverse of the Matrix
- Rank of The Matrix
- Symmetric, Skew symmetric, Hermitian
- Cayley Hamilton Theorem

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES :

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Definition of Matrix , Transpose of a Matrix , Symmetric, Rank of The Matrix .	K1
CO2	Classify the Addition, Subtraction, Multiplication of Matrices, Adjoint of a Matrix ,Skew symmetric, Finding Rank of the Matrix , Cayley Hamilton Theorem .	K2
CO3	Simplify the Addition, Subtraction, Multiplication of Matrices, Inverse of the Matrix, Hermitian, Rank of The Matrix , Cayley Hamilton .	K3
CO4	Calculate the Addition, Subtraction, Multiplication of Matrices, Inverse of the Matrix, Skew Hermitian Matrix , Finding Rank of the Matrix , Cayley Hamilton Theorem .	K4
CO5	Examine the Addition, Subtraction, Multiplication of Matrices, Inverse of the Matrix, Skew Hermitian Matrix , Finding Rank of the Matrix , Cayley Hamilton Theorem .	K4

UNIT I: (6 Hours)

Definition of Matrix – Addition, Subtraction, Multiplication of Matrices.

UNIT II: (6 Hours)

Transpose of a Matrix – Adjoint of a Matrix – Inverse of the Matrix.

UNIT III: (6 Hours)

Symmetric, Skew symmetric, Hermitian and Skew Hermitian Matrix – Problems.

UNIT IV: (6 Hours)

Rank of The Matrix – Definition – Finding Rank of the Matrix – Problems up to 3x3 Matrix.

UNIT V: (6 Hours)

Cayley Hamilton Theorem (statement only) – Problems only.

TEACHING METHODS:
Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Name of The Book	Author	Publisher	Year of Publications
1.	Allied Mathematics	Dr.P.R.Vittal	Margham Publications, Chennai -17	2000

REFERENCE BOOKS :

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Allied Mathematics	A.Singaravelu	Meenakshi Traders, Chennai	2002
2.	A Text Book Of Matrices	Shanthi; Narayanan	S.Chand & Company	1998

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S
CO2	S	S	M	M	S
CO3	M	S	S	M	M
CO4	M	S	M	S	S
CO5	S	M	M	S	M

S- Strong; **M**-Medium.

GEC-II	For other Department (B.Sc. Chemistry and Physics)	Credits:3
Course Code: M23UMAGE3	ELECTIVE – II - GENERIC ELECTIVE - MATHEMATICS - II	Contact Hour Per Week: 5

OBJECTIVES:

To focuses on basic mathematics concepts and to develop an idea of allied mathematics. The main objective is to impart the knowledge on fundamental topics such as

- Second order differential equation with constant coefficient
- Formation of partial differential equation by eliminating arbitrary constants and arbitrary functions
- Solutions of standard types of partial differential equations
- Laplace transforms, Inverse Laplace transforms
- Vector and Scalar Point Function
- Solenoidal Vector , Irrotational Vector. Vector Identities and Simple Problem

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Define the Second order differential equation ,Formation of partial differential equation ,Laplace transforms ,Vector Point Function , Vector Identities .	K1
CO2	Demonstrate the Second order differential equation with constant coefficient , Formation of partial differential equation by eliminating arbitrary constants and arbitrary functions , Laplace transforms , Vector Point Function ,Standard formula ,Vector Identities .	K2
CO3	Solve the particular integral of the type, complete, particular, singular and general integrals, Elementary theorems, Normal Surface , Vector Identities .	K3
CO4	Differentiate the particular integral of the type e^{ax}, cosax or sinax , x^n, Solutions of standard types of partial differential equations , Inverse Laplace transforms , curl of vector Point Function, Vector Identities .	K4
CO5	Classify the particular integral of the type e^{ax}, cosax or sinax , x^n, e^{ax}V, – clairuts's form, Standard formula , Solenoidal Vector –Irrotational Vector, Vector Identities .	K4

UNIT I: (15 Hours)

Second order differential equation with constant coefficient - particular integral of the type e^{ax}, $\cos\alpha x$ or $\sin\alpha x$, x^n, $e^{ax}V$ where V is any function of $\cos\alpha x$ or $\sin\alpha x$ or x or x^2.

UNIT II: (15 Hours)

Formation of partial differential equation by eliminating arbitrary constants and arbitrary functions – problems – definitions – complete, particular, singular and general integrals. Solutions of standard types of partial differential equations – clairuts's form.

UNIT III: (15 Hours)

Laplace transforms – definitions – Standard formula – Elementary theorems –-Inverse Laplace transforms – Standard formula –Simple Problems.

UNIT IV: (15 Hours)

Vector Point Function – Scalar Point Function – Normal Surface – curl of vector Point Function –Solenoidal Vector –Irrotational Vector.

UNIT V: (15 Hours)

Vector Identities and Simple Problem.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Allied Mathematics	Dr.P.R.Vittal .	Margham Publications, 24, RameswaramRoad ,T.Nager, Chennai -600017.	2002
2.	Vector Analysis	Dr.P.R.Vittal . V.Malini	Margham Publications, 24, RameswaramRoad ,T.Nager, Chennai -600017.	1997

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Engineering Mathematics	Gunavathi & Thilkavathy	Emerald Publishers, 135,AnnaSalai, Chennai – 600002.	1984
2.	Calculus	N.P.Bali.	Krishna Prakasam Mandir,9,Shivaji Road, Meerut(UP).	1994

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	M
CO2	S	S	S	M	S
CO3	M	S	S	M	M
CO4	M	S	S	M	S
CO5	S	S	S	M	S

S- Strong; **M**-Medium.

GEC-II	For other Department (B.Sc. Statistics)	Credits:3
Course Code: M23UMAGE9	ELECTIVE – II - GENERIC ELECTIVE - REAL ANALYSIS	Contact Hour Per Week: 5

OBJECTIVES:

- To study the basic operations of sets and functions
- To know the structure of the real sequence and its convergence
- To learn series and its convergence
- To learn the limits, continuity and derivative of real valued functions
- To know and to apply the Riemann integration

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge Level
CO1	Do basic operations of sets and understand set functions	K1
CO2	To Understand sequence and its convergence	K2
CO3	To Understand series and its convergence	K2
CO4	To identify real valued functions and its discontinuity	K2
CO5	To Understand integration concepts	K3

UNIT – I   **(15 hours)**

Operations on sets, Functions, Real valued functions, Equivalence, Countability, Real Numbers, Cantor set, Least Upper Bounds, Greatest Lower Bound.

UNIT – II   **(15 hours)**

Definition of Sequence, Subsequence,Limit of a sequence, Convergent and Divergent sequences, Oscillating sequence, Bounded and Monotone sequences, Operations on convergent sequences, Limit Infimum, Limit Supremum, Cauchy sequences, Summability of sequences.

UNIT – III   **(15 hours)**

Definition of Series, Convergent and Divergent series, series with nonnegative terms, alternating series, conditional convergence, absolute convergences and test for absolute convergence.

UNIT-IV   **(15 hours)**

Limit of a function on the real line, Increasing and Decreasing functions, Continuous function, Operations on continuous functions, Composition of continuous functions, Derivatives, Derivative and continuity, Rolle's Theorem, Mean value theorem, Taylor's theorem.

UNIT – V   **(15 Hours)**

Concept of Riemann Integral, Refinement of partition, Upper and Lower sums, Upper integral and Lower Integral Riemann integrability, Necessary and Sufficient condition for Riemann integrable, Properties of Riemann integrals, Fundamental theorem.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Methods of Real Analysis	Richard R. Goldberg .	Oxford & IBH Publishing Co.Pvt.Ltd.	1970

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Real Analysis	Shanthinarayan	S.Chand& Co, New Delhi	2012
2.	Principles of Mathematical Analysis, 3rd Edition	Walter Rudin	McGraw-Hill	2017
3.	Principles Of Real Analysis	Charalambos D.Aliprantis; Owen Burkinshaw	Academic Press	2010

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	M
CO2	S	S	S	S	M
CO3	S	S	S	M	S
CO4	S	S	S	M	S
CO5	S	S	M	M	M

S- Strong; **M**-Medium.

SEMESTER – II

GENERIC ELECTIVE COURSE-II

GEC –II	For other Department (B.Sc. Computer Science , BCA, IT ,AIDS & AI&ML)	Credits:3
Course Code: M23UMAGE4	**ELECTIVE – II - GENERIC ELECTIVE - DISCRETE MATHEMATICS - II**	**Contact Hour Per Week: 5**

OBJECTIVES:

To focuses on basic mathematics concepts and to develop an idea of Discrete mathematics. The main objective is to impart the knowledge on fundamental topics such as

- Algebraic Structures
- Boolean Algebra
- Lattices

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge level
CO1	Define the groups- monoids-groups Subgroups and Homomorphism and related Ideas.	K1
CO2	Solve the problems on groups and sub groups	K3
CO3	Demonstrate the Normal subgroubs and cosets related Theorems.	K2
CO4	Explain the concept of lattices and its properties	K3
CO5	Classify the Idea of Boolean algebra and its properties.	K4

UNIT I: Algebraic Structures   **(15 Hours)**

Introduction- Algebraic Systems – defintions- Examples- properties-semigroups- monoids-groups Subgroups and Homomorphism –Groups-Theorems. (Page number : 4.1-4.14 & 4.29-4.34)

UNIT II: Algebraic Structures(continued...)   **(15 Hours)**

Permutation functions - Problem based on Permutation -subgroups-Theorems. (Page number : 4.41-4.50 & 4.52-4.55)

UNIT III: Algebraic Structures(continued...)   **(15 Hours)**

Normal subgroubs and cosets – Lagrange's theorm- Theorems .

(Page number : 4.65-4.79)

UNIT IV: Lattices   **(15 Hours)**

Partial ordering- Posets -Lattices as Posets-Properties of Lattices-Lattices as Algebraic systems- Theorems.

(Page number : 5.1-5.3 & 5.9-5.19)

UNIT V: Boolean Algebra   **(15 Hours)**

Boolean Algebra- Sub Boolean Algebra – Boolean Homomorphism-Simple Problems. (Page number : 5.42-5.53)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Discrete Mathematics	Dr. G. Balaji	G. Balaji Publishers, chennai	2022

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Discrete Mathematics	Dr. A. Singaravelu & Dr. M.P. Jeyaraman	Meenakshi Agency, chennai	2010
2.	Discrete Mathematics with Graph Theory and Combinatorics	T . Veerarajan	Tata McGraw-Hill, New Delhi	2009

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	M
CO2	S	S	S	M	S
CO3	M	S	S	M	M
CO4	M	S	S	M	S
CO5	S	S	S	M	S

S- Strong; **M**-Medium.

GEC PRACTICAL -I	For other Department (B.Sc. Chemistry and Physics)	Credits:2
Course Code: M23UMAGEP1	GENERIC ELECTIVE – PRACTICAL - I - MATHEMATICS PRACTICAL	Contact Hour Per Week: 2

OBJECTIVES:

To focuses on basic mathematics concepts and to develop an idea of allied mathematics. The main objective is to impart the knowledge on fundamental topics such as

- Exponential Series – Logarithmic Series
- Partial differentiation – Euler's theorem
- Finite differences – Newton's forward formula – Newton's backward formula Laplace transforms, Inverse Laplace transforms
- Expansions for Sin $n\theta$, Cos $n\theta$ and tan $n\theta$
- Application of Laplace transforms to solve second order differential equations with constant coefficients and simultaneous linear differential equations

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Solve the Exponential Series, Partial differentiation , Finite differences , Expansions for Sin $n\theta$, Application of Laplace transforms .	K3
CO2	Assume that the Logarithmic Series , Euler's theorem , Newton's forward formula , Expansions for Sin $n\theta$, solve second order differential equations with constant coefficients.	K3
CO3	Apply the Exponential Series, Partial differentiation , Finite differences , Expansions for Sin $n\theta$, Cos $n\theta$, simultaneous linear differential equations.	K4

UNIT I: **(6 Hours)**

Exponential Series – Logarithmic Series – Simple problems.

UNIT II: **(6 Hours)**

Partial differentiation – Euler's theorem – Simple problems.

UNIT III: **(6 Hours)**

Finite differences – Newton's forward formula – Newton's backward formula – Simple problems.

UNIT IV: (6 Hours)

Expansions for Sin $n\theta$, Cos $n\theta$ and tan $n\theta$ - Simple problems.

UNIT V: (6 Hours)

Application of Laplace transforms to solve second order differential equations with constant coefficients and simultaneous linear differential equations – Simple problems.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Allied Mathematics	T.K.Manicka vasagamPillai and S.Narayanan.	S.Viswanathan and Co., Chennai	1992
2.	Allied Mathematics	Dr.P.R.Vittal .	Margham Publications, 24, RameswaramRoad, T.Nager, Chennai - 600017.	2002
3.	Allied Mathematics	A.Singaravelu	Meenakshi Traders, Chennai	2002

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Engineering Mathematics	Gunavathi & Thilkavathy	Emerald Publishers, 135,AnnaSalai, Chennai – 600002.	1984
2.	Calculus	N.P.Bali.	Krishna Prakasam Mandir,9,Shivaji Road, Meerut(UP).	1994

GEC -III	For other Department (B.Sc. Computer Science , IT & AIDS)	Credits:5
Course Code: M23UMAGE5	ELECTIVE – III - GENERIC ELECTIVE - NUMERICAL METHODS	Contact Hour Per Week: 4

OBJECTIVES:

To focuses on basic mathematics concepts and to develop an idea of Numerical Methods. The main objective is to impart the knowledge on fundamental topics such as

- Bisection Method
- Gauss Elimination Method
- Interpolation
- Numerical Integration
- Picard's Method of Successive Approximations

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge level
CO1	Examine the Ideas of Bisection Method and Newton Raphson Method	K1
CO2	Solve the problems on Gauss Elimination Method	K3
CO3	Demonstrate the concept of Interpolation	K2
CO4	Explain the concept of Numerical Integrations	K3
CO5	Classify the Idea of Picard's Method and Euler's Method	K4

UNIT I: **(12 Hours)**

Bisection Method - Newton Raphson Method-Simple Problems.

[section – 3.1&3.4]

UNIT II: **(12 Hours)**

Gauss Elimination Method – Gauss Jordon Method –Inversion of a matrix using Gauss Elimination Metod -Simple Problems.

[section – 4.2 & 4.3]

UNIT III: **(12 Hours)**

Interpolation – Newton Forward Interpolation- Newton Backward Interpolation-Simple Problems. [section – 6.1-6.3]

UNIT IV: **(12 Hours)**

Trapezoidal Rule- Simpons 1/3 rd Rule- Simpons 3/8 Rule-Simple Problems. [section – 9.8 & 9.13 -9.14]

UNIT V: **(12 Hours)**

Picard's Method of Successive Approximations- Euler's Method-Simple Problems. [section – 11.8 &11.9- 11.11]

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Numerical Methods	Dr. P.Kandasamy, Dr. K.Thilagavath, Dr. K.Gunavathy	Chand & Company limited, NewDelhi	2013

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Introducing methods of Numerical analysis	S. S. Sastry	Prentice Hall of India private limited, New Delhi	3rd Edition 2002
2.	Numerical Methods	Vedamurthy V.N	Vikas Publishing House	2005
3	Numerical Analysis	Richard Bronson	Thomson India Limited	2002
4	Elementary Numerical Analysis	Samuel D.Conte; Carl De Boor	Narosa Publishing House	1981

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	M
CO2	S	S	S	M	S
CO3	M	S	S	M	M
CO4	M	S	S	M	S
CO5	S	S	S	M	S

S- Strong; **M**-Medium.

GEC -III	For other Department (BCA)	Credits:5
Course Code: M23UMAGE6	ELECTIVE – III - GENERIC ELECTIVE - OPTIMIZATION TECHNIQUES	Contact Hour Per Week: 5

OBJECTIVES:

To focuses on basic mathematics concepts and to develop an idea of Operation Research. The main objective is to impart the knowledge on fundamental topics such as

- Linear programming problem
- Transportation Problem
- Assignment Problems
- PERT/CPM Method
- Games and Strategies

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge level
CO1	Examine the Ideas of Graphical Method and Simplex Method	K1
CO2	Solve the problems on Transportation Problem	K3
CO3	Demonstrate the concept of Assignment Problems	K2
CO4	Explain the concept of CPM/PERT Method	K3
CO5	Classify the Idea of Game theory & Inventory	K4

Unit I: Linear programming problem   (15 Hours)

Introduction- Graphical Method – Simplex Method- Big M Method- Problems only . [section – 2.3 & 3.1-3.5]

Unit II: Transportation Problem   (15 Hours)

Introduction-Transportation Problem – North-west corner rule – Matrix Minima Method – Vogels Approximations Methods-Modi Method-Problems only.   [section – 6.1-6.5 & 6.8]

Unit III: Assignment Problems   (15 Hours)

Introduction- Assignment Problems – Hungarian Method - Problems only. [section – 7.1-7.4]

Unit IV: PERT/CPM Method   (15 Hours)

Introduction-Network: Basic Components-Critical Path Method- PERT Method – Simple Problems only. [section – 21.1-21.2 & 21.5-21.6]

Unit V: Games and Strategies & Inventory   (15 Hours)

Introduction -Two person zero sum Games – Maxmin- Minmax Principle – Saddle point – Inventory –Introduction – EOQ- Determinstic Inventory Problems - Problems only. [section – 9.1-9.4 &

Section -18.5& 18.6]

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Operations Research 8th Edition	KantiSwarup, P.K.Guptaand Manmohan	Sultan Chand & Sons, Chennai.	1999

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Operations Research, Second Edition	S.Kalavathy	Vikas Publishing House, New Delhi	2002
2	Operations Research 15th Edition	KantiSwarup, P.K.Gupta and Manmohan	Sultan Chand & Sons, Chennai.	2010
3	Operations Research, Second Edition	P.K.Gupta and D.S.Hira	S.Chand& Co, NewDelhi	2004
4	Operations Research	HamdyTaha	Prentice Hall Publications, NewDelhi	1996
5	Operations Research	Nita Hshah Ravi M. GorHardiksoni	PHI, P,Ltd,	2010

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	M
CO2	S	S	S	M	S
CO3	M	S	S	M	M
CO4	M	S	S	M	S
CO5	S	S	S	M	S

S- Strong; **M**-Medium.

GEC -IV	For other Department (B.Sc. Computer Science, IT & AI&DS)	Credits:5
Course Code: M23UMAGE7	ELECTIVE – IV - GENERIC ELECTIVE - OPTIMIZATION TECHNIQUES	Contact Hour Per Week: 5

OBJECTIVES:

To focuses on basic mathematics concepts and to develop an idea of Operation Research. The main objective is to impart the knowledge on fundamental topics such as

- Linear programming problem
- Transportation Problem
- Assignment Problems
- Sequencing Problem
- Games and Strategies

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge level
CO1	Examine the Ideas of Graphical Method and Simplex Method	K1
CO2	Solve the problems on Transportation Problem	K3
CO3	Demonstrate the concept of Assignment Problems	K2
CO4	Explain the concept of Sequencing Problem	K3
CO5	Classify the Idea of Game theory	K4

UNIT I: Linear programming problem   **(15 Hours)**

Introduction- Graphical Method – Simplex Method- Problems only .

[section – 2.3 & 3.1-3.2]

UNIT II: Transportation Problem   **(15 Hours)**

Introduction-Transportation Problem – North-west corner rule – Matrix Minima Method – Vogels Approximations Methods- Problems only. [section – 6.1-6.5]

UNIT III: Assignment Problems   **(15 Hours)**

Introduction- Assignment Problems – Hungarian Method - Problems only. [section – 7.1-7.4]

UNIT IV: Sequencing Problem   **(15 Hours)**

Introduction- Sequencing Problem – n jobs two machines - n jobs k machines - Problems only. [section – 10.1-10.4]

UNIT V: Games and Strategies   **(15 Hours)**

Introduction -Two person zero sum Games – Maxmin- Minmax Principle – Saddle point - Problems only. [section – 9.1-9.4]

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Operations Research 15th Edition	Kanti Swarup, P.K.Gupta and Manmohan	Sultan Chand & Sons, Chennai.	2010

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Operations Research, Second Edition	S.Kalavathy	Vikas Publishing House, New Delhi	2002
2	Operations Research 15th Edition	KantiSwarup, P.K.Gupta and Manmohan	Sultan Chand & Sons, Chennai.	2010
3	Operations Research, Second Edition	P.K.Gupta and D.S.Hira	S.Chand& Co, NewDelhi	2004
4	Operations Research	HamdyTaha	Prentice Hall Publications, NewDelhi	1996
5	Operations Research	Nita Hshah Ravi M. GorHardiksoni	PHI, P,Ltd,	2010

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

Cos	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	M
CO2	S	S	S	M	S
CO3	M	S	S	M	M
CO4	M	S	S	M	S
CO5	S	S	S	M	S

S- Strong; **M**-Medium.

SKILL ENHANCEMENT COURSE-II

SEC – II (NME – II)	For Other Department (NME)	Credits:2
Course Code: **M23UMAN03**	**SEC - II - NME – II - APTITUDE FOR COMPETITIVE EXAMINATIONS - II**	**Contact Hour Per Week:2**

OBJECTIVES:

To focuses on basic technical concepts and to develop an idea of aptitude examination. The main objective is to impart the knowledge on fundamental topics such as

- Partnership
- Area
- Compound interest
- Simple interest
- Odd man out & series

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES :

On the successful completion of the course , students will be able to

COs	Statement	Knowledge level
CO1	Identify the Partnership, Simple interest , Compound interest , Area, Odd man out & series.	K1
CO2	Give Example of Partnership, Simple interest , Compound interest , Area, Odd man out & series.	K2
CO3	Apply the Partnership, Simple interest , Compound interest , Area, Odd man out & series.	K3
CO4	Analyze the Partnership, Simple interest , Compound interest , Area, Odd man out & series.	K4
CO5	Calculate the Partnership, Simple interest , Compound interest , Area, Odd man out & series.	K4

UNIT I: **(6 Hours)**
   Partnership (Section-I: 13)

UNIT II: **(6 Hours)**
   Simple interest (Section-I: 21)

UNIT III: **(6 Hours)**
   Compound interest (Section-I: 22)

UNIT IV: **(6 Hours)**
   Area. (Section-I: 24)

UNIT V: **(6 Hours)**
   Odd man out & series (Section-I: 35)

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOK:

S. No	Name of the Book	Author	Publisher	Year Of Publications
1.	Quantitative Aptitude for competitive Examinations	R.S.AggarWal	S.Chand & Co Ltd,152, Annasalai, Chennai.	2001

REFERENCE BOOK:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Wiley's Quantitative Aptitude	P.A. Anand	Wiley's Publications	2015 First Edition

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M
CO2	S	M	S	M	S
CO3	M	S	M	S	M
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S- Strong; **M**-Medium.

SKILL ENHANCEMENT COURSE-II

SEC – II (NME – II)	For Other Department (NME)	Credits:2
Course Code: M23UMAN04	SEC - II - NME – II - APPLIED NUMERICAL METHODS	Contact Hour Per Week:2

OBJECTIVES:

To focuses on basic technical concepts and to develop an idea of numerical methods. The main objective is to impart the knowledge on fundamental topics such as

- Solution of algebraic and Transcendental Equations
- Bisection Method
- Newton – Raphson Method
- Newton Forward difference
- Newton Backward difference
- Central differences

In addition, it also provides technical thinking to solve the problems related to the above concepts.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

COs	Statement	Knowledge level
CO1	Define the Solution of algebraic, Finite difference , Newton Forward , difference , Newton Backward difference , Central differences .	K1
CO2	Express the Solution of algebraic and Transcendental Equations , First difference , Newton Forward difference , Newton Backward difference , Properties of the operator D .	K2
CO3	Explain the Bisection Method – Newton, – Higher differences , Newton Forward difference , Newton Backward difference , Properties of the operator D .	K3
CO4	Simplify the Raphson Method, Expression of any value of y in terms of the initial value y_0 and differences, Newton Forward difference , Newton Backward difference , Central differences .	K4
CO5	Correlate the Raphson Method, Expression of any value of y in terms of the initial value y_0 and differences, Newton Forward difference , Newton Backward difference , Central differences .	K4

UNIT I: **(6 Hours)**

Solution of algebraic and Transcendental Equations – Bisection Method - Newton – Raphson Method.

UNIT II: **(6 Hours)**

Finite difference – Definition – First difference – Higher differences – Difference tables – Expression of any value of y in terms of the initial value y_0 and differences.

UNIT III: (6 Hours)

Newton Forward Difference – Simple problems.

UNIT IV: (6 Hours)

Newton Backward Difference – Simple problems.

UNIT V: (6 Hours)

Central differences – Properties of the operator D – simple problems.

TEACHING METHODS:

Chalk and Talk / PowerPoint presentation/ Seminar / Quiz / Discussion / Assignments

TEXT BOOKS:

S. No	Name of the Book	Author	Publisher	Year Of Publication
1.	Introductory methods of Numerical Analysis – 2nd Edition	S.S.Sastry	Prentice Hall of India Pvt Ltd, New Delhi	1990
2.	Numerical Methods in Science and Engineering – 2nd Edition (revised)	Dr.M.K.Venkataraman	The National Publishing Company, Chennai.	2003

REFERENCE BOOKS:

S. No	Title of the Book	Author	Publisher	Year of Publication
1.	Introducing methods of Numerical analysis	S. S. Sastry	Prentice Hall of India private limited, New Delhi	2002
2	Numerical Analysis	Richard Bronson	Thomson India Limited	2002
3	Elementary Numerical Analysis	Samuel D.Conte; Carl De Boor	Narosa Publishing House	1981

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES:

COs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S
CO2	S	S	M	M	S
CO3	M	S	M	S	M
CO4	S	M	S	M	S
CO5	S	M	S	M	S

S- Strong; **M**-Medium.