

PREAMBLE

The Four-Year Undergraduate Programme in **Mathematics** (FYUGP - HONOURS) offered by Fatima Mata National College has a student centric approach in which the student can choose their own pathway for learning. The syllabus has been revised and the revised syllabus is to be effective from 2024 admission. On successful attainment of 133 credits in a three-year period, a student shall be awarded an Undergraduate Degree. In a four-year period, the student can successfully attain 177 credits and shall be awarded with either Undergraduate Honours Degree or Undergraduate Honours with Research Degree. The students can acquire credits through the following categories of subjects.

1. Discipline Specific Core (DSC) Courses
2. Discipline Specific Elective (DSE) Courses
3. General Foundation Courses
 - a) Multi-Disciplinary (MDC) Courses
 - b) Ability Enhancement Courses
 - c) Value Addition Courses
 - d) Skill Enhancement Courses

Discipline Specific Core (DSC) courses are the core credit courses in a particular discipline. Students may choose DSC courses as their major or minor course of study. Discipline Specific Elective (DSE) Courses are a pool of credit courses in a particular discipline. These courses offer specialisation to students in a particular discipline. It can be a major or minor course of study. Multi-Disciplinary Courses (MDC) are Generic Elective courses meant to ensure multi-disciplinary/interdisciplinary education to students. Every Discipline has to offer MDCs. Ability Enhancement Courses (AEC) are courses offered by language and Literature Disciplines to ensure enhancement of language proficiency among students.

Students who secure at least 75 % of marks in all the six semesters can choose Undergraduate Honours with Research stream in the fourth year. Value Addition Courses (VAC) are meant to inculcate ethics, constitutional values, soft skills, sports and such similar values to students. Every discipline may offer VACs. Skill Enhancement Courses (SEC) are skill-based courses in all disciplines which may inculcate skill, competencies and hands on training. In the first three semesters of the FYUGP, the student should learn one Multi-Disciplinary Course (MDC) each from a discipline other than the Major and Minor disciplines already chosen. The first and second MDC (MDC1 and MDC2), respectively in the first and second semesters, can be offered by all departments. The third MDC (MDC3) in the third semester is common to all the students, with Kerala-specific content (KS), and offered by English (E) and Other Language (OL) departments. Each MDC has 3 credits. Total 9 credits shall be earned from MDC. The four Ability Enhancement Courses (AEC) are to be offered by English and Other language departments. Out of the total 4 Courses, the student has to Choose two from English department and another two from any of the other languages department. VAC and SEC shall be offered by all Disciplines.

Exit Points and Credit Requirements

On Completion of 3 Years (6 Semesters) the student has an option to exit the programme with 133 credits and shall be awarded with a bachelor's degree. The Maximum credit a student can acquire in three-year period is limited to 150. On Completion of 4 years of study (8 Semesters) by acquiring 177 credit the student shall be awarded with a Bachelors (Honours) Degree or Bachelors (Honours with Research) Degree. One semester is defined as 90 working days and an academic year is divided into two semesters and an optional summer fast track semester. In addition to the 90 working days, 10 working days in a semester shall be used for co-curricular activities. ·An academic year shall consist of 200 working days. ·One semester consisting of 18 weeks with 5 working days per week. In each semester 15 days (3week) should be kept a side for examinations including internal examination evaluation and other academic activities. The maximum available weeks for curriculum transactions should be fixed as 15 in each semester. Minimum of 5 teaching / tutorial hours could be made available for a day in a 5-day week. A 4 - year Degree with (Honours/Research) program shall have a minimum credit requirement of 177. A 3-year exit option (Bachelor's Degree) is given to a student completing 133 credits.

COURSE OUTLINE

Semester	Course Code	Course Title	Instructional hrs/Week			Credit	
			T	P	Total		
I	24UMM-DSC111	Foundations of Mathematics	4	1	5	4	
	24UMM-DSC112	Differential Calculus and Linear Algebra	4	1	5	4	
	24UMM-DSC113	Differentiation and Complex Numbers	4	1	5	4	
	24UMM-DSC114	Relations, Functions and Number Theory	4	1	5	4	
	24UMM-DSC115	Mathematics for Social Sciences-I	4	1	5	4	
	24UMM-DSC116	Differentiation, Sequences and Series	4	1	5	4	
	24UMM-DSC117	Differentiation and Theory of Numbers	4	1	5	4	
	24UMM-DSC118	Matrices and Linear Equations	4	1	5	4	
	24UMM-MDC111	Numerical Ability-I	3	0	3	3	Anyone
	24UMM-MDC112	Business Mathematics	3	0	3	3	
24UMM-MDC113	Mathematical Thinking	3	0	3	3		
II	24UMM-DSC211	Theory of Equations, Differential Calculus and Geometry	4	1	5	4	
	24UMM-DSC212	Integral Calculus and Vectors	4	1	5	4	
	24UMM-DSC213	Integration and Multivariate Calculus	4	1	5	4	
	24UMM-DSC214	Applications of Differentiation and Ordinary Differential Equations	4	1	5	4	
	24UMM-DSC215	Mathematics for Social Sciences-II	4	1	5	4	
	24UMM-DSC216	Integration and Applications of	4	1	5	4	

		Differentiation						
	24UMM-DSC217	Integral Calculus and Ordinary Differential Equations	4	1	5	4		
	24UMM-DSC218	Integral Calculus and Series	4	1	5	4		
	24UMM-MDC211	Numerical Ability-II	3	0	3	3	Anyone	
	24UMM-MDC212	Basic Operations Research	3	0	3	3		
	24UMM-MDC213	Introduction to Modular Arithmetic and Cryptography	3	0	3	3		
III	24UMM-DSC321	Integral Calculus and Foundations of Vector Calculus	4	1	5	4		
	24UMM-DSC322	Applications of Integration, Special Functions and Fourier Series	4	1	5	4		
	24UMM-DSC323	Group Theory and Probability	4	1	5	4		
	24UMM-DSC324	Geometry, Multivariate and Vector Calculus	4	1	5	4		
	24UMM-DSC325	Mathematics for Social Sciences-III	4	1	5	4		
	24UMM-DSC326	Differential Equations, Multiple Integrals and Vector Calculus	4	1	5	4		
	24UMM-DSC327	Numerical Analysis	4	1	5	4		
	24UMM-DSC328	Applications of Integration and Vector Calculus	4	1	5	4		
	24UMM-DSE321	Programming with LaTeX and Python	4	0	4	4	Anyone	
	24UMM-DSE322	Numerical Analysis	4	0	4	4		
	24UMM-DSE323	Discrete Mathematics	4	0	4	4		
	24UMM-DSE324	Probability Theory	4	0	4	4		
		24UMM-VAC321	Mathematics in Nature	3	0	3	3	Anyone
		24UMM-VAC322	Introduction to Actuarial Mathematics	3	0	3	3	
IV	24UMM-DSC421	Introduction to Real Analysis and Multiple Integrals	4	1	5	4		

	24UMM-DSC422	Partial Differentiation and Introduction to Abstract Algebra	4	1	5	4	
	24UMM-DSE421	Elementary Graph Theory	4	1	5	4	Anyone
	24UMM-DSE422	Data Analysis using Python	3	2	5	4	
	24UMM-DSE423	Introduction to Operations Research	4	1	5	4	
	24UMM-SEC421	Typesetting Documents with LaTeX	2	2	4	3	Anyone
	24UMM-SEC422	Numerical Methods	2	2	4	3	
	24UMM-VAC421	Introduction to Mathematical Modelling	3	0	3	3	
	24UMM-VAC422	Project Management and Game Theory	3	0	3	3	
V	24UMM-DSC531	Ordinary Differential Equations and Advanced Vector Calculus	4	1	5	4	
	24UMM-DSC532	Real Analysis-I	4	0	4	4	
	24UMM-DSC533	Abstract Algebra	4	1	5	4	
	24UMM-DSC534	Advanced Mathematics for Social Sciences	4	0	4	4	
	24UMM-DSE531	Intermediate Graph Theory	4	1	5	4	
	24UMM-DSE532	Advanced Python Programming	3	2	5	4	
	24UMM-DSE533	Special Functions	4	0	4	4	
	24UMM-DSE534	Optimization Techniques	4	0	4	4	
	24UMM-SEC531	Programming with Scilab	3	0	3	3	Anyone
	24UMM-SEC532	Programming with R	3	0	3	3	
	24UMM-SEC533	Programming with Python	3	0	3	3	
VI	24UMM-DSC631	Real Analysis-II	4	1	5	4	
	24UMM-DSC632	Complex Analysis-I	4	0	4	4	
	24UMM-DSC633	Linear Algebra	4	0	4	4	
	24UMM-DSE631	Foundations of Computational Mathematics with Sage Math	3	2	5	4	

	24UMM-DSE632	Partial Differential Equations	4	0	4	4	
	24UMM-DSE633	Integral Transforms	4	0	4	4	
	24UMM-DSE634	Advanced Linear Programming	4	0	4	4	
	24UMM-DSE635	Fuzzy Mathematics	4	0	4	4	
VII	24UMM-DSC741	Topology	4	0	4	4	
	24UMM-DSC742	Complex Analysis-II	4	0	4	4	
	24UMM-DSC535	Linear Algebra	4	0	4	4	
	24UMM-DSC536	Abstract Algebra	4	1	5	4	
	24UMM-DSC537	Special Functions	4	0	4	4	
	24UMM-DSE741	Research Methodology	4	0	4	4	
VIII	24UMM-DSE841	Advanced Graph Theory	4	0	4	4	
	24UMM-DSE842	Semigroup Theory	4	0	4	4	
	24UMM-DSE843	Functional Analysis	4	0	4	4	
	24UMM-DSE844	Advanced Linear Algebra	4	0	4	4	
	24UMM-DSE845	Advanced Abstract Algebra	4	1	5	4	
	24UMM-DSE846	Ordinary and Partial Differential Equations	4	0	4	4	
	24UMM-DSE847	Coding Theory	4	0	4	4	
	24UMM-DSE848	Measure Theory	4	0	4	4	
	24UMM-DSE849	Machine Learning using Python	3	2	5	4	
	24UMM-DSE8410	The Theory of Automata	4	0	4	4	
	Mandatory Research Project for UG Honours with Research or Internship Project for UG Honours.					12	

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC111				
Course Title	Foundations of Mathematics				
Type of Course	DSC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	1	5
Pre-requisites- if any	<ol style="list-style-type: none"> 1. Definition and preliminary results of matrices. 2. Understanding on methods to solve a system of simultaneous of equations. 3. Basic knowledge of various number systems. 				
Course Summary	This course includes set theory, determinants and matrices, number theory and solution of system of equations using matrices and number theory				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC112				
Course Title	Differential Calculus and Linear Algebra				
Type of Course	DSC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	<ol style="list-style-type: none"> 1. Derivative of functions 				

	2. Matrices
Course Summary	This course provides a comprehensive idea of differentiation, its applications and solutions of linear equations

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC113				
Course Title	Differentiation and Complex Numbers				
Type of Course	DSC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Functions, limits and continuity 2. Complex numbers				
Course Summary	This course provides basics on differentiation and complex numbers				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC114				
Course Title	Relations, Functions and Number Theory				
Type of Course	DSC				
Semester	I				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week

	4	4	-	1	5
Pre-requisites- if any	Sets				
Course Summary	Sets, relations, functions and basics of number theory.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC115				
Course Title	Mathematics for Social Sciences-I				
Type of Course	DSC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	1	5
Pre-requisites- if any	Basic knowledge of Mathematics in Secondary level				
Course Summary	This course includes basic set theory, solutions of linear and quadratic equations, linear programming problems and functions				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC116				
Course Title	Differentiation, Sequences and Series				
Type of Course	DSC				
Semester	I				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Functions and limits 2. Arithmetic and geometric progression				
Course Summary	This course provides a detailed study of differentiation and convergence of sequence and series				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSCMAT117				
Course Title	Differentiation and Theory of Numbers				
Type of Course	DSC				
Semester	I				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Functions, limits and continuity 2. Natural numbers				
Course Summary	This course provides a brief idea about differentiation and theory of numbers				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC118				
Course Title	Matrices and Linear Equations				
Type of Course	DSC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	Matrices				
Course Summary	This is a brief introductory course on matrices and system of linear equations.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-MDC111				
Course Title	Numerical Ability-I				
Type of Course	MDC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours		0	3
Pre-requisites- if any	Basic Mathematical Operations				
Course Summary	This course is primarily meant for students who have not undergone a Mathematics course beyond their secondary school. The course is expected to improve the student's basic mathematical skills and to understand the mathematics used in their respective fields better.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-MDC112				
Course Title	Business Mathematics				
Type of Course	MDC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	0	3
Pre-requisites- if any	Basic algebra				
Course Summary	The course covers methods for finding simple interest and compound interest using different period of compounding concepts like index numbers, time series, trend arc - introduced and different ways for finding these are dealt in detail.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-MDC113				
Course Title	Mathematical Thinking				
Type of Course	MDC				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3	-	0	3
Pre-requisites- if any	Basic School Mathematics				
Course Summary	This course is an introduction to the foundations of logic, proof, fundamental properties of integers and linear Diophantine equations.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC211				
Course Title	Theory Equations, Differential Calculus and Geometry				
Type of Course	DSC				
Semester	II				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours		1	5
Pre-requisites- if any	1.Awareness on polynomials 2. Knowledge on the concepts of functions, differentiation and basic geometry				
Course Summary	This course includes theory of equations, differential calculus, polar co-ordinates and conic sections				

GENERAL INFORMATION ABOUT THE COURSE	
Faculty	SCIENCE
Course offering Department	MATHEMATICS
Course Code	24UMM-DSC212

Course Title	Integral Calculus and Vectors				
Type of Course	DSC				
Semester	II				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Integral of elementary functions 2. Vectors				
Course Summary	This course enable the students to find the integrals and know about the vector valued functions				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC213				
Course Title	Integration and Multivariate Calculus				
Type of Course	DSC				
Semester	II				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Derivative of functions 2. Vectors				
Course Summary	This course equips the students to find the integral of functions, its applications, partial derivatives of functions and to know about the basic concepts of vector valued functions				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC215				
Course Title	Mathematics for Social Sciences-II				
Type of Course	DSC				
Semester	II				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	1	5
Pre-requisites- if any	Knowledge of functions, particularly, demand functions, revenue functions and cost functions.				
Course Summary	This course includes Differential calculus, its applications in matrix theory and game theory.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC216				
Course Title	Integration and Applications of Differentiation				
Type of Course	DSC				
Semester	II				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Integration of elementary functions 2. Differentiation				
Course Summary	This course enables the student to understand the applications of differentiation and evaluate the integrals				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC217				
Course Title	Integral Calculus and Ordinary Differential Equations				
Type of Course	DSC				

Semester	II				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Integration 2. Differentiation				
Course Summary	This course enables the students to find the integrals and to solve certain differential equations				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC218				
Course Title	Integral Calculus and Series				
Type of Course	DSC				
Semester	II				
Academic Level	100 -199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	Differential Calculus				
Course Summary	The course deals with Integrals, applications of integrals and the fundamental theorem of calculus. The intuitive idea of Infinite series and Taylors's theorem is also explained.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-MDC211				
Course Title	NUMERICAL ABILITY – II				
Type of Course	MDC				
Semester	II				

Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3	-	0	3
Pre-requisites- if any	Basic Arithmetic Operations				
Course Summary	This course is primarily meant for students who have not undergone a Mathematics course beyond their secondary school. The course is expected to equip the student tackle basic arithmetic problems. The student is further expected to form linear and quadratic equations from simple real world problems on their own and solve the same				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-MDC212				
Course Title	Basic Operations Research				
Type of Course	MDC				
Semester	II				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3	-	0	3
Pre-requisites- if any	Basic Mathematical operations				
Course Summary	This course covers the fundamentals of Operations Research including the historical background, mathematical formulation, graphical solution methods. It delves into the Transportation Problem and Assignment Problem, exploring various methods for obtaining initial basic feasible solutions and introducing algorithms for solving the assignment problem and travelling salesman problem.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-MDC213				
Course Title	Introduction to Modular Arithmetic and Cryptography				

Type of Course	MDC				
Semester	II				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	0	3
Pre-requisites- if any	Basic properties of integers, divisibility, gcd, Linear Diophantine equations, Unique factorization				
Course Summary	This course provides an introduction to Cryptography using congruences.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC321				
Course Title	Integral Calculus and Foundations of Vector Calculus				
Type of Course	DSC				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Awareness of Differential Calculus and Integral Calculus 2. Knowledge of various co-ordinate systems in 2 dimension				
Course Summary	The course deal with identifying the applications of integration and vector valued				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC322				
Course Title	Applications of Integration, Special Functions and Fourier Series				

Type of Course	DSC				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	1	5
Pre-requisites- if any	1.Integration 2. Differentiation				
Course Summary	This course provides applications of integration, beta and gamma functions and Fourier series				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC323				
Course Title	Group Theory and Probability				
Type of Course	DSC				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	Sets, relations, functions, matrices				
Course Summary	This course provides a comprehensive idea about group theory and probability. We start the course with the concepts of groups and subgroups and then we go through permutation groups, cosets and their properties. After this we give an idea about basic probability theory, infact, random variables and its distributions namely binomial, normal and Poisson.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC324				

Course Title	Geometry, Multivariate and Vector Calculus				
Type of Course	DSC				
Semester	III				
Academic Level	200 – 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Differentiation 2. Integration 3.Vectors				
Course Summary	This course enables the students to know the parametric and polar representation of curves, vector-valued functions, partial derivatives, multiple integrals and vector fields.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC325				
Course Title	Mathematics for Social Sciences – III				
Type of Course	DSC				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	Basic knowledge of differential calculus				
Course Summary	This course includes Integral calculus, Partial Differentiation and Differential equations				

GENERAL INFORMATION ABOUT THE COURSE	
Faculty	SCIENCE
Course offering Department	MATHEMATICS
Course Code	24UMM-DSC326
Course Title	Differential Equations, Multiple Integrals and Vector Calculus
Type of Course	DSC

Semester	III				
Academic Level	200 – 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Differential calculus 2. Vectors 3. Integration				
Course Summary	The course enables the students to find the solutions of certain differential equations, identify the applications of multiple integrals and get a brief idea of vector calculus.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC327				
Course Title	Numerical Analysis				
Type of Course	DSC				
Semester	3				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	0	1	5
Pre-requisites- if any	1.Differentiation 2.Integration				
Course Summary	This course enable the students to gain a thorough understanding of various numerical methods used for solving mathematical problems				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC328				
Course Title	Applications of Integration and Vector Calculus				
Type of Course	DSC				
Semester	III				
Academic Level	200 – 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5

Pre-requisites- if any	1.Integration 2. Differentiation 3.Vectors
Course Summary	This course enables the students to get an idea about the applications of integration and vector calculus.

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE321				
Course Title	Programming with LaTeX and Python				
Type of Course	DSE				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	0	4	4
Pre-requisites- if any	Basic computer knowledge				
Course Summary	This course provides basic skill in LaTeX and python programming				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE322				
Course Title	Numerical Analysis				
Type of Course	DSE				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4		0	4
Pre-requisites- if any	1.Differentiation 2. Integration 3. Solution of system of equations				

Course Summary	This course enables the students to gain a thorough understanding of various numerical methods used for solving mathematical problems
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GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE323				
Course Title	Discrete Mathematics				
Type of Course	DSE				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	0	0	4
Pre-requisites- if any	Basic understanding of algebra and mathematical reasoning				
Course Summary	This course serves as an introduction to the fundamental concepts and techniques of discrete mathematics, focusing on topics relevant to computer science, mathematics, and related fields.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE324				
Course Title	Probability Theory				
Type of Course	DSE				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	Sets, limit and continuity of functions				
Course Summary	This course provides a comprehensive idea on basic probability theory and some standard distributions				

GENERAL INFORMATION ABOUT THE COURSE	
Faculty	SCIENCE
Course offering	MATHEMATICS

Department					
Course Code	24UMM-VAC321				
Course Title	Mathematics in Nature				
Type of Course	VAC				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	0	3
Pre-requisites- if any	Basic concepts in Mathematics				
Course Summary	This course explores two fascinating mathematical concepts: the golden ratio and fractals. Both concepts are prevalent in various fields, including mathematics, art, architecture, and nature. Through this course students will be able to gain a deeper appreciation for the beauty and complexity inherent in mathematical patterns and structures.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-VAC322				
Course Title	Introduction to Actuarial Mathematics				
Type of Course	VAC				
Semester	III				
Academic Level	200 – 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	0	3
Pre-requisites- if any	<p>1. Basics of probability theory, including basic concept like probabilities, events, random variables, expected value, and variance.</p> <p>2. Fundamentals of algebra, especially for solving equations and manipulating mathematical expressions.</p>				

Course Summary	This course provides a comprehensive overview of key concepts in actuarial mathematics, including probability theory, financial mathematics and insurance principles. Through exploration of topics such as probabilities, interest calculation, life insurance premiums and annuities, students develop the analytical skills necessary for careers in insurance, finance and risk management.
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GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC421				
Course Title	Introduction to Real Analysis and Multiple Integrals				
Type of Course	DSC				
Semester	IV				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Knowledge of number systems 2. Awareness of Calculus				
Course Summary	This course includes introductory Real Analysis and Multiple Integrals				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC422				
Course Title	Partial Differentiation and Introduction to Abstract Algebra				
Type of Course	DSC				
Semester	IV				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5

Pre-requisites- if any	Awareness of Differential Calculus and Set Theory
Course Summary	This course includes Partial Differentiation and basic Abstract Algebra

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE421				
Course Title	Elementary Graph Theory				
Type of Course	DSE				
Semester	IV				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	0	1	5
Pre-requisites- if any	Fundamental concepts in set theory, Algebra and Geometry				
Course Summary	This course is intended to motivate the students to study Graph Theory as a branch of Discrete Mathematics and prepare them to learn more advanced concepts in Graph Theory				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE422				
Course Title	Data Analysis using Python				
Type of Course	DSE				
Semester	IV				
Academic Level	200 - 299				

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3	-	2	5
Pre-requisites- if any	Basics of Python, Descriptive Statistics, Statistical Plotting, Testing of Hypothesis, Simple Linear Regression and Correlation				
Course Summary	This course in Data Visualization and Statistical Analysis using Python equips students with the skills to visualize data through various plots and graphs, obtain statistical measures, conduct hypothesis tests, and perform correlation and regression analysis, all within the Python programming environment.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE423				
Course Title	Introduction to Operations Research				
Type of Course	DSE				
Semester	IV				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	Matrix Theory				
Course Summary	At the end of the course, students get a clear idea of using the technique in algebra that uses linear equations to determine how to arrive at the optimal situation (maximum or minimum) as an answer to a mathematical problem, assuming the finiteness of resources and the quantifiable nature of the end optimization goal.				

GENERAL INFORMATION ABOUT THE COURSE	
Faculty	SCIENCE
Course offering Department	MATHEMATICS
Course Code	24UMM-SEC421

Course Title	Typesetting Documents with LaTeX				
Type of Course	SEC				
Semester	IV				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2	-	2	4
Pre-requisites- if any	Basic computer knowledge				
Course Summary	This course provides the basics of LaTeX programs which enable the students to create good quality scientific documents and presentations				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-SEC422				
Course Title	Numerical Methods				
Type of Course	SEC				
Semester	IV				
Academic Level	200 – 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2	4
Pre-requisites- if any	1.Differentiation 2.Integration				
Course Summary	This course enable the students to gain a thorough understanding of various numerical methods used for solving mathematical problems				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-VAC421				

Course Title	Introduction to Mathematical Modelling				
Type of Course	VAC				
Semester	IV				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3	-	0	3
Pre-requisites- if any	Basic School Mathematics and basic Calculus				
Course Summary	This course is designed for enhancing students to work with data from the real world by formulating mathematical questions and drawing conclusions based on the analysis of that data using different mathematical tool				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-VAC422				
Course Title	Project Management and Game Theory				
Type of Course	VAC				
Semester	IV				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3	-	0	3
Pre-requisites- if any	Matrix Theory				
Course Summary	After completing the course students get the clear idea of the following, minimizing some measure of performance of a system such as the total completion time for the project, overall cost and so on, types of game theory, Mathematics required for solving game theory, Technique of solving for different types of games.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC531				
Course Title	Ordinary Differential Equations and Advanced Vector Calculus				
Type of Course	DSC				
Semester	V				
Academic Level	300 -399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Differential calculus 2. Integral calculus 3. Vector calculus				
Course Summary	This course will introduce the fundamental concepts of ODE, different techniques for solving these ODE's and gives fundamental concepts of Vector Calculus including Vector Field, Line Integrals, Surface Integrals and Volume Integrals. Also it explains the physical interpretation of Green's Theorem, Stoke's Theorem and Divergence Theorem.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC532				
Course Title	Real Analysis-I				
Type of Course	DSC				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	1. Functions 2. Sequences 3. Convergence of sequences				
Course Summary	This course provides the basics of real analysis.				

GENERAL INFORMATION ABOUT THE COURSE	
Faculty	SCIENCE
Course offering Department	MATHEMATICS
Course Code	24UMM-DSC533
Course Title	Abstract Algebra
Type of Course	DSC

Semester	V				
Academic Level	300 – 399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	Groups and Subgroups				
Course Summary	This course delves into the fundamental concepts of homomorphism and factor groups. It covers the definition of Rings, fields and Integral Domains along with the field of quotients of an integral domain, rings of polynomials and factorization of polynomials over a field, factor rings and prime and maximal ideals				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC534				
Course Title	Advanced Mathematics for Social Sciences				
Type of Course	DSC				
Semester	V				
Academic Level	300 –399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours /Week
	4	4	-	0	4
Pre-requisites if any	Knowledge of Matrices, Calculus and Basics of Linear Programming				
Course Summary	This course includes Determinants and Matrices, Differential and integral Calculus, Differential and Difference Equations, Linear Programming				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE531				
Course Title	Intermediate Graph Theory				
Type of Course	DSE				
Semester	V				
Academic Level	300-399				

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	Basic concepts in Graph Theory				
Course Summary	This course is developed to prepare the students studying graph theory to develop a clear understanding of graph theoretic concepts.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE532				
Course Title	Advanced Python Programming				
Type of Course	DSE				
Semester	V				
Academic Level	300 - 399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3	-	2	5
Pre-requisites- if any	<ol style="list-style-type: none"> 1. Basic knowledge of mathematics, including algebra and calculus 2. Familiarity with programming concepts and Python programming language 3. Some exposure in signal processing concepts 				
Course Summary	This course comprehensively explores computational methods and tools for data analysis and visualization. Students will gain practical skills to tackle real-world challenges by covering modules on SciPy for mathematical problem-solving, signal processing, Pandas for data manipulation, and advanced visualization techniques. Through hands-on exercises and projects, learners will develop proficiency in solving complex problems, analyzing diverse datasets, and creating compelling visualizations to communicate insights effectively.				

GENERAL INFORMATION ABOUT THE COURSE	
Faculty	SCIENCE
Course offering Department	MATHEMATICS
Course Code	24UMM-DSE533
Course Title	Special Functions
Type of Course	DSE

Semester	V				
Academic Level	300 – 399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	1. Derivatives 2. Integral Calculus 3. Linear Differential Equations				
Course Summary	This course will enable the students to understand the properties of special functions like Legendre Functions, Bessel's Function etc.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE534				
Course Title	Optimization Techniques				
Type of Course	DSE				
Semester	V				
Academic Level	300 – 399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	Probability Distributions (Poisson and Exponential)				
Course Summary	At the end of the course student get the clear ideas of the following, minimizing some measure of performance of a system such as the total completion time for the project, overall cost and so on, how lines form, how they function, and why they malfunction. He can also examine every component of waiting in line, including the arrival process and the number of customers in a waiting line, a systematic procedure in assigning priorities to waiting jobs thereby determining the sequence in which jobs will be processed and decomposing a multistage problem into a sequence of interrelated one-stage problems and hence finding an optimal solution				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-SEC531				
Course Title	Programming with Scilab				
Type of Course	SEC				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3	-	0	3
Pre-requisites- if any	Basic computer knowledge				
Course Summary	This course provides an introduction to programming in Scilab, focusing on data manipulation, analysis, and visualization.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-SEC532				
Course Title	Programming with R				
Type of Course	SEC				
Semester	V				
Academic Level	300 -399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3	-	0	3
Pre-requisites- if any	Basic Programming skill				
Course Summary	This course provides an introduction to programming in R, focusing on data manipulation, analysis, and visualization. Students will learn how to write R scripts, understand basic data structures like vectors, lists, and data frames, and perform data analysis, graphical data representation and solve some statistical problems.				

GENERAL INFORMATION ABOUT THE COURSE	
Faculty	SCIENCE
Course offering Department	MATHEMATICS

Course Code	24UMM-SEC533				
Course Title	Programming with Python				
Type of Course	SEC				
Semester	V				
Academic Level	300 – 399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	0	3
Pre-requisites- if any	Basic computer programming skill				
Course Summary	This course offers basics of python programming.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC631				
Course Title	Real Analysis –II				
Type of Course	DSC				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	1	5
Pre-requisites- if any	1. Limits 2. Continuity 3. Differentiation				
Course Summary	This course includes Riemann Integral, Fundamental Theorems, Metric spaces and the concepts Interior, closure and boundary of sets.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC632				
Course Title	Complex Analysis –I				
Type of Course	DSC				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	1. Complex Numbers 2. Differentiation 3. Integration				
Course Summary	This course deals with the study of analytic functions and help the students to evaluate complex integrals				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC633				
Course Title	Linear Algebra				
Type of Course	DSC				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial	Practical	Total Hours/Week

			per week	per week	
	4	4	-	0	4
Pre-requisites- if any	1. Matrix operations & its algebraic properties 2. Singular and Non-singular Matrices 3. Matrix inverses and their properties				
Course Summary	The primary purpose of this course is to explore the concepts of vector spaces, linear transformation on vector spaces and the relationship between linear transformation and matrices.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE631				
Course Title	Foundations of Computational Mathematics with Sage Math				
Type of Course	DSE				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3	-	2	5
Pre-requisites- if any	Basic knowledge of algebra, calculus, and basic programming concepts, Familiarity with mathematical topics like matrices, derivatives, integrals, and number theory, Basic knowledge of programming fundamentals such as variables, loops, and control structures				
Course Summary	This course provides a comprehensive introduction to computational mathematics using Sage Math, covering topics ranging from basic arithmetic operations to advanced calculus, matrix algebra, and programming techniques. Students will learn to leverage the power of computational tools for mathematical exploration, problem-solving, and visualization, equipping them with essential skills for mathematical analysis in various fields				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE632				
Course Title	Partial Differential Equations				
Type of Course	DSE				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	1. Differential Calculus 2. Integral Calculus 3. Differential equations				
Course Summary	This course will introduce the fundamental concepts of PDE and different techniques for solving these PDE's				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE633				
Course Title	Integral Transforms				
Type of Course	DSE				
Semester	VI				
Academic Level	300-399				

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	Integral Calculus				
Course Summary	This course will equip the students with the knowledge and techniques to utilize the Laplace transform and Fourier Analysis for solving various problems.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE634				
Course Title	Advanced Linear Programming				
Type of Course	DSC				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	Linear Programming Problems				
Course Summary	At the end of the course student get a clear picture of following: assign a dual variable for each primal constraint, construct a dual constraint for each primal variable, finding the solution of the primal from the dual, locate a basic feasible solution of a transportation problem by various methods and a minimum transportation schedule by MODI method, determine the optimal solutions of assignment problems using the Hungarian method, types of game theory, Mathematics required for solving game theory, Techniques of solving for different types of games.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE635				
Course Title	Fuzzy Mathematics				
Type of Course	DSE				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	Sets, Operations and Functions				
Course Summary	This course will introduce the fundamental concepts of fuzzy set theory, fuzzy logic, fuzzy arithmetic and fuzzy relations. Through this course students will be able to apply these concepts to model real-world problems where there is inherent uncertainty in data or decision making.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC741				
Course Title	Topology				
Type of Course	DSC				
Semester	VII				
Academic Level	400 – 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week

	4	4	-	0	4
Pre-requisites- if any	Metric Space: Definition, examples, basic concepts such as Interior, closure and boundary, their examples and properties				
Course Summary	This course provides important concepts in metric spaces and point set topology. We begin the course by continuous functions on metric spaces. Then we introduce the concept of topological spaces and its properties. Also the topological properties such as connectedness, compactness and related concepts are also discussed.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC742				
Course Title	Complex Analysis - II				
Type of Course	DSC				
Semester	VII				
Academic Level	400 - 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	1. Analytic Functions 2. Integration				
Course Summary	The course deals with the study of power series, conformal mapping and helps the student to evaluate certain real and improper integrals.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC535				
Course Title	Linear Algebra				
Type of Course	DSC				
Semester	VII				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	1. Matrix operations & its algebraic properties 2. Singular and Non-singular Matrices 3. Matrix inverses and their properties				
Course Summary	The primary purpose of this course is to explore the concepts of vector spaces, linear transformation on vector spaces and the relationship between linear transformation and matrices.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC536				
Course Title	Abstract Algebra				
Type of Course	DSC				
Semester	VII				
Academic Level	300 – 399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	Groups and Subgroups				
Course Summary	This course delves into the fundamental concepts of homomorphism and factor groups. It covers the definition of Rings, fields and Integral Domains along with the field of quotients of an integral domain, rings of polynomials and factorization of polynomials over a field, factor rings and prime and maximal ideals				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSC537				
Course Title	Special Functions				
Type of Course	DSC				
Semester	VII				
Academic Level	300 – 399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	1. Derivatives 2. Integral Calculus 3. Linear Differential Equations				
Course Summary	This course will enable the students to understand the properties of special functions like Legendre Functions, Bessel's Function etc.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE741				
Course Title	Research Methodology				
Type of Course	DSE				
Semester	VII				
Academic Level	400 – 499				
Course Details	Credit	Lecture per week	Tutorial	Practical	Total Hours/Week

			per week	per week	
	4	4	-	0	4
Pre-requisites- if any	Basic idea of research				
Course Summary	The main purpose of this course is to help the researchers and students of the sciences in our discipline to prepare manuscripts that will have a high probability of being accepted for publication and of being completely understood when they are published.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE841				
Course Title	Advanced Graph Theory				
Type of Course	DSE				
Semester	VIII				
Academic Level	400 – 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	Basic concepts in Graph Theory				
Course Summary	This course is intended to prepare the students for more advanced level concepts and ideas leading to research in Graph Theory.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE842				
Course Title	Semigroup Theory				
Type of Course	DSE				
Semester	VIII				
Academic Level	400 – 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	Basic concepts from elementary group theory such as the definition of groups, cosets, factor groups and homomorphism.				
Course Summary	This course provides an elementary idea about semigroup theory. We begin the course with elementary concepts on semigroup theory such as generators, subsemigroups, binary relations, lattices, homomorphisms, sub-direct products, actions and Cayley graph. Then we give the green's relations to understand the structure of semigroups. After this, we go through regular semigroups, inverse semigroups and related concepts.				

GENERAL INFORMATION ABOUT THE COURSE	
Faculty	SCIENCE
Course offering Department	MATHEMATICS
Course Code	24UMM-DSE843
Course Title	Functional Analysis
Type of Course	DSE
Semester	VIII

Academic Level	400 – 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	A quick review on : Metric spaces and continuous functions				
Course Summary	This course explores the interplay between algebraic structures and distance structures. Students will gain a comprehensive idea on Banach and Hilbert spaces and bounded operators on them.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE844				
Course Title	Advanced Linear Algebra				
Type of Course	DSE				
Semester	VIII				
Academic Level	400 – 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	<ol style="list-style-type: none"> 1. Vector spaces 2. Subspaces 3. Bases and dimensions 				
Course Summary	This course provides a comprehensive idea about the mathematical concepts of linear algebra in an advanced level.				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE845				
Course Title	ADVANCED ABSTRACT ALGEBRA				
Type of Course	DSE				
Semester	VIII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	1	5
Pre-requisites- if any	1. Groups 2. Rings and Fields				
Course Summary	The Course covers advanced topics in group theory like Sylow theorems, Isomorphism theorems and Series of groups. Commutative algebra delves into Unique factorization domains, Euclidean domains. Finally, explore the topics Extension Fields, Algebraic Extensions and Finite Fields				

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE846				
Course Title	Ordinary and Partial Differential Equations				
Type of Course	DSE				
Semester	VIII				
Academic Level	400 – 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4

Pre-requisites- if any	Differential Equations
Course Summary	This course aims to teach the basic concepts of ODE and PDE, and different techniques for solving these ODE's and PDE's. Also, this will discuss the physical applications in Physics and Engineering fields.

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE847				
Course Title	Coding Theory				
Type of Course	DSE				
Semester	VIII				
Academic Level	400 – 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	Basic Linear Algebra				
Course Summary	Linear codes involve encoding data into a sequence of bits using mathematical operations to correct errors during transmission. Cyclic codes are special type of linear codes facilitating efficient encoding and decoding.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE848				
Course Title	Measure Theory				
Type of Course	DSE				
Semester	VIII				
Academic Level	400 – 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	Sequence and series of real numbers and their limits, Limit of functions, Continuity and uniform continuity of functions, Sequence and series of functions and their limits, Riemann Integration.				
Course Summary	This course provides a comprehensive idea about Lebesgue measure, measurable functions and integration of measurable functions.				

GENERAL INFORMATION ABOUT THE COURSE					
Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE849				
Course Title	Machine Learning Using Python				
Type of Course	DSE				
Semester	VIII				
Academic Level	400 – 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3	-	2	5

Pre-requisites- if any	Basics of Python
Course Summary	An introduction to supervised and unsupervised machine learning algorithms using python.

GENERAL INFORMATION ABOUT THE COURSE

Faculty	SCIENCE				
Course offering Department	MATHEMATICS				
Course Code	24UMM-DSE8410				
Course Title	The Theory of Automata				
Type of Course	DSE				
Semester	VIII				
Academic Level					
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4	-	0	4
Pre-requisites- if any	Fundamental Topics in Maths				
Course Summary	This course provides the theory of Automata.				