

## **Programme: B. Sc. Mathematics**

SEMESTER – I				
Core I Classical Algebra				
Code :18UMAC11	Hrs / Week: 5	Hrs / Semester: 75	Credits: 4	

# **Course Outcome**

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	solve polynomial equations and simultaneous linear equations.	4	An
CO-2	solve the equations using the relation between the roots and coefficients.	4	An
CO-3	form the equations from the given roots and identify and solve the reciprocal equations	5,9	Cr, Un
CO-4	transform the equations by increasing, decreasing and multiplying the roots of the equations	4	Un
CO-5	solve the equations by removing the terms of the equations.	4	Ар
CO-6	locate real and imaginary roots of the equations	5,9	Un
CO-7	find the approximate values of the irrational roots of the equations.	4	Cr
CO-8	determine the roots of the equations by using various methods like Cardon's method, Ferrari's method.	4	Cr

Criterion I

SEMESTER – I			
Core II Calculus			
Code :18UMAC12	Hrs / Week: 5	Hrs / Semester: 75	Credits: 4

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CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	state the concept of curvature of a plane curve.	5	Re
CO-2	calculate the curvature of various curves in plane and space	5,9	Ev
CO-3	apply the fundamental concepts of Calculus to variety of real world problems.	4	Ap
CO-4	find surface area using a double integral.	3,8	Un
CO-5	evaluate triple integrals and use them to find volumes in rectangular, cylindrical and spherical coordinates.	4 ,10	Ev
CO-6	compute definite and indefinite integrals of algebraic and trigonometric functions using formulae and substitution	10	Cr
CO-7	know the relationship between the Gamma and Beta functions	6,7	An
CO-8	use Beta and Gamma function to solve different type of integrals and to understand Gamma function as a generalization of factorial function.	7	Un, Ev

Criterion I

SSR Cycle V

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SEMESTER - I					
Allied Physics – Paper I					
18UPHA11Hrs / Week: 4Hrs / Semester: 60Credits: 3					

**Course Outcome:** 

CO No	Unon completion of this course, students will be able to		CL
0.110.	opon completion of this course, students will be able to	addressed	
CO-1	define fundamentals of elasticity and discuss concepts of stress and strain and the relationship between both, use the stress-strain equations to solve the problems of elastic modes	1	Re, Un
CO-2	solve problems related to uniform and non-uniform bending of beams	1	An
CO-3	define the terms viscosity and surface tension	1	Re
CO-4	describe the properties of fluids such as viscosity, surface tension and capillary rise and evaluate the value of coefficient of viscosity	1,2,6	Un,Ev
CO-5	estimate the thermal conductivity of a bad conductor	1	Ev
CO-6	calculate the specific heat capacity of a liquid	1, 6	An
CO-7	calculate the thickness of a thin wire by forming interference fringes	1, 2, 6	An
CO-8	assess the dispersive power and resolving power of a grating	1, 2, 6	Ev

Criterion I

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Ability	Enhancement Cou	urse - Value Education	
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#### Unit I : Introduction

Value education and its Relevance to present day – Meaning of Value Education – Education and its role – Leading a fulfilling life of universal values

Unit II : Cultivation of Personal Values

Personal Values– Truth - Honesty and Integrity – Love –Compassion – Gratitude -Courage – Optimism – Friendship

**Unit III :** Elimination of Negative Emotions

Overcome fear – Jealousy is harmful – Sources of jealousy - Jealousy and compulsiveness- Be an optimist – Gossip is Dynamite – Anger

#### **Unit IV** : Family Values

Familial Responsibilities –Five Basic Functions of a Mother - Fathers' role in the family - Five Duties of Children to Parents - Indian Cultural Values

Unit V: Spiritual Value

Cultivating Good Manners – Being Persuasive – Being authentic – Professional Ethics – Work Culture – Code of Conduct

Criterion I

SEMESTER – II					
Core III	Core III Analytical Geometry of Three Dimensions				
Code:18UMAC21	Hrs / Week: 5	Hrs / Semester: 75	Credits: 4		

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CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the fundamental aspects of three-dimensional	1,2 , 3	Un
	geometry.		
CO-2	represent simple three-dimensional figures using two-	4	Un
	dimensional drawings.		STREET, STR
CO-3	demonstrate basic mathematical understanding and	5,9	Un
	computational skills in three dimensions.		
CO-4	apply algebraic methods to the study of curves and	5	Ар
	surfaces that lie in three dimensions.		
CO-5	apply geometric properties and relationships to solve	5	Un
	problems in three dimensions.		
CO 6	develop logical thinking accomptain thinking and there	67	Am
0-0	develop logical uninking, geometric uninking and unee-	0,7	An
	unnensional spatial admity.		
CO-7	solve many difficult problems with simple solutions.	6, 10	Cr
CO 8	and a superior to any sortial shills in such as	5.0	C.
00-8	create opportunities to use spatial skills in problem-	5,9	Cr
- Start	solving tasks.	a started	14
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Criterion I

SEMESTER – II				
Core IV Differential Equations				
Code:18UMAC22	Hrs / Week: 5	Hrs / Semester: 75	Credits: 4	

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	identify an ordinary differential equation and its order.	4	Un
CO-2	verify whether a given function is a solution of a given ordinary differential equation (as well as verifying initial conditions when applicable).	5, 9	An
CO-3	classify ordinary differential equations into linear and nonlinear equations.	5, 9	Un
CO-4	solve first order linear differential equations.	4	An
CO-5	find the general solution of second order linear homogeneous equations with constant coefficients.	4	Cr
CO-6	compute the Laplace transform and inverse Laplace transform	4	Ap
CO-7	use the Laplace transform to compute solutions of second order, linear equations with constant coefficients	4	Ap
CO-8	identify essential characteristics of ordinary and partial differential equations.	4	Un

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SEMESTER – II					
Allied Physics – Paper II					
18UPHA21Hrs / Week: 4Hrs / Semester: 60Credits: 3					

# **Course Outcome**

CO.No.	Upon completion of this course, students will be	PSO	CL
	able to	addressed	
CO-1	apply the Gauss law in the calculation of electric fields	1	Ap, Un
	due to various charge distributions and Understand		
	electrostatic force between point charges.		
CO-2	define and explain self and mutual inductance	1	Re, Un
CO-3	employ Lenz law and Faraday's law for magnetically coupled circuits	1	An
CO-4	apply knowledge of electricity and magnetism to	1	Ар
	technological advances		
CO-5	understand the principle of energy release in nuclear	8	Un
	the need for energy conservation		
CO-6	examine the structure of various number system and its application in digital design	6, 8	Un, An
CO-7	analyse the environmental aspects of renewable energy sources	5	An
CO-8	acquire the knowledge of solar cells, photovoltaic	5	Un
	applications		

Criterion I

Semester – III						
Part III	Core V	Sequences and Serie	s, Trigonometry			
Code :18UM	Code :18UMAC31 Hrs/week :6 Hrs/Semester :90 Credits :4					

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Co No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	develop the analytical thinking to generalize the known concepts.	3	Cr
CO-2	know the important inequalities necessary to compare the real numbers.	3	Ev
CO-3	explain the difference between a sequence and a series in the mathematical context.	2	Un
CO-4	able to identify boundedness, monotonic, limit points etc. of a sequence.	8	Un
CO-5	able to apply various tests to verify the convergence or divergence of a given sequence and also the series.	4	Ар
CO-6	gain a basic knowledge about analysis which helps them in higher studies.	3	Re
CO-7	apply the real situation wherever usage of trigonometrical equations	4	Ap
CO-8	reconstruct the formulae which are accustomed in elementary levels	8	Ev

Criterion I

SSR Cycle V

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Semester – III						
Part III Allied III	Part III Allied III Statistics I					
Code :18UMMA31	Hrs/week :3	Hrs/ Semester:45	Credits : 3			

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CO.No.	Upon completion of this course, students will be	PSO	CL
	able to	addressed	
CO-1	understand the difference between the central	1	Un
	moments and general moments		
CO-2	compute the central moments and general moments	3	Ev
CO-3	analyse the time reversal test	8	Cr, Ap
CO-4	convert fixed base index to chain base index	3	Ap
CO-5	classify the different index numbers	8	Un, Ap
CO-6	find correlation between two variables	3	Ap
CO-7	evaluate particular regression lines	3,7	Ар
CO-8	know the uses of index numbers	4	Cr

Criterion I

Semester –III						
Part III     Allied IV     Linear Programming						
Code: 18UMMA32	Credits : 3					

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CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	develop a fundamental understanding of linear programming models	1, 3	Un
CO-2	develop a linear programming model from problem description	5	An
CO-3	formulate a simplified description of a suitable real- world problem as a linear programming model in general, standard and canonical forms	8	Cr
CO-4	solve a two-dimensional linear programming problem graphically.	8	Ap
CO-5	convert a linear programming problem into standard form.	8	Un
CO-6	apply the simplex method for solving linear programming problem.	5	Ар
CO-7	express the dual of a linear programming problem and solve the resulting dual problem using the dual simplex method	8	Cr,Ap
CO-8	model, analyze or solve a practical real-world problem using the theory and methods learned in this course	4, 5	Ap,An

Criterion I

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Semester – III						
Part III	Part III Core Skill Based Numerical Aptitude and Arithmetic Ability					
Code :18UMAS31Hrs/week : 4Hrs/ Semester : 60Credits :4						

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	acquire the ability to understand and analyze the problem	2	Un
CO-2	develop their calculating and computing skills.	5	Ар
CO-3	solve mathematical problems using shortcut methods.	4	Cr
CO-4	build confidence to face the competitive examinations.	5	Cr
CO-5	solve the questions with accuracy and within the given time limit.	3	Cr
CO-6	enhance logical skills, arithmetic skills and aptitude skills.	5	Ар
CO-7	simplify and evaluate algebraic expressions.	3	Ev
CO-8	use mathematical concepts in real world situations.	4, 8	Ар

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Criterion I

SSR Cycle V

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SEMESTER – IV						
Part III	Part IIICore VIReal Analysis					
Code :18UMAC41Hrs / Week: 6Hrs / Semester: 90Credits: 4						

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	interpret real number system and its properties.	1	Un
CO-2	define and recognize the continuity of real functions	1	Re
CO-3	define and recognize the real functions and its limits	1	Re
CO-4	interpret mathematical ideas via extended written presentation.	2	Un
CO-5	develop a broad understanding encompassing logical reasoning, generalization, abstraction, and formal proof.	5	An
CO-6	formulate proofs and structure mathematical arguments.	6	An
CO-5	determine the continuity, differentiability and integrability of functions defined on subsets of the real line	3	Ev
CO-7	apply the Mean Value Theorem and the Fundamental theorem of Calculus to problems in the context of real analysis	5	Ap
CO-8	describe fundamental properties of the real numbers that lead to the formal development of real analysis.	3	An

Criterion I

Semester - IV					
Part III	Part III     Allied V     Statistics II				
Code : 18UMMA41Hrs/week :3Hrs/ Semester :45Credits : 3					

CO.No.	Upon completion of this course, students will be	PSO	CL
	able to	addressed	
CO-1	understand the difference between the discrete distribution and continuous distribution.	1, 2	Un
CO-2	calculate the mean, mode and median for different distributions.	7	Ap
CO-3	find approximate solutions to problems	4, 8	Cr, Un
CO-4	apply concepts and theorems in solving problems.	4	Ap
CO-5	demonstrate problem solving skills	3	An
CO-6	evaluate recurrence relation of p.d.f for various distribution.	3 4	An
CO-7	fit binomial, poisson and normal distribution.	8	Ар
CO-8	compare moment generating function and cumulant generating function	2, 7	Ev

Criterion I

SSR Cycle V

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Semester –IV							
Part III	Part III         Allied VI         Discrete Mathematics						
Code :18UMMA42Hrs/week :3Hrs/ Semester:45Credits :3							

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand logic and mathematical reasoning to count or enumerate objects in a systematic way.	1	Un
CO-2	use truth tables for expressions involving the logical connectives .	8	Ар
CO-3	develop capacity in knowing what constitutes a valid- argument, and in constructing valid arguments or proofs.	3	An
CO-4	apply standard rules of inference.	3	Ap
CO-5	grasp the notions of lattices.	1	Un
CO-6	understand Boolean algebra and truth tables.	1	Un
CO-7	evaluate Boolean functions and simplify expressions using the properties of Boolean Algebra.	5	Ev
CO-8	apply logical reasoning to solve a variety of problems.	4	Ap

Criterion I

Semester – IV						
Part III Core Skill Based Math Type using LaTeX						
Code :18UMAS41Hrs/week :4Hrs/ Semester:60Credits :4						

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CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	know the difference between MS Word and LaTeX	3	Un
CO-2	understand the uses of LaTeX	2	Un
CO-3	apply LaTeX in their typing work	1	Un
CO-4	handle math symbols and tables	3	An
CO-5	create documents and make small presentations.	3	Ар
CO-6	become proficient in the use of software applications as used in an office environment.	3, 8	Ар
CO-7	manipulate with the real life needs in preparing documents	3	Ар
CO-8	prepare projects in updating with the new updates and versions	8	Cr

Criterion I

Semester –V							
Part III Core	Part III Core VII (Common Core) Computer Oriented Numerical Methods						
Code: 18UCCC51Hrs/Week: 6Hrs/ Semester : 90Credits : 4							

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CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	find numerical solution of a problem in all aspects and apply these methods to practical implementation as reliable and efficient.	3	Re
CO-2	recognize and apply appropriate principles and concept relevant to numerical analysis.	5	Ap
CO-3	discover the most appropriate estimate for the missing data.	1	Cr
CO-4	analyze the errors obtained in the numerical solutions of problems.	6	An
CO-5	use appropriate numerical methods, determine the solutions to given problems.	3	Ap
CO-6	demonstrate the use of the interpolation method to find the solution for the data.	8	Un
CO-7	develop their calculation skills.	1	Cr
CO-8	differentiate gauss jacobi iteration and gauss seidal iteration method.	3	

Criterion I

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Semester – V							
Part III     Core VIII     Modern Algebra							
Code :18	UMAC52	Hrs/week :5	Hrs/Semester :75	Credits :4			

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CO No	Upon completion of this course, students will	PSO addressed	CL
CO-1	explain the theory behind relations and functions and how functions may relate dissimilar structures to each other.	3	Cr
CO-2	describe and generate the basic algebraic structures such as Groups, Rings, Fields, Integral Domain, Euclidean Domain, etc., and will identify examples of these specific constructs.	1	Ev
CO-3	have a working knowledge of important mathematical concepts such as order of Group, order of an element, generator of a cyclic group, index of a subgroup, characteristic of a Ring, Maximal and Prime Ideals etc.,	2	Un
CO-4	analyze relationship between abstract algebraic structures with familiar number system such as integers, complex and real numbers	2	An
CO-5	critically analyze and construct mathematical arguments that relate to the study of introductory linear algebra. (Proof and Reasoning).	8	An
CO-6	develop ability to form and evaluate conjectures.	1, 5	Ap
CO-7	produce the group concepts in other science disciplinary	3	Ар
CO-8	illustrate the isomorphic structures	8	An

Criterion I

Semester – V						
Part III	Part III Core IX Modern Analysis					
Code :18UMAC53Hrs / Week: 5Hrs / Semester: 75Credits: 4						

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	gain knowledge of concepts of modern analysis, such as open sets ,closed sets, completeness, connectedness and compactness in metric spaces	1	Un
CO-2	be able to write simple proofs on their own and study- rigorous proofs	5	Ap
CO-3	develop a higher level of mathematical maturity combined with the ability to think analytically	2	Un
CO-4	develop a broad understanding encompassing logical reasoning, generalization, abstraction, and formal proof.	5	Ар
CO-5	formulate proofs and structure mathematical arguments.	6	Ap
CO-6	explain the basic theory of metric spaces and its application to function spaces.	3	Ev
CO-7	follow more advanced treatments of real analysis and study its applications	3	Ар
CO-8	apply the theory to solve mathematical problems including the construction of simple proofs.	2	An

Criterion I

Semester –V						
Part III	Part III         Core X         Operations Research					
Code :18UMAC54Hrs/week : 4Hrs/Semester :60Credits : 4						

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CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	identify optimum solution.	1	Un
CO-2	interpret the mathematical tools that are needed to solve optimization problems.	2	Ap
CO-3	make decision and improve its quality.	3	Ev
CO-4	comprehend the concept of a Transportation Model and develop the initial solution for the same	4	Un
CO-5	apply the Hungarian method for solving assignment problems	5	Ар
CO-6	examine the significant impact of job sequencing system on total elapsed time management	8	An
CO-7	use CPM and PERT techniques, to plan, schedule, and control project activities.	4	Ар
CO-8	apply Mathematical theories to Commerce and Business and Management	3	Ар

Criterion I

SSR Cycle V

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Semester –V						
Part III	Core In	tegral I	Vector	r Calculus and Fourier	Series	
Code :18U	MAI51	Hrs/wee	ek :4	Hrs/Semester :60	Credits :4	

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CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	differentiate and integrate vector-valued functions and apply calculus to motion problems in two and three dimensional space	2	An
CO-2	compute gradient, curl and divergence of vector fields.	1, 3	С
CO-3	use the gradient to find directional derivatives.	3	Ар
CO-4	solve problems in multiple integration using rectangular, - cylindrical, and spherical coordinate systems	8	A
CO-5	select and apply appropriate models and techniques to define and evaluate integrals	3	Е
CO-6	apply greens theorem, stokes theorem and gauss divergence theorem to evaluate integrals.	3	A
CO-7	know that any periodic function can be expressed as a fourier series.	6	Cr
CO-8	expand an odd or even function as a half-range cosine or sine fourier series.	1	Un, An

Criterion I

SSR Cycle V

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Semester – V						
Part III	Core In	ntegral II S	Statistical Inference			
Code :18U	MAI52	Hrs/week :4	4 Hrs/Semester :6	50 Credits :4		

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CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the uses of statistical quality control.	1	Un
CO-2	compute the upper and lower control limits for different chart	3	Ev
CO-3	analyse the usage of different charts.	8	Cr, Ap
CO-4	know type I and type II error	1	Cr
CO-5	classify the different test static	5	Un, Ap
CO-6	check the difference between small and large samples.	1	Ap
CO-7	evaluate t-test, F-test etc	3, 7	Ap
CO-8	apply the correct test static	4	Ap Li

Criterion I

	Semester -	V	
Common Skill Based (	Core Computer for Dig	tal Era and Soft Skills	
Code: 18UCSB51	Hrs / Week : 2	Hrs / Sem : 30	Credits : 2
Course Outcome			
Identify diff	erent types of computer syst	ems.	
Classify var	ious types of software being	used.	
• Compare va	rious digital payments and u	se them in day to day lif	e.
• Recognise the	ne innovative technologies I	oT and integrate it in var	rious fields.
• Analyze var	ious social networking platf	orms and use them effici	ently.
Distinguish	various cyber attacks and ap	ply preventive measures	5.
Understand	the various soft skills needed	l to become successful.	
• Analyze self	f and adapt oneself to work i	n a team.	
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Semester –VI						
Part III         Core XI         Complex         Analysis						
Code :18U	MAC61	Hrs/week :6	Hrs/Semester :90	Credits :4		

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CO. No	Upon successful completion of this course students will be able to	PSO addressed	CL
CO-1	compute sums, products, quotients, conjugate, modulus, and argument of complex numbers.	1	An
CO-2	understand the significance of differentiability for complex functions and be familiar with the Cauchy- Riemann equations.	2	Un
CO-3	evaluate integrals along a path in the complex plane and understand the statement of Cauchy's Theorem.	6	Ev
CO-4	know the condition(s) for a complex variable function to be analytic and/or harmonic.	3	Un
CO-5	compute the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues.	2	An
CO-6	use the Cauchy Residue theorem to evaluate integrals and sum series.	6	Ap
CO-7	demonstrate curve properties for image processing with transformation	6	Ар
CO-8	outline complex number system with intense perception	6	An

Criterion I

SSR Cycle V

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Semester –VI						
Part III	Part III Core XII Linear Algebra					
Code	: 18UMAC62	Hrs/week : 6	Hrs/Semester : 90	Credits : 4		

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CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	know all the definitions in Linear Algebra	1	U
CO-2	analyze and construct mathematical arguments that relate to the study of linear algebra. (proof and reasoning).	2, 3	An
CO-3	solve systems of linear equations.	3	A
CO-4	work within vector spaces and to distill vector space properties	3	An
CO-5	determine whether a system of equations is consistent or not and find its general solution.	6	An
CO-6	compute eigenvalues and eigenvectors of a matrix.	4	A
CO-7	develop analytical thinking	5	An
CO-8	understand the concept of Inner Product Spaces	1	U

Criterion I

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Semester VI				
Part III Core	XIII	Mechanics		
Code :18UMAC63	Hrs/week :6	Hrs/Semester :90	Credits :4	

CO.No.	Upon completion of this course, students will be able to	PSO	CL
		addressed	
CO-1	understand the equilibrium of forces	1	Un
CO-2	know the conditions for equilibrium	3	Ev
CO-3	distinguish between parallel and non parallel forces	8	Cr, Ap
CO-4	know the types of friction laws	1	Cr
CO-5	apply friction laws in problems	5	Un, Ap
CO-6	understand the two types of impact	1	Ар
CO-7	understand the simple harmonic motion	3, 7	Ар
CO-8	determine the simple harmonic motion	4	Ap

Criterion I

Semester VI					
Part III         Core Integral III         Graph Theory					
Code :18UMAI61Hrs / Week: 5Hrs / Semester: 75Credits: 4					

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CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	interpret the basics of graphs.	1	Un
CO-2	identify induced subgraphs, paths,cycles ,independent sets and coverings in graphs	1	Re
CO-3	determine whether graphs are Hamiltonian and/or Eulerian and to solve problems involving vertex and edge connectivity, planarity and crossing numbers	5	An
CO-4	combine theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.	8	Un
CO-5	inspect the applications of graph theory	7	An
CO-6	model and solve real-world problems using graphs both quantitatively and qualitatively.	4	Ар
CO-7	develop an appropriate level of mathematical literacy and competency.	6	Cr
CO-8	formulate problems in terms of graphs, solve graph theoretic problems and apply algorithms.	5	Cr

Criterion I

Semester VI					
Core Integral IV	ore Integral IV Coding theory				
Code: 18UMAI62	Code: 18UMAI62Hrs / Week: 7Hrs / Semester: 105Credits: 4				

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CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the fundamental concepts of coding theory, types of error and control code technique.	1	Un
CO-2	perform with vectors, matrices and projective spaces over finite fields and polynomials.	4	Cr
- CO-3	describe the concepts of extended golay code and decode the extended golay code.	3	Ev
CO-4	analyze the theoretical principles of source coding.	6	An
CO-5	analyze the notion of various decoding techniques.	3	An
CO-6	understand and analyze the concepts of error control coding.	2	Un, An
CO-7	prove general facts about different codes and block control coding.	6	Ev
CO-8	apply the knowledge of perfect codes, hamming codes, extended codes and golay codes for error detection and correction.	5	Ap

Criterion I

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SEMESTER – I				
Part III	Core I	Classical Algeb	ra	
Course Cod	le:21UMAC11	Hrs / Week: 4	Hrs / Semester: 60	Credits: 3

# **Course Outcome:**

CO.No.	Upon completion of this course, students will be able to	PSO	CL
		addressed	
CO-1	solve polynomial equations and simultaneous linear equations.	3	An
CO-2	form the equations from the given roots and identify and solve the reciprocal equations	4	Cr
CO-3	transform the equations by increasing, decreasing and multiplying the roots of the equations	3	Un
CO-4	locate real and imaginary roots of the equations	4	Un
CO-5	find the approximate values of the irrational roots of the equations.	3	Cr
CO-6	determine the roots of the equations by using various methods like Cardon's method, Ferrari's method.	3	Cr

Criterion I

SEMESTER – I				
Core II Calculus				
Course Code :21UMAC12	Hrs / Week: 4	Hrs / Semester: 60	Credits: 3	

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CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	state the concept of curvature of a plane curve.	4	Re
CO-2	calculate the curvature of various curves in plane and space	4	Ev
CO-3	apply the fundamental concepts of Calculus to variety ofreal world problems.	3	Ap
CO-4	evaluate triple integrals and use them to find volumes in rectangular, cylindrical and spherical coordinates.	3	Ev
CO-5	compute definite and indefinite integrals of algebraic and trigonometric functions using formulae and substitution	3	Cr
CO-6	use Beta and Gamma function to solve different type of integrals and to understand Gamma function as a generalization of factorial function.	6	Ev

Criterion I

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## SEMESTER I / III

# Allied Physics – Paper I - I B.Sc., Mathematics / II B.Sc., ChemistryCourse Code : 21UPHA11Hrs/Week: 4Hrs/ Semester: 60Credits : 4

# **Course Outcome**

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	recall the fundamentals of elasticity, stress and (K1)	1	Re
CO-2	solve problems related to uniform and non-uniform bending of beams (K3)	1	Ар
CO-3	estimate the thermal conductivity of a bad conductor (K2)	1,6	Un
CO-4	calculate the specific heat capacity of a liquid (K3)	1,6	Ap
CO-5	evaluate the thickness of a thin wire by forming interference fringes (K5)	1,6	Ev
CO-6	outline dispersive power and resolving power of a grating (K4)	1,6	An



Criterion I

SEMESTER-I				
Skill Enhancement Course - I Professional English for Mathematics - I				
Course Code:21UMAPE1	Hrs/Week: 2	Hrs/Sem: 30	Credits: 2	

C

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	recognise their own ability to improve their own competence in using the language	3	Un
CO-2	use language for speaking with confidence in an intelligible and acceptable manner	3	An
CO-3	read independently any unfamiliar texts with comprehension	3	Un
CO-4	understand the importance of writing in academic life	3	An
CO-5	write simple sentences without committing error of spelling or grammar.	4	Un
CO-6	develop critical thinking skills and get culturally aware of the targetsituation	3	Cr

Criterion I

SEMESTER - I				
Ability Enhancement Course -Value Education				
Code : 21UAVE11Hrs/Week : 2Hrs / Semester: 30Credits : 2				

#### **Unit I: Introduction to Value Education**

Concept of Values - Types of Values- Approaches to values - Benefits of Value Education-Characteristics of Values

#### **Unit II: Human Values**

Human Values -Sources of Human Values - Love - Compassion - Gratitude -Courage - Optimism - Forgiveness- the need and urgency to reinforce Human Values

#### **Unit III: Social Values**

Role of family and society in teaching values - Role of educational institutions in inculcating values-Three general functions of education for society-Self-Reflection- Our society's needs - Social Responsibilities of a student

## Unit IV: Spiritual Values

Spiritual Values - Spiritual Development -Moral Development - Importance of Spiritual Values - Cultivation of Spiritual Values -Five most common spiritual values -Spiritual Resources

#### Unit V: Values for Life Enrichment

Goal Setting - Building relationship - Friendship - Love relationship - Family relationship - Professional relationship Interpersonal Relationship -Essential Life Skills that Help in Students Future Development-Life Enrichment Skills Domain

#### **Books for Reference:**

1. Sneha M. & K. Pushpanadham Joshi. *Value Based Leadership in Education Perspective and Approaches*, Anmol Publications Pvt. Limited, 2002.

2. Venkataiah.N. Value Education, APH Publishing, 1998

3. Pramod Kumar M. A Handbook on Value Education, Ramakrishna Mission Institute of Culture (RMIC) 2007

4. Jagdosh Chand, Value Education, Shipra Publication 2007

5. Indrani Majhi (Shit) Ganesh Das, Value Education, Laxmi Publication Pvt. Ltd., 2017

6. Arumugam, N. S. Mohana, Lr.Palkani, Value Based Education, Saras Publication2014

Criterion I

SEMESTER – II			
Core III Analytical Geometry of Three Dimensions			
Course Code :21UMAC21Hrs / Week: 4Hrs / Semester: 60Credits: 3			

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CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the fundamental aspects of three-dimensional geometry.	1	Un
CO-2	represent simple three-dimensional figures using two- dimensional drawings.	3	Un
CO-3	demonstrate basic mathematical understanding and computational skills in three dimensions.	8	Un
CO-4	apply algebraic methods to the study of curves and surfaces that lie in three dimensions.	4	Un
CO-5	apply geometric properties and relationships to solve problems in three dimensions.	4	Un
CO-6	develop logical thinking, geometric thinking and three- dimensional spatial ability.	6	An

Criterion I

SEMESTER – II				
Part III     Core IV     Differential Equations				
Course Code :21UMAC22Hrs / Week: 4Hrs / Semester: 60Credits: 3				

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	verify whether a given function is a solution of a given ordinary differentialequation (as well as verifying initial conditions when applicable).	8	An
CO-2	classify ordinary differential equations into linear and nonlinear equations.	4	Un
CO-3	solve first order linear differential equations.	3	An
CO-4	find the general solution of second order linear homogeneous equations withconstant coefficients.	3	Cr
CO-5	use the laplace transform to compute solutions of second order, linearequations with constant coefficients	3	An
CO-6	identify essential characteristics of ordinary and partial differential equations.	3	Un

Criterion I

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# **SEMESTER II / IV**

Allied Physics – Paper II - I B.Sc., Mathematics/ II B.Sc., ChemistryCourse Code : 21UPHA21Hrs/Week: 4Hrs/ Semester: 60Credits : 4

## **Course Outcome:**

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	recall coulomb's law and the gauss law (K1)	1	Re
CO-2	CO-2 discuss Lenz's law (K2)		Un
CO-3	3 distinguish self inductance from mutual inductance (K4)		An
CO-4	apply knowledge of electricity and magnetism to the nature	1	Ap
	of physical process and related technological		
	advancements (K3)		
CO-5	prove De Morgan's laws (K5)	1,6	Ev
CO-6	discuss the postulates of special theory of relativity (K2)	1	Un
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Criterion I

SEMESTER-II					
Skill Enhancement Course - II Professional English for Mathematics - II					
Course Code :21UMAPE2Hrs/Week: 2Hrs/Sem: 30Credits: 2					

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CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	apply the knowledge for writing purposes such as Presentation, drafting and project report etc.	4	Ap
CO-2	evaluate the correct and error-free writing by being well- versed in rules of English grammar and cultivate relevant technical style of communication and presentation.	6	Ev
CO-3	apply techniques for developing inter-personal communication and to respond questions at a formal interview	3	Ар
CO-4	use critical thinking skills to face everyday life situations.	7	Cr
CO-5	develop strategic competence that will help in efficient communication	6	Ар
CO-6	apply the acquired knowledge and ideas in giving opinions during the meeting and making concluding remarks.	8	An

Criterion I

Semester – III				
Part III Core V Sequences and Series, Trigonometry				
Course Code :21UMAC31       Hrs/week : 6       Hrs/Semester : 90       Credits : 5				

C

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	know the important inequalities necessary to compare the real numbers.	3	Ev
CO-2	explain the difference between a sequence and a series in the mathematical context.	2	Un
CO-3	Identify boundedness, monotonic, limit points etc. of a sequence.	8	Un
CO-4	apply various tests to verify the convergence or divergence of a given sequence and also the series.	4	Ap
CO-5	gain a basic knowledge about analysis which helps them in higher studies.	3	Re
CO-6	reconstruct the formulae which are accustomed in elementary levels	4	Ev

Criterion I

SSR Cycle V

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Semester - III				
Part III Allied	Statistics I			
Course Code :21UMMA31Hrs/week : 6Hrs/Sem : 90Credits :				

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	Concerners in
4	Ap
3	Ap
3 and 7	Ap
4	Ар
1 2 and 7	Ev
	3 3 and 7 4 1 2 and 7

Criterion I

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Semester - III				
Part III Skill Based Elective Introduction to Python Programming				
Course Code :21UMAS31 Hrs/week :2 Hrs/Sem :30 Credits : 2				

# **Course Outcome:**

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
		auuresseu	
CO-1	understand the fundamental concepts to write a Python Program	1	Un
CO-2	apply decision and repetitive structures in programme	5	Ap
	design and demonstrate the use of Python		
CO-3	use string function in Python	7	Ev
CO-4	distinguish various Python Objects	4	An
			******
CO-5	write python programs to solve problems	4	Cr
CO-6	use compound data using Python lists and tuples	5	Ev
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Criterion I

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Semester – III					
Part III Skill Based Elective Quantitative Aptitude I					
Course Code : 21UMAS32     Hrs/week : 2     Hrs/ Semester : 30     Credits : 2					

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
C <b>O</b> -1	solve the problems easily by using short-cut method with time management to face the competitive examinations	4	Ap
C <b>O</b> -2	develop their calculating and computing skills.	5	Ap
C <b>O</b> -3	acquires the ability to understand and analyze the problem	2	Un
C <b>O</b> -4	apply quantitative methods to solve a variety of business problems	5	Ар
C <b>O</b> -5	solve the questions with accuracy and approach the problems in different manner	3	Cr
C <b>O</b> -6	enhances logical skills, arithmetic skills and aptitude skills.	5	Ар

Criterion I

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Semester – III					
Part III NME I Mathematics for Competitive Examinations I					
Course Code : 21UMAN31       Hrs/week : 2       Hrs/Semester : 30       Credits : 2					

## **Course Outcomes**

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
C <b>O</b> -1	solve mathematical problems using shortcut methods.	3	Cr
C <b>O</b> -2	develop their calculating and computing skills.	5	Ap
C <b>O</b> -3	solve the questions with accuracy and within the given time limit.	3	Cr
C <b>O</b> -4	build confidence to face the competitive examinations.	3	Cr
C <b>O</b> -5	enhances logical reasoning skills, arithmetic skills, aptitude skills.	6	Ap
C <b>O</b> -6	simplify and evaluate algebraic expressions.	3	Ev



Criterion I

Semester – III					
	Women's Synergy				
Code : 18UAWS31Hrs/ Week : 2Hrs/Sem:30Credits : 2					

- To know about Women's health issues including menstruation, pregnancy, child birth etc, thereby taking care of themselves.
- Create awareness about their own biases, fears and comfort levels and encourage to dream and fuel their own growth and self development.
- Engage in promoting social justice and women rights
- Create platforms and facilitate the young women to operate symbiotically towards issues affecting their lives and take self initiatives for growth.
- Identify historic and contemporary women of importance as well as crucial moments in Women's history



Criterion I

Semester – IV				
Part III Core VI	Modern Al	gebra		
Course Code: 21UMAC41	Hrs/week: 6	Hrs/Semester: 90	Credits : 5	

Co. No	Upon completion of this course, students will	PSO addressed	CL
CO -1	describe and generate the basic algebraic structures such as Groups, Rings, Fields, Integral Domain, Euclidean Domain, etc., and will identify examples of these specific constructs.	1	Ev
CO -2	have a working knowledge of important mathematical concepts such as order of Group, order of an element, generator of a cyclic group, index of a subgroup, characteristic of a Ring, Maximal and Prime Ideals etc.,	2	Un
CO -3	analyze relationship between abstract algebraic structures with familiar number system such as integers, complex and real numbers	2	An
CO -4	critically analyze and construct mathematical arguments that relate to the study of introductory linear algebra. (Proof and Reasoning).	4	An
CO -5	produce the group concepts in other science disciplinary	3	Ар
CO -6	illustrate the isomorphic structures	4	An

Criterion I

Semester – IV				
Part III Allied Statistics II				
Course Code : 21UMMA41Hrs/week : 6Hrs/Sem : 90Credits				

C

CO.No.	Upon completion of this course, students will be	PSO	CL
	able to	addressed	
CO-1	understand the difference between the weighted index	1 and 2	Un
	numbers and unweighted		
CO-2	compute the upper and lower control limits for different chart	3	Ev
CO-3	apply concepts and theorems in solving problems.	4	Ap
CO-4	demonstrate problem solving skills	3	An
CO-5	know type I and type II error	1	Cr
CO-6	classify the different test static and apply the correct test static	4 and 5	Un &Ap

Criterion I

Semester - IV					
Part III Skill Based Elective Documentation using LaTeX					
Course Code :21UMAS41Hrs/week :2Hrs/ Semester:30Credits :2					

CO.No	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	know the difference between MS Word and LaTeX	3	Un
CO -2	understand the uses of LaTeX	2	Un
CO -3	apply LaTeX in their typing work	1	Un
CO-4	handle math symbols and tables	3	An
CO-5	become proficient in the use of software applications as used in an office environment.	3 and 8	Ap
CO -6	manipulate with the real life needs in preparing documents	3	Ap

Criterion I

Semester – IV					
Part III Skill Based Elective Quantitative Aptitude II					
Course Code : 21UMAS42	Hrs/week : 2	Hrs/ Semester : 30	Credits : 2		

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	acquires the ability to understand and analyze the problem	2	Un
CO-2	develop their calculating and computing skills.	5	Ар
CO-3	solve mathematical problems using shortcut methods.	4	Cr
CO-4	build confidence to face the competitive examinations.	5	Cr
CO-5	solve the questions with accuracy and within the given time limit.	3	Cr
CO6	enhances logical skills, arithmetic skills and aptitude skills.	5	Ap

Criterion I

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Semester – IV					
Part III NME II Mathematics for Competitive Examinations II					
Course Code : 21UMAN41Hrs/week : 2Hrs/Semester : 30Credits : 2					

# **Course Outcomes**

CO. No	Upon completion of this course, students will be able to		CL
CO-1	solve mathematical problems using shortcut methods.	3	Cr
CO-2	develop their calculating and computing skills.	5	Ap
CO-3	solve the questions with accuracy and within the given time limit.	3	Cr
CO-4	build confidence to face the competitive examinations.	3	Cr
CO-5	enhances logical reasoning skills, arithmetic skills, aptitude skills.	6	Ap
CO-6	use mathematical concepts in real world situations.	4	Ар

Criterion I

Semester - V					
Part III Core VII (Common Core) Computer Oriented Numerical Methods					
Course Code: 21UCMC51Hrs/Week: 6Hrs/ Semester : 90Credits : 5					

CO. No.	Upon completion of this course, students will be able to	PSO	CL
		addressed	
CO-1	find numerical solution of a problem in all aspects and apply these methods to practical implementation as reliable and efficient.	3	Re
CO-2	recognize and apply appropriate principles and concept relevant to numerical analysis.	5	Ар
CO-3	discover the most appropriate estimate for the missing data.	1	Cr
CO-4	analyze the errors obtained in the numerical solutions of problems.	6	An
CO-5	use appropriate numerical methods, determine the solutions to given problems.	3	Ар
CO-6	demonstrate the use of the interpolation method to find the solution for the data.	4	Un

Criterion I

Semester - V					
Part III	Core VIII	Linear Alge	bra		
Course Co	ode: 21UMAC51	Hrs/week : 5	Hrs/Semester : 75	Credits : 4	

	CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
	CO-1	analyze and construct mathematical arguments that relate to the study of linear algebra. (proof and reasoning).	3	An
No.	CO-2	work within vector spaces and to distill vector space properties	3	An
	CO-3	solve systems of linear equations and determine whether a system of equations is consistent or not and find its general solution.	6	An
	CO-4	compute eigenvalues and eigenvectors of a matrix.	4	Ap
	<mark>CO</mark> -5	develop analytical thinking in R-Programming	5	An
)	CO-6	understand the concept of Inner Product Spaces		Un

Criterion I

Semester V	V
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Part III Core IX

Graph Theory

 Course Code : 21UMAC52
 Hrs / Week : 5
 Hrs / Semester: 75
 Credits: 4

# **Course Outcome:**

CO.	Upon completion of this course, students will be able to		CL
No.	opon completion of this course, students will be able to	addressed	CL
CO-1	identify induced subgraphs, paths,cycles ,independent sets and coverings in graphs	1	Re
CO-2	determine whether graphs are Hamiltonian and/or Eulerian and to solve problems involving vertex and edge connectivity, planarity and crossing numbers	5	An
CO-3	combinetheoreticalknowledgeandindependentmathematical thinking in creative investigation of questionsin graph theory.	8	Un
CO-4	inspect the applications of graph theory	7	An
CO-5	model and solve real-world problems using graphs both quantitatively and qualitatively.	4	Ap
CO-6	develop an appropriate level of mathematical literacy and competency and formulate problems in terms of graphs, solve graph theoretic problems and apply algorithms.	6	Cr

Criterion I

SEMESTER – V					
Part III Core X Real Analysis					
Course Code :21UMAC53	Hrs / Week: 4	Hrs / Semester: 60	Credits: 4		

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Co No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	interpret real number system, define and recognize the continuity of real functions	1	Re
CO -2	define and recognize the real functions and its limits	1	Re
CO -3	develop a broad understanding encompassing logical reasoning, generalization, abstraction, and formal proof.	5	An
CO -4	determine the continuity, differentiability of functions defined on subsets of the real line	3	Ev
CO -5	apply the Mean Value Theorem and the intermediate value property to problems in the context of real analysis	5	Ар
CO -6	describe fundamental properties of the real numbers that lead to the formal development of real analysis.	3	An

Criterion I

SSR Cycle V

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Semester –V				
Part III Core XI- Vector Calculus and Fourier Series				
Course Code :21UMAC54	Hrs/week :4	Hrs/Semester :60	Credits :4	

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	differentiate and integrate vector-valued functions and apply calculus to motion problems in two and three dimensional space	2	An
CO-2	compute gradient, curl and divergence of vector fields.	1 and 3	Cr
CO-3	use the gradient to find directional derivatives.	3	Ар
CO-4	solve problems in multiple integration using rectangular, cylindrical, and spherical coordinate systems	8	Ар
CO-5	select and apply appropriate models and techniques to define and evaluate integrals	3	Ev
CO-6	know that any periodic function can be expressed as a fourier series.	6	Cr

Criterion I

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Semester –V					
Part III	<b>Core Elective</b>	D	iscrete Mathema	tics	
Course Co	de : 21UMAE51		Hrs/week : 4	Hrs/ Semester: 60	Credits : 4

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand logic and mathematical reasoning to count or enumerate objects in a systematic way.	1	Un
CO -2	use truth tables for expressions involving the logical connectives .	8	Ap
CO -3	apply standard rules of inference and graspthe notions of lattices.	3	Ар
CO -4	understand Boolean algebra and truth tables.	1	Un
CO -5	evaluate and simplify expressions using the properties of Boolean Algebra.	5	Ev
CO -6	apply logical reasoning to solve a variety of problems.	4	Ар

Criterion I

Semester V					
Part III	<b>Core Elective</b>	Transfor	ms		
Course C	ode: 21UMAE52	Hrs/Week: 4	Hrs/Sem: 60	Credits: 4	

C

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the relation between Fourier and Laplace transforms.	4	Ар
CO-2	evaluate complex integrals by various methods.	1	An
CO-3	understand Z - Transforms	1	Un
CO-4	solve ordinary differential equations using Laplace transform.	1,4	An
CO-5	understand the applications of Laplace transform and Fourier Transform	1,5	Un
CO-6	apply the Transforms to various differential equations.	2	Ap
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Criterion I

	Semester - V	V		
Common Skill Based Core Computer for Digital Era and Soft Skills				
Code : 21UCSB51	Hrs / Week : 2	Hrs / Sem : 30	Credits : 2	
Course Outcome				
Course Outcome				
<ul> <li>Identify diffe</li> <li>Classify varie</li> </ul>	erent types of computer syste	ems. used.		
Compare var	ious digital payments and us	se them in day to day lif	e.	
Recognise th     Analyze varie	e innovative technologies Io	T and integrate it in var	ious fields.	
Distinguish v	various cyber attacks and app	oly preventive measures	· ]	
• Understand t	he various soft skills needed and adapt oneself to work it	to become successful.		
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Semester –VI				
Part III Core XII	Complex An	nalysis		
Course Code : 21UMAC61	Hrs/week :6	Hrs/Semester :90	Credits :5	

	Upon successful completion of this course students	PSO	CI
CUNO	will be able to:	addressed	CL
CO-1	compute sums, products, quotients, conjugate, modulus, and argument of complex numbers.	1	An
CO-2	understand the significance of differentiability for complex functions and be familiar with the Cauchy- Riemann equations.	2	Un
CO-3	evaluate integrals along a path in the complex plane and understand the statement of Cauchy's Theorem.	6	Ev
CO-4	know the condition(s) for a complex variable function to be analytic and/or harmonic.	3	Un
CO-5	compute the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues.	2	An
CO-6	demonstrate curve properties for image processing with transformation	6	Ар

Criterion I

Semester VI

## Semester – VI

Part III Core XIII

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**Modern Analysis** 

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	gain knowledge of concepts of modern analysis, such as open sets ,closed sets, completeness, connectedness and compactness in metric spaces	1	Un
CO -2	write simple proofs on their own and study rigorous proofs	5	Ap
CO -3	develop a higher level of mathematical maturity- combined with the ability to think analytically	2	Un
CO -4	develop a broad understanding encompassing logical reasoning, generalization, abstraction, and formal proof.	5	Ар
CO -5	explain the basic theory of metric spaces and its application to function spaces.	3	Ev
CO -6	apply the theory to solve mathematical problems including the construction of simple proofs.	2	An
Course C	Code : 21UMAC62   Hrs / Week: 6   Hrs / Semester	r: 90 C	redits:

**Course Outcome:** 

Criterion I

SSR Cycle V

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Part III	Core XIV	Mechanic	S	
Course (	Code :21UMAC63	Hrs/week :6	Hrs/Semester :90	Credits :5

CO. No.	Upon completion of this course, students will be	PSO	CL
	able to	addressed	
CO-1	understand the equilibrium of forces	1	Un
CO-2	distinguish between parallel and non-parallel forces	4	Cr &Ap
CO-3	know the types of friction laws	1	Cr
CO-4	apply friction laws in problems	5	Un &Ap
CO-5	understand the two types of impact and simple harmonic motion	1	Ap
CO-6	determine the simple harmonic motion	4	Ар

Criterion I

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Semester –VI			
Part III Core XV Operations Research			
Course Code :21UMAC64	Hrs/week : 6	Hrs/Semester :90	Credits : 5

**Course Outcome:** 

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CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	develop a fundamental understanding of linear programming models	1,3	Un
CO-2	solve dual linear programming problem and two- dimensional linear programming problem.	8	Ар
CO-3	apply the simplex method for solving linear programming problem	5	Ap
	interpret the mathematical tools that are needed to		
CO-4	solve optimization problems and comprehend the concept of a Transportation Model and develop the initial solution for the same	4	Un
CO-5	apply the Hungarian method for solving assignment problems	5	Ар
CO-6	examine the significant impact of job sequencing system on total elapsed time management	8	An

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Criterion I