

ST. MARY'S COLLEGE (Autonomous)

(Re-accredited with 'A⁺' Grade by NAAC)

Thoothukudi-628001, Tamil Nadu

(Affiliated to Manonmaniam Sundaranar University)



Syllabus

B.Sc. Mathematics

School of Computing Sciences

Outcome Based Curriculum

(W.e.f.2018)

Preamble

Mathematics, the foundation of all sciences is a subject which offers limitless scope for diversification in higher education. The improvements and achievements in various fields are the gift of Mathematics. The world of education without mathematics would be non-existent. The fields of Information Technology, Social Research and Economic forecasts will not be successful but for the effective application of Mathematics. The demand for courses in Mathematics is bound to be consistent, continual and increasing.

Vision

To promote and support a comprehensive, innovative and dynamic learning environment that meets the changing needs of a diverse global student population.

Mission

- To provide an exemplary mathematics program that prepares students to be life-long learners and responsible, numerate citizens.
- To enhance the students logical, reasoning, analytical and problem solving skills.
- To provide meaningful support services, responds to the changing environment of mathematics education.
- To promote effective instructional strategies with students actively participating in the learning process.

Programme Outcome

PO.No	Upon completion of B.Sc Degree programme , the graduates will be able to
PO - 1	apply the acquired knowledge of fundamental concepts in the field of science and to find solutions to various problems.
PO - 2	inculcate innovative skills and team – work among students to meet societal expectations.
PO - 3	perform analysis to assess, interpret, and create innovative ideas through practical experiments.
PO - 4	facilitate to enter multidisciplinary path to solve day-to-day scientific problems.
PO - 5	carry out fieldworks and projects, both independently and in collaboration with others, and to report in a constructive way.
PO - 6	improve communication ability and knowledge transfer through ict aided learning integrated with library resources.
PO - 7	transfer the knowledge to the other stakeholders through extensive community development programme.
PO - 8	attain competency in job market / entrepreneurship.

Course Structure (w.e.f. 2018)
Semester –I

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil	18ULTA11	இக்கால இலக்கியம்: செய்யுள், இலக்கணம், உரைநடை, சிறுகதை, இலக்கியவரலாறு	6	4	40	60	100
	French	18ULFA11	Preliminary French Course					
II	General English	18UGEN11	Prose,Poetry,Extensive Reading & Language Study - I	6	4	40	60	100
III	Core I	18UMAC11	Classical Algebra	5	4	40	60	100
	Core II	18UMAC12	Calculus	5	4	40	60	100
	Allied I Allied Practical	18UPHA11 18UPHAR1	Allied Physics I Allied Physics Practical	4 2	3	40	60	100
IV	Ability Enhancement Course	18UAVE11	Value Education	2	2	20	30	50
Total				30	21			

Semester II

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil	18ULTA21	சமய இலக்கியங்களும், நீதி இலக்கியங்களும்: செய்யுள்,இலக்கணம், உரைநடை,வாழ்க்கை வரலாறு, இலக்கிய வரலாறு	6	4	40	60	100
	French	18ULFA21	Basic French Course					
II	General English	18UGEN21	Prose,Poetry,Extensive Reading & Language Study - II	6	4	40	60	100
III	Core III	18UMAC21	Analytical Geometry of Three Dimensions	5	4	40	60	100
	Core IV	18UMAC22	Differential Equations	5	4	40	60	100
	Allied II Allied Practical	18UPHA21 18UPHAR1	Allied Physics II Allied Physics Practical	4 2	3 2	40	60	100
IV	Ability Enhancement Course	18UAEV21	Environmental Studies	2	2	20	30	50
Total				30	23			

Semester III

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil	18ULTA31	காப்பிய இலக்கியம்: செய்யுள், இலக்கணம்,உரைநடை, சிறுகதை,இலக்கிய வரலாறு	6	4	40	60	100
	French	18ULFA31	Advanced French Course					
II	General English	18UGEN31	Prose, Poetry, Extensive Reading & Language Study - III	6	4	40	60	100
III	Core V	18UMAC31	Sequences and Series,Trigonometry	6	4	40	60	100
	Allied III	18UMMA31	Statistics I	3	3	40	60	100
	Allied IV	18UMMA32	Linear Programming	3	3	40	60	100
	Core Skill Based	18UMAS31	Numerical Aptitude and Arithmetic Ability	4	4	40	60	100
	NME I	18UMAN31	Mathematics for Competitive Examinations I	2	2	40	60	100
IV	Ability Enhancement Course	18UAWS31	Women's Synergy		2	20	30	50
	Self Study / On-line Course/ Internship (Optional)	18UMASS1	Foundation of Mathematics		+2		50	50
Total				30	26+2			

Semester IV

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil	18ULTA41	சங்க இலக்கியம்: செய்யுள், இலக்கணம்,உரைநடை, வாழ்க்கைவரலாறு, இலக்கிய வரலாறு Language through Literature	6	4	40	60	100
	French	18ULFA41						
II	General English	18UGEN41	Prose, Poetry, Extensive Reading & Language Study - IV	6	4	40	60	100
III	Core VI	18UMAC41	Real Analysis	6	4	40	60	100
	Allied V	18UMMA41	Statistics II	3	3	40	60	100
	Allied VI	18UMMA42	Discrete Mathematics	3	3	40	60	100
	Core Skill Based	18UMAS41	Math Type using LaTeX	4	4	40	60	100
	NME II	18UMAN41	Mathematics for Competitive Examinations II	2	2	40	60	100
IV	Ability Enhancement Course	18UAYM41	Yoga & Meditation		2	20	30	50
	Self Study / On-line Course/ Internship (Optional)	18UMASS2	Industrial Mathematics		+2		50	50
	NCC, NSS & Sports				1			
	Extension Activities CDP				+1			
Total				30	27+3			

Semester V

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
III	Core VII (Common Core)	18UCCC51	Computer Oriented Numerical Methods	6	4	40	60	100
	Core VIII	18UMAC52	Modern Algebra	5	4	40	60	100
	Core IX	18UMAC53	Modern Analysis	5	4	40	60	100
	Core X	18UMAC54	Operations Research	4	4	40	60	100
	Core Integral I	18UMAI51	Vector Calculus and Fourier Series	4	4	40	60	100
	Core Integral II	18UMAI52	Statistical Inference	4	4	40	60	100
IV	Common Skill Based	18UCSB51	Computers for Digital Era and Soft Skills	2	2	20	30	50
	Self Study or On-line Course (Compulsory)	18UMASS3	Astronomy	--	2			50
Total				30	28			

Semester VI

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
III	Core XI	18UMAC61	Complex Analysis	6	4	40	60	100
	Core XII	18UMAC62	Linear Algebra	6	4	40	60	100
	Core XIII	18UMAC63	Mechanics	6	4	40	60	100
	Core Integral III	18UMAI61	Graph Theory	5	4	40	60	100
IV	Core Integral IV / Project	18UMAI62/ 18UMAP61	Coding Theory/ Project	7	4	40	60	100
Total				30	20			
Total				180	145+5			

Semester	Hours	Credits	Extra Credits
I	30	22	---
II	30	22	---
III	30	26	2
IV	30	27	3
V	30	26	--
VI	30	22	--
Total	180	145	5

Courses	Number of Courses	Hours / week	Credits	Extra Credits
Tamil	4	24	16	--
English	4	24	16	--
Core	12	64	48	--
Core Skill Based	2	8	8	--
Core Integral	4	19	16	--
Group Project	1	7	4	--
Allied	6	20T+4P	18T+2P	--
NME	2	4	4	--
Ability Enhancement Course	4	4 (4 Extra Hours)	8	--
Common Skill Based	1	2	2	--
NCC, NSS & Sports		--	1	
Extension Activities		--		1
Self Study Papers (Optional)	2	--		4
Self Study Papers (Compulsory)	1	--	2	--
Total	43	180	145	5

Programme Specific Outcome

PSO No.	Upon completion of the B.Sc. Mathematics program, students will be able to
PSO-1	understand the foundations of mathematics and perform basic computations in higher mathematics.
PSO-2	understand the power of abstraction and generalization and to carry out investigative and mathematical work with independent judgement.
PSO-3	communicate mathematical ideas, develop proficiency in the analysis of problems and use mathematical or other appropriate techniques to solve them.
PSO-4	apply mathematical ideas to model real-world problems.
PSO-5	apply rigorous, analytic, highly numerate approach to analyze, execute tasks and solve problems in daily life and at work.
PSO-6	appreciate the role of mathematical proof as a means of conveying mathematical knowledge.
PSO-7	carry out objective analysis and prediction of quantitative information with independent judgement.
PSO-8	create, use and analyze graphical representation of mathematical relationships

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

Vision

It provides a platform where students can develop algebraic problem solving strategies without the tediousness of pen and paper.

Mission

Transforming real life problems into equations and then solving them.

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	Ap
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

SEMESTER – I			
Part III	Core I	Classical Algebra	
Code :18UMAC11	Hrs/week:5	Hrs/Semester:75	Credits:5

Unit I

Fundamental theorem of algebra - In an equation with real coefficients, imaginary roots occur in pairs - In an equation with rational coefficients, irrational roots occur in pairs - Relations between the roots and coefficients of equations. Symmetric function of the roots

Chapter - 6, Sec: 1 – 12 (Pages: 282-307)

Unit II

Sum of the powers of the roots of an equation - Newton's theorem on the sum of the powers of the roots - Transformation of equation - Reciprocal equation - Standard form of reciprocal equations - To increase or decrease the roots of a given equation by a given quantity - Form of the quotient and remainder when a polynomial is divided by a binomial

Chapter- 6, Sec: 13-18 (Pages: 308-334)

Unit III

Removal of terms – To form an equation whose roots are any power of the roots of a given equation - Transformation in General - Descarte's rule of signs - Rolle's theorem

Chapter-6, Sec: 19-25 (Pages: 334-358)

Unit IV

Multiple roots -Strum's Theorem - Solutions of numerical equations – A rational fraction cannot be a root of an equation with integral coefficients, the coefficient of x^n being unity – Integral roots – Newton's method of divisors

Chapter-6, Sec: 26 – 29 (Pages: 358-376)

Unit V

Horner's method.- General solution of the cubic equations - Cardon's method – Trigonometrical method – Solution of biquadratic equation - Solution of cubic equations - Ferrari method.

Chapter-6,Sec: 30,34 (Pages:376-382,390-398).

Text Book

1. ManicavachagomPillay T.K., Natarajan T., Ganapathy K.S., Algebra, Volume-I, Ananda Book Depot, Chennai., Reprint 2017

Books for Reference

1. Arumugam S. and A. Thangapandi Isaac, Algebra, New Gamma Publishing House, August 2006.
2. Kandasamy P and K. Thilagavathi, Mathematics for B.Sc., 2004, Volume I and Volume IV, S. Chand & Co., New Delhi.

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

Vision:

We will have high expectations of ourselves and of our students, be willing to take risks and to be challenged, work collaboratively and be patient in the learning process of calculus.

Mission:

To prepare the students for success in Calculus while helping them to develop an appreciation and proficiency with mathematical thinking which can be applied to real life situations.

Course Outcome :

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

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

Unit I

Curvature and radius of curvature – Cartesian form-Centre of curvature

(Vol I,Chapter X, Sec 2.1 - 2.4, Pages : 291-309)

Unit II

Evolute and Involute-Pedal Equation -Asymptotes

(Vol I Chapter X, Sec 2.5 - 2.8, Pages : 309-317,Exercises 45: 1-11, Chapter XI, Pages 324-341)

Unit III

Singular Points(Node,cusp,conjugate points)and Tracing of curves (Cartesian only)

(Vol I, Chapter XII, Chapter XIII, Pages : 342-372)

Unit IV

Double and Triple Integrals - Changing the order of integration.Jacobians and Change of variables

(Vol II , Chapter V, Pages : 203-213,219-223,Chapter VI, Pages : 251-269)

Unit V

Beta and Gamma functions – Application of Beta and Gamma Functions in evaluation of Double and Triple Integrals, Improper Integrals.

(Vol II,Chapter VII, Pages : 278-300)

Text Book

1. S.NarayananandT.K.ManicavachagomPillay, Calculus Vol I and Vol II,S.Viswanathan (Printers & Publishers) PVT. LTD. (Edition-2015)

Books for Reference

1. Kandasamy P and K. Thilagavathi, Mathematics for B.Sc., Volume II – 2004, S. Chand & Co., New Delhi.
2. Apostol T.M., Calculus, Vol. I (4th edition) John Wiley and Sons, Inc., Newyork 1991.
3. Apostol T.M., Calculus, Vol. II (2nd edition) John Wiley and Sons, Inc., New York 1969)
4. Stewart.J, Single Variable Calculus (4th edition) Brooks / Cole, Cengage Learning 2010.

SEMESTER - I			
Allied Physics – Paper I			
18UPHA11	Hrs / Week: 4	Hrs / Semester: 60	Credits: 3

Vision: To enable students to understand and appreciate the principle behind various physical phenomena and apply them in appropriate situations

Mission: To provide knowledge in the physical phenomena such as elasticity, bending of beams, surface tension, heat and light through the systematic study of theory and experiments

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
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

SEMESTER - I			
Allied Physics – Paper I			
18UPHA11	Hrs / Week: 4	Hrs / Semester: 60	Credits: 3

Unit I: Elasticity

Elastic moduli – Work done in shearing strain – Relation between elastic constants – Twisting couple on a cylindrical wire – Expression for couple per unit twist – Torsion pendulum – Experiment to determine the rigidity modulus of a wire using Torsion pendulum.

Unit II: Bending of beams

Bending of beams – Expression for bending moment – Theory of uniform bending – Expression for elevation in uniform bending – Experiment to find Young's modulus using microscope – Non-uniform bending – Expression for depression – Experiment to find Young's modulus using scale and telescope

Unit III: Surface tension & Viscosity

Surface tension – Excess of pressure over a curved surface – Coefficient of viscosity and its dimension – Experiment to determine the coefficient of viscosity of a highly viscous liquid (Stoke's) – Rate of flow of liquid through a capillary tube by dimension method and by Poiseuille's method – Experimental determination of surface tension: Drop-weight method – Analogy between current flow and liquid flow.

Unit IV: Thermal Physics

Mean free path – Expression for mean free path – Transport phenomena – Expression for viscosity, thermal conductivity and diffusion – Thermal conductivity – Lee's disc experiment to determine the thermal conductivity of a bad conductor – Newton's law of cooling – Determination of specific heat capacity of a liquid.

Unit V: Interference and diffraction

Young's double slit experiment – Condition for interference – Additional phase difference due to dissimilar reflections – Colour of thin film – Air wedge – Thickness of a wire – Fresnel and Fraunhofer diffraction – Plane transmission grating – Experiment to find wavelength by normal incidence method – Distinction between interference and diffraction bands.

Text Books:

1. A. Ubald Raj and G. Jose Robin, Allied Physics vol. – I (Revised Syllabus), Indira publication, Marthandam, First edition 2006.
2. A. Ubald Raj and G. Jose Robin, Allied Physics vol. – II, Indira publication, Marthandam, First edition 2008.

Books for Reference:

1. Brijlal and Subramanian, A text book of Optics, S. Chand & Co.
2. D.S. Mathur, Elements of Properties of matter, ShyamLal charitable trust, New Delhi, Reprint 2013.
3. R. Murugesan, Properties of matter, Revised edition, S. Chand & Co. Ltd. 2008.
4. David Halliday & Robert Resnik & Jearl Walker, Fundamentals of Physics, John Wiley & sons Inc.

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

Vision:

- To study the properties of straight lines and curves in three-dimensional surfaces.
- To explore the implementation and far-reaching consequences of systems of measurement.

Mission:

This course deals with plane, straight line and sphere in rectangular Cartesian coordinates. This course is so developed as to help students visualize ideas, classify and identify different problem types in analytic geometry of three dimensions and select suitable problem solving techniques.

Course Outcome

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.	1,2 , 3	Un
CO-2	represent simple three-dimensional figures using two-dimensional drawings.	4	Un
CO-3	demonstrate basic mathematical understanding and computational skills in three dimensions.	5 , 9	Un
CO-4	apply algebraic methods to the study of curves and surfaces that lie in three dimensions.	5	Ap
CO-5	apply geometric properties and relationships to solve problems in three dimensions.	5	Un
CO-6	develop logical thinking, geometric thinking and three-dimensional spatial ability.	6 , 7	An
CO-7	solve many difficult problems with simple solutions.	6, 10	Cr
CO-8	create opportunities to use spatial skills in problem-solving tasks.	5, 9	Cr

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

Unit I:

Direction cosines - direction ratios - angle between the lines – condition for perpendicularity and parallelism. **(Chapter 1, Pages: 1 – 23)**

Unit II:

Equation of planes - normal form - intercept form - angle between two planes **(Chapter 2, Pages: 24-45)**

Unit III:

Straight line- symmetrical form - plane and the straight line- angle between two planes - image of a point - image of line. **(Chapter 2, Pages: 46-61)**

Unit IV:

Skew lines - shortest distance between two lines - coplanar lines – volume of tetrahedron. **(Chapter 3, Pages: 61 - 91)**

Unit V:

Sphere - plane section of sphere - tangent line - intersection of two spheres - intersection of a plane with sphere. **(Chapter 4, Pages: 92 - 114)**

Text Book

1. Manicavasagom Pillay T.K. and Natarajan T., Analytical Geometry of 3D, S.Viswanathan (Printers & Publishers) Pvt.Ltd. Reprint 2017.

Books for Reference

1. Arumugam S. and Thangapandi Isaac A., Analytical Geometry of 3D and Vector Calculus, New Gamma Publishing House, January 2006.
2. Arup Mukherjee and Naba Kumar Bej., Analytical Geometry of Two and Three Dimensions, Books and Allied (P) Ltd., Kolkota, November 2010.

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

Vision

Exposing Differential Equations as a powerful tool in solving problems in physical and social sciences.

Mission

Furnishing the students with the tools necessary to solve ordinary differential equations and application problems modeled by them.

Course Outcome

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

SEMESTER– II			
Part III	Core IV	Differential Equations	
Code :18UMAC22	Hrs/week :5	Hrs/Semester :75	Credits :5

Unit I

Linear equation with constant coefficients: Complementary function of a linear equation with constant coefficients-Particular Integral-Special methods for finding Particular Integral
(Chapter 5, Sec 1-4,pages :68-88)

Unit II

Linear equations with variable coefficients- Special method of evaluating the P.I when X is of the form x^m - Equations reducible to the linear equations-Linear equations of the second order - Complete solution given a known integral - Reduction to the normal form–Change of the independent variable– variation of parameters -Methods of operational factors.

(Chapter 5 Sec 5 and 6 pages : 89-102 &Chapter8Sec1-5, pages: 145- 160)

Unit III

Equations of the first order, but of higher degree - Solvable for p, x & y - Clairaut's form – Equations that do not contain x explicitly- Equations that do not contain y explicitly- Equations homogeneous in x and y.

(Chapter4 Sec1- 4 , pages : 60 – 67)

Unit IV

Laplace transform - Definition-Sufficient conditions for the existence of Laplace transform- Laplace transform of periodic functions-Some general theorems- the Inverse transforms.

(Chapter9 Sec1-6,pages: 161-199)

Unit V

Partial differential equation of first order – Classification of integrals - Derivation of partial differential equations - Lagrange's method of solving the linear equation – Special methods, Standard forms – Charpit's method .

(Chapter 12, Sec1-4, Sec5 (5.1-5.4), Sec 6pages : 219-238,240-247)

Text Book

S.Narayanan and T.K.ManickavachagamPillay, Differential Equations and its applications. Published by: Divya Subramanian for Aanda Book Depot ,Edition 2017

Books for Reference

1. A.R. Vasishtha and Dr.S.K.Sharma, Differential Equations, Krishna Educational Publishers,Seventeenth Edition : 2015
2. A.R. Vasishtha and Dr.S.K.Sharma, Partial Differential Equations, Krishna Educational Publishers,Seventeenth Edition : 2015
3. Dr.S.Arumugam and A.ThangapandiIssac, Differential Equations and Applications, New Gamma Publishing House, Edition 2011

SEMESTER – II			
Allied Physics – Paper II			
18UPHA21	Hrs / Week: 4	Hrs / Semester: 60	Credits: 3

Vision: To enable students to understand the importance of Physics in the development of latest technology and apply them in appropriate situations

Mission: To offer knowledge in the physical phenomena such as electrostatics, electromagnetism, relativity, electronics and energy physics through the systematic study of theory and experiments

Course Outcome

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	apply the Gauss law in the calculation of electric fields due to various charge distributions and Understand coulomb's law which gives an idea about the electrostatic force between point charges.	1	Ap, Un
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 explain the nature of physical process and related technological advances	1	Ap
CO-5	understand the principle of energy release in nuclear reactions and identify the present energy scenario and the need for energy conservation	8	Un
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 cells, wind energy and solar energy principles and applications	5	Un

SEMESTER – II			
Allied Physics – Paper II			
18UPHA21	Hrs / Week: 4	Hrs / Semester: 60	Credits: 3

Unit I: Electrostatics

Coulomb's law – Electric field and field intensity – Electric field due to point charge – Electric dipole – Electric flux – Gauss law – Applications – Electric field due to a charged conducting sphere (point inside and point outside) – Uniformly charged cylinder (line charge) – Electric potential – Potential difference – Relation connecting electric field and electric potential at a point – Equipotential surface .

Unit II: Electromagnetism

Faraday's laws of induction – Induced current and charge – Self induction – Self inductance of toroidal solenoid – Determination of self inductance using Rayleigh method – Mutual inductance – Coefficient of coupling – Determination of mutual inductance using B.G.

Unit III: Nuclear Physics

Nuclear Reactions – Energy balance in nuclear reactions and Q-value – Threshold energy of an endoergic reaction – Nuclear fission – Energy released in fission – Chain reaction – Atom bomb – Nuclear reactors – Uses of nuclear reactors – Nuclear fusion – Sources of stellar energy – Thermonuclear reactions – Hydrogen bomb – Controlled thermonuclear reactions.

Unit IV: Digital electronics

Binary numbers – Conversion of decimal number into binary number – Binary to decimal – Binary addition – Multiplication – Subtraction by 2's complement – Basic logic gates – OR, AND, NOT (Implementation only for basic gates), NOR, NAND gates – De Morgan's laws – Boolean equations and logic circuit from truth table – NOR and NAND gates as universal building blocks – Binary adder – Half adder.

Unit V: Energy Physics

World's reserve of commercial energy source and their availability – Various forms of energy – Conventional and Non-conventional energy sources – Solar energy – Photo voltaic effect – Photo voltaic cells – Conversion of solar energy into electricity – Solar cells – Solar heaters – Wind energy – Power of wind – Wind mill – Wind farms – Energy crisis and possible solutions – Global warming.

Text Books:

1. A. Ubald Raj and G. Jose Robin, Allied Physics, Indira Publication, Marthandam, First edition 2008.
2. A. Ubald Raj, Electromagnetism and Plasma Physics, Indira Publication, Marthandam, Revised edition 1998.
3. R. Murugesan, Er. KiruthigaSivaprasath, Modern Physics, S. Chand & Co. Pvt. Ltd., New Delhi, Reprint 2014.
4. S.L.Kakani, K.C. Bhandari, Electronics Theory and Applications, New Age International Publishers, New Delhi, Reprint 2014.
5. G. D. Rai, Non-conventional energy sources, Khanna Publishers, 11th reprint 2014.

Books for Reference:

1. Brijlal N. Subramanian, Electricity & Magnetism, Published by RatanPrakashanMandir, 14th revised edition, 1985.
2. G. Jose Robin and A. Ubald Raj, Energy Physics, Indira Publications, Marthandam, Revised edition: December 2014.
3. R. Murugesan, Electricity and Magnetism, S. Chand and Company Ltd., 7th Revised edition 2018.

SEMESTER – I & II			
Allied Physics - Practical			
18UPHAR1	Hrs / Week: 2	Hrs / Semester: 30	Credits: 2

List of Experiments (Any twelve)

1. Young's modulus – Uniform bending – Pin and microscope
2. Young's modulus – Non-uniform bending – Scale and telescope
3. Rigidity modulus – Torsion pendulum
4. Specific heat capacity of liquid – Newton's law of cooling
5. Spectrometer – Grating – Normal incidence
6. Spectrometer – Refractive index of the prism
7. Air wedge – Thickness of a wire
8. Basic logic gates – OR, AND and NOT
9. Thermal conductivity of a bad conductor – Lee's disc
10. Determination of surface tension – Drop weight method
11. Coefficient of viscosity – Burette method
12. Co-efficient of viscosity – Stoke's method
13. Demorgan's law verification
14. Boolean expression verification
15. Half adder

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

Vision

It gives an introductory knowledge of the basic abstract systems and fundamentals of Mathematics

Mission

To train the students to generalize the known concepts and to develop analytical thinking

Course Outcome

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	Ap
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

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

Unit I

Sequences - Bounded Sequences - Monotonic Sequences - Convergent Sequences - Divergent and oscillating sequences - The algebra of limits- Behaviour of monotonic sequences

(Chapter 3 Sec 3.1 – 3.7, pages 39 - 68)

Unit II

Some theorems on limits – Subsequences - Limit points - Cauchy sequences - Cauchy's general principle of convergence of sequences

(Chapter 3 Sec 3.8 – 3.11, pages 69 - 103)

Unit III

Series of Positive Terms - Infinite series - Comparison test - Kummer's test - D' Alembert's ratio test - Raabe's test - Gauss's test - Cauchy's Root test – Cauchy's condensation test(without proof)

(Chapter 4 Sec 4.1 - 4.4, pages 112 - 150)

Unit IV

Alternating series – Leibnitz's test - Absolute convergence - Tests for convergence of series of arbitrary terms – Dirichlet's test – Abel's test - Multiplication of series - Abel's theorem – Merten's theorem

(Chapter 5 Sec 5.1 - 5.3 &5.5, pages: 157 – 172, 182 - 188)

Unit V

Hyperbolic functions - Logarithm of a complex number - Gregory's Series - Summation of trigonometric series using C+iS method(only)

(Chapter 7, pages: 20 – 43, 58-60)

Text Book

Dr. Arumugam.S & Thangapandi Issac.A, Sequences and Series and Trigonometry, New Gamma Publishing House, Palayamkottai (June 2014).

Books for Reference

1. Joseph A. Mangaladoss, Sequences and Series and Trigonometry, Sarup and Sons, First Edition, 2005
2. J.A. Green, Sequences and Series, Routledge & Kegan Paul Ltd, 1958

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

Vision

The students knows different types of moments and the shape of the curves

Mission

The students understand different statistical concepts which are useful for the economic growth of the country and for the industrial development

Course Outcome

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the difference between the central moments and general moments	1	Un
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	Ap
CO-8	know the uses of index numbers	4	Cr

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

Unit I

Introduction - Moments - Skewness and Kurtosis

(Text Book 1: Chapter 4, Sec 4.1- 4.2, pages: 82-94)

Unit II

Curve fitting: Principles of Least Squares -Fitting a straight line-Fitting a second degree parabola.

(Text Book 1: Chapter 5, Sec 5.1, pages: 95-105)

Unit III

Correlation - Rank correlation.

(Text Book 1: Chapter 6, Sec. 6.1- 6.2, pages: 106-129)

Unit IV

Regression.

(Text Book 1: Chapter 6, Sec. 6.3, pages: 129-144)

Unit V

Introduction - Uses of Index numbers - Methods of constructing index numbers - Tests of adequacy of index number formulae - The chain index numbers.

(Text Book 2: chapter 13, Pages: 536-568)

Text Books

1. S. Arumugam and A. Thangapandi Issac, Statistics, New Gamma Publishing House, Palayamkottai, 2011.
2. S.P.Gupta, Statistical Methods, Sultan Chand & Sons, Educational Publishers, New Delhi, Forty Third Revised Edition, 2014,

Books for Reference

1. H.C.Saxena, Elementary Statistics, S.Chand & Company Ltd., New Delhi, Tenth Edition, 2011.
2. J.N.Kapur and Saxena, Mathematical Statistics, S.Chand & Company Pvt Ltd., New Delhi, First Edition, 1960.

Semester –III			
Part III	Allied IV	Linear Programming	
Code : 18UMMA32	Hrs/week : 3	Hrs/ Semester:45	Credits : 3

Vision

Discuss Linear Programming as a mathematical technique to model decision and optimization problems relevant in engineering, various industries and other applications, as well as methods for solving the resulting models and interpret the solutions.

Mission

To apply appropriate methods for the efficient computation of optimal solution of a problem which is modeled by a linear objective function and a set of linear constraints.

Course Outcome

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	Ap
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

Semester –III			
Part III	Allied IV	Linear Programming	
Code : 18UMMA32	Hrs/week : 3	Hrs/ Semester :45	Credits : 3

Unit I

Introduction - Mathematical formulation of the problem - Graphical Solution method - General linear programming problem - Canonical and standard forms of L.P.P. (Chapter 2, Sec 2.1, 2.2, 2.3 & 2.4 , pages 39-64 ,Chapter 3, Sec 3.1, 3.2, 3.4 & 3.5, pages 65 - 76 & 79 – 86).

Unit II

Simplex Algorithm – Introduction, Fundamental Properties of Solutions(Theorems-Statement only)-The Computational Procedure

(Chapter 4, Sec 4.1& 4.3, pages 87- 89 & 99 -106).

Unit III

Use of Artificial Variables - The big M method (Charnes Penalty Method) - Two phase simplex method (Chapter 4, Sec 4.4, pages 106 – 114).

Unit IV

Duality – Introduction – General Primal Dual pair – Formulating a Dual Problem - Dual and Simplex method

(Chapter 5, Sec 5.1, 5.2, 5.3, 5.4 ,5.7 & 5.9, pages 129 – 134 & 138 – 142).

Unit V

Duality - Dual and Simplex method.

(Chapter 5, Sec 5.9, pages 148 – 150)

Text Book

1. Gupta P.K., Kantiswarup and Manmohan, Operations Research, Sultan Chand & Sons, Educational publishers, New Delhi -2, Reprint 2011.

Books for Reference

1. Prem Kumar Gupta and Hira D.S., Operations Research, Sultan Chand & Sons, Educational publishers, New Delhi -2
2. Billy E Gillet, Introduction to Operations Research, Tata McGraw Hill publishing Company, New Delhi.

Semester – III			
Part III Core Skill Based Numerical Aptitude and Arithmetic Ability			
Code :18UMAS31	Hrs/week : 4	Hrs/ Semester : 60	Credits :4

Vision:

To bring out the mental ability and skill of the students

Mission:

To train the students for competitive and professional examinations

Course outcome

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	Ap
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	Ap
CO-7	simplify and evaluate algebraic expressions.	3	Ev
CO-8	use mathematical concepts in real world situations.	4, 8	Ap

Semester – III			
Part III Core Skill Based Numerical Aptitude and Arithmetic Ability			
Code :18UMAS31	Hrs/week :4	Hrs/ Semester :60	Credits :4

Unit I

Percentage– Time and Work – Time and Distance

(Chapters 10,15,17, pages 179-218, 309-330, 343-360)

Unit II

True discount and Banker's discount – Ratio and Proportion

(Chapters 26, 27, 12, Pages 485-489, 490-493, 248-276)

Unit III

Average – Chain rule - Calendar – Trains – Boats and Streams

(Chapters 6,14,18,19, Pages 123-142, 291-308, 361-370)

Unit IV

Simplification – profit and loss

(Chapters 4,11, Pages 68-95, 219-247).

Unit V

Line Graphs-Pie charts - Bar Diagrams

(Chapters 33,34,35, Pages 525-536, 537-542, 543-549)

Text Book

1. Aggarwal R.S., Arithmetic Subjective and Objective for Competitive Examinations, S.Chand and Company Ltd. , Ram Nagar, New Delhi - 55. Revised Edition 2014

Books for Reference

1. Aggarwal R.S., Quantitative Aptitude , S.Chand and Company Ltd. , Ram Nagar, New Delhi.
2. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Semester III	
Self Study Course	Foundation of Mathematics
Code: 18UMASS1	Credits: +2

Vision

To equip the students with a foundation for lifelong learning, critical thinking and collaborative, technical problem solving in professional and business context.

Mission

To inspire the students to learn foundation of mathematics and creative approaches to addressing mathematical problem and make them to become competent users of mathematics and mathematical application.

Course Outcome

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	gain enriched understanding of concepts of mathematical sets, theory of sets, equivalent sets and cardinal number.	1	Un
CO-2	describe and explain the concepts of axiomatic method and euclidean geometry.	3	Un
CO-3	obtain a basic outline of a paradoxes in set theory, cantor's paradox and russell's paradox.	1	Un
CO-4	differentiate advantages and disadvantages of the axiomatic method and genetic method.	3	An
CO-5	discuss the method of truth table and the predicate calculus.	3	Cr
CO-6	understand and analyze the concepts of axiomatic method and the completeness of an axiom system.	6	Un
CO-7	construct geometry according to euclid, euclid's postulates and non-euclidean geometry	8	Cr
CO-8	analyze the notion of axiomatic method and formal axiomatic method.	2	An

Semester III	
Self Study Course	Foundation of Mathematics
Code: 18UMASS1	Credits: 2

Unit I

The Axiomatic method – Geometry according to Euclid – Euclid’s postulates – Non Euclidean Geometry. **(Chapter: 1, pages: 1 - 6)**

Unit II

The formal axiomatic method - Description of formal axiomatic method –Analysis of axiomatic method – Consistency of axiomatic method - Completeness of an axiom system – Advantages and Disadvantages of the axiomatic method **(Chapter: 1, pages:6 - 18)**

Unit III

The Genetic method - The theory of sets – Equivalent sets – Cardinal numbers

(Chapter: 1, pages: 18 - 25)

Unit IV

Paradoxes in set theory –Cantor’s Paradox – Russell’s Paradox – Axiomatic set theory – The three schools of thought. **(Chapter: 1, pages: 25 - 40)**

Unit V

Truth tables method – The Predicate Calculus **(Chapter: 1, pages: 40 - 44)**

Text Book

K.S. Narayanan and K. Narasimhan, A History of Mathematics ,Taj printers, First Edition Reprint 1985.

SEMESTER – IV			
Part III	Core VI	Real Analysis	
Code :18UMAC41	Hrs / Week: 6	Hrs / Semester: 90	Credits: 4

Vision

To inculcate knowledge on Real numbers and their properties & proofs.

Mission

To develop the application of the concepts.

Course Outcome

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

SEMESTER – IV			
Part III	Core VI	Real Analysis	
Code :18UMAC41	Hrs / Week: 6	Hrs / Semester: 90	Credits: 4

Unit I

Algebra of the Real Number System – Upper and Lower bounds – L.U.B property and its applications-Absolute value and Triangle inequality.

(Chapter 1, Sec 1.1- 1.4, pages 1-20).

Unit II

Continuous functions - $\varepsilon - \delta$ Definition of Continuity -Intermediate value theorem- Extreme value theorem - Monotone functions.

(Chapter 3, Sec 3.1- 3.5, pages 63-90).

Unit III

Limits - Uniform continuity - Differentiability of function - Mean value theorem - L'Hospital's Rules.

(Chapter 3, Sec 3.6 - 3.7, Chapter 4, Sec 4.1- 4.3, pages 90-103, 110 -134).

Unit IV

Higher order Derivatives - Taylor's Theorem - Darboux integrability - Properties of the integral - Fundamental theorem of Calculus.

(Chapter 4, Sec 4.4-4.5, Chapter 6, Sec 6.1-6.3, pages 134-144,175-199).

Unit V

Mean value theorem for integrals - Riemann's Original definition -Sum of an infinite series as an integral - Improper Riemann integrals.

(Chapter 6, Sec 6.4, 6.6, 6.7, 6.9, pages 199-203, 205-212, 214-219).

Text Book

1. Ajit Kumar and S.Kumaresan, Real Analysis, Crc Press, 2015.

Books for Reference

1. Richard R. Goldberg Methods of Real Analysis, Oxford & IBH Publishing Co, New Delhi. Reprint 1973.
2. Robert G. Bartle and Donald R. Sherbert Introduction to Real Analysis Fourth Edition Wiley India Edition, Reprint 2017.

Semester - IV			
Part III	Allied V	Statistics II	
Code : 18UMMA41	Hrs/week :3	Hrs/ Semester :45	Credits : 3

Vision:

Aims to create awareness about the uses of basic statistical concepts in their day-to-day life problems.

Mission

The students understand different distributions and their applications.

Course Outcome

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
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	An
CO-7	fit binomial, poisson and normal distribution.	8	Ap
CO-8	compare moment generating function and cumulant generating function	2, 7	Ev

Semester – IV			
Part III	Allied V	Statistics II	
Code :18UMMA41	Hrs/week : 3	Hrs/ Semester :45	Credits : 3

Unit I

Random variables - Discrete random variables - continuous random variables –Mathematical expectations.

(Text Book 1: Chapter12, Sec 12.1 - 12.4, pages: 304 -328)

Unit II

Moment generating function - Characteristic function.

(Text Book 1: Chapter12, Sec 12.5 - 12.6, pages: 331-342)

Unit III

Binomial distribution - Poisson distribution.

(Text Book 1: Chapter13, Sec 13.1 - 13.2, pages: 343 -369)

Unit IV

Normal distribution.

(Text Book 1: Chapter13, Sec 13.3, pages: 371 -389)

Unit V

Continuous probability distributions - Beta1, Beta2 & Gamma distributions,

(Text Book 2: Chapter 9, Sec 9.5 - 9.7, pages: 9.38 - 9.50)

Text Books

1. S. Arumugam and A. Thangapandi Issac; Statistics, New Gamma Publishing House, Palayamkottai, 2011.
2. S.C. Gupta and V.K. Kapoor; Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Educational Publishers, New Delhi, Eleventh edition, 2014.

Books for Reference

1. S.C. Gupta and V.K. Kapoor; Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Educational Publishers, New Delhi, Eleventh edition, 2014.
2. Sancheti D.C and Kapoor V.K; Statistics, Sultan Chand & Sons, Educational Publishers, New Delhi, Eleventh edition, 2014.

Semester –IV			
Part III	Allied VI	Discrete Mathematics	
Code :18UMMA42	Hrs/week :3	Hrs/ Semester:45	Credits :3

Vision

To provide students with the basic knowledge, both theoretical and empirical, necessary to understand, analyze and solve discrete mathematical problems arising throughout their higher education and professional future.

Mission

To familiarize the students with the basic concepts, results, methods, vocabulary and notation associated with Discrete Mathematics.

Course Outcome

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	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

Semester – IV			
Part III	Allied VI	Discrete Mathematics	
Code :18UMMA42	Hrs/week :3	Hrs/ Semester :45	Credits :3

Unit I

Tautological Implications and Equivalence of Formulae – Replacement Process

(Chapter IX, Sec 8 - 9, pages 9.30 – 9.40).

Unit II

Functionally Complete sets of Connectives and Duality Law – Normal Forms - Principal Normal Forms

(Chapter IX, Sec 10 - 12, pages 9.40 – 9.56).

Unit III

Lattices – Hasse diagrams - Properties of Lattices – Duality Principle – Lattices through algebraic operations

(Chapter X, Sec 1- 2, pages 10.1– 10.12).

Unit IV

New Lattices – Lattice homomorphisms – Product lattice of two lattices - Modular and Distributive Lattices

(Chapter X, Sec 3 - 4, pages 10.13 – 10.34).

Unit V

Boolean Algebras – Boolean polynomials

(Chapter X, Sec 5 - 6, pages 10.34 – 10.50).

Text Book

1. Discrete Mathematics, M.K. Venkataraman, N. Sridharan and N. Chandrasekaran, The National Publishing Company, Chennai, 2009.

Books for Reference

1. J.P.Trembly, R.Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata Mc Graw Hill, NewDelhi, Reprint 2010.
2. Discrete Mathematics, Seymour Lipschutz, Marc Lars Lipson, Tata Mc Graw Hill, NewDelhi.

Semester – IV			
Part III Core Skill Based Math Type using LaTeX			
Code :18UMAS41	Hrs/week :4	Hrs/ Semester:60	Credits :4

Vision

We give a deep knowledge of the LaTeX for Mathematical documentation

Mission

To train the students to use LaTeX skills in documenting and preparing for publications

Course Outcome

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	Ap
CO-6	become proficient in the use of software applications as used in an office environment.	3, 8	Ap
CO-7	manipulate with the real life needs in preparing documents	3	Ap
CO-8	prepare projects in updating with the new updates and versions	8	Cr

Semester – IV			
Part III Core Skill Based Math Type using LaTeX			
Code :18UMAS41	Hrs/week :4	Hrs/ Semester :60	Credits :4

Unit I

Typing text : Words, sentences, and paragraphs - Symbols not on the keyboard - Comments and footnotes - Changing font characteristics - Lines, paragraphs, and pages – Spaces - Boxes

(Chapter 5, Sec 5.1 - 5.9, pages 61 - 115)

Unit II

Text environments: Some general rules for displayed text environments - List environments - Style and size environments - Proclamations (theorem-like structures) - Proof environments - Tabular environments - Tabbing environments - Miscellaneous displayed text environments

(Chapter 6, Sec 6.1 to 6.8, pages 117 - 149)

Unit III

Typing math: Math environments - Spacing rules - Equations - Basic constructs - Arithmetic operations - Delimiters - Operators - Math accents - Stretchable horizontal lines - Formula Gallery

(Chapter 7, Sec 7.1 to 7.9, pages 151 - 186)

Unit IV

More math: Spacing of symbols Building new symbols - Math alphabets and symbols - Vertical spacing - Tagging and grouping - Generalized fractions - Boxed formulas

(Chapter 8, Sec 8.1 to 8.6, pages 187 - 206)

Unit V

LaTeX documents: The structure of a document - The preamble - Abstract - Sectioning - Cross-referencing - Bibliographies.

(Chapter 10, Sec 10.1 to 10.6, pages 245 - 270)

Text Book:

1. George Gratzer, More Math into LaTeX, 4th Edition, Springer, 2007

Books for Reference:

1. Helmut Kopka and Patrick W. Daly, A guide to LaTeX, Fourth Edition, Addison-Wesley.
2. David R. Wilkins, Getting started with LaTeX, Second Edition.

Practicals:

Typing Text and Tables: Chapter 4.1 - Inserting Figures: Chapter 5.1 - Mathematical Equations: Chapter 6.3- Inserting References: Chapter 7.6 - Preparing an article for mathematical journal

Work Book: iSkills, LaTeX for beginners Workbook, 5th Edition, March 2014

Semester IV	
Self Study Course	Industrial Mathematics
Code: 18UMASS2	Credits:2

Vision

To understand and develop the linkage between mathematics and business.

Mission

To apply mathematics to engineering, science, society and industry and to emphasis on mathematical modeling, computational techniques and statistical reasoning.

Course Outcome

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	evaluate range, quartile, mean deviation and standard deviation.	1	Ev
CO-2	apply basic operation to calculate frequencies.	3	Ap
CO-3	make connections of mathematical ideas to other ideas both inside of and outside of mathematics.	4	Ap
CO-4	demonstrate mathematical skills in the area of conditionally probability.	6	Un
CO-5	evaluate the consistency of data from a sample.	7	Ev
CO-6	demonstrate the knowledge of probability and the standard statistical distributions.	7	Un
CO-7	relate mean deviation and standard deviation.	3	Un
CO-8	measure the association between two binary variables with yule's coefficient.	5	Ev

Semester IV	
Self Study Course	Industrial Mathematics
Code: 18UMASS2	Credits: 2

Unit: I

Measures of dispersions: Measures of dispersions - Range - Quartile - Mean deviation - Standard deviation.

(Chapter: 3, Sec: 3.1, Pages: 60-80)

Unit: II

Theory of Attributes: Theory of Attributes – Positive class frequencies – negative class frequencies - Contrary frequencies.

(Chapter: 8, Sec: 8.1, Pages: 196 - 212)

Unit: III

Consistency of data: Consistency of data- Consistent- Inconsistent - Independence and association of data: Two attributes are independence.

(Chapter: 8, Sec: 8.2, 8.3, Pages: 212-228)

Unit: IV

Probability: Probability – random experiment – relative frequency – probability set function

(Chapter: 11, Sec: 11.1, Pages: 274-281& Exercise)

Unit: V

Probability: Conditional probability.

(Chapter: 11, Sec: 11.2, Pages: 281 - 303)

Text Book

1. Dr. S. Arumugam and Mr. A. Thangapandi Issac., Statistics, 2013, New Gamma Publishing House, Palayamkottai.

Semester –V			
Part III Core VII (Common Core) Computer Oriented Numerical Methods			
Code: 18UCCC51	Hrs/Week: 6	Hrs/ Semester : 90	Credits : 4

Vision:

To inspire the students with modern computational methods to carry out the problems.

Mission:

To equip students with the knowledge of algorithms of numerical analysis and execute it efficiently with MATLAB.

Course Outcome:

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	An

Semester –V			
Part III Core VII (Common Core) Computer Oriented Numerical Methods			
Code: 18UCCC51	Hrs/Week: 6	Hrs/Semester: 90	Credits: 4

Unit I

Difference operators-Other difference operators-Newton's interpolation formula-Lagrange's interpolation formulae-Divided difference-Divided difference formula-Inverse interpolation.

(Textbook: 1, Chapter 3, Sec 3.1, 3.2, Chapter 4, Sec 4.1,4.3,4.4,4.5,4.6, pages 3.1 – 3.45, 4.1- 4.16, 4.31- 4.54) (Problems only)

Unit II

Derivatives using Newton's forward difference formula-Derivatives using Newton's backward difference formula-Derivatives using Newton's central difference formula-Maxima and minima of the interpolating Polynomial-Numerical Integration-Newton – Cote's quadrature formula-Trapezoidal Rule-Simpson's one third rule-Simpson's three eighth rule-Weddley's rule.

(Textbook: 1, Chapter 5, Sec 5.1 – 5.4, Chapter 6, Sec 6.1 – 6.4, pages 5.1 – 5. 24, 6.1 – 6.26) (Problems only)

Unit III

Taylor series method-Picard's method- Runge-Kutta method.

(Textbook: 1, Chapter 7, Sec 7.1,7.2,7.4, pages 7.1-7.15, 7.25-7.40) (Problems only)

Unit IV

Introduction to MATLAB: MATLAB environment – Types of files _ platform – search path – Constants, variables and expressions – Vectors and Matrices – Polynomials – Input Output statements – MATLAB Graphics.

(Textbook:2, Chapters:1,2,3,4,5,6)

Unit V

Control Structures- writing programs and functions – ordinary differential equation and symbolic mathematics – MATLAB Applications.

(Textbook: 2, Chapters: 7,8,9,10)

Text Books

- 1.Arumugam S and Thangapandi Isaac A, Numerical Analysis With Programming in C, New Gamma Publishing House, Palayamkottai.
- 2.Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, MATLAB and its Applications in engineering, Pearsons Publications.

Books for Reference

1. Stormy Attaway, MATLAB- A Practical Introduction to Programming and Problem Solving.
2. Stephen J. Chapman, Essentials of MATLAB Programming, Published November 1st 2007 by Thomson Learning.

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

Vision

To give an introductory knowledge of the basics abstract systems of mathematics

Mission

To train the students to generalize the known concepts and to develop analytical thinking.

Course Outcome

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	Ap
CO-8	illustrate the isomorphic structures	8	An

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

Unit I

Relations and Mappings - Relations - Equivalence Relations - Functions – Binary Operations

(Chapter 2, Sec 2.1 - 2.5, pages 2.1 – 2.18)

Unit II

Permutation groups - Sub groups - Cyclic Groups - Order of an Element - Cosets and Lagrange's theorem - Euler's theorem - Fermat's theorem

(Chapter 3, Sec 3.4 - 3.8, pages 3.12 – 3.31)

Unit III

Normal Subgroups and Quotient Groups - Isomorphism - Cayley's theorem - Homomorphism - Automorphism - Fundamental theorems of Homomorphism

(Chapter 3, Sec 3.9 - 3.11, pages 3.31 – 3.50)

Unit IV

Rings - definition and examples – Elementary properties of rings- Isomorphism – Types of rings - Characteristic of a ring - Sub rings

(Chapter 4, Sec 4.1 - 4.6, pages 4.1 – 4.18)

Unit V

Ideals - Quotient Rings - Maximal and PrimeI – Homomorphism of rings - Unique factorization domain(U.F.D.) – Euclidean domain.

(Chapter 4, Sec 4.7 - 4.10, 4.13- 4.14, pages 4.18 – 4.26, 4.31-4.36)

Text Book

1. Arumugam S. and Thangapandi Isaac A - Modern Algebra, Scitech Publications (India) PVT Ltd. Chennai Edition, 2003

Books for Reference

1. Bhattacharya P.B., Jain S.K., Nagpaul S.R., Basic Abstract Algebra, Second Edition, Cambridge University Press.
2. Santiago M.L., Modern Algebra, Arul Publications, Madras, 1988

Semester – V			
Part III	Core IX	Modern Analysis	
Code :18UMAC53	Hrs / Week: 5	Hrs / Semester: 75	Credits: 4

Vision

To introduce the basic concepts in Analysis and to enable the students to understand fundamental ideas and theorems on Metric spaces

Mission

To develop the application of the concepts.

Course Outcome

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	Ap
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	Ap
CO-8	apply the theory to solve mathematical problems including the construction of simple proofs.	2	An

SEMESTER – V			
Part III	Core IX	Modern Analysis	
Code :18UMAC53	Hrs / Week: 5	Hrs / Semester: 75	Credits: 4

Unit I

Metric spaces - Bounded sets - open ball - open sets - diameter of a set - interior of set

(Chapter 2, Sec 2.1-2.6, pages 17-58)

Unit II

Closed sets - closure - limit point - dense sets

(Chapter 2, Sec 2.7-2.10, pages 59-79)

Unit III

Complete metric space - Cantor's intersection theorem - Baire's Category Theorem

(Chapter 3, Sec 3.1-3.2, pages 80-100)

Unit IV

Connectedness - equivalent conditions - connected subsets of \mathbb{R} - connectedness and continuity - continuous image of a connected set is connected - Intermediate mean value theorem

(Chapter 5, Sec 5.1-5.3, pages 139-150)

Unit V

Compactness - definition of open cover - compact metric space – Heine Borel theorem - compactness and continuity - continuous image of a compact set is compact - uniform continuity – Continuous function on a compact metric space is uniformly continuous – equivalent characterizations of compactness–compactness and continuity.

(Chapter 6, Sec: 6.1-6.4, pages: 150-178)

Text Book

1. Arumugam S. and Issac, Modern Analysis New Gamma Publishing House, Edition 2010.

Books for Reference

1. Richard R Goldberg, Methods of Real Analysis, Oxford & IBH Publishing Co, New Delhi, Reprint 1973.
2. Robert G. Bartle and Donald R. Sherbert, Introduction to Real Analysis Fourth Edition Wiley India Edition, Reprint 2017.

Semester –V			
Part III	Core X	Operations Research	
Code :18UMAC54	Hrs/week : 4	Hrs/Semester :60	Credits : 4

Vision

To solve problems using appropriate techniques, interpret the results obtained and translate solutions into directives for action.

Mission

To familiarize the students with the basic concepts, models and statements of the operations research theory.

Course Outcome:

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	Ap
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	Ap
CO-8	apply Mathematical theories to Commerce and Business and Management	3	Ap

Semester – V				
Part III	Core X	Operations Research		
Code :18UMAC54	Hrs/week : 4	Hrs/Semester :60	Credits : 4	

Unit I

Transportation problem - Mathematical formulation - North West Corner Rule - Vogel's approximation method (Unit penalty method) - The method of matrix minima - optimality test - Maximization - u - v method.

(Chapter 10, Sec 10.1 10.2 10.8 – 10.13, pages 247, 248, 252 273)

Unit II

Assignment problem - Mathematical formulation - Method of solution - Maximization of the effective matrix

(Chapter 11, Sec 11.1, 1.2, 11.3 &11.4, pages 295 – 315)

Unit III

Sequencing problem - n - jobs and two machines - n - jobs and three machines, two jobs and m – machines

(Chapter 12, Sections 12.1, 12.2, 12.3 12.4 12.5 &12.6, pages 327 – 342)

Unit IV

Network Scheduling – Introduction - Basic Components – Logical Sequencing – Rules of Network Construction – Critical Path Analysis

(Chapter 25, Sec 25.1, 25.2, 25.3, 25.4 25.5,25.6 &12.6, pages 763 – 780)

Unit V

Probability Considerations in PERT - Probability of Meeting the Schedule Time.

(Chapter 25, Sec 25.7, pages 781 – 790)

Text Book

1.GuptaP.K., Kantiswarup and Manmohan, Operations Research, Sultan Chand & Sons, Educational Publishers, New Delhi -2, Reprint 2011.

Books for Reference

1.Prem Kumar Gupta and Hira D.S., Operations Research, Sultan Chand & Sons, Educational Publishers, New Delhi -2 .

2.Billy E Gillet, Introduction to Operations Research, Tata McGraw Hill publishing Company, New Delhi.

Semester –V			
Part III Core Integral I Vector Calculus and Fourier Series			
Code :18UMAI51	Hrs/week :4	Hrs/Semester :60	Credits :4

Vision

To introduce physical application of derivatives of vectors.

Mission

To help the students to study the line integral, surface integral and volume integral and their applications.

Course Outcome

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	C
CO-3	use the gradient to find directional derivatives.	3	Ap
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	E
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

Semester –V			
Part III Core Integral I Vector Calculus and Fourier Series			
Code :18UMAI51	Hrs/week :4	Hrs/Semester :60	Credits :4

Unit I

Vector differentiation –Differentiation of vectors – Gradient

(Text Book 1: Chapter 5, Sec 5.0,5.1,5.2,5.3, Pages 5-1 to 5-18)

Unit II

Divergence and Curl – Solenoidal, Irrotational

(Text Book 1: Chapter 5, Sec 5.4, Pages 5-18 to 5-30)

Unit III

Vector integration - line integrals - surface integrals

(Text Book 1: Chapter 7, Sec 7.1, 7.2, Pages L&S INT 1 to 11)

Unit IV

Vector integration - Gauss, Stokes and Green's theorems (Without proof), problems only

(Text Book 1: Chapter 7, Sec 7.3, Pages L&S INT 11 to 32)

Unit V

Fourier series - Half - range, sine & cosine series

(Text Book 2: Part II Chapter 5, 459-478)

Text Books

1. Arumugam S. and Thangapandi Isaac A, Analytical Geometry of Three Dimensions and Vector Calculus, New Gamma Publishing House, Edition 2014,
2. Arumugam S. and Thangapandi Isaac A, Calculus, New Gamma Publishing House, Edition 2014.

Books for Reference

- 1.DuraiPandian P and Laxmi Duraipandian, Vector Analysis, Emerald Publishers, Edition 1986.
- 2.Piskunov N, Differential and Integral Calculus, Vol II, CBS Publishers and Distributors.

Semester – V			
Part III Core Integral II Statistical Inference			
Code :18UMAI52	Hrs/week :4	Hrs/Semester :60	Credits :4

Vision

It gives the knowledge of statistical quality control techniques and their applications

Mission

To apply the statistical techniques in their work stations

Course Outcome

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

Semester – V			
Part III	Core Integral II	Statistical Inference	
Code :18UMAI52	Hrs/week :4	Hrs/Sem :60	Credits :4

Unit I

Statistical Quality Control - Definition, Advantages, Process control - Control chart, Mean chart, Range chart

(Text Book1: Vol.2, Chapter 7, Pages1051-1074)

Unit II

Control chart for standard Deviation, Control chart for C, Control chart for P ,np- chart

(Text Book1: Vol.2, Chapter 7, Pages 1082-1091)

Unit III

Testing of hypothesis - Null and Alternate Hypothesis. Type I and Type II errors - Critical region, level of significance - Test of significance for large samples - Testing a single proportion - Difference of proportions - testing a single mean - Difference of means.

(Text Book1: Vol.2, Chapter 3, Pages 882 – 908)

Unit IV

Tests based on t - distribution - Single mean - Difference of means - Tests based on F distribution - Variance ratio test - Test based on chi square distribution - Independence - Goodness of fit. (excluding the test for correlation)

(Text Book1: Chapter 3- 4, Pages 910 – 920, 954 – 970, 1006-1009)

Unit V

Analysis of Variance - One way and two way classified data - Basis of experimental design - simple problems.

(Text Book2: chapter 17 pages 481 – 506)

Text Books

- 1.Gupta S.P., Statistical Method , 44-th edition Sultan Chand & Sons Publishers-New Delhi.
- 2.Arumugam S. and Issac A., Statistics, New Gamma publishing House. Palayamkottai, 2016.

Books for Reference

1. Gupta S.C., Kapoor V.K., Fundamentals of mathematical Statistics , Eleventh edition, Sultan Chand & Sons, Educational Publishers, New Delhi
2. Sancheti D.C, Kapoor V.K., Statistics, Sultan Chand & Sons, Educational Publishers, New Delhi

Semester V	
Self Study Course (Compulsory)	Astronomy
Code:18UMASS3	Credits:2

Vision

To enhance and share scientific understanding of the universe.

Mission

To introduce the exciting world of astronomy to the students and to help the students to study about the celestial objects.

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	use mathematics to perform calculations on earth or space science problems	4	Ap
CO-2	make observations regarding the earth or space and infer conclusion from them.	3	Ap
CO-3	describe and explain the motion of objects (sun, moon, planets, stars)	4	Un
CO-4	sketch and explain the relationships of objects in solar and lunar eclipse.	8	Cr
CO-5	discuss the contribution of lunar and solar calendar.	6	Cr
CO-6	discuss about stars, meteorites, comets and their masses.	5	Cr
CO-7	describe how stars evolve.	6	Un
CO-8	describe astronomical distance and size scales.	1	Un

Semester - V	
Self Study Course (Compulsory)	Astronomy
Code: 18UMASS3	Credits: 2

Unit I

Solar System - The Sun - Mercury - Venus - Mars

(Chapter: XVII, Sections: 328 - 331)

Unit II

Asteroids - Jupiter - Saturn - Uranus - Neptune - Pluto

(Chapter: XVII, Sections : 332 - 337)

Unit III

Comets – Meteors – Zodiacal Light

(Chapter: XVII, Sections: 338 - 340)

Unit IV

Stellar Universe – The Colour And Size Of Stars - Double And Multiple Stars - Variable Stars - Star Cluster – Milky Way

(Chapter: XVIII, Sections: 349 - 351, 353, 357)

Unit V

The calendar – Lunar and solar calendars - Egyptian calendar - Mayan Calendar - Roman calendar – Julian calendar - Gregorian calendar – world calendar – Indian National calendar – Tamil and Malayalam Calendars.

(Chapter: XX, Sections: 362 - 370)

Text Book

1. S. Kumaravelu & Susheela Kumaravelu, Astronomy, 2011, A. Baskara Selvan printers, Sivakasi.

Semester –VI			
Part III	Core XI	Complex Analysis	
Code :18UMAC61	Hrs/week :6	Hrs/Semester :90	Credits :4

Vision

To expose students to more complex theories of study

Mission

To sharpen analytical thinking and their problem solving capacity

Course Outcome

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	Ap
CO-8	outline complex number system with intense perception	6	An

Semester –VI			
Part III	Core XI	Complex Analysis	
Code :18UMAC61	Hrs/week :6	Hrs/Semester :90	Credits :4

Unit I

Complex Numbers- Conjugation and modulus – Inequalities –Square Root – Geometrical Representation of Complex Numbers – nth Roots of Complex numbers - Circles and Straight lines – Regions in the Complex Plane - Extended Complex Plane - Continuous functions- Differentiability - The Cauchy - Riemann equations- Analytic Functions.

(Chapter 1 Sec 1.0 – 1.9, Chapter 2 Sec 2.4, 2.5, 2.6 & 2.7, pages 1- 21, 30 - 50)

Unit II

Harmonic functions - Conformal mapping – Elementary Transformations -Bilinear Transformations - Cross ratio –Fixed points of Bilinear Transformations – Some Special Bilinear Transformation.

(Chapter 2 Sec 2.8 - 2.9, Chapter 3, pages 50 - 100)

Unit III

Complex integration- Definite integral - Cauchy's theorem - Cauchy's integral formula - Higher derivatives

(Chapter 6, Sec 6.0 – 6.4, pages 132-172)

Unit IV

Series Expansions - Taylor's series - Laurent's series - Zeros of Analytic Functions – Singularities

(Chapter 7, Sec 7.0 – 7.4, pages 173 - 208)

Unit V

Calculus of Residues Residues - Cauchy's Residue Theorem - Evaluation of Definite Integrals

(Chapter 8, Sec 8.0 – 8.3, pages 209 -255)

Text Book

1. Arumugam S, Thangapandi Issac A, SomasundaramA.,Complex Analysis, SciTech publications(India) Pvt.Ltd, 2014

Books for Reference

1. Narayanan, ManicavachagomPillai, Complex Analysis, S.Viswanathan printers & Publishers Pvt. Ltd
2. P.Duraipandian, Laxmi Duraipandian & D.Muhilan, Complex Analysis, Emerald Publishers, Chennai

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

Vision

To extend the knowledge in Abstract Algebra and develop analytical thinking.

Mission

To equip the students with the ideas of Linear Algebra to pursue their higher studies.

Course Outcome :

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

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

Unit I

Vector spaces - Elementary properties - subspaces - Quotient spaces - Direct sum - Linear span of a set - Linear dependence and independence

(Chapter 5, Sec 5.1, 5.2, 5.4, 5.5, Pages 5.1-5.10, 5.14-5.19)

Unit II

Linear transformations - vector space of linear transformations - Basis - Dimension, Any two bases of a finite dimensional vector space have the same number of elements – Theorems on dimension.

(Chapter 5, Sec 5.3, 5.6, Pages 5.10-5.13, 5.19-5.26)

Unit III

Rank and nullity theorem – Matrix of linear transformations – Algebra of matrices - Types of matrices – The inverse of a matrix.

(Chapter 5, Sec 5.7, 5.8, Chapter 7, Sec 7.1, 7.2, 7.3, Pages 5.26-5.30, 7.1-7.15)

Unit IV

Elementary transformations – Rank of a matrix - Characteristic equation of a matrix - Eigen values and eigen vectors - Cayley Hamilton theorem and problems – Solution of simultaneous equations using matrices.

(Chapter 7, Sec 7.4, 7.5, 7.6, 7.7, 7.8, Pages 7.15-7.40)

Unit V

Inner product spaces – Norm – Schwartz inequality – Triangular inequality - Gram Schmidt orthogonalisation process - orthogonal complement.

(Chapter 6, Pages 6.1-6.9)

Text Book

1.Arumugam .S and Thangapandi Issac.A , Modern Algebra , Scitech Publications (India) Pvt. Ltd., Chennai, Reprint 2017.

Books for Reference

1. Bhattacharya P.B., Jain S.K., Nagpaul S.R., Basic Abstract Algebra, Second Edition,Cambridge University Press.
2. Santiago M.L., Modern Algebra, Arul Publications, Madras, 1988

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

Vision

Getting knowledge to apply mechanical theory

Mission

Using the mechanical knowledge in their day-to -day life

Course Outcome

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
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	Ap
CO-7	understand the simple harmonic motion	3, 7	Ap
CO-8	determine the simple harmonic motion	4	Ap

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

Unit I

Lami's theorem, Parallel forces and moments - Resultant of Two like and unlike parallel forces, moment of a force - t Varignon's theorem - moment of force about an axis couples.

(Text Book 1: Chapter 3,4, pages 52-96)

Unit II

Equilibrium of three forces acting on rigid body subjected to any three forces - three coplanar forces theorem, Two Trigonometrical theorems, problems.

(Text Book 1: Chapter5, pages 98-142)

Unit III

Frictions - Laws of friction - angle of friction - cone of friction - Equilibrium of particle on a rough inclined plane under a Force.

(Text Book 1: Chapter7, pages 206-262)

Unit IV

Fundamental laws of impact - impact of a smooth sphere on a fixed smooth plane - direct impact of smooth elastic spheres.

(Text Book2: Chapter 8, pages 215-261)

Unit V

Definition - Geometrical representation of S.H.M.'s –Composition of S.H.M.'s of the same period and in the same line - Composition of S.H.M.'s of the same period and in two perpendicular directions.

(Text Book2: Chapter 10, pages 309-355)

Text Books

1. Venkatraman, M.K. Statics, Agasthiar Book House, Tiruchirapalli, Aug 2011
2. Venkatraman M.K, Dynamics, Agasthiar Book house, Tiruchirapalli, 16th Edition, Jan 2014

Books for Reference

1. Duraipandian P., Mechanics, S.Chand and Company Ltd
2. Bali N.P., Dynamics, Laxmi Publication, Delhi

Semester VI			
Part III	Core Integral III	Graph Theory	
Code :18UMAI61	Hrs / Week: 5	Hrs / Semester: 75	Credits: 4

Vision

To learn basic concepts in graph theory.

Mission

To translate situations to diagrammatic representations and to develop problem solving skills.

Course Outcome

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	Ap
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

Semester VI			
Part III	Core Integral III	Graph Theory	
Code :18UMAI61	Hrs / Week: 5	Hrs / Semester: 75	Credits: 4

Unit I

Graphs and sub graphs:

Introduction - Definition and examples - Degrees - Sub graphs –Isomorphism - independent sets and coverings - intersection graphs - Line graphs - Matrices - Operation on graphs

(Chapter 2, Sec 2.1-2.4, 2.6-2.9, pages 5-17, 19-27).

Unit II

Degree Sequences: Introduction –Degree sequences - Graphic Sequence **Connectedness** - introduction-walks - trails and paths - Connectedness and components - blocks - connectivity.

(Chapters 3 and 4 Sec 3.1-3.2, 4.1-4.4, pages 29-47).

Unit III

Eulerian and Hamiltonian graphs:

Introduction - Eulerian graphs - Hamiltonian graphs - Trees – introduction - Characterization of trees - Centre of a tree .

(Chapters 5 and 6, Sec 5.1-5.2, 6.1-6.2, pages 48-65).

Unit IV

Planarity:

Definition and properties, Characterization of planar graphs – thickness, crossing and outer planarity

(Chapter- 8, Sec 8.1-8.3, pages 73-84).

Unit V

Colourability:

Chromatic number and Chromatic index - the five colour theorem –Chromatic polynomials

(Chapter- 9, Sec 9.1-9.4, pages: 85-98).

Text Book

1. S. Arumugam , S. Ramachandran - Invitation to Graph theory, Scitech Publications (India) Pvt. Ltd., (2001) Chennai - 17.

Books for Reference

- 1.Parthasarathy K.R., Basic Graph Theory, Tata McGraw Hill Publishing Company Limited, New Delhi
- 2.John Clark and Derek Allan Holton A First Look at Graph Theory, World Scientific Publishing Co.Pte.Ltd, Singapore, Reprint 2013.

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

Vision

To obtain the concept of source coding and various coding techniques that are used for practical purposes.

Mission

To generate mathematical ideas and methods that can be used to transmit information more reliably.

Course Outcome

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

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

Unit I

Basic assumptions – Correcting and detecting error patterns – Information rate – Effects of error correction and detection – Finding the most likely code word transmitted.

(Chapter 1, Sections: 1.1 - 1.6)

Unit II

Linear codes – Two important subspaces - Independence – Basis, Dimension – Matrices – Bases for C and C^\perp – Generating matrices and Encoding.

(Chapter 2, Sections: 2.1 - 2.6)

Unit III

Parity check matrices – Equivalent codes – Distance of a linear code – Cosets – MLD for linear codes – Reliability of IMLD for linear codes.

(Chapter 2, Sections: 2.7 - 2.12)

Unit IV

Some bounds for codes – Perfect codes – Hamming codes – Extended codes – The Extended Golay code – Decoding the extended Golay code – The Golay code.

(Chapter 3, Sections: 3.1 - 3.7)

Unit V

Polynomials and Words – Introduction to cyclic codes – Polynomial Encoding and Decoding – Finding cyclic codes – Dual cyclic codes.

(Chapter 4, Sections: 4.1 - 4.5)

Text Book

1. D.G. Hoffman, D.A Leonard, C.C. Linder, K.T. Phelps, C.A. Rodger and J.R. Wall, Coding Theory - The Essentials, Marcel Dekker, Inc., 1991, New York.

Books for Reference

1. Ron M. Roth, Introduction to Coding Theory, 2006, Cambridge University Press, Cambridge, UK.
2. Raymond Hill, A first course in coding theory, 2004, Clarendon Press, Oxford.