A.D.M. COLLEGE FOR WOMEN

(AUTONOMOUS)

Nationally Accredited with "A" Grade by NAAC - 3rd Cycle
(Affiliated to Bharathidasan University, Thiruchirappalli)
No.1, College Road, Velippalayam,
Nagapattinam – 611 001, Tamil Nadu, India

PG & RESEARCH DEPARTMENT OF MATHEMATICS

(for the candidates admitted from the academic year 2021-2024)

B.Sc., MATHEMATICS

SYLLABUS

2021-2024

A.D.M COLLEGE FOR WOMEN (AUTONOMOUS),
Nagapattinam

UG Programme - B.Sc Mathematics

(For the candidates admitted from 2021 – 2024 onwards)

Bloom's Taxonomy Based Assessment Pattern

Knowledge Level

K1 – Recalling	**K2** – Understanding	**K3** – Applying	**K4** – Analyzing	**K5** – Evaluating	**K6** – Creating

1. Part I, II and III

Theory (External + Internal = 75 + 25 = 100 marks)

External/Internal					
Knowledge Level	**Section**	**Marks**	**Hrs.**	**Total**	**Passing Mark**
K1-K3	A (Answer all)	10 ×2 = 20	3	75	30
K3-K6	B (Either or pattern)	5 × 5 = 25			
K3-K6	C (Answer 3 out of 5)	3 × 10 = 30			

PG DEPARTMENT OF MATHEMATICS

(for the candidates admitted from the academic year 2021-2024)

B.Sc., Mathematics

Programme Educational Objectives (PEO):

PEO 1:	To gain knowledge in fundamental ideas of mathematics and to develop the mathematical thinking.
PEO 2:	To provide the highest level of education in mathematics and to produce competent and creative Mathematicians.
PEO 3:	To enable the learners to solve mathematical problems using mathematical techniques.
PEO 4:	To communicate mathematics accurately, precisely and effectively.
PEO 5:	To inculcate the mathematical concepts, intellectual skills, courage and integrity, sensitivity to the needs and aspiration of the society among the learners.

Programme Outcomes(POs)UG

On completion of the course the learner will be able to

PO 1:	apply the basic concepts of mathematics to formulate and evaluate the real- world problems.
PO 2:	utilize the mathematical principles to think analytically, systematically and critically while solving problems and making decisions.
PO 3:	construct the logical arguments and apply the laws of logic in mathematical proofs.
PO 4:	learn and apply the appropriate methods and procedures in MATLAB, SPSS etc.
PO 5:	pursue careers in academia, industry and the other areas of Mathematics.

Programme Specific Outcomes(PSO) B.Sc.,

On completion of the course the learner will be able

PSO 1:	identify the applications of mathematics in other disciplines and society.
PSO 2:	formulate and develop mathematical arguments in a logical manner.
PSO 3:	able to identify, locate and solve the issue or problem effectively.
PSO 4:	acquire good knowledge in advanced areas of mathematics.
PSO 5:	understand and formulate quantitative models arising in social science, business and other contexts.

PG AND RESEARCH DEPARTMENT OF MATHEMATICS

COURSE STRUCTURE OF THE UG PROGRAMME-B.Sc., MATHEMATICS

B. Sc., Mathematics 2021- 2024 Batch

STRUCTURE OF THE PROGRAMME

Part	Title of the part	No. of Courses	Hours	Credit
I	LC- Language Course	4	24	12
II	ELC – English Language Course	4	24	12
III	CC- Core Course	14	72	67
	AC –Allied Course	4	27	18
	MBE - Major Based Elective	3	16	13
IV	NME - Non- Major Elective	2	4	4
	SBE - Skill Based Elective	3	6	6
	SSD – Soft Skill Development	1	2	2
V	ES - Environmental Studies	1	2	2
	VE - Value Education	1	2	2
	EA - Extension Activities	-	-	1
	GS - Gender Studies	1	1	1
	Total	**38**	**180**	**140**

Passing Minimum

A candidate shall be declared to have passed in each course if she secures not less than 40% marks out of 75 marks (i.e., 30 marks) in the End Semester Examination (SE) and 40% out of 25 marks (i.e., 10 marks) in the Continuous Internal Assessment.(CIA).

A.D.M. COLLEGE FOR WOMEN (AUTONOMOUS), NAGAPATTINAM
DEPARTMENT OF MATHEMATICS
B.Sc., MATHEMATICS

Course Structure under CBCS
(for the candidates admitted from the academic year 2021-2024 onwards)

Sem.	Part	Course	Ins. Hrs	Credit	Exam Hours	Marks		Total Marks
						CIA	SE	
I	I	LC - Language Course –I –Tamil I	6	3	3	25	75	100
	II	ELC – English Language Course –English I	6	3	3	25	75	100
	III	CC- Core Course I –Differential Calculus and Trigonometry	5	5	3	25	75	100
		CC- Core Course II – Classical Algebra	4	4	3	25	75	100
		AC –Allied Course I – Physics I	4	4	3	25	75	100
		AC –Allied Course II – Physics II (Practical)	3	-	-			
	IV	Value Education	2	2	3	25	75	100
		Total	**30**	**21**				**600**
II	I	LC- Language Course –Tamil II	6	3	3	25	75	100
	II	ELC – English Language Course –English II	6	3	3	25	75	100
	III	CC - Core Course III -Integral Calculus	5	4	3	25	75	100
		CC- Core Course IV -Analytical Geometry of Three Dimensions	4	4	3	25	75	100
		AC -Allied Course II - Physics II (Practical)	3	3	3	40	60	100
		AC -Allied Course III - Physics III	4	2	3	25	75	100
	IV	ES – Environmental Studies	2	2	3	25	75	100
		Total	**30**	**21**				**700**

III	I	LC- Language Course –Tamil III	6	3	3	25	75	100
	II	ELC – English Language Course – English III	6	3	3	25	75	100
	III	CC - Core Course V-Differential Equations and Laplace Transforms	4	4	3	25	75	100
		CC - Core Course VI- Vector Calculus and Fourier Series	5	5	3	25	75	100
		AC - Allied Course IV- Mathematical Statistics I	4	4	3	-	-	-
		AC -Allied Course V- Statistics Practical	3	-	-	25	75	100
	IV	NME -Non Major Elective I – Mathematics for Competitive Examinations I / Quantitative Aptitude I	2	2	3	25	75	100
		Total	**30**	**21**				**600**
IV	I	LC- Language Course –Tamil IV	6	3	3	25	75	100
	II	ELC – English Language Course – English IV	6	3	3	25	75	100
	III	CC - Core Course VII –Sequences and Series	4	4	3	25	75	100
		CC - Core Course VIII-Number Theory	4	4	3	25	75	100
		AC - Allied Course V- Statistics Practical	3	3	3	40	60	100
		AC - Allied Course VI- Mathematical Statistics II	3	2	3	25	75	100
	IV	NME - Non Major Elective II – Mathematics for Competitive Examinations II/ Quantitative Aptitude II	2	2	3	25	75	100
	V	SBE – Skill- Based Elective I- Statistical Programming using Computational Packages/ Introduction to MATLAB	2	2	3	25	75	100
		Total	**30**	**23**				**800**

V	III	CC - Core Course IX - Algebra	6	6	3	25	75	100
		CC- Core Course X –Real Analysis	6	5	3	25	75	100
		CC - Core Course XI - Mechanics	6	5	3	25	75	100
		MBE –Major Based Elective I – Operations Research/ Logic and Boolean Algebra	6	5	3	25	75	100
	IV	SBE –Skill Based Elective II- Quantitative Aptitude/ Introduction to Fuzzy Mathematics	2	2	3	25	75	100
		SBE – Skill Based Elective III- Document Preparation System Using LATEX / R- Lab with Practical	2	2	3	25	75	100
		Soft Skills Development	2	2	3	25	75	100
		Total	**30**	**27**				**700**
VI	III	CC- Core Course – X II - Complex Analysis	6	6	3	25	75	100
		CC- Core Course – XIII– Numerical Methods with C Programming(Theory)	5	4	3	25	75	100
		CC - Core Practical – XIII(P)– Numerical Methods with C Programming(Practical)	2	2	3	25	75	100
		CC – Core Course XIV - Astronomy	6	5	3	25	75	100
		MBE – Major Based Elective II- Stochastic Processes/ Discrete Mathematics	5	4	3	25	75	100
		MBE – Major Based Elective III- Graph Theory/ Mathematical Modeling	5	4	3	25	75	100
	V	EA - Extension Activities-	-	1	-			
		GS - Gender Studies	1	1	3			
		Total	**30**	**27**				**700**
		Grand Total	**180**	**140**				**4100**

B. Sc., Mathematics 2021- 2024 Batch

***Extra Credit Course - Structure**

Year	Semester	Course	Title of the Course	Instructional hours	Hours/ Week	Credit	Total Marks
I UG	I	**Extra Credit Course**	Business Mathematics I	30	3	2	100
	II		Business Mathematics II	30	3	2	100
II UG	III	**Skill Initiative Programme (Choice Based)**	• Journalism • Integrated Live Stock Management • Life Saving and First Aid Training • Travel Management and Tourism • Fashion Technology • Beautician • Digital Marketing	30	-	-	-
	IV	**Mini Project**	• Any Topic related to Mathematics	During Vacation.	-	-	-
III UG	V	**Value Added Course**	Programming in R Language	30	3	2	100
	VI	**Multi Disciplinary Course**	Statistical Programming Using SPSS	30	3	2	100

***Grades will be awarded for the above courses.**

Semester-I / Core Course-I(CC)	**DIFFERENTIAL CALCULUS AND TRIGONOMETRY**	**Course Code: MUA**
Instruction Hours: 6	**Credits: 3**	**Exam Hours: 3**
Internal Marks:25	**External Marks:75**	**Total Marks: 100**

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To inculcate the basics of differentiation and their applications. • To introduce the notion of curvatures, circle and radius of curvature. • To develop conceptual understanding on evolutes & involutes and polar co-ordinates.. • To acquire the basic knowledge of circular and hyperbolic functions of complex variables. • To develop skill in summing up infinite trigonometric series using appropriate methods.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**Successive Differentiation** Successive Differentiation – The n^{th} derivative – Standard Results – Fractional expressions –Trignometrical transformation –Formation of equations involving derivatives –Leibnitz formula for the n^{th} derivative of a product –A complete formal proof for induction –Examples –Geometrical interpretation –Meaning of the sign of the differential coefficient. **(Chapter III: Sec 1.1 – 2.2, Chap. IV: Sec 2.1-2.2)**	**15 Hours**
UNIT II	**Envelopes, Curvature of plane curves** Curvature – Circle, radius and centre of curvature –Cartesian formula for the radius of curvature. **(Chap. X : Sec 2.1-2.3)**	**15 Hours**
UNIT III	**Envelopes, Curvature of plane curves, Maxima and Minima** The coordinates of the centre of curvature – Evolute & Involute –Radius of curvature when the curve is given in polar coordinates – p-r equations: pedal equation of a curve - Maxima and Minima –Theorems(without proof) –Problems. **(Chap.X:Sec2.4-2.7&Chap.V:Sec1.1-1.4)**	**15 Hours**

UNIT IV	**Hyperbolic functions** Introduction –Hyperbolic functions –Relations between hyperbolic functions corresponding to relations between circular functions - Inverse hyperbolic functions. **(Chap. IV: Sec. 1-2.3)**	**15 Hours**
UNIT V	**Summation of Trigonometric series** Logarithms of complex quantities – Method of Differences Angles in arithmetic progression method – Gregory's series. **(Chap. V: Sec 5 & Chap. VI Sec 1-2, 3.1)**	**15 Hours**
UNIT VI Self Learning	**Quadrilaterals and Polygons:** Area of Cyclic Quadrilaterals – Quadrilaterals Circumscribing a Circle – Regular Polygons. **(Chapter VII)**	

Text Books:

1. T.K.ManickavachagamPillai, S.Narayanan, Calculus Volume I, S.V Publications, Chennai, 2019.
2. S. Narayanan, T.K.ManickavachagamPillai, Trigonometry, S.Viswanathan Pvt. Ltd and Vijay Nicole Imprints Pvt. Ltd, 2010.

Reference Books:

1. S.Arumugam and Isaac, Calculus, Volume I, New Gamma Publishing House,1991.
2. S.Arumugam, Isaac, Thangapandi, Trigonometry and Fourier series, New Gamma Publications, revised edition,1999.

Web – Resources:

1. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwij35zRntjyAhUT7HMBHeSqCW4QFnoECCQQAQ&url=http%3A%2F%2Fwww.ru.ac.bd%2Fwpcontent%2Fuploads%2Fsites%2F25%2F2019%2F03%2F205_07_-Courant-Differential-and-Integral-Calculus-Volume11988.pdf&usg=AOvVaw2PiORIggamgyQk9yWO8DaD
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiDm4eA79ryAhVW7HMBHWCNCiIQFnoECAQQAQ&url=https%3A%2F%2Fd3bxy9euw4e147.cloudfront.net%2Foscms prodcms%2Fmedia%2Fdocuments%2Fcalculus-volume-1-5.2-previous.pdf&usg=AOvVaw1MpbBX2Q3wdN4emkR0UNIQ

Course Outcomes

On Completion of the Course, Students should be able to

CO1 : apply Leibnitz's Theorem for finding the n^{th} derivative of product of functions.
CO2 : evaluate envelopes and curvatures of plane curves.
CO3 : compute maxima and minima of plane curves.
CO4 : interpret the relation between circular and hyperbolic functions.
CO5 : find the sum of infinite series using appropriate methods

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	M	S	M	M	M	S	S	S	S	M
CO2	S	S	M	M	M	M	M	S	S	M
CO3	M	S	M	M	M	M	S	M	W	M
CO4	M	M	M	W	M	M	M	S	S	M
CO5	M	M	M	W	M	M	M	S	S	M

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-I / Core Course-I(CC)	CLASSICAL ALGEBRA	Course Code: MUB
Instruction Hours: 4	Credits: 4	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To lay a good foundation for the study of theory of equations. • To learn the concepts of algebraic equations and transformation of equations. • To understand the basics of inequalities, maxima and minima. • To study the types of matrices and their inverse. • To inculcate the C-H theorem and its properties.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**Theory of equations** Forming the equations with the given roots – Relation between the roots and coefficients – Symmetric functions of the roots– Sum of the powers of the roots of an equation – Newton's theorem on the sum of the powers of the roots (Problems only). **(Chapter 6: Sec 9- 14)**	**12 Hours**
UNIT II	**Theory of equations** Transformations of equations – Reciprocal equation – Diminishing and Increasing the roots – Form of the quotient and remainder when a polynomial is divided by a Binomial – Removal of terms – Descartes' rule of signs – Simple problems**.(Chapter 6: Sec 15 –19 & Sec. 24)**	**12 Hours**
UNIT III	**Inequalities** Inequalities – Elementary Principles – Geometric and Arithmetic means – Weirstrass inequalities – Cauchy's inequality – Applications to Maxima and Minima. **(Chapter IV: Sec 1-5,9,11,13)**	**12 Hours**
UNIT IV	**Matrices** Definition and algebraic operations -Types of Matrices – Transpose of a matrix –Singular matrix –Symmetric, Skew-symmetric, Orthogonal, Hermitian, Skew- Hermitian – Adjoint matrix –The Inverse of the matrix –Reciprocal matrix –Reversal law for the inverse of a product – Orthogonal matrices and its properties –Unitary matrix –Rank of the matrix. **(Chapter III: Sec 3.1-3.2)**	**12 Hours**

UNIT V	**Matrices** Simultaneous linear equations (except proof of the theorems) – Eigen values and Eigen vectors –Cayley Hamilton's theorem(Statement only).**(Chapter III: Sec 3.3-3.4)**	**12 Hours**
UNIT VI **Self Learning**	**Theory of Equations:** To form an equation whose roots are any power of the roots of a given equation – Transformation in General – Rolles' Theorem – Multiple Roots – Strum's Theorem. (**Chapter 6: Sec 20,21,25, 26 & 27)**	

Text Books:

1. . K. M. Pillai and S. Narayanan, Algebra Vol I, (For Units I and II), S.Viswanathan Printers and Publishers Pvt. Ltd., Chennai, 2019.
2. T. K. M. Pillai, S. Narayanan and K. S. Ganapathy, Algebra Vol II, (For Unit III), S.Viswanathan Printers and Publishers Pvt. Ltd., Chennai, 2015.
3. S.Narayanan, R.HanumanthaRao&T.K.M.Pillai, Ancillary Mathematics Vol I, (Units IV & V), S. Viswanathan (Printers & Publishers) Pvt. Ltd, 2018.

Reference Books:

1. M. L. Khanna, Algebra, Jai PrakashNath& Co, 1974.
2. K. Balakrishnan and N. Ramabathran, Text Book of Modern Algebra, Vikas Publishing House Pvt. Ltd,1978.

Web – Resources:

1. https://www.google.com/search?client=firefox-b-d&q=%E2%80%A2+https%3A%2F%2Fwww.sakshieducation.com%2FEngg%2FEnggAcademia%2FCommonSubjects%2FMathMethods-Fourier_Series.pdf++
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiT-9LG8NryAhUw63MBHdUtClAQFnoECCUQAQ&url=http%3A%2F%2F162.241.27.72%2FsiteAdmin%2Fdde-admin%2Fuploads%2F1%2FUG_B.Sc._Mathematics_113%252013-%2520Classical%2520Algebra.pdf&usg=AOvVaw0JVJ5HeInDE43uVdzKxRmK

Course Outcomes

On Completion of the Course, Students should be able to

CO1	:	understand the aspects of classical algebraic structures.
CO2	:	find the nature of the roots of the equations.
CO3	:	solve and apply the inequalities.
CO4	:	find the inverse and rank of the matrix.
CO5	:	calculate the eigen values and vectors of a matrix and apply the C-H theorem for finding the inverse of a matrix.

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	W	S	S	S	S	S	M
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester- II / Core Course-III (CC)	INTEGRAL CALCULUS	Course Code: MUC
Instruction Hours: 5	Credits: 4	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To inculcate the basics of integration. • To study some applications of definite integrals. • To know the techniques for integration. • To find area under plane curves using integration. • To understand the consequences of beta and gamma function.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**Integration** Revision of all integral models – Simple problems. **(Chapter 1: Sec 1.1 to 7)**	**12 Hours**
UNIT II	**Integration** Definite integrals - Integration by Parts, Reduction formula, Bernoulli's Formula. **(Chapter 1: Sec 11,12,13 & 15.1)**	**12 Hours**
UNIT III	**Geometrical Applications of Integration** Area under plane curves- Cartesian co-ordinates - Area of a closed curve - Examples - Areas in polar co-ordinates**.** **(Chapter 2: Sec 1.1, 1.2, 1.3 & 1.4)**	**12 Hours**
UNIT IV	**Multiple Integrals** Double integrals – Changing the order of Integration – Triple Integrals. **(Chapter 5: Sec 1,2.1, 2.2,3.1& Sec 4)**	**12 Hours**
UNIT V	**Improper Integrals: Beta and Gamma Functions** Beta & Gamma functions and the relation between them – Integration using Beta & Gamma functions. **(Chapter 7: Sec 2.1 to 2.3, 3, 4& 5)**	**12 Hours**
UNIT VI Self Learning	**Physical Applications of Integration:** Centroid – Centre of Mass of an Arc - Centre of Mass of a Plane – Centroid of a Solid of revolution - Centroid of Surface of revolution – Pappu's Theorems. **(Chapter 3: Sec. 1.1 – 1.6)**	

Text Books:

1. S. Narayanan and T. K. ManickavasagamPillai, Calculus Volume II , S.Viswanathan (Printers & Publishers) Pvt Ltd, Chennai, 2017

Reference Books:

1. Shanti Narayan, Differential & Integral Calculus, 10th Revised Edition, S.Chand& Co. Ltd, 1962.
2. Shanti Narayan, P. K. Mittal, Integral Calculus, S.Chand & Co. Ltd, 2005.

Web – Resources:

1. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwij35zRntjyAhUT7HMBHeSqCW4QFnoECCQQAQ&url=http%3A%2F%2Fwww.ru.ac.bd%2Fwp-content%2Fuploads%2Fsites%2F25%2F2019%2F03%2F205_07_-Courant-Differential-and-Integral-Calculus-Volume-11988.pdf&usg=AOvVaw2PiORIggamgyQk9yWO8DaD

2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiR1fGi8dryAhXj4zgGHdLEC80QFnoECAsQAQ&url=https%3A%2F%2Flibrary.um.edu.mo%2Febooks%2Fb31290735.pdf&usg=AOvVaw2PC91c1qdIP5cs1HYKe1yd

Course Outcomes

On Completion of the Course, Students should be able to

CO1 : find the solutions of the integral.
CO2 : solve the integration by parts.
CO3 : find the area of plane curves using Cartesian and polar coordinates
CO4 : find the area by changing the given order of integration
CO5 : understand the concepts of Beta and Gamma functions

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-II / Core Course-IV(CC)	ANALYTICAL GEOMETRY OF THREE DIMENSIONS	Course Code: MUD
Instruction Hours: 4	Credits: 4	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To familiarize with the three dimensional surfaces and their properties. • To study the straight lines and its properties. • To learn the system of spheres generated by a sphere and plane. • To know the concepts of cone, the tangent lines and tangent plane at a point. • To inculcate the basics of cylinder along with their properties.	
UNIT	**CONTENT**	**HOURS**
I	**The Plane** Coordinates in Space –Direction consines of a line in space – Angle between lines in space –Equation of a plane in normal form – Angle between planes– Distance of a plane from a point.	**12 Hours**
II	**The Straight line** Straight lines in space – line of intersection of planes – plane containing a line- Coplanar lines – Skew lines and shortest distance between skew lines- length of the perpendicular from point to line**.**	**12 Hours**
III	**The Sphere** General equation of a sphere- Section of sphere by plane – tangent planes – condition of tangency –system of spheres generated by two spheres –system of spheres generated by a sphere and plane**.**	**12 Hours**
IV	**The Cone** Equation of a Cone with a conic as guiding curve – Quadric Cones with vertex at origin –Condition that the general equation of the second degree should represent a cone- The tangent lines and tangent plane at a point**.**	**12 Hours**
V	**The Cylinder** Equation of a Cylinder – Enveloping cylinder – the right circular cylinder – equation of a right circular cylinder**.**	**12 Hours**
VI Self Learning	**The Conicoid:** Trace the Ellipsoid – Hyperboloid of one Sheet – Hyperboloid of Two Sheets – Central Conicoid – Intersection of a line and a conicoid.	

Text Books:

1. Shanthi Narayanan and Mittal P.K, Analytical Solid Geometry, 16th Edition, S.Chand& Co., New Delhi, 2016.
2. N.P. Bali, Analytical Solid Geometry, Laxmi Publications, New Delhi. **(VI Self Learning)**

Reference Books:

1. S. Arumugam and A. ThangapandiIssac, Analytical Geometry 3D and Vector
2. Calculus, New Gamma Publication House, Palayamkottai, 2017.
3. S. G. Venkatachalapthy, Analytical Geometry, Margham Publications, Chennai, 2013.

Web – Resources:

1. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwi2oYSWn9jyAhWL73MBHTXZA4YQFnoECAIQAQ&url=https%3A%2F%2Fncert.nic.in%2Ftextbook%2Fpdf%2Flemh205.pdf&usg=AOvVaw0melYIjinSO6fj8F78B89E
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwix-suL8tryAhWn4jgGHd6xBQkQFnoECAIQAQ&url=https%3A%2F%2Fkupdf.net%2Fdownload%2Fanalytical-geometry-2d-and-3d-p-r-vittal_58ddb8c6dc0d60560e8970ec_pdf&usg=AOvVaw12pgWfLzw3hkDfC3Y6batx

Course Outcomes

On Completion of the Course, Students should be able to

CO1 : understand the three dimensional space, angle between lines and planes.
CO2 : find the coplanar lines, skew lines and to find shortest distance between them.
CO3 : formulate the equation of sphere and their properties.
CO4 : form the equation of cone with a conic as guiding curve and the tangent lines.
CO5 : retrieve the equation of cylinder and right circular cylinder.

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	M	M	M	M	M	S	S	M
CO2	S	S	M	M	M	M	M	S	S	M
CO3	S	S	M	M	M	M	M	S	S	M
CO4	S	S	M	M	M	M	M	S	S	M
CO5	S	S	M	M	M	M	M	S	S	M

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-III / Core Course- V (CC)	**DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS**	**Course Code: MUE**
Instruction Hours: 4	**Credits: 4**	**Exam Hours: 3**
Internal Marks:25	**External Marks:75**	**Total Marks: 100**

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To study the higher order linear differential equations with constant coefficients. • To find the solutions of linear differential equations with variable coefficients . • To acquire the knowledge of complete, singular and particular integrals of first order PDE. • To compute solutions of PDEs using Charpits method. • To gain the basic knowledge of Laplace transforms and its inverse with applications.	
UNIT	**CONTENT**	**HOURS**
I	**Linear Differential equations with constant coefficients** Evaluation of particular integral of e^{ax}, cos ax, sin ax, x^k, where k is a positive integer and $e^{ax}f(x)$ where $f(x)$ is any function of x. **(Chapter 2: Sections 1 to 4).**	**12 Hours**
II	**Linear Equations with variable Coefficients** To find the particular integral – Equations reducible to linear homogeneous equation – method of variation of parameters. **(Chapter 2: Sections 8 to 10)**	**12 Hours**
III	**Partial Differential Equations** Formation of equations by elimination of constants and arbitrary functions – General, particular, complete and singular integral (Geometrical meaning not expected) – Solutions of first order equations of the standard forms. **(Chapter 4: Sections 1 to 4 and 5.1- 5.4)**	**12 Hours**
IV	**Partial Differential Equations** Equations reducible to the standard forms- Lagrange's equation – Charpit' s method**.** **(Chapter 4: Sections 5.5, 6, 7)**	**12 Hours**

V	**Laplace Transforms** Standard formulae – Some general Theorems (statement only)and Simple Applications – Inverse Laplace transforms (problems only) – Application to the solution of Second order ordinary differential equations with constant coefficients. **(Chapter 5 : Sections: 1 - 8)**	**12 Hours**
VI **Self Learning**	**Simultaneous differential equations:** Simultaneous equations of the first order and first degree-Solutions of $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ – Methods for solving $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ – Geometrical interpretation of $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$. Simultaneous linear differential equations with constant co-efficients-Total differential equations. **(Chapter 3: Sections: 1-7)**	

Text Books:

T.K. Manickavasagam Pillai and S. Narayanan , Calculus Vol III, S.Viswanathan Printers and Publishers Pvt. Ltd., Chennai, Reprint 2012.

Reference Books:

1. M.L.Khanna, DifferentialEquations, Jai PrakashNath& Co, Meerut City, 1984.
2. M.K.Venkatraman, Engineering Mathematics, The National Publishing Co, Madras, 1984

Web – Resources:

1. https://www.sakshieducation.com/Engg/EnggAcademia/CommonSubjects/MathMethods-Fourier_Series.pdf
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwi7woqJ99ryAhVSmuYKHV6WAvEQFnoECAMQAQ&url=http%3A%2F%2Fdsp-book.narod.ru%2FTAH%2Fch05.pdf&usg=AOvVaw3JM2twdl0pr0iLA57YSwoe

Course Outcomes

On Completion of the Course, Students should be able to

CO1	:	solve the higher order linear differential equations with constant coefficients.
CO2	:	solve differential equations by using method of variation of parameters
CO3	:	find solutions of first order partial differential equations of the standard forms
CO4	:	solve the PDE's using Charpit's method.
CO5	:	apply the techniques of Laplace transform and inverse Laplace transform

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	M	M	S	S	M	S	S	S
CO2	S	S	M	M	S	S	M	S	S	S
CO3	S	S	M	M	S	S	M	S	S	S
CO4	S	S	M	M	M	S	S	S	S	M
CO5	S	S	M	M	S	S	M	M	S	S

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Semester-III/ Core Course-VI(CC)	VECTOR CALCULUS AND FOURIER SERIES	Course Code: MUF
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To understand the fundamental concepts of vector differentiation. • To develop the knowledge of vector integration.. • To acquire the interpretation of curl of a vector field. • To inculcate the basic concepts of Fourier series. • To know about half range sine and cosine series	
UNIT	**CONTENT**	**HOURS**
UNIT I	**Vector differentiation:** Velocity & acceleration – Level surfaces – The vector differential operator – Gradient of a vector – Direction and magnitude of gradient – Divergence & curl of a vector – Solenoidal &I rrotational vectors . – Formula involving operator ∇– Operators involving ∇ twice and problems. **(Chapter IV: Section 4 – 12)**	**15 Hours**
UNIT II	Vector integration: Line integral – Conservative field – Volume integral – Surface integral(problems and theorem statement only). **(Chapter VI: Section 2 – 5)**	**15 Hours**
UNIT III	**Application of vector integration:** Gauss Divergence Theorem – Green's theorem – Stoke's Theorem (Statements Only) – Simple Problems. **(Chapter VI: Section 6 – 10)**	**15 Hours**
UNIT IV	**Fourier series:** Definition of Fourier series – Fourier series expansion of periodic functions with period 2π[$(0, 2\pi), (0, 2l)$] **(Chapter VI: Sections 1 and 2)**	**15 Hours**
UNIT V	**Even and odd functions:** Definition of even and odd functions – Properties – Use of these functions in Fourier series – Half range Fourier series – Development in cosine series –Development in sine series. (Chapter VI: Section 3 – 5)	**15 Hours**
UNIT VI Self Learning	**Fourier Transforms:** Complex Form of Fourier Integral Formula – Fourier Integral Theorem – Properties of Fourier transform – Fourier Cosine Transform – Fourier Sine Transform – Properties of F_c and F_s. **(Chapter VI: Section 9 – 12)**	

Text Books:

1. T.K.Manickavasagam Pillai and S.Narayanan, Vector Algebra and Analysis, S.Viswanathan Printers and Publishers Pvt. Ltd.,Chennai, 1986.(For units I, II and III)
2. T.K. Manickavasagam Pillai and S. Narayanan, Calculus Volume III, S.Viswanathan Printers and Publishers Pvt.Ltd., Chennai, 2004. (For units IV&V and VI Self Learning)

Reference Books:

1. P. Duraipandiyan and Lakshmi Duraipandiyan, Vector Analysis, Emerald Publishers 1986.
2. R. Balaji, Transforms and Partial Differential Equations, G. Balaji Publishers, 2005.

Web – Resources:

1. https://www.sakshieducation.com/Engg/EnggAcademia/CommonSubjects/MathMethods-Fourier_Series.pdf
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjqsY2k9NzyAhXR4nMBHYVhBlUQFnoECAcQAQ&url=https%3A%2F%2Fwww.math.ust.hk%2F~machas%2Fvector-calculus-for-engineers.pdf&usg=AOvVaw3UmDgmJIoj7nWOznTeyO7P

Course Outcomes

On Completion of the Course, the students should be able to

CO1 : explain the concepts of differentiation of vector field.
CO2 : integrate the vector functions over curves and surfaces.
CO3 : compute integrals using Green's theorem, Stoke's theorem and the divergence theorem.
CO4 : solve the wave equations, Laplace equations using Fourier series
CO5 : derive the Fourier Series to the periodic signals in half range.

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	M	W	S	S	M	S	S	S
CO2	S	S	M	W	S	S	M	S	S	S
CO3	S	S	M	W	S	S	S	S	S	M
CO4	S	S	M	W	S	S	M	M	S	S
CO5	S	S	M	W	S	S	S	M	S	S

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Semester-III / NME I	**MATHEMATICS FOR COMPETITIVE EXAMINATIONS I**	Course Code:**MUE1**
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives:	• To study the problems on series. • To understand the coding and decoding. • To learn the problems relating blood relation. • To know about the mathematical puzzles. • To interpret the logics using venn diagram	
UNIT	**CONTENT**	**HOURS**
Unit I	**Series Completion:** Number Series - Alphabet Series. **(P. No. 139 – 159**)	**6 Hours**
Unit II	**Coding and Decoding:** Letter Coding – Number Coding – Matrix Coding. **(P. No. 169 – 192)**	**6 Hours**
Unit III	**Blood Relation:** Deciphering jumbled up descriptions – Relation Puzzle – Coded Relations**. (P.No. 220 – 241)**	**6 Hours**
Unit IV	**Puzzle Test:** **Seating / Placing arrangements – Comparison Test.** **(**P.No. 253 – 278**)**	**6 Hours**

Unit V	**Venn Diagram** **Direction Sense Test – Logical Venn Diagram.** **(**P.No. 324 – 333, 348 – 366).	**6 Hours**

Text Book:

R.S. Agarwal, A modern approach to Verbal and Non-Verbal Reasoning, S.Chand & Company Ltd, New Delhi- 55.

Reference Books:

1. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson Publications, 2014.
2. Arun Sharma, Teach Yourself Quantitative Aptitude, Mc GrawHill Education, 2017.

Web - Resources:

1. https://www.splessons.com/lesson/profit-loss-problems/
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiQ7pHb9tzyAhWp7HMBHcEbBcEQFnoECAMQAQ&url=https%3A%2F%2Fgradeup.co%2Fquantitative-aptitude-practice-questions-answers-pdf-i&usg=AOvVaw11iv2GCS3pvGLz9i2Nd48L

Course Outcomes:

On completion of the course the learner will be able to

CO1: solve the problems on series.
CO2: write the coding and decoding.
CO3: evaluate problems on blood relation
CO4: solve mathematical puzzles
CO5: compute problems using venn diagram.

Semester-IV / Core Course-VII (CC)	SEQUENCES AND SERIES	Course Code: MUG
Instruction Hours: 4	Credits: 4	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To lay a good foundation for sequences. • To study the behavior of monotonic sequences. • To know the concepts of subsequences and Cauchy sequences. • To find the convergence of series using different tests. • To learn about the alternating series and absolute convergence	
UNIT	**CONTENT**	**HOURS**
UNIT I	**Sequences** Sequences– Bounded Sequences– Monotonic Sequences– Convergent Sequences–Divergent and Oscillating sequences.**(Chapter3:Sec.3.0–3.5)**	**15 Hours**
UNIT II	**Monotonic Sequences** Algebra of Limits–Behavior of Monotonic Sequences. **(Chapter3:Sec.3.6& 3.7)**	**15 Hours**
UNIT III	**Subsequences** Some theorems on limits–Subsequences–Limit points–Cauchy sequences. **(Chapter3:Sec.3.8-3.11)**	**15 Hours**
UNIT IV	**Series:** Infinite series – Cauchy's general principle of Convergence – Comparison test.(comparison test statement only, no proof**).** **(Chapter4:Sec.4.1&4.2)**	**15 Hours**
UNIT V	**Tests of convergence:** DAlembert's Ratio test–Cauchy's root test– Alternating Series– Absolute Convergence (Statements only for all tests**).** **(Chapter4:SecRelevant part of 4.3 and 4.4,Chapter 5: Sec 5.1& 5.2)**	**15 Hours**
UNIT VI Self Learning	**Infinite Series :** Higher Ratio Tests –Raabe's Test – Kummer's Test – Logarithmic Ratio Test – Gauss's Test **(Chapter 4- Sec 7 & 9)**	

Text Books:

1. Dr.S.Arumugam & Mr.A.Thangapandi Isaac Sequences and Series, New Gamma Publishing House,2002.
2. S L Gupta, Nisha Rani, Fundamental Real Analysis, (4th edition) Vikas Publishing House Pvt. Ltd., **(VI Self Learning)**

Reference Books:

1. T.K.ManickavasagamPillai, T. Natarajan and K.S. Ganapathy, Algebra Vol I, S.Viswanathan Printers & Publishers Pvt. Ltd., Chennai, 2018.

2. M.K. Singal and AshaRaniSingal, A first course in Real Analysis , 20th edition , R. Chand and Co., New Delhi.

Web – Resources:

1. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwim0c-YktjyAhXygtgFHQWjDbUQFnoECAMQAQ&url=http%3A%2F%2Fwww.stet.edu.in%2FSSR_Report%2FStudy%2520Material%2FPDF%2FMATHS%2FUG%2FII%2520Year%2F1.pdf&usg=AOvVaw2qrx17JQoDI4_E8hFnAV1w
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwibxYSj-9zyAhUTIbcAHXdWCQ8QFnoECCUQAQ&url=https%3A%2F%2Fpeople.math.osu.edu%2Ffowler.291%2Fsequences-and-series.pdf&usg=AOvVaw3b6gLzhe84ycqzcCJCSqB5

Course Outcomes

On Completion of the Course, Students should be able to

CO1 : find the convergence of sequences
CO2 : evaluate the limits and describe the behavior of monotonic sequences
CO3 : interpret the concepts of subsequences and Cauchy sequences.
CO4 : discuss the convergence or divergence of series using various tests
CO5 : compute the absolute convergence of series.

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	M	M	W	S	S	M	S	S	S
CO2	S	S	M	W	S	S	M	S	S	S
CO3	S	S	M	W	S	S	M	S	S	S
CO4	S	S	M	W	S	S	M	S	S	M
CO5	S	S	M	W	S	S	M	S	S	M

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W-Weakly Correlated

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Semester-IV / Core Course-VIII (CC)	NUMBER THEORY	Course Code: MUH
Instruction Hours: 4	Credits: 4	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To introduce the concepts of divisibility, prime number and prime-factorization. • To learn about Euler Function, Greatest integer function and Mobius function. • To know the conjectures in number theory. • To acquire the knowledge of linear congruences. • To study the methods of classifying numbers	
UNIT	**CONTENT**	**HOURS**
UNIT I	**Prime and Composite Numbers** Coprimes-Sieve of Eratothenes-Euclid's Theorem- Unique factorization-Fundamental Theorem of Arithmetic–Positional Representation of Integers-Number of Divisors-Sum of Divisors-Symbols $d(n), \sigma(n)$ -Arithmetic functions. **(Chapter IV : Sec 77 to 97)**	**12 Hours**
UNIT II	**Prime and Composite Numbers** Perfect Numbers- Euclid's Theorem on Perfect Numbers-Amicable Numbers-Euler's Function $\Phi(n)$- Greatest integer function-Mobious function $\mu(n)$ -Inversion formula and its converse. **(Chapter IV: Sec 98 to 128)**	**12 Hours**
UNIT III	**Distribution of Primes** General Discussion – Fermat's Conjecture-Fermat Numbers-Gold Bach' S Conjecture- Mersenne Numbers –Gap Theorem –Infinitude of Primes. **(Chapter V)**	**12 Hours**
UNIT IV	**Congruences** **Definition – Residue Classes - Complete and Least Residue Systems-Reduced Residue Systems – Casting out 9 – Magic Numbers- Divisibility Tests - Linear Congruences - Solution of Congruences - Chinese Remainder Theorem.** (Chapter VI)	**12 Hours**

UNIT V	**Quadratic Reciprocity** Quadratic Residues and Non Residues –Euler Criterion –Primitive Roots is a Quadratic Non Residue –Legendre symbol –Gauss lemma –Quadratic Reciprocity Law**.** **(Chapter X: Sec 255 to 278)**	**12 Hours**
UNIT VI **Self Learning**	**Quadratic Reciprocity:** application of quadratic reciprocity law – primes for which a given integer is a quadratic residue – Jacobi's symbol – quadratic congruences prime power modulii and composite modulii- number of solutions of quadratic congruences. (**Chapter X: Sec. 279 – 303)**	

Text Books:

1. Prof. S.Kumaravelu and SusheelaKumaravelu, Elements of Number Theory, Raja Sankar off set Printers, Sivakasi,2002.

Reference Books:

1. David M. Burton, Elementary Number Theory , W.M.C. Brown Publishers, Dubuque, Lawa, 1989.
2. George E. Andrews, Number Theory, Hindhustan Publishing Corporation, 1984.

Web – Resources:

1. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiWwpfAitjyAhXo_3MBHSUACxMQFnoECAIQAQ&url=https%3A%2F%2Fwww.maths.ed.ac.uk%2F~v1ranick%2Fpapers%2Fborevich.pdf&usg=AOvVaw372Va5g3fXMVkCKzlBH_dW
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiKvO6K_NzyAhVk7HMBHXlADM8QFnoECAgQAQ&url=http%3A%2F%2Fwww.maths.gla.ac.uk%2F~ajb%2Fdvi-ps%2F3q-notes.pdf&usg=AOvVaw0811YhiBQ4RbMdPWRioKyt

Course Outcomes

On Completion of the Course, Students should be able to

CO1 : find the divisor, sum and product of a given naturalnumber
CO2 : gain the knowledge of number theoretic functions
CO3 : interpret the famous conjectures in number theory
CO4 : solve the system of linear congruences using the chinese remainder theorem.
CO5 : apply the law of quadratic reciprocity to classify numbers as quadratic residues and quadraticnon-residues

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	M	W	S	S	M	S	S	S
CO2	S	S	M	W	S	S	M	M	S	S
CO3	S	S	M	W	S	S	M	S	S	S
CO4	S	S	S	W	S	S	S	S	S	S
CO5	S	S	S	W	S	S	S	S	S	S

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W-Weakly Correlated

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Semester-IV / SBE I	**STATISTICAL PROGRAMMING USING COMPUTATIONAL PACKAGES**	Course Code:**MUS1**
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Course Objectives:

- To know the computational methods for solving mathematical problems.
- To understand the computational methods for drawing simple and multiple bar diagrams.
- To learn the computational methods on histogram concepts.
- To study the computational methods on correlation and regression.
- To interpret the computational methods on t-test and goodness of fit

1. Mean, Median and Mode.
2. Standard Deviation
3. Simple Bar Diagram
4. Multiple Bar Diagram.
5. Pie Diagram.
6. Histogram.
7. Correlation.
8. Regression.
9. Paired t – test for Means.
10. Chi – Square test for Goodness of fit.

Text Book:

1. P. Chandran, A. Rajathi, SPSS For U, MJP Publishers, 2010.

Reference Books:

1. Kiran Pandya, Addison-Wesley, Dreamtech Press, 2011.
2. K. V. S. Sharma, Statistics Made Simple: Do it Yourself on PC, Prentice Hall India Learning Private Limited, 2010.

Web- Resources:

- https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwizkauQg93yAhXEjOYKHedoBKYQFnoECAYQAQ&url=http%3A%2F%2Fwww.academia.dk%2FBiologiskAntropologi%2FEpidemiologi%2FPDF%2FSPSS_Statistical_Analyses_using_SPSS.pdf&usg=AOvVaw18WQeOj5jEKncZ9x89ryZ1
- https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiR4f_0g93yAhXh4nMBHVmvB-0QFnoECCQQAQ&url=http%3A%2F%2Fwww.hstathome.com%2Ftjziyuan%2FSPSS%2520for%2520beginner%2520428pages.pdf&usg=AOvVaw0LtoFtB-B_0-6BFOp-43Bp

Course Outcomes:
On completion of the course the learner will be able to

CO 1:	use the computational methods for solving mean, median, mode and standard deviation.
CO 2:	draw simple and multiple bar diagrams.
CO 3:	apply the computational methods on histogram concepts.
CO 4:	compute correlation and regression.
CO 5:	evaluate t-test and goodness of fit.

Semester-IV / NME -II	**MATHEMATICS FOR COMPETITIVE EXAMINATIONS II**	Course Code: MUE2
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks - 25	External Marks-75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives:	• To learn the problems solving techniques for numbers. • To study the operations on numbers. • To develop arithmetical skills. • To know about puzzles. • To enhance the facts of logical reasoning	
UNIT	**CONTENT**	**HOURS**
Unit I	**Number, Ranking and Time Series Test** Number Test – Ranking Test – Time sequence Test**.** **(P. No. 417 – 432)**	**6 Hours**
Unit II	**Mathematical Operations:** Problem Solving by Substitution – Interchange of signs and numbers – Deriving the appropriate conclusion. **(P. No. 432 – 454)**	**6 Hours**
Unit III	**Arithmetical Reasoning** Calculation based Problem – Data based question – Problem on ages – Venn diagram based questions**.** **(P. No. 459 – 474)**	**6 Hours**
Unit IV	**Missing Characters** Inserting the Missing character. **(P. No. 475 – 492)**	**6 Hours**

Unit V	**Logical Reasoning** **Data sufficiency – Logical Sequence of Words – Logical Reasoning.** (P. No. 495 – 506, 455 – 458, Part II 1 - 14)	**6 Hours**

Text Book:

R.S. Agarwal, A Modern Approach to Verbal and Non-Verbal Reasoning, S. Chand & Company Ltd, New Delhi- 55.

Reference Books:

1. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson Publications, 2014.
2. Arun Sharma, Teach Yourself Quantitative Aptitude, Mc GrawHill Education, 2017.

Web- Resources:

1. https://www.splessons.com/lesson/profit-loss-problems/
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiQ7pHb9tzyAhWp7HMBHcEbBcEQFnoECAMQAQ&url=https%3A%2F%2Fgradeup.co%2Fquantitative-aptitude-practice-questions-answers-pdf-i&usg=AOvVaw11iv2GCS3pvGLz9i2Nd48L

Course Outcomes:

On completion of the course the learner will be able to

CO1: develop quantitative ability.
CO2: apply mathematical operations.
CO3: decipher arithmetical reasoning
CO4: solve logical reasoning.
CO5: crack competitive examinations.

Semester-V / Core Course-IX (CC)	ALGEBRA	Course Code: MUI
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To acquire the knowledge of basic abstract system of mathematics. • To understand the concepts of subgroups, normal subgroups, isomorphism and homomorphism. • To study the algebraic systems with two binary operations and properties of rings up to isomorphism. • To learn the concepts of vector spaces, subspaces and linear independence. • To explore the concepts of basis and dimension, matrix of a linear transformation and the inner product space.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**Groups** Introduction –Definitions and Examples – Subgroups – Cyclic groups – Order of an element – Cosets and Lagrange's Theorem . **(Sections 3.1, 3.5 to 3.8)**	**18 Hours**
UNIT II	**Groups** Normal subgroups and quotient groups – Finite groups and Cayley's theorem – isomorphism and homomorphism. **(Sections 3.9 to 3.11).**	**18 Hours**
UNIT III	**Rings** Definition and examples – Elementary properties of rings –Types of rings – Characteristics of rings – Subrings – Ideals – Quotient rings – Homomorphism of rings. **(Sections 4.1 to 4.8 & 4.10).**	**18 Hours**
UNIT IV	**Vector spaces** Introduction **–**Definition and examples – Subspaces – Linear transformation- Span of a set – Linear independence. **(Sections 5.1 to 5.5)**	**18 Hours**
UNIT V	**Vector spaces and Inner Product Space** Basis and dimension – Rank and Nullity – Matrix of a linear transformation – Inner product space. **(Sections 5.6 to 5.8 & Chapter 6)**	**18 Hours**

UNIT VI **Self Learning**	**Bilinear forms:** Introduction – Bilinear forms-quadratic forms. **Lattices:** Introduction-Partially ordered sets-Lattices-Distributive Lattices-Modular Lattices-Boolean Algebras. **Chapter 8: Sec. 8.0-8.2 and Chapter 9:Sec. 9.0 – 9.5**

Text Books:

Modern Algebra by S. Arumugam and A. Thangapandi Isaac., New Gamma Publishing House, Revised Edition, Palayamkottai, 2003.

Reference Books:

1. R. Balakrishnan& N. Ramapathran, Modern Algebra, Vikas publishing House Pvt Ltd, New Delhi, 1982.
2. S. G. Venkatachalapathy, Modern Algebra, Margham Publications, 2016.

Web – Resources:

1. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjsv-St_NfyAhVIzTgGHVh4CPAQFnoECAQQAQ&url=https%3A%2F%2Fmathcs.clarku.edu%2F~djoyce%2Fma225%2Falgebra.pdf&usg=AOvVaw1U-vMmDOAnPKn3xikKHzJ5
2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwi1wdHugN3yAhVAzzgGHZjqDLsQFnoECAMQAQ&url=http%3A%2F%2Fusers.metu.edu.tr%2Fserge%2Fcourses%2F116-2015%2FTextbook116.pdf&usg=AOvVaw1L8OuhRUPC1inu8zQWWh1M

Course Outcomes

On Completion of the Course, Students should be able to

CO1	:	gain the knowledge of sets, mapping, relations, groups and subgroups.
CO2	:	interpret the notion of normal groups and isomorphism.
CO3	:	analyze the concepts of homomorphism and isomorphism for rings and field.
CO4	:	recognize the facts of vector space and linear independence.
CO5	:	calculate the basis, dimension, matrix of the linear transformation and inner product space

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	M	S	M	S	M	M	S	S	S
CO2	S	S	M	M	S	M	M	M	S	M
CO3	S	S	M	M	S	M	M	S	S	M
CO4	S	S	S	M	S	S	M	S	S	M
CO5	S	S	S	S	S	S	M	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester- V / Core Course-X (CC)	REAL ANALYSIS	Course Code: MUJ
Instruction Hours: 6	Credits: 5	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To lay a good foundation for real analysis. • To explore the concepts of continuity and discontinuity. • To understand the derivability and its related parameters. • To learn mean value theorems and Taylor's series. • To gain the knowledge of Riemann integration	
UNIT	**CONTENT**	**HOURS**
UNIT I	**Real numbers** Absolute value – Completeness –Some important subsets of R – Representation of real numbers as a point on a straight line – Intervals – Countable and Uncountable sets. **(Chapter 1: Sec 5-10)**	**18 Hours**
UNIT II	**Limits and Continuity** Continuous functions – Types of discontinuities – Algebra of Continuous functions – Boundedness of Continuous Functions – Intermediate value Theorem – Inverse function theorem – Uniform continuity of a function. **(Chapter 5: Section: 2-8)**	**18 Hours**
UNIT III	**Derivatives** Introduction –Derivability and continuity – Algebra of derivatives – Inverse function theorem for derivatives – Darboux's theorem –Inverse Trigonometric Functions – Derivatives of Inverse Trigonometric Functions. **(Chapter 6 : Sec 1-7)**	**18 Hours**
UNIT IV	**Mean Value Theorems** Rolle's Theorem – Lagrange's Mean value theorem–Cauchy's Mean Value Theorem -Taylor's theorem –Taylor Series –Power Series expansions of some standard functions. **(Chapter 8: Sec 1-6)**	**18 Hours**

UNIT V	**Riemann integration** Definition – Riemann Integrability and integral of a bounded functions over finite domain -Darboux's theorem –Another equivalent definition of Integrability and Integral -Conditions of Integrability –Particular classes of bounded integrable functions – Properties of Integrable functions – Functions defined by definite integrals –Mean Value Theorem of integral calculus –Change of variable in an integral –Integration by **(Chapter 6: 6.1-6.11)**	**18 Hours**
UNIT VI **Self Learning**	**Mean Value Theorems:** Monotone Functions – Inequalities. **Maxima & Minima:** Introduction – Conditions for the Existence of Extreme Values. **Chapter 8 : Sec. 7 & 8 ; Chapter 9 : Sec. 1 & 2**	

Text Books:

1. M.K. Singal and AshaRaniSingal, A first course in Real Analysis , 34th edition , R. Chand and Co., New Delhi, 2020. (For units I to IV) .
2. Shanthi Narayan, A Course of Mathematical Analysis, S. Chand and Co., New
3. Delhi,1962. (For Unit V).

Reference Books:

1. Walter Rudin, Principles of Mathematical Analysis, Third edition, McGraw-Hill International Company, New York, 1984.
2. Robert G. Bartle, Donald R. Sherbert, Introduction to Real Analysis, Third Edition, ShriBalaji Art, Delhi.

Web – Resources:

1. **http://library.lol/main/89E381DC3B8895ECC7A1F2AD7032E9E8**
2. **https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjDl5mLiN3yAhUX9nMBHYIiBscQFnoECAMQAQ&url=https%3A%2F%2Fdusolution.files.wordpress.com%2F2015%2F07%2Fkumar-ajit_-kumaresan-s-a-basic-course-in-real-analysis-taylor-francis-2014.pdf&usg=AOvVaw1UUFlb8TaMG37BMeMxq7AW**

Course Outcomes

On Completion of the Course, Students should be able to

CO1 : apply the order completeness property.
CO2 : differentiate the continuity and discontinuity of functions.
CO3 : find the derivative of a given function.
CO4 : demonstrate the mean value theorems.
CO5 : interpret the integrability of functions

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	S	W	M	S	S	S	S	M
CO2	S	S	S	W	M	S	S	S	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	W	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester - V / Core Course - XI (CC)	MECHANICS	Course Code: MUK
Instruction Hours: 6	Credits: 5	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To provide the basic knowledge about Equilibrium of a particle and rigid bodies. • To learn the effect of Hanging strings and Suspension bridge. • To study the simple harmonic motions and projectiles. • To know the concepts of Impact and Impulsive force. • To handle practical problems in central objects and basics of moment of inertia.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**Equilibrium of A Particle And Forces On A Rigid Body** Equilibrium of a Particle – Triangle of Forces – Lami's Theorem – Moment of a Force – General Motion of a Rigid Body – Parallel Forces – Varigon's Theorem – Forces along the sides of a triangle - Couples. **(Chapter 3: Section 3.1, Chapter 4: Sections 4.1, 4.2, 4.4, 4.5, 4.6)**	**18 Hours**
UNIT II	**Hanging strings** Equilibrium of a uniform homogeneous strings – Suspension bridge – Simple Problems. **(Chapter 9: Sections 9.1 & 9.2)**	**18 Hours**
UNIT III	**Rectilinear motions under varying force and Projectiles** Simple Harmonic Motion –S.H.M along a horizontal line – S.H.M. along a vertical line — Forces on a Projectile –Projectile projected on an inclined plane – enveloping Parabola or bounding parabola. **(Chapter 12: sections 12.1 to 12.3 & 13.1 to 13.3)**	**18 Hours**
UNIT IV	**Impact** Impulsive force – Impact of Spheres – Impact of two smooth spheres - Impact of a smooth sphere on a plane – Oblique impact of two smooth spheres.**(Chapter 14: Sections 14.1 to 14.5)**	**18 Hours**
UNIT V	**Central Orbits and Moment of Inertia** General orbits – Central orbit – Conic as a centered orbit - Moment of Inertia – Perpendicular and Parallel axes theorems. **(Chapter 16: Sections 16.1- 16.3 & Chapter 17: 17.1)**	**18 Hours**
UNIT VI Self Learning	**Virtual Work:** Principles of Virtual Work. **Chapter 8** **Work, Energy & Power:** Units of Work – Workdone in stretching an elastic string – conservative field of Force : Energy – Conservation of Energy – Power. **Chapter 11**	

Text Books:

P.Duraipandian, LaxmiDuraipandian and MuthamizhJayapragasam, Mechanics S. Chand and Company, New Delhi, 2007.

Reference Books:

1. M.K. Venkatraman, Dynamics, Agasthiyar Publications, 11th Edition, 2004.
2. M.K. Venkatraman, Statics, A. Rajhan's Publications, 16thEdition, 1990.

Web – Resources:

1. **https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwikiOCDgdjyAhVz7HMBHaO9AmQQFnoECA0QAQ&url=http%3A%2F%2Fruina.tam.cornell.edu%2FBook%2FRuinaPratap8-21-10.pdf&usg=AOvVaw3daJpt3IvSMrvvaTfdhF-Y**
2. **https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjruLGqid3yAhXL8HMBHcJdB1gQFnoECAMQAQ&url=https%3A%2F%2Fbrown.edu%2FDepartments%2FEngineering%2FCourses%2FEn4%2FNotes%2FJF_Rigid_Body_Lectures%2FLecture3_Jen_RigidBodies.pdf&usg=AOvVaw1cD-uc8CViO_IBH1jT3Ubx**

Course Outcomes

On Completion of the Course, Students should be able to

CO1 : understand the equilibrium of a particle in statics and dynamics.
CO2 : demonstrate the clear concept of Hanging strings and suspension bridge.
CO3 : learn the concepts of rectilinear motion, simple harmonic motion and projectile
CO4 : clarify the Impact of spheres and Impulsive forces.
CO5 : exhibit the concepts on Central Orbit and Moment of Inertia.

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	M	W	S	M	M	S	S	S
CO2	S	S	M	W	S	S	M	S	S	M
CO3	S	S	S	W	S	S	S	S	S	S
CO4	S	S	M	W	S	S	M	S	S	W
CO5	S	S	M	W	S	S	M	S	S	M

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-V / MBE I	**OPERATIONS RESEARCH**	Course Code:**MUE3**
Instruction Hours: 6	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To find the solution of the LPP using graphical method • To understand different types of LPP • To solve Transportation Problem using various methods • To introduce Assignment Problem and solve it • To explore the concepts of Network Analysis and rules of network construction	
UNIT	**CONTENT**	**HOURS**
Unit I	**Linear Programming Problem(Mathematical Formulation):** Mathematical Formulation of L.P.P – Graphical Solution – Introduction – Graphical Solution method – Some exceptional cases – General Linear Programming Problem – Canonical and Standard form of LPP – Simplex method – Introduction - The computational Procedure. (Excluding Theorems). **(Chapter 2: Sections 2.1 , 2.2, 3.1 to 3.5, 4.1-4.3)**	**18 Hours**
Unit II	**Linear Programming Problem(Simplex Method):** Use of Artificial Variables – Two – Phase Method – Duality in Linear Programming problem – Introduction – General primal- Dual Pair– Formulating a dual Problem – Duality and Simplex Method– Dual Simple Method.(Excluding Theorems). **(Chapter 4: Section: 4.4 and Chapter 5: Section 5.1 - 5.3, 5.7, 5.9)**	**18 Hours**
Unit III	**Transportation Problem:** Introduction– LP Formulation of the Trnsportation problem – Existence of solution in TP –Duality in Transportation problem –The Transportation Table –Loops in Transportation Tables –Triangular basis in TP –Solution of a Transportation problem –Finding an Initial Basic feasible Solution – Test for Optimality – Transportation Algorithm (MODI Method). **(Chapter 10: Section 10.1-10.10& 10.13)**	**18 Hours**

Unit IV	**Assignment problem:** Introduction –Mathematical formulation of the problem – Solution methods of Assignment algorithm – The Travelling Salesman Problem. **(Chapter 11: Section 11.1 - 11.3 & 11.7)**	**18 Hours**
Unit V	**Network Scheduling by PERT/ CPM:** Introduction– Network and Basic Components – Logical Sequencing –Rule of Network Construction –Concurrent Activities – Critical Path Analysis – Probability considerations in PERT –Distinction between PERT and CPM –Applications of Network Techniques. **(Chapter 25: Section 25.1 - 25.9)**	**18 Hours**

Text Book:

Kanti Swarup, P.K. Gupta and Man Mohan, Operations Research, Sultan Chand and Sons , Educational Publishers, New Delhi, 2014

Reference Books:

1. V. Sundaresan, K. Ganesan, Resource Managemant Techniques, A.R. Publications, 2002 .
2. J.K.Sharma, Operations Research Theory and Applications, Macmillan India Ltd, 3rd edition, 2006.

Web- Resources:

- **https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwji3JTx_tfyAhWS8XMBHSA4C40QFnoECAsQAQ&url=http%3A%2F%2Fwww.ru.ac.bd%2Fstat%2Fwp-content%2Fuploads%2Fsites%2F25%2F2019%2F03%2F405_01_Srinivasan_Operations-Research_-Principles-and-Applications-Prentice-Hall-of-India-2010.pdf&usg=AOvVaw2dnrAYWf2nwV5__kL0Q5V9**
- https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwihrbini93yAhXe4nMBHRw4DwIQFnoECAoQAQ&url=https%3A%2F%2Fprolightinggroup.com%2Fwp-content%2Fuploads%2F2020%2F08%2FOperations-Research-and-Management-Science-Handbook.pdf&usg=AOvVaw2uoiENWCkpg0CjXMtRe5Jk

Course Outcomes

On Completion of the Course, Students should be able to

CO1 : analyze and solve linear programming models of real life situations
CO2 : understand the problem solving method of Simplex and Big M Method.
CO3 : exhibit the applications of Transportation Problem.
CO4 : solve Assignment problems.
CO5 : use PERT and CPM techniques in solving Network Analysis problems

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	M	S	M	M	S	S	S
CO2	S	S	M	M	S	S	M	S	S	M
CO3	S	S	S	M	S	S	S	S	S	S
CO4	S	S	M	M	S	S	M	S	S	M
CO5	S	S	M	M	S	S	M	S	S	M

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-V / SBE-II	**QUANTITATIVE APTITUDE**	Course Code: **MUS 2**
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• • To learn puzzles. • To know the time series problems. • To study the arithmetical reasoning problems. • To identify the missing characters. • To get the logical ability.	
UNIT	**CONTENT**	**HOURS**
Unit I	**Problems on puzzles :** Blood Relation - Puzzle Test **(P. No. 220 – 241, 253 – 278)**	**6 Hours**
Unit II	**Mathematical Operations**: Number, Ranking and Time Series Test - Mathematical Operations. **(P. No. 417 – 432, 432 – 454)**	**6 Hours**
Unit III	**Problems on reasoning:** Arithmetical Reasoning **(P. No. 459 – 474)**	**6 Hours**
Unit IV	**Puzzles on missing character:** Inserting the Missing character.**(P. No. 475 – 492)**	**6 Hours**
Unit V	**Logical Reasoning:** Data sufficiency – Logical Sequence of Words. **(P. No. 495 – 506, 455 – 45**	**6 Hours**

Text Book:

R.S.Agarwal, "A modern approach to Verbal and Non-verbal Reasoning" , S.Chand & Company Ltd, Delhi.

Reference Books:

1. Arun Sharma, Teach Yourself Quantitative Aptitude, Mc GrawHill Education, 2017.
2. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson Publications, 2014.

Web- Resources:

3. https://www.splessons.com/lesson/profit-loss-problems/
4. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiQ7pHb9tzyAhWp7HMBHcEbBcEQFnoECAMQAQ&url=https%3A%2F%2Fgradeup.co%2Fquantitative-aptitude-practice-questions-answers-pdf-i&usg=AOvVaw11iv2GCS3pvGLz9i2Nd48L

Course Outcomes:

On completion of the course the learner will be able to

CO 1:	solve all types of puzzles.
CO 2:	calculate the time series.
CO 3:	discuss the arithmetical reasoning problems.
CO 4:	find the missing characters.
CO 5:	interpret the logical ability problems.

Semester-V / SBE-III	**DOCUMENT PREPARATION SYSTEM USING LATEX**	Course Code:MUS3
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives:	• To introduce the fundamentals of Latex. • To know the symbols and arrays in Latex. • To study the commands and floating body in Latex. • To know the of table of contents, sections and paragraphs. • To understand the page breaking, numbering and listing environment .	
UNIT	**CONTENT**	**HOURS**
Unit I	**Introduction:** Preparing Inputs – Sentences and Paragraphs (Quotation mark, dashes, Space after a period, Special Symbols and Simple text Generating Commands).	**6 Hours**
Unit II	**Sectioning the document:** Document classes – Sectioning – Changing the text style – Accents, Symbols – Mathematical Formulas and Symbols – Arrays – Delimeters and Multiline Formulas.	**6 Hours**
Unit III	**Commands and Floating Bodies:** Defining commands and environments – Figures and Floating Bodies – marginal Notes – Lining up in Columns.	**6 Hours**
Unit IV	**Table of contents and Citations:** Creating Table of Contents – Cross References – Bibliography and Citations – Splitting Your Input – Making Index and Glossary – Keyboard Input and Screen Output.	**6 Hours**
Unit V	**Page break and numbering:** Slides and Overlays – Notes – Printing only some slides and Notes – Letters – Lining and Page Breaking – Numbering – Length, spaces and boxes – List making Environments.	**6 Hours**

Text Book:

A Document Preparation System Latex, By Leslie Lamport, Addison-Wesley Publications, 1994.

Reference Books:

1. Stefan Kottwitz, Latex Beginner's Guide: Create high-quality, professional-looking documents and books for business and science using LaTeX, Packt Publishing, 2011.
2. S. Swapna Kumar, LATEX - A Beginner Guide to Professional Documentation, Laxmi Publications Pvt Ltd, 2020.

Web- Resources:

- https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjRoMX0pNjyAhUp8HMBHZgDC5UQFnoECAIQAQ&url=http%3A%2F%2Fwww.docs.is.ed.ac.uk%2Fskills%2Fdocuments%2F3722%2F3722-2014.pdf&usg=AOvVaw1rdgIk6SR2IqqtgFZ5xOIq
- https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwilt4mQveTyAhXQcn0KHRAmD48QFnoECAMQAQ&url=https%3A%2F%2Frkdf.ac.in%2FEresources%2F2.%2520Introduction%2520to%2520LaTeX.pdf&usg=AOvVaw1TlSC8kRn7MZmBfFhYooxA

Experiment:

1. Creating a document.
2. Creating table of contents in a document.
3. Numbering and alignment of a document.
4. Writing mathematical equations.
5. Inserting footnotes, header and footer.
6. Creating matrices.
7. Creating tables.
8. Drawing graphs.
9. Inserting diagrams, pictures and graphs.
10. Creating bibliography.

Course Outcomes:

On completion of the course the learner will be able to

CO 1:	interpret the fundamentals of Latex.
CO 2:	apply the symbols and arrays in Latex.
CO 3:	compile the commands and floating body in Latex.
CO 4:	write table of contents, sections and paragraphs.
CO 5:	put page break, number the contents and list the environment.

Semester-VI / Core Course XII CC	**COMPLEX ANALYSIS**	Course Code: **MUL**
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To lay a good foundation for complex analysis. • To acquire the knowledge in elementary and bilinear transformations. • To explore the ideas of complex integration. • To understand the expansions of series. • To find the residues using poles.	
UNIT	**Content**	**No.of Hours**
I	**Analytic Functions** Functions of complex variable – Limits –Theorems on limit – Continuous functions –Differentiability –The Cauchy-Riemann Equations – Analytic functions - Harmonic functions. **(Chapter 2: Sections 2.1- 2.8).**	**18 Hours**
II	**Bilinear Transformations** Elementary transformations – Bilinear transformations – Cross ratio – Fixed points of bilinear transformations. **(Chapter 3: Section 3.1 - 3.4)**	**18 Hours**
III	**Complex Integration** Definite integral – Cauchy's theorem – Cauchy's integral formula – Higher derivatives. **(Chapter 6: Section 6.1 - 6.4)**	**18 Hours**
IV	**Series Expansions** Taylor's series – Laurent's series – Zeros of an analytic function – Singularities. **(Chapter 7: Section 7.1 - 7.4)**	**18 Hours**
V	**Calculus of Residues** Residues – Cauchy's Residue theorem – Evaluation of definite integrals. **(Chapter 8: Sections 8.1 - 8.3)**	**18 Hours**
VI Self Learning	**Elliptic Functions:** Groups – Elliptic Functions – Weierstrass's Elliptic Functions – The Addition Theorems – The Weierstrass's Zeta Function – The Weierstrass's Sigma Functions. **Chapter 12**	

Text Books:

1. S.Arumugam, A.Thangapandi Issac, A.Somasundaram, Complex Analysis, Scitech Publications (India Pvt Ltd), Chennai, 2019.
2. B.Choudhary, The Elements of Complex Analysis, Wiley Eastern Limited , 1985. **(VI Self Learning)**

Reference Books:

1. P. Duraipandiyan, LaxmiDuraipandiyan, D. Muhilan, Complex Analysis, Emerald Publishers, Channai, 1986.
2. T. K. ManikavachaagamPillai, Complex Analysis, S. Viswanathan Printers and Publishers Pvt Ltd, 2009.

Web- Resources:

1. **http://library.lol/main/AF7B3A0C662BCFD4FC95BE5DF7B1278F**
2. **https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjRnJ65o93yAhUB4HMBHRVzBRwQFnoECAUQAQ&url=https%3A%2F%2Fwww.oulu.fi%2Fsites%2Fdefault%2Ffiles%2F151%2Fcomplex_book.pdf&usg=AOvVaw3YDQGdD5CeCnYEVbElwsqN**

Course Outcomes	On completion of the course, the learners will be able to
	CO 1: understand the basic concepts of Cauchy-Riemann equations in Cartesian and polar coordinates.
	CO 2: interpret the analytic functions, harmonic functions, elementary and bilinear transformation concepts.
	CO 3: apply the theorems using complex integration.
	CO 4: expand the Taylor's and Laurent's series of functions.
	CO 5: solve the definite integrals using the concepts of residues.

Mapping of Course outcomes with Programme Outcomes & Programme Specific Outcomes:

CO/PO	**PO**					**PSO**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	M	S	S	M	M	S	M
CO2	S	S	M	M	M	S	M	S	S	M
CO3	S	S	M	W	S	S	M	S	S	S
CO4	S	S	M	W	M	S	M	S	S	S
CO5	S	S	S	W	M	S	S	S	S	M

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-VI / Core Course- XIII (CC)	**NUMERICAL METHODS WITH C PROGRAMMING (THEORY)**	**Course Code: MUM**
Instruction Hours: 5	**Credits: 4**	**Exam Hours: 3**
Internal Marks:25	**External Marks:75**	**Total Marks: 100**

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To study the higher order linear differential equations with constant coefficients. • To find the solutions of linear differential equations with variable coefficients . • To acquire the knowledge of complete, singular and particular integrals of first order PDE. • To compute solutions of PDEs using Charpits method. • To gain the basic knowledge of Laplace transforms and its inverse with applications.	
UNIT	**CONTENT**	**HOURS**
I	**Structure of C:** Overview of C - Constants, Variables and Data types-Operators and Expressions- Managing Input and Output operators.**(Chapters: 1-4)**	**15 Hours**
II	**Decision making and Branching**: Introduction –Decision making with IF statement –Simple IF statement –The IF ELSE statement –Nesting of IF …ELSE statement –ELSE IF ladder –The switch statement –The ? Operator –GOTO statement-Decision making and looping - WHILE, DO, FOR statements-Arrays.**(Chapters: 5-7)**	**15 Hours**
III	**Character Strings and Functions** Handling of Character Strings –User defined functions. **(Chapters: 8,9)**	**15 Hours**
IV	**Curve Fitting, The solution of Numerical Algebraic and Transcendental Equations and Simultaneous Linear Algebraic Equations)** Fitting a Straight line - Fitting a Parabola - Bisection method, Method of false position method - Newton Raphson method - Solving simultaneous algebraic equations - Gauss-Seidel method - Gauss elimination method**.(Chapter 1, Sect 1.7-1.8, Chapter 3: Sec 2, 4 and 5, Chapter 4: Sec 2, 6 of [2])**	**15 Hours**
V	**(Interpolation, Interpolation with unequal intervals, Numerical Differentiation and Integration and Numerical Solution of Ordinary Differential Equations)** Interpolation – Newton's forward and backward difference formulae – Lagrange's interpolation formula - Numerical integration using Trapezoidal and Simpson's one-third rules - solution of ODE"s - Euler method and Runge-Kutta fourth order method**.** **(Chapter 6: Sec 1-4, Chapter 8: Sec 4, Chapter 9: Sec 8,10, Chapter 11: Sec 10,13,14,15)**	**15 Hours**
VI Self Learning	**Numerical Solution of Ordinary Differential Equations:** Solution by Taylor Series – Taylor Series method for Higher order differential Equations – Picards Method of Successive Approximations – Euler's Method – Improved Euler's Method – Modified Euler's Method. **(Chapter XI: Sec. 6,8 – 12)**	

Text Books:

1. E. Balagurusamy, Programming in ANSI C, Sixth edition, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi. (For Units I, II and III), 2021
2. M.K.Venkatraman, Numerical methods in Science and Engineering, National Publisher Company, Fifth Edition, 2001. (For Units IV and V).

Reference Books:

1. Yashavant.P.Kanetkar, Let us "C", BPB Publications, 2002.
2. S.S. Sastry, Introductory Methods of Numerical Analysis, Third Edition, Prentice-Hall of India, 2000.

Web – Resources:

1. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjii6KIktjyAhUq7HMBHdg7C5EQFnoECAMQAQ&url=https%3A%2F%2Fwww.math.ust.hk%2F~machas%2Fnumerical-methods.pdf&usg=AOvVaw2XYqzDmJzupEa79S98dhiS

2. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjT8I2RgtjyAhWC7XMBHZknBY8QFnoECAMQAQ&url=https%3A%2F%2Fwww-personal.acfr.usyd.edu.au%2Ftbailey%2Fctext%2Fctext.pdf&usg=AOvVaw1vmjykV3ynWgE-1Ifz4Th5

Course Outcomes

On Completion of the Course, Students should be able to

CO1 : find the variables, constants, expressions and operators.
CO2 : use functions and arrays.
CO3 : write the programmes on arithmetic operations and recursion.
CO4 : evaluate the linear equations and matrices numerically.
CO5 : solve simultaneous system of equations using numerical techniques. solve simultaneous system of equations using numerical techniques.

Mapping of Course outcomes with Programme Outcomes/ Programme Specific Outcomes

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-VI / Core Course-XIV(CC)	NUMERICAL METHODS WITH 'C'PROGRAMMING – PRACTICAL	Course Code: MUNY
Instruction Hours: 2	**Credits: 2**	**Exam Hours: 3**
Internal Marks:40	**External Marks:60**	**Total Marks: 100**

1. Solving a Quadratic Equation.
2. Sum of series (Sine , Cosine , e^x)
3. Ascending and descending order of numbers.
4. Largest and smallest of given numbers.
5. Sorting names in alphabetical order.
6. Finding factorial, generating Fibonacci numbers using recursive functions.
7. Matrix Manipulations (Addition, subtraction and Multiplication).
8. Mean Standard Deviation and Variance.
9. Solving equations by Bisection method
10. Solving equations by False position method
11. Solving equations by Newton –Raphson method
12. Gauss elimination method of solving simultaneous equations
13. GAUSS-Seidel method of solving simultaneous equations
14. Euler method ,Trapesoidel and Simpson's 1/3 rd rule of integration
15. .R-K Fourth order method of solving differential equations.

Semester-VI / Core Course-XIV(CC)	ASTRONOMY	Course Code: MUO
Instruction Hours: 6	Credits: 5	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To introduce the exciting world of astronomy. • To study spherical trigonometry in the field of astronomy. • To conceptualize the structure of the solar system and the universe. • To classify the difference between the planets, stars and types of galaxies in the universe. • To relate the earth, sun, galaxy with the universe.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**Spherical Trigonometry** Relevant properties of sphere and formulae in spherical trigonometry (no proof, no problems)-Celestial sphere and diurnal motion-Celestial coordinates-sidereal time. **(Chapter I: properties and formulae only, Chapter II: Article 39-69)**	**18 Hrs**
UNIT II	**Celestial Sphere** Morning and evening stars-circumpolar stars- diagram of the celestial sphere -zones of earth-perpetual day-dip of horizon-twilight. **(Chapter II: Article 80-82, 86,87,89,90, Sec 5: Article 10-109, Sec 6: Article 111-116)**	**18 Hrs**
UNIT III	**Refraction** Refraction-laws of refraction-tangent formula-Cassini's formula-horizontal refraction-geocentric parallax-horizontal parallax. **(Chapter IV: Article 117-120, 129,130,131, Chapter V: Article 135)**	**18 Hrs**
UNIT IV	**Kepler's Laws** Kepler's laws - verification of 1^{st} and 2^{nd} laws in the case of earth - Anomalies -Kepler's equation-Seasons-causes-kinds of years. **(Chapter VI, VII Article 173-175)**	**18 Hrs**
UNIT V	**The Moon** Moon-sidereal and synodic months - elongation - phase of moon - eclipses-umbra and penumbra-lunar and solar eclipses-ecliptic limits- maximum and minimum number of eclipses near anode an dina year Saros. **(Chapter XII: Article 229-241, Chapter XIII: Article 256-259, 269,273-275)**	**18 Hrs**

UNIT VI **Self Learning**	**Astronomical Instruments:** Sidereal Clock-Chronometer-Gnomon-Sun Dial-Astronomical Telescope-Heliometer-The Sextant-The Transit Circle Or Meridian Circle-The Equatorial-Filar Micrometer- Chronograph-Spectroscope-Radio Telescope. **(Chapter XV: Article 305-320)**

Text Books:

1. Kumaravelu S and Susheela Kumaravelu, Astronomy for degree classes, 7th edition*SKV Publishers*, Nagercoil, 1986.

Reference Books:

1. M. L. Khanna, Sperical Astronomy, Jai Prakash and Co, 1983.
2. Dinah L. Moche, Astronomy: A Self Teaching Guide, Eighth Edition, Wiley Publications, 2014

1. **Web – Resources:**
   https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiG4Lj3hdjyAhX6-nMBHavECa8QFnoECAIQAQ&url=https%3A%2F%2Fwww.sisd.net%2Fcms%2Flib%2FTX01001452%2FCentricity%2FDomain%2F834%2FAstronomy%2520Textbook%2520Part%25201.pdf&usg=AOvVaw1UVXuvR3kA9XwCp9LQoO9h
2. **https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjmq62NwOTyAhUMWX0KHca4BQMQFnoECAMQAQ&url=https%3A%2F%2Fwww.nsf.gov%2Fnews%2Fclassroom%2Fastronomy.jsp&usg=AOvVaw3WCR1unwl8H77y7eX0QS5y**

Course Outcomes

On Completion of the Course, Students should be able to

CO1 : perform calculations on celestial bodies.
CO2 : compare our galaxy with other galaxies.
CO3 : apply the principles and fundamental techniques of the astronomy.
CO4 : analyze the size, age structure and motion of the universe over all using cosmological models.
CO5 : understand the phases of moon and occurrence of Eclipses.

Mapping of Course outcomes with Programme Outcomes/ Programme Specific Outcomes

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	M	W	M	S	M	M	M	M
CO2	S	M	M	W	M	S	M	M	S	M
CO3	M	M	M	W	M	M	M	M	M	M
CO4	S	S	M	W	M	S	M	M	M	M
CO5	S	S	M	W	M	S	M	M	M	M

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-VI / Elective Course-I(EC)	DISCRETE MATHEMATICS	Course Code: MUE4
Instruction Hours: 5	Credits: 4	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	**The Course aims** • To know Formal Languages • To understand the concept of permutations and Combinations • To study about Finite State Machines • To gain the knowledge of Numeric Functions • To know the concept of Recurrence Relations.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**Computablity And Formal Languages** Languages – Phrase structure grammars – Types of grammars and languages**. (Sections : 2.4 to 2.6)**	**15 Hours**
UNIT II	**Permutations , Combinations and Discrete Probability** Introduction – The Rules of sum and Product – Permutations – Combinations – Generation of permutations and combinations. **(Sections : 3.1 to 3.5)**	**15 Hours**
UNIT III	**Finite State Machines** Introduction – Finite State Machines – Finite State Machines as Models of Physical systems – Equivalent Machines – Finite State Machines as language recognizers. **(Sections: 7.1 to 7.5)**	**15 Hours**
UNIT IV	**Discrete Numeric Functions and Generating Functions** Introduction – Manipulation of Numeric functions – Asymptotic behaviour of Numeric functions – Generating functions. **(Sections: 9.1 to 9.4)**	**15 Hours**
UNIT V	**Recurrence Relations and Recursive Algorithms** Introduction – recurrence relations – linear recurrence relations with constant co – efficients – Homogeneous solutions – Particular solutions – Total solutions. **(Sections 10.1 to 10.6)**	**15 Hours**

Text Books:

C.L. Liu, Elements of Discrete Mathematics , McGraw Hill Book Company, Second edition, 1985.

Reference Books

1. Knuth D.E – The art of Computer Programming , Volume III , Addison – Wesley Publishing Company, 1973.
2. Hopcraoft J.E. and J.D. Ullman – Introduction to Automata Theory, Languages and Computation, Addison – Wesley, 1979.

Web – Resources:

1. **https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjtgoP3h9jyAhVimeYKHTwtAJQQFnoECAIQAQ&url=https%3A%2F%2Fgurukpo.com%2FContent%2FB.SC%2FDiscrete_Maths.pdf&usg=AOvVaw3vrwMxdGVfyqoQ5SqJNrCi**
2. **https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiV6cenjd3yAhUbIbcAHfkhCZ8QFnoECAMQAQ&url=http%3A%2F%2Fdiscrete.openmathbooks.org%2Fpdfs%2Fdmoi-tablet.pdf&usg=AOvVaw3qckwD1F6JlR6GOQUarnb3**

Course Outcomes

On Completion of the Course, Students should be able to

CO1 : understand the basic concepts of Formal Languages.
CO2 : Permutations and Combinations
CO3 : acquire knowledge about Finite State Machines
CO4 : understand Numeric Functions
CO5 : understand Recurrence Relations.

Semester-VI / MBE-III	**GRAPH THEORY**	Course Code: MUE5
Instruction Hours: 5	Credits: 4	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives:	• To understand the basic concepts of the graphs. • To learn the various operations and degree sequences of graphs. • To discuss the properties of Hamiltonian graphs and trees. • To know about the planar graphs. • To gain the knowledge of colourability of the graph.	
UNIT	**CONTENT**	**HOURS**
Unit I	**Graphs and Subgraphs:** Introduction –The Konigsberg Bridge problem –Definition and examples –Degrees –Subgraphs –Isomorphism. **(Chapter 1:Sections 1.0, 1.1 and Chapter 2:Section 2.1 -2.4)**	**15 Hours**
Unit II	**Matrices and Degree Sequences:** Matrices –Operations on graphs –Degree Sequences and Graphic Sequences–Walk, trials and paths – Connectedness and components. **(Chapter 2: Sections 2.8 & 2.9, Chapter 3: Sections 3.1 & 3.2 and Chapter 4: Sections 4.1 & 4.2)**	**15 Hours**
Unit III	**Hamiltonian graphs and Trees:** Eulerian Graphs–Hamiltonian graphs –Characterization of Trees – Centre of a tree. **(Chapter 5: Sections 5.1 &5.2 and Chapter 6: Sections 6.1 & 6.2)**	**15 Hours**
Unit IV	**Planar Graphs:** Introduction –Definition and properties –Characterization of Planar graphs. **(Chapter 8: Section 8.0 – 8.2)**	**15 Hours**
Unit V	**Colourability:** Introduction –Chromatic number and chromatic index –The Five Colour Theorem –Four colour problem –Chromatic polynomials. **(Chapter 9: Section 9.0 – 9.4)**	**15 Hours**

Text Book:

1. S. Arumugam and S. Ramachandran, Invitation to Graph Theory, New Gamma Publishing House, Palayamkottai(2013).

Reference Books:

1. Gary Chartrand and Ping Zhang, Introduction to Graph Theory, Tata McGraw-Hill, NewYork(2006).

2. S. Kumaravelu, Susheela Kumaravelu, Graph Theory, Janki Calender Corporation, Sivakasi(1999).

Web- Resources:

1. **https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjH_I6X-dfyAhXk4jgGHe-nCscQFnoECCIQAQ&url=https%3A%2F%2Fwww.zib.de%2Fgroetschel%2Fteaching%2FWS1314%2FBondyMurtyGTWA.pdf&usg=AOvVaw0AdrSj_OV0mNm_RmBixjQS**
2. **https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwit-6j1w-TyAhXFV30KHYVpA8kQFnoECAoQAQ&url=http%3A%2F%2Fwww.nrce.niepa.ac.in%2Fmod%2Fpage%2Fview.php%3Fid%3D3681&usg=AOvVaw3Ri7FhsEm7bd7Kz29CiYpg**

Course Outcomes:

On completion of the course the learner will be able to

CO 1: understand the concepts of graphs upto isomorphism.
CO 2: acquire the knowledge of degree sequences, connectedness and components of graphs.
CO3: demonstrate the characterization of Eulerian, Hamiltonian and trees.
CO4: interpret the planarity of graphs.
CO5:identify the chromatic number, index and polynomial of a graph.