THE GANDHIGRAM RURAL INSTITUTE (DEEMED TO BE UNIVERSITY)

GANDHIGRAM - 624302

(Ministry of Education, Govt. of India)

Accredited by NAAC with 'A' Grade (3rd cycle)

Department of Mathematics

UG & PG Courses offered to other Departments

Pre-Requisite: Mathematics as a subject of study at the Higher Secondary level.

Revised Syllabus with effect from 2024 – 2025 onwards

List of UG Courses

Category	Course Code	Course Title	Number of Credits	Lecture Hours per week	Exam Duration (Hrs.)	Marks		
						C.F.A	E.S.E	Total
Semester-I								
Multidisciplinary	24MAUI1101	Quantitative Aptitude	3	3	3	40	60	100
Minor Courses	24MAUB1103	Algebra and Calculus (B.Sc Physics/Chemistry)	4	4	3	40	60	100
	24MAUB1104	Foundation Mathematics for Computer Science (B.Sc Computer Science)	4	4	3	40	60	100
	24MAUB1105	Mathematics-I (B.Sc. Geology)	4	4	3	40	60	100
	24MAUP1101	Mathematics- I (B.Tech Civil Engineering)	4	4	3	40	60	100
	24AMMU0101	Elementary Mathematics (B.Sc Agri)	4	4	3	40	60	100
Major Course	24REUC1102	Basic Mathematics (B.Voc Renewable Energy)	4	4	3	40	60	100
Semester-II								
Multidisciplinary	24MAUI1202	Logical Reasoning	3	3	3	40	60	100
Minor Courses	24MAUB1208	Mathematical Methods and Applications (B.Sc Physics/Chemistry)	4	4	3	40	60	100
	24MAUB1209	Mathematical Methods for Computer Science (B.Sc Computer Science)	4	4	3	40	60	100
	24MAUB1210	Mathematics-II (B.Sc. Geology)	4	4	3	40	60	100
Major Courses	24RMUC1103	Business Statistics and Logic (B.B.A)	4	4	3	40	60	100
	24MAUP1202	Mathematics- II (B.Tech Civil Engineering)	4	4	3	40	60	100
Semester III								
Major Course	24MAUP2303	Mathematics – III (B.Tech	4	4	3	40	60	100

		Civil Engineering)						
		Semester VII						
Major Course	24COUC3108	Business Statistics (B.Com Cooperation)	4	4	3	40	60	100
		Semester VII						
Major Course	24REUC4103	Engineering Mathematics (B.Voc Renewable Energy)	4	4	3	40	60	100

List of PG Courses

Category	Course Code	Course Title	Number of Credits	Lecture Hours per week	Exam Duration (Hrs.)	Marks		
						C.F.A	E.S.E	Total
Semester-I								
Major Course	21REEP01D5	Advanced Numerical Analysis (M.Tech Renewable Energy)	4	4	3	40	60	100
Allied Courses	24MCAP0104	Mathematical Foundation for Computer Science (M.C.A)	4	4	3	40	60	100
Semester II								
Generic Elective	24MATP02G1	Numerical and Statistical Methods	3	3	3	40	60	100
	24MATP02G2	Operations Research	3	3	3	40	60	100
Allied Courses	24MCAP0315	Optimization Techniques (M.C.A)	4	4	3	40	60	100

Semester	I	Course Code	24MAUI1101
Course Title	QUANTITATIVE APTITUDE		
No. of. Credits	3	No. of. contact hours per week	3
New Course/ Revised Course	--	If revised, Percentage of Revision effected (Minimum 20%)	--
Category	Multidisciplinary-I		
Scope of the Course	● Skill Development ● Employability		
Cognitive Levels addressed by the course	● Knowing various concepts like simplifications, problems on numbers for competitive exams (K-1). ● Understanding different topics like Time and work, percentages (K-2). ● Applying various techniques to solve problems in real life situations. (K-3)		
Course Objective	The Course aims to impart skills in numerical and quantitative techniques.		

Unit	Content	No. of. Hours
I	H.C.F and L.C.M of Numbers- decimal fractions- simplifications- square roots and cube roots.	10
II	Average- Problems on Numbers- Problems on Ages, Surds and Indices.	10
III	Percentages- Profit and Loss- Ratio-Proportion- Partnership.	9
IV	Chain Rule- Pipes and cisterns- Time and Work- Time and Distances.	9
V	Boats and Streams- Problems on Trains- Allegation or mixture – Simple Interest-Compound Interest.	10

References	**Text Book:**
	 1. R.S. Agarwal, **Quantitative Aptitude, Revised and Enlarged Edition**, S. Chand & Company Ltd., New Delhi, 2017.
	          Unit 1: Section I: Chapters 2-5
	          Unit 2: Section I: Chapters 6-9.
	          Unit 3: Section I: Chapters 11-14
	          Unit 4: Section I: Chapters 15-18
	          Unit 5: Section I: Chapter 19- 23.

	Reference Book: 1. Rajesh Verma, **Fast Track Objective Arithmetic**, Arihant Publications Ltd (India), Revised Edition 2017.
Course Outcomes	On completion of the course students should be able to CO1: evaluate various real-life situations by resorting to Analysis of key issues and factors.

CO2: solve problems related to numbers, age.

CO3: discuss the problems on profit, loss and partnership.

CO4: demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

CO5: compute simple and compound interest problems in real life situations.

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	3	1
CO2	2	2	2	3	1
CO3	2	1	2	3	2
CO4	2	1	2	2	3
CO5	3	2	2	3	1

Semester	I	Course Code	24MAUB1103
Course Title	ALGEBRA AND CALCULUS		
No. of. Credits	4	No. of. contact hours per week	4
New Course/ Revised Course	--	If revised, Percentage of Revision effected (Minimum 20%)	20%
Category	Core Course - Minor (B.Sc., Physics/Chemistry Major)		
Scope of the Course	● Basic Skill ● Skill Development		
Cognitive Levels addressed by the course	● Gain knowledge of Binomial series and Exponential series (K-1) ● Evaluation of Eigenvalues and Eigenvectors. (K-5) ● Become proficient in Successive Differentiation. (K-2) ● Acquire skills of applications of Curvature, Evolutes and Involutes. (K-3) ● Gain concepts of Definite integral(K-4)		
Course Objective	The Course aims to impart different concepts of algebra and calculus.		

Unit	Content	No. of. Hours
I	Binomial series, Exponential series, and Logarithmic series – problems related to series.	14
II	Types of Matrices: Symmetric and Skew symmetric matrices – Rank of a matrix – Test of Consistency of Equations using ranks – Characteristic equation - Cayley – Hamilton theorem – Evaluation of eigen values and eigen vectors.	14
III	Successive Differentiation – Leibnitz's theorem and its application – Applications of Differential Calculus: Rate of change of variables – Velocity and Acceleration – Maxima and Minima.	12

IV	Curvature – Radius of Curvature and Centre of Curvature – Evolutes and Involutes.	12
V	Properties of definite integral – Integration by parts – Reduction formulae –Integration as process of summation. Evaluation of double, triple integral (simple problems only).	12

References	**Text Books:**
	1. Arumugam & Isaac, **Ancillary Mathematics Paper I**, New Gamma Publishing House, Palayamkottai, 2002.
	    Unit I: Chapter 1, Sec. 1.1 – 1.3.
	2. Arumugam & Isaac, **Ancillary Mathematics Paper III**, New Gamma Publishing House, Palayamkottai, 2006.
	    Unit II: Chapter 7, Sec. 7.1-7.4.
	3. S. Narayanan & T.K. Manicavachagom Pillay, **Calculus**, Vol. I, S.Viswanathan Pvt. Ltd., Chennai, 2004.
	    Unit III: Chapter III: Sec. 1.1 – 2.2.
	4. Paulraj Joseph & G. Mahadevan, **A text book of Calculus,** Anuradha Publications, 2016.
	    Unit IV: Chapter 1
	    Unit V: Chapter 5 , Chapter 6.

	Reference Books: 1. S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillai, **Ancillary Mathematics**, S. Viswanathan Pvt. Ltd., Chennai, 2002. 2. T. K. Manicavachagom Pillay, T. Natarajan & K.S. Ganapathy, **Algebra**, Vol-I, S. Viswanathan Pvt. Ltd., Chennai, 2003.
Course Outcomes	On completion of the course students should be able to **CO1**: evaluate binomial series and exponential series. **CO2:** assess basic knowledge of Types of Matrices and Evaluation of Eigenvalues and Eigenvectors. **CO3**: discuss the successive Differentiation. **CO4**: explain the applications of Curvature, Evolutes, and Involutes. **CO5**: analyze the properties of definite integral.

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	3	1
CO2	2	2	2	2	2
CO3	3	3	1	3	2
CO4	3	2	1	3	2
CO5	3	3	2	1	1

Semester	I		Course Code	24MAUB1104
Course Title	FOUNDATION MATHEMATICS FOR COMPUTER SCIENCE			
No. of. Credits	4	No. of. contact hours per week		4
New Course/ Revised Course	Revised	If revised, Percentage of Revision effected (Minimum 20%)		50%
Category	Core Course - Minor (B.Sc., Computer Science)			
Scope of the Course	● Basic Skill ● Skill Development ● Employability			
Cognitive Levels addressed by the course	• Recall definitions basic operations on sets (K-1). • Understand the fundamentals of matrix operations (K-2) • Apply logical principles to solve problems (K-3). • Evaluate limits of functions (K-5). • Find the solutions in combinatorial problems (K-1).			
Course Objective	The Course aim to develop a comprehensive understanding of fundamental mathematical concepts			

Unit	Content	No. of. Hours
I	Set Theory: Types of Sets – Operations on sets – Laws of set operation – Simple Problems	13
II	Matrices: Matrix – Addition and Multiplication of Matrices – Properties of Matrices – inverse of Matrix – Solution of Simultaneous linear equation - Rank of a Matrix.	13
III	Logics: Introduction – Connectives - Truth tables - Tautology implication and equivalence of formulae	12
IV	Limits: Limit of a function – Evaluation of limits – standard results - Properties of limits –Simple problems.	12
V	Permutation and Combinations: Introduction – Factorial Notation – Two Basic Counting Principle – Permutation - Permutations of things not all different – Combination.	14

References	**Text Books:**
	 1. M. K. Venkataraman, N. Sridharan, N. Chadrasekaran, **Discrete Mathematics**, The National Publishing Company, New Delhi.2012.
	     Unit 1: Chapter I, Sec: 1 -6
	     Unit 2: Chapter VI, Sec: 1-4
	     Unit 3: Chapter IX, Sec: 1-8
	 2. Rangaraj G, Mallieswari R & Rema B, **Business Mathematics**, Cengage,Coimbatore. 2020.
	     Unit 4: Chapter 16, Sec: 16.1 – 16.5
	 3. J.P. Singh, **Business Mathematics**, Ane Books Pvt. Ltd, New Delhi. 2014.
	     Unit 5: Chapter 1, Sec: 1.1 – 1.10	

	Reference Books:
	1. S.Arumugam & A. Thangapandi Issac, **Modern Algebra**, SCI Tech Publications, Chennai. 2002
	2. Dr.M.K.Venkkatraman, Dr.N.Sridharan, Dr.N.Chandrasekaran, **Discrete Mathematics,** National Publishing Company, New Delhi. 2000.
Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Understand types of sets, operations, and laws of set operations. **CO2:** Apply matrix operations, properties, solve linear equations, and determine matrix rank. **CO3:** Analyze logical connectives, truth tables, and equivalence of logical formulas. **CO4:** Evaluate limits of functions, applying standard results and properties. **CO5:** Solve problems using factorial notation, permutations, and combinations principles.

Mapping of COs with Pos

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	3	1	2	3	3
CO2	3	2	2	2	1
CO3	3	3	2	2	1
CO4	3	2	3	2	1
CO5	3	2	3	2	1

Semester	I	Course Code	24MAUB1105
Course Title	**Mathematics - I**		
No. of. Credits	**4**	No. of. contact hours per week	**4**
New Course/ Revised Course	Revised Syllabus	If revised, Percentage of Revision effected (Minimum 20%)	70%
Category	**Core Course - Minor (B.Sc., Applied Geology)**		
Scope of the Course	● Basic Skill ● Skill Development		
Cognitive Levels addressed by the course	• Apply logical principles to solve problems (K-3). • Recall definitions basic operations on sets (K-1). • Evaluate the equation on lines and circle(K-4). • Understand the fundamentals of matrix operations (K-2) • Solving system of equations (K-4).		
Course Objective	The Course aim to develop a comprehensive understanding of fundamental mathematical concepts		
Unit	Content		No. of. Hours
I	Logics: Introduction – Connectives - Truth tables - Tautology implicationand equivalence of formulae		13
II	Set Theory: Types of Sets – Operations on sets – Laws of set operation – Simple Problems		13
III	Co-ordinate Geometry: Co-ordinate system- straight lines- slope of straight lines-straight lines passing through given two pointsangle between two lines and related problems- Circles: General equation of a circle- tangent to circle- Related problems.		12
IV	Matrices: Concept- notation- order- equality- types of matriceszero matrix- transpose of a matrix- symmetric and skew symmetric matrices. Addition, multiplication, and scalar multiplication of matrices- Related problems.		12
V	Determinants: Determinant of a square matrix (up to 3 x 3 matrices), properties of determinants- Adjoint and inverse of a square matrix-Solving system of linear equations in two or three variables using inverse of a matrix.		14

References	**Text Books:**
	 1. Rangaraj G, Mallieswari R & Rema B, **Business Mathematics**, Cengage,Coimbatore. 2020.
	      Unit 1: Chapter 16, Sec: 16.1 – 16.5
	 2. M. K. Venkataraman, N. Sridharan, N. Chadrasekaran, **Discrete Mathematics**, The National Publishing Company, New Delhi.2012.
	      Unit 2: Chapter I, Sec: 1 -6
	
	 3. P.R. Vittal, Business Mathematics, Margham Publications, Chennai 2015.		

Unit-3: Chapter -12 (Page No. 338-385)
Unit-4: Chapter-14 (Page No. 595-623)
Unit-5: Chapter-14 (Page No. 623-653)

Reference Books:

1. Seymour Lipschutz, Set theory & Related Topics, Schaum's outlines, 2nd Edition, Tata McGraw Hill, New Delhi, 2005.

2. Arumugam & Issac, Classical Algebra, New gamma Publishing house, Tirunelveli, 2003.

3. S. Narayanan & T. K. Manicavachagom Pillay, Analytical Geometry 2D, S. Viswanathan Pvt. Ltd., Chennai, 2001.

Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Understand types of sets, operations, and laws of set operations. **CO2:** Apply matrix operations, properties, solve linear equations, and determine matrix rank. **CO3:** Analyze logical connectives, truth tables, and equivalence of logical formulas. **CO4:** Evaluate limits of functions, applying standard results and properties. **CO5:** Solve problems using factorial notation, permutations, and combinations principles.

Semester	I	Course Code	24MAUP1101
Course Title	MATHEMATICS- I		
No. of. Credits	4	No. of. contact hours per week	4
New Course/ Revised Course	Revised Course	If revised, Percentage of Revision effected (Minimum 20%)	85%
Category	Basic Sciences (B.Tech CE)		
Cognitive Levels addressed by the course	• Understanding the concepts of curvature, evolutes and involutes (K-2) • Knowing the fallouts of Rolle's Theorem (K-3). • Evaluate limits of functions (K-5). • Finding the solutions of gradient and tangent (K-1). • Gaining the knowledge of integration (K-4).		
Course Objective	The Course aims to impart the fundamental concepts of calculus.		

Unit	Content	No. of. Hours
I	Basic Calculus: Curvature, evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties.	12

II	Single-variable Calculus (Differentiation): Rolle's Theorem, Mean value theorems and applications; Extreme values of functions; Linearapproximation; Indeterminate forms and L'Hospital's rule.	13
III	Sequences and series: Limits of sequence of numbers, Calculation of limits, Infinite series; Tests for convergence; Powerseries, Taylor and Maclaurin series; Taylor theorem, convergence of Taylor series.	13
IV	Multivariable Calculus (Differentiation): Limit, continuity and partial derivatives, directional derivatives, gradient, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers.	13
V	Multivariable Calculus (Integration): Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Gradient, curl and divergence, Theorems of Green, Gauss and Stokes.	13
References	**Text Books:** 1. Reena Garg, **Advanced Engineering Mathematics**, Khanna Book Publishing Company, New Delhi. 2021. Unit I: Chapters 2, 6 and 11 2. Reena Garg, **Mathematics-I (Calculus & Linear Algebra),** Khanna Book Publishing Co. New Delhi. 2022 Unit 2: Sections 3.1, 3.2, 3.3, 3.7 & 6.6 Unit 3: Sections 8.1-8.6, 8.8-8.10 Unit 4: Sections 12.1-12.5, 12.7-12.9 Unit 5: Sections 13.1 – 13.7, 14.1 – 14.8	
	Reference Books: 1. G.B. Thomas and R.L. Finney, **Calculus and Analytic geometry**, 9th Edition, Pearson, Reprint,2002. 2. Ravish R Singh, **Engineering Mathematics,** MC Graw Hill, New Delhi. 2017. 3. Veerarajan T., **Engineering Mathematics for first year**, Tata McGraw-Hill, New Delhi, 2008. 4. N.P. Bali and Manish Goyal, **A text book of Engineering Mathematics**, Laxmi Publications,Cami Reprint, 2008. 5. B.S. Grewal, **Higher Engineering Mathematics**, Khanna Publishers, New Delhi . 36th Edition,2010.	
Course Outcomes	**CO1**: Understand curvature, evaluate integrals, and apply properties of Beta and Gamma functions. **CO2**: Apply Rolle's Theorem, analyze extreme values, and solve indeterminate forms using L'Hospital's rule. **CO3**: Compute limits, test series convergence, and expand functions into Taylor series.	

	CO4: Analyze partial derivatives, gradients, and solve optimization problems using Lagrange multipliers.
	CO5: Compute double and triple integrals, apply change of variables, and utilize vector calculus theorems (Green's, Gauss's, Stokes's).

Mapping of COs with POs

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	1	3	2	3	3
CO2	1	3	2	3	3
CO3	2	3	2	3	3
CO4	1	3	2	3	3
CO5	2	3	2	3	3

Semester	I	Course Code	24AMMU0101
Course Title	ELEMENTARY MATHEMATICS		
No. of. Credits	2	No. of. contact hours per week	2
New Course/ Revised Course	-	If revised, Percentage of Revision effected (Minimum 20%)	20%
Category	Course Category - Minor (B.Sc., Agri. Hons.,)		
Scope of the Course	• Foundation course		
Cognitive Levels addressed by theCourse	• Recall definitions of matrices, determinants, straight line and list the properties (K-1). • Explain geometric interpretations, describe circle intersections (K-4). • Apply differentiation to find rates of change, solve optimization problems and integration to find area (K-2). • Analyse critical points, classify functions using derivative information, evaluate behaviours in different contexts (K-3).		
Course Objective	The Course aims to impart basic knowledge about solving problems in matrices and calculus		
Unit	Content		No. of. Hours
I	Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.		5

II	Straight lines: Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.	7
III	Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2), Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line y = mx + c to the given circle $x_2 + y_2 = a_2$.	4
IV	Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of x^n, e^x, sin x & cos x from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y = f(x)$ (Simple problems based on it).	6
V	Integral Calculus: Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).	5

References	**Text Books:**
	1. T.K.Manickavasagam Pillai, T. Natarajan and K.S. Ganapathy. **Algebra,Vol. II**, S.Viswanathan Printers, Chennai. 2006.
	    Unit 1: Chapter 1, Sections 1 -16, Chapter 2, Sec: 1 -8
	2. T.K.Manickavasagam Pillai , T. Natarajan, **Analytical Geometry – Part I,Two Dimensions,** S.Viswanathan Printers, Chennai. 2011.
	    Unit II: Chapter II - Sections 1-9
	    Unit III: Chapter IV - Sections 1-9
	3. T.K.Manickavasagam Pillai, T. Natarajan, **Calculus, Vol. I & II.** S. Viswanathan Printers, Chennai. 2014.
	    Unit 4: Chapter II, V (Sections 1.1-1.5).
	    Unit 5: Chapter 1, 2 (Sections 1.1-1.3).	

	Reference Books:
	1. Arumugam S. and A. Thangapandi Isaac, **Calculus**, New Gamma Publishing House, Palayamkottai. 2012. 2. Arumugam S. and A. Thangapandi Isaac, Linear Algebra, Scitech Publications, Chennai. 2016. 3. Arumugam S. and A. Thangapandi Isaac, Analytical Geometry 3D and Vector Calculus, Scitech Publications, Chennai. 2014.
Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Perform matrix operations and compute determinants. **CO2:** Calculate the distance between straight lines, determine equation of straight lines, parallel and perpendicular lines. **CO3:** Define and explain the concept of circle and determine equations of circle. **CO4:** Define function, limit and continuity and solve problems in differential Calculus. **CO5:** Perform integration of simple functions, product of two functions, solve problems in definite integrals.

Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	1	2	2	1	1
CO2	1	2	2	1	1
CO3	1	2	2	1	1
CO4	1	2	2	1	1
CO5	1	2	2	1	1

Semester	I	Course Code	24REUC1102
Course Title	**BASIC MATHEMATICS**		
No. of. Credits	**4**	No. of. contact hours per week	**4**
New Course/ Revised Course	Revised	If revised, Percentage of Revision effected (Minimum 20%)	50%
Category	**Core Course - Major (B. Voc. RE)**		
Scope of the Course	● Basic Skill		
Cognitive Levels addressed by the course	● Understand the fundamentals of set theory (K-2). ● Compute solutions of problems in game theory (K-3). ● Apply central tendencies in real life problems (K-2).		
Course Objective	The Course aims to learn the fundamentals of Set theory, Central Tendencies and Game theory.		

Unit	Content	No. of. Hours
I	Set Theory: Types of Sets – Operations on sets – Laws of set operation – Simple Problems	13
II	Logics: Introduction – Connectives - Truth tables - Tautology implication and equivalence of formulae	13
III	Limits: Limits of a function – Evaluation of limits – standard results - Properties of limits –Simple problems.	13
IV	Measures of Central Tendencies: Arithmetic Mean - Geometric Mean - Harmonic Mean - Median and Mode.	13
V	Games and Strategies: Introduction, Two-Person Zero-Sum Games- Some Basic Terms, MaxMin- MiniMax Principle- Games without Saddle Points – Mixed Strategies-- Graphic Solution of 2xn and mx2Games- Dominance Property	12

References	**Text Books:**
	1. M. K. Venkataraman, N. Sridharan, N. Chadrasekaran, **Discrete Mathematics**, The National Publishing Company, New Delhi. 2012
	    Unit 1: Chapter I, Sec: 1 -6
	    Unit 2: Chapter IX, Sec: 1-8
	2. Rangaraj G, Mallieswari R & Rema B, **Business Mathematics**, Cengage, 2020
	    Unit 3: Chapter 16, Sec: 16.1 – 16.5
	3. RSN Pillai & Bhagavathi, **Statistics**, S.Chand & Company Ltd, New Delhi 2013.
	    Unit 4: Chapter 9, Pg.No: 124 -240
	4. Kanti Swarup, P.K. Gupta, Man Mohan, **Operations Research**, Sultan Chand & Sons, 2017
	    Unit 5: Chapter 17, Sec: 17.1 – 17.7
	
	Reference Books:
	1. P. K. Gupta & D. S. Hira, **Operations Research**, S. Chand & Company Ltd., New Delhi, 2013.
	2. J. K. Sharma, **Operations Research theory and its applications**, 2nd Edition, Macmillan, New Delhi, 2006.
	3. R. Panneerselvam, **Operations Research**, Prentice Hall of India Pvt. Ltd., New Delhi, 2002.
	
	E-Recourses:
	1. https://nptel.ac.in/courses/112106134/
	2. https://nptel.ac.in/courses/111105039/
	3. https://nptel.ac.in/courses/110/106/110106062/	

Course Outcomes	On completion of the course students should be able to CO1: Students will have the capacity to demonstrate the ability to solve problems in set theory. CO2: Analyze logical identities CO3: Solving the limitation values CO4: explain the concepts of central tendency. CO5: utilize the acquired knowledge of basics in game theory.	

Mapping of COs with POs

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	1	3	2	3	3
CO2	1	3	2	3	3
CO3	2	3	2	3	3
CO4	1	3	2	3	3
CO5	2	3	2	3	3

Semester	II	Course Code	24MAUI1202
Course Title	LOGICAL REASONING		
No. of. Credits	**3**	No. of. contact hours per week	**3**
New Course/ Revised Course	New Course	If revised, Percentage of Revision effected (Minimum 20%)	--
Category	Multidisciplinary-II		
Scope of the Course	● Basic Skill		
Cognitive Levels addressed by the course	● Knowing volume and surface Areas, Odd man out and series (K-1). ● Understanding the concepts of Permutation and combinations, Probability (K-2). ● Analysing direction problems (K-4) ● Evaluating ranking problems and performing mathematical operations(K-5)		
Course Objective	The Course aims to impart mathematical competitive skills.		

Unit	Content	No. of. Hours
I	Area- Volume and surface Areas - Calendar - Odd man out and series.	10
II	Permutation and combinations-Probability- True discount-Heights and distances.	10
III	Verbal Reasoning: General Mental Ability- Analogy, Classification, Series completion,	10
IV	Puzzle Test, Sequential output tracing, Direction sense test	10
V	Number, ranking and time sequence test, mathematical operations	8
References	**Text Books:** 1. R.S. Agarwal, **Quantitative Aptitude**, 7th Revised Edition, S. Chand and	

Company Ltd, New Delhi, 2015.

    Unit 1: Section I: 24, 25, 27, 35

    Unit 2: Section I: 30-32, 34.

2. R.S. Aggarwal, **A Modern Approach to Verbal and Nonverbal Reasoning**, S. Chand & Company Ltd., New Delhi, 2007.

    Unit 3: Section I: 1-3

    Unit 4: Section I: 6-8

    Unit 5: Section I: 11, 12

Reference Books:

1. Abhijit Guha, **Quantitative Aptitude for MBA Entrance Examinations**, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2006

E-Recourses:

1. https://www.youtube.com/watch?v=ARSxlUX1yWw

Course Outcomes	On completion of the course students should be able to CO1: Evaluate area and volume of different geometrical shapes. CO2: Finding solutions to permutations and combinatorial problems CO3: Evaluate various real-life situations by resorting to Analysis of key issues and factors. CO4: Analyse direction problems in real life situations CO5: Perform mathematical operations

Mapping of COs with POs

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	2	1	2	2	3
CO2	2	1	2	2	2
CO3	3	2	2	3	1
CO4	2	3	2	3	3
CO5	2	1	2	3	2

Semester	II	Course Code	24MAUB1208
Course Title	MATHEMATICAL METHODS AND APPLICATIONS		
No. of. Credits	4	No. of. contact hours per week	4
New Course/ Revised Course	--	If revised, Percentage of Revision effected (Minimum 20%)	20%
Category	Core Course - Minor (B.Sc., Physics/Chemistry)		

Scope of the Course	● Basic Skill
Cognitive Levels addressed by the course	● Knowing trigonometry function. (K-1) ● Understanding the hyperbolic functions.(K-2) ● Applying the differential equations in Laplace & their inverse transforms. (K-3) ● Analysing the differential equation of first order and higher degree. (K-4) ● Evaluating the integrals using Gauss's stokes' and green's theorem. (K-5)
Course Objective	The Course aims to impart different concepts of trigonometry, differential equation, and vector calculus.

Unit	Content	No. of. Hours
I	Trigonometry: Expansion of functions $\sin n\,\theta, \cos n\theta,\ \tan n\theta$ - Series for $\sin x, \cos x, \tan x, \sin^n x$ and $\cos^n x$ - simple applications and problems.	14
II	Hyperbolic functions – simple problems – Logarithm of a Complex number – simple problems.	14
III	Differential equations of first order and higher degree (Equation solvable for $\frac{dy}{dx}$, x & y including Clairaut's form) – Second order linear equations with constant coefficients (particular integrals of functions of the type $X^m, X^m e^{ax}, e^{ax} \cos bx$ and $e^{ax} \sin bx$ only).	12
IV	Laplace transforms – Properties - Standard forms – Inverse transforms – Simple problems.	12
V	Vector Calculus: Gradient, Curl, and Divergence of vector – Gauss's, Stoke's and Green's theorems (without proof) and evaluation of integrals using these theorems.	12

References	**Text Books:**
	1. S. Narayanan & T.K. Manicavachogom Pillay, **Trigonometry**, S. Viswanathan Pvt. Ltd., Chennai, 2018.
	Unit 1: Chapter III, Sec. 1 – 3 , Sec. 4 & 5
	Unit 2: Chapter IV, Sec. 1&2 .
	2. T.K. Manicavachogom Pillay, T. Natarajan & K.S. Ganapathy, **Calculus Vol**. III, S.ViswanathanPvt. Ltd., Chennai, 2010.
	Unit 3: Chapter I, Sec. 5 & 6 .
	    Chapter II, Sec. 1 & 4 .
	 Unit 4: Chapter V, Sec. 1 – 7 .
	3. Arumugam & Isaac, **Ancillary Mathematics**, New Gamma Publishing House, Palayamkottai, 2004.
	Unit 5: Chapter 1, Sec. 1.4 & 1.5
	    Chapter 2, Sec. 2.1 -2.3 .
	Reference Books:
	1. S. Narayanan & T.K. Manicavachogom Pillay, **Ancillary Mathematics**, S. Viswanathan Pvt. Ltd., Chennai, 2002.

Course Outcomes	On completion of the course students should be able to **CO1**: evaluate series of trigonometric functions.

	CO2: determine the hyperbolic functions and Logarithm of Complex numbers.
	CO3: identify and solve different types of ODEs.
	CO4: apply Laplace and Inverse Laplace transforms to solve ODE.
	CO5: compute vector integrals using Gauss's, Stokes, and Green's theorems.

Mapping of COs with POs

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	3	1	2	3	3
CO2	3	2	2	2	1
CO3	3	3	2	2	1
CO4	3	2	3	2	1
CO5	3	2	3	2	1

Semester	II	Course Code	24MAUB1209
Course Title	MATHEMATICAL METHODS FOR COMPUTER SCIENCE		
No. of. Credits	4	No. of. contact hours per week	4
New Course/ Revised Course	Revised	If revised, Percentage of Revision effected (Minimum 20%)	50%
Category	Core Course - Minor (B.Sc., Computer Science)		
Scope of the Course	• Basic Skill		
Cognitive Levels addressed by theCourse	• Knowing the concept of measures of central tendencies (K-1) • Understanding the concepts of Measures of Dispersion (K-2) • Apply correlation and regression to problems in real life (K-4) • Analyze data distributions, interpret correlation results, functions using differentiation and integration for practical applications (K-3) • Evaluate the effectiveness and correctness of solutions in measures of central tendencies, dispersion, correlation, differentiation, and integration techniques (K-5)		
Course Objective	The Course aims to impart different concepts of measures of dispersions, central tendencies, correlation and Calculus.		
Unit	Content		No. of. Hours
I	Measures of Central Tendencies: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median and Mode.		12
II	Measures of Dispersion: Range, Mean Deviation, Quartile Deviation, Standard Deviation and Co-efficient of Variation.		12

III	Correlation: Meaning and Definition-Scatter Diagram-Pearson's Co-efficient of Correlation-Rank Correlation-Regression-Linear Regression-Simple Problems.	13
IV	Differential Calculus: Standard Formulae (Except Hyperbolic Function) - Derivative of Sum, difference - Multiplication and Division of two Functions - Differentiation of Function of a Function - Logarithmic Differentiation - Differentiation of Implicit Functions - Differentiation of Parametric Functions - Differentiation by Trigonometric Transformations Differentiation of a Function w.r.t. another Function - Second Order Derivative - Maxima and Minima of Function with one Variable	14
V	Integral Calculus: Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Indefinite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).	13

References	**Text Books:**
	1. RSN Pillai & Bhagavathi, **Statistics**, S. Chand & Company Ltd, New Delhi Revised 2013.
	    Unit 1: Chapter 9
	     Unit 2: Chapters 10, 11
	     Unit 3: Chapters 12, 13
	2. S. Narayanan, T. K. Manicavachagom Pillay, **Calaculus – Vol I,** S.Viswanathan Pvt., Ltd. 2010
	     Unit 4: Chapter II, V (Sections 1.1-1.5).
	3. S. Narayanan, T. K. Manicavachagom Pillay, **Calaculus – Vol II,** S.Viswanathan Pvt., Ltd. 2010
	      Unit 5: Chapter 1, 2 (Sections 1.1-1.3).
	
	Reference Books:
	1. S.Arumugam & A. Thangapandi Issac, **Statistics,** New Gamma publishing House, Palayamkottai. 2018
	2. S.Arumugam & A. Thangapandi Issac, **Calculus**, New Gamma publishing House, Palayamkottai.2014	

Course Outcomes	On successful completion of the course, the students will be able to CO1: Understand the basic concepts in measures of central tendency CO2: Evaluate the concepts of dispersion CO3: Know to solve the regression relations CO4: Analyze the structure the ways of finding the differential calculus CO5: Evaluate the integral calculus and solve the problems	

<u>Mapping of COs with POs</u>

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	3	1	2	3	3
CO2	3	2	2	2	1
CO3	3	3	2	2	1
CO4	3	2	3	2	1
CO5	3	2	3	2	1

Semester	II	Course Code	24MAUB1210
Course Title	**MATHEMATICS II**		
No. of. Credits	**4**	No. of. contact hours per week	**4**
New Course/ Revised Course	Revised Syllabus	If revised, Percentage of Revision effected (Minimum 20%)	20%
Category	**Core Course - Minor (B.Sc., Applied Geology)**		
Scope of the Course	• Basic Skill		
Cognitive Levels addressed by theCourse	• Knowing the concept of measures of central tendencies (K-1) • Understanding the concepts of Measures of Dispersion (K-2) • Apply correlation and regression to problems in real life (K-4) • Analyze data distributions, interpret correlation results, functions using differentiation and integration for practical applications (K-3) • Evaluate the effectiveness and correctness of solutions in measures of central tendencies, dispersion, correlation, differentiation, and integration techniques (K-5)		
Course Objective	The Course aims to impart different concepts of measures of dispersions, central tendencies, correlation and Calculus.		
Unit	Content		No. of. Hours
I	Measures of Central Tendencies: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median and Mode.		12
II	Measures of Dispersion: Range, Mean Deviation, Quartile Deviation, Standard Deviation and Co-efficient of Variation.		12
III	Correlation: Meaning and Definition-Scatter Diagram-Pearson's Co-efficient of Correlation-Rank Correlation-Regression-Linear Regression-Simple Problems.		13
IV	Differentiation: Limits of functions- Definition of derivative – Differentiation of trigonometric, inverse trigonometric and logarithmic functions-Differentiation of Implicit functionsParametric Differentiation- Successive Differentiation.		14

V	Integration: Definition of integration-Standard rules on integration-Integration by substitution-Integration of rational functions-Integration by partial fractions-Integration by parts.	13

References	**Text Books:**
	
	1. RSN Pillai & Bhagavathi, **Statistics**, S. Chand & Company Ltd, New Delhi Revised 2013.
	       Unit 1: Chapter 9
	       Unit 2: Chapters 10, 11
	       Unit 3: Chapters 12, 13
	2. P.R. Vittal, Business Mathematics, Margham Publications, Chennai 2015.
	       Unit 4: Chapter 13 (Page No. 434-502)
	       Unit 5: Chapter 13 (Page No. 535-579)

	Reference Books: 1. S.Arumugam & A. Thangapandi Issac, **Statistics,** New Gamma publishing House, Palayamkottai. 2018 2. S.Arumugam & A. Thangapandi Issac, **Calculus**, New Gamma publishing House, Palayamkottai.2014 3. R. Jayaprakasa Reddy and Y. Mallikarjuna Reddy, A Text Book of Business Mathematics, Ashish Publishing House, New Delhi, 2002.
Course Outcomes	On successful completion of the course, the students will be able to CO1: Understand the basic concepts in measures of central tendency CO2: Evaluate the concepts of dispersion CO3: Know to solve the regression relations CO4: Analyze the structure the ways of finding the differential calculus CO5: Evaluate the integral calculus and solve the problems

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	3	1	2	3	3
CO2	3	2	2	2	1
CO3	3	3	2	2	1
CO4	3	2	3	2	1
CO5	3	2	3	2	1

Semester	II	Course Code	24RMUC1103
Course Title	BUSINESS STATISTICS AND LOGIC		
No. of. Credits	4	No. of. contact hours per week	4
New Course/ Revised Course	New Course	If revised, Percentage of Revision effected	-

	(Minimum 20%)	

Category	Core Course-Minor (B.B.A)
Scope of the Course	Basic Skill
Cognitive Levels addressed by theCourse	• Knowing the concepts of measures of dispersion, central tendencies and logic concepts. (K-1) • Analyzing the different methods for data classification and interpretation (K-3) • Solving problems using permutation and combination. (K-2)
Course Objective	The Course aims to gain basic knowledge about statistical methods and mathematical logic.

Unit	Content	No. of. Hours
I	Introduction to Statistics: Meaning and Definition of Business Statistics, Scope and Importance, uses in Business and Statistics and Limitations, Collection of Data Survey and, Sampling Design, Classification and Tabulation, Diagrammatic Representation, Graphic Representation	12
II	Measures of Dispersion: Measures of Central Tendency, Measures of Dispersion, Range, Quartile Deviation, Mean Deviation, Standard Deviation and Coefficient of Variation.	13
III	Correlation and Regression: Meaning and Definition of Correlation, Regression, Significance, Types and Properties of Correlation-Merits and Demerits of using Correlation and Regression-Difference between Regression and Correlation.	13
IV	Permutation and Combinations: Introduction – Factorial Notation – Two Basic Counting Principle – Permutation - Permutations of things not all different – Combination.	13
V	Mathematical Logic: Negation, Conjunction, Disjunction, Statement Formulas and Truth Tables, Statement Formulas and Truth Tables, Conditional and Biconditional, Well-Formed Formulas, and Tautologies.	13

References	**Text Books:**
	1. Pillai R.S.N and Bagavathi, **Statistics Theory and Practices**, S. Chand and company ltd, New Delhi .2009.
	    Unit 1: Chapters 1- 7
	    Unit 2: Chapters 9 - 11
	    Unit 3: Chapters 12, 13
	2. J.P. Singh, **Business Mathematics**, Ane Books Pvt. Ltd, New Delhi. 2014.
	    Unit 4: Chapter 1, Sec: 1.1 – 1.10
	3. Tremblay J. P. and Manohar R, **Discrete mathematical structures with**

	applications to computer science. McGraw-Hill, Inc, 1975. Unit 5: Chapter 1: Sec: 1.2 (1.2.1-1.2.4, 1.2.7, 1.2.8)
	Reference Books: 1. John Vince, **Foundation Mathematics for Computer Science**, A visual Approach Springer, 2015. 2. Gupta. S.P, **Statistical Methods**, Sultan Chand & Co. New Delhi, 2019. 3. P N Arora & S Arora, **Statistics for Management**, Sultan Chand & Co. New Delhi, 2009 4. G. V. Shenoy, Uma K. Srivastava, S. C. Sharma, **Business Statistics**, New Age Publications, 2005.
Course Outcomes	On successful completion of the course, the students will be able to CO1: To enable the students to apply the statistical techniques in a work setting. CO2: To understand and solve business problems CO3: To apply statistical techniques to data sets, and correctly interpret the results. CO4: To develop skill-set that is in demand in both the research and business environments. CO5: To apply mathematical logic in business problems.

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	3	1	2	3	3
CO2	3	2	2	2	1
CO3	3	3	2	2	1
CO4	3	2	3	2	1
CO5	3	2	3	2	1

Semester	II	Course Code	24MAUP1202
Course Title	MATHEMATICS- II		
No. of. Credits	4	No. of. contact hours per week	4
New Course/ Revised Course	Revised Course	If revised, Percentage of Revision effected (Minimum 20%)	85%
Category	Basic Sciences (B.Tech CE)		
Cognitive Levels addressed by the course	• Knowing the concept of matrix theory (K-1) • Applying various methods for solving first order differential equations (K-3) • Evaluate the integrals of complex valued functions (K-5)		
Course Objective	The Course aims to gain basic knowledge about matrices, differential equations and complex functions		

Unit	Content	No. of. Hours
I	Matrices: Linear Systems of Equations; Linear Independence; Rank of a Matrix; Determinant, Inverse of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Orthogonal transformation; Diagonalization of matrices; Cayley-Hamilton Theorem.	13
II	First order ordinary differential equations: Exact, linear and Bernoulli's equations. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	13
III	Ordinary differential equations of higher orders: Second order linear differential equations with variable coefficients: Euler-Cauchy equations, solution by variation of parameters; Power series solutions: Legendre's equations and Legendre polynomials.	13
IV	Complex Variable – Differentiation: Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Mobius transformations and their properties.	13
V	Complex Variable – Integration: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine	12
References	**Text Book:** 1. Garima Singh, **Mathematics-II**, Khanna Book Publishing Co, New Delhi 2022. Unit 1: Sections 7.3-7.5, 7.7, 7.8, 8.1-8.4 Unit 2: Sections 1.4, 1.5 Unit 3: Sections 2.5, 2.6, 2.10, 5.1, 5.3, 5.4, 5.5 Unit 4: Sections 13.3 – 13.7, 17.1 – 17.3 Unit 5: Sections 14.1 – 14.4, 15.2 – 15.4, 16.1 – 16.4 **Reference Books:** 1. Reena Garg, **Advanced Engineering Mathematics**, Khanna Book Publishing Company, New Delhi 2021. 2. Erwin Kreyszig, **Advanced Engineering Mathematics**, 10th Edition, John Wiley & Sons, 2006. 3. Veerarajan T., **Engineering Mathematics for first year**, Tata McGraw-Hill, New Delhi, 2008. 4. B.S. Grewal, **Higher Engineering Mathematics**, 36th Edition, Khanna Publishers, New Delhi. 2010. 5. Ravish R Singh, **Engineering Mathematics**, MC Graw Hill, New Delhi . 2017.	

Course Outcomes	**CO1:** Understand linear systems, matrix properties, determinants, eigenvalues, and orthogonal transformations. **CO2:** Solve first-order ordinary differential equations, including exact, linear, and Bernoulli's equations. **CO3:** Solve higher-order ordinary differential equations, such as Euler-Cauchy equations and power series solutions. **CO4:** Apply complex variable differentiation and integration techniques, including Cauchy-Riemann equations and the residue theorem. **CO5:** Utilize contour integrals, Cauchy's integral formulas, series expansions, and analyse analytic functions in complex analysis.

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	1	3	2	3	3
CO2	1	3	2	3	3
CO3	2	3	2	3	3
CO4	1	3	2	3	3
CO5	2	3	2	3	3

Semester	III	Course Code	24MAUP2303
Course Title	**MATHEMATICS - III**		
No. of. Credits	**4**	No. of. contact hours per week	**4**
New Course/ Revised Course	Revised Syllabus	If revised, Percentage of Revision effected (Minimum 20%)	75%
Category	**Basic Sciences - (B.Tech CE)**		
Scope of the Course	Basic Skill		
Cognitive Levels addressed by the course	• Knowing eigenvalues of matrices and related concepts (K-1) • Solving problems using Laplace and Fourier transforms (K-2) • Finding solutions of partial differential equations (K-3) • Applying vector calculus techniques to solve real life problems (K-3)		
Course Objective	The course aims to impart fundamental concepts on matrices, vector calculus, partial differential equations.		
Unit	Content		No. of. Hours
I	Matrices: Eigen values Eigen vectors of square matrix, Cayley Hamilton's theorem and function of square matrix, Diagonalization of square matrix, Minimal Polynomial and Minimal Equation of a Matrix.		12
II	Basic concepts of vector calculus: Scalar and vector point function, differential operator, gradient, directional derivative, physical		13

	meaning of gradient, divergence, curl and Laplacian with their properties; Line Integrals, Surface Integral, Volume integral; Green's theorem, Gauss' theorem and Stoke's theorem (without proof) & its application.	
III	Fourier Series: Definition of Fourier series, Orthogonal and orthonormal functions, Fourier series with arbitrary period, in particular periodic function with period 2, Fourier series of even and odd function, Half range Fourier series.	13
IV	Partial Differential Equation: Second order PDE of mathematical physics (Heat, wave and Laplace equation, one dimensional with standard boundary conditions) Solution by separation of variable method using Fourier series.	13
V	Laplace Transforms and Applications: Introduction, Definition of the Laplace transform, Useful properties of Laplace transform (without proof): Linearity, Frist shifting theorem, Multiplication and division by t, transforms of derivatives and integrals, Laplace transform of Periodic function, Inverse Laplace transform using partial fraction and Convolution theorem (without proof), Application to solve initial and boundary value problem involving ordinary differential equations with one dependent and constant coefficient.	13
References	**Text Books:** 1. Ravish R Singh, **Engineering Mathematics**, McGraw Hill, New Delhi. 2017. Unit I: Chapter 1, Sections 1.13 -1.16 Unit 2: Chapter 8, Sections 8.1 - 8.6 Unit 3: Chapter 9, Sections 9.1 – 9.4 2. B.S. Grewal, **Higher Engineering Mathematics**, Khanna Publishers, New Delhi. 44th Edition, 2010. Unit 4: Chapter 18, Sections 18.3 – 18. 5, 18.7 Unit 5: Chapter 21, Sections 21.1 – 21.5, 21.7 – 21.10, 21.12, 21.14	
	Reference Books: 1) Kreyszing E, **Advanced Engineering Mathematics**, John Wiley & Sons, Singapore, Int. Student Ed. 1995. 2) Wiley C. R, **Advanced Engineering Mathematics**, McGraw Hill Inc., New York Ed, 1993. 3) Peter V. O'Neil, **Advanced Engineering Mathematics**, Cengage India Edition, 2012.	
Course outcomes	On completion of the course students should be able to CO1: solve problems using matrices. CO2: apply vector calculus concepts to find length, surface area and volume. CO3: compute Fourier series of functions. CO4: solve second-order partial differential equations using different methods. CO5: apply Laplace transforms to solve initial and boundary value problems.	

Mapping of COs with POs

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	1	3	2	3	3
CO2	1	3	2	3	3
CO3	2	3	2	3	3
CO4	1	3	2	3	3
CO5	2	3	2	3	3

Semester	V	Course Code	24COUC3108
Course Title	BUSINESS STATISTICS		
No. of. Credits	4	No. of. contact hours per week	4
New Course/ Revised Course	Revised Course	If revised, Percentage of Revision effected (Minimum 20%)	20%
Category	Core Course – Minor (B. Com)		
Scope of the Course	● Basic Skill		
Cognitive Levels addressed by the course	● Knowing the concept of correlation (K-1). ● Understanding the basic concepts of statistical parameters (K-2). ● Applying the growth rate & growth index to solve real life problems (K-3).		
Course Objective	The Course aims to impart the fundamental concepts of statistical techniques.		

Unit	Content	No. of. Hours
I	Statistics: Meaning, Scope, Uses and Limitations of Statistics-Collection of Data-Primary and Secondary Data Sources-Classification, Tabulation, and Interpretation.	12
II	Measures of Central Tendencies: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median and Mode.	12
III	Measures of Dispersion: Range, Mean Deviation, Quartile Deviation, Standard Deviation and Co-efficient of Variation.	14
IV	Correlation: Meaning and Definition-Scatter Diagram-Pearson's Co-efficient of Correlation-Rank Correlation-Regression-Linear Regression-Simple Problems.	13
V	Index Numbers: Method of construction-Aggregative & Relative Types-Cost of living Index- Growth Rate and Growth Index- Time Series- Definition-Applications.	13
References	**Text Book:** 1. RSN Pillai & Bhagavathi, **Statistics**, S. Chand & Company Ltd, New Delhi Revised 2013. Unit 1: Chapters 3, 4, 5, 6, 7	

	Unit 2: Chapter 9 Unit 3: Chapters 10, 11 Unit 4: Chapters 12, 13 Unit 5: Chapter 14.
	Reference Books: 1. P.R. Vittal, **Business Mathematics and Statistics**, Margham Publications, Chennai, 2015. 2. P. Navnitham, **Business Mathematics & Statistics,** Jai Publishers, Trichy, 2019.
Course Outcomes	On completion of the course students should be able to CO1: explain basic data collection statistical techniques. CO2: evaluate various types of mean, median and mode. CO3: assess Measures of Dispersion. CO4: compare correlation and regression. CO5: analyze the concepts of Index Numbers.

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	1	2	3	3	3
CO2	1	1	2	3	3
CO3	1	1	3	3	3
CO4	2	2	3	3	3
CO5	2	1	3	3	3

Semester	VII	Course Code	24REUC4103
Course Title	**ENGINEERING MATHEMATICS**		
No. of. Credits	**4**	No. of. contact hours per week	**4**
New Course/ Revised Course	New Course	If revised, Percentage of Revision effected (Minimum 20%)	--
Category	**Core Course-Major (B. Voc. RE)**		
Cognitive Levels addressed by the course	• Knowing differential and integral calculus to notions of curvature and to improper integrals.(K- 1) • Understanding the Engineering problems based on various functions. (K- 2) • To deal with functions of several variables that are essential in most branches of engineering. (K- 3)		

Unit	Content	No. of. Hours
	• To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage. (K- 4)	
Course Objective	This course aims to equip students with a solid foundation in advanced calculus concepts, preparing them for practical applications in engineering, physics, and other related fields.	
I	Differential Calculus: Standard Formulae (Except Hyperbolic Function) - Derivative of Sum, difference - Multiplication and Division of two Functions - Differentiation of Function of a Function - Logarithmic Differentiation - Differentiation of Implicit Functions - Differentiation of Parametric Functions - Differentiation by Trigonometric Transformations Differentiation of a Function w.r.t another Function - Second Order Derivative - Maxima and Minima of Function with one Variable	12
II	Tracing of curves: Tracing of curves – Folium of Descarte's – cycloid, cardioid and Lemniscate of Bernoulli	13
III	Integral Calculus: Properties of definite integral – Bernoulli's formula & reduction formulae – double and triple integrals – changing the order of integration – Jacobians and change of variables.	14
IV	Beta and Gamma functions: Beta and Gamma functions – applications of Beta and Gamma functions in evaluation of double and triple integrals, improper integrals.	12
V	Laplace Transform: Definition – Conditions for existence - Transform of elementary functions – Properties of Laplace transform – Inverse Laplace transform – Applications to differential equations.	13
References	**Text Books:** 1. T.K.Manickavasagam Pillay, T. Natarajan, **Calculus, Vol. I** S. Viswanathan Printers, Chennai. 2014. 　　　Unit I: Chapter II, V (Max-Mini problems) 2. Paulraj Joseph & G. Mahadevan, **A Text Book of Calculus**, Anuradha Publications, Chennai. 2016. 　　　Unit II: Chapter 4, Sec 4.1 – 4.4 　　　Unit III: Chapter 5, Sec 5.1 – 5.4 　　　　　　Chapter 6, Sec 6.1 – 6.9 　　　Unit IV: Chapter 7, Sec 7.1 – 7.3 3. T.K. Manicavachogom Pillay, T. Natarajan & K.S. Ganapathy, **Calculus Vol. III**, S.ViswanathanPvt. Ltd., Chennai, 2010. 　　　Unit V: Chapter V, Sec. 1 – 7

	Reference Books:
	1. S. Narayanan & T.K. Manicavachogom Pillay, **Ancillary Mathematics**, S. Viswanathan Pvt. Ltd., Chennai, 2002. 2. Arumugam S. and A. Thangapandi Isaac. **Calculus**, New Gamma Publishing House, Palayamkottai. 2012.
Course Outcomes	On successful completion of the course, the students will be able to **CO1:** define function, limit and continuity and solve problems in differential Calculus. **CO2:** perform cartesian and parametric form. **CO3:** evaluate the integrals. **CO4**: deal with beta and gamma functions. **CO5**: apply Laplace and Inverse Laplace transforms to solve ODE.

Mapping of COs with POs

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	1	3	2	3	3
CO2	1	3	2	3	3
CO3	2	3	2	3	3
CO4	1	3	2	3	3
CO5	2	3	2	3	3

Semester	I	Course Code	24REEP01D5
Course Title	**ADVANCED NUMERICAL ANALYSIS**		
No. of. Credits	4	No. of. contact hours per week	4
New Course/ Revised Course	--	If revised, Percentage of Revision effected (Minimum 20%)	30%
Category	**Core Course – Major** (M. Tech)		
Scope of the Course	• Advanced Skill		
Cognitive Levels addressed by the course	• Finding approximate roots of transcendental equations (K-1) • Compute the solutions of system of equations using various methods (K-3) • Applying numerical methods to compute approximate value of integrals (K-4) • Solving partial differential equations using various techniques (K-2).		

Course Objective	The course aims to impart advanced knowledge in numerical methods.	
Unit	Content	No. of. Hours
I	Numerical Algebra and Transcendental Equation: Finding approximate values of the roots iteration method – Bisection method – Newton Raphson method – Regula falsi method.	14
II	Solving a system of simultaneous equations; elimination method – the Gaussian elimination and Gauss - Jordan method – Iterative methods – Gauss Jacobi iteration – Gauss Seidel iteration- Relaxation method.	14
III	Numerical differentiation and integration: Numerical differentiation – derivatives using Newton's forward and backward formula –Derivatives using Striling's formula – Trapezoidal rule – Simpson's $1/3^{rd}$ rule – 3/8 rule – Weddles's rules – Errors in quadrature formula.(Some Portions are deleted)	12
IV	Numerical solution of ordinary differential equations: the Taylor series method – Picard's method Euler and modified Euler methods – Runge – Kutta methods – Milne's method – The Adams – Moulton method	12
V	Numerical solution of Partial differential equations – Introduction - Difference quotients – Geometrical representation of partial differential quotients – Classification of partial differential equations - Elliptic equations – Solutions to Laplace's equation by Liebmann's iteration process – Poission's equations and its solutions – Parabolic equations – Crank – Nicholson method - Hyperbolic equations.	12
References	**Text Books:** 1. P. Kandasamy, K. Thilagavathy & K. Gunavathi, **Numerical Methods,** S. Chand & Company Ltd. New Delhi, 2022. 　　　Unit I: Chapter 3, Sec 3.1 – 3.4 　　　Unit II: Chapter 4, Sec 4.1, 4.2, 4.7 – 4.10 　　　Unit III: Chapter 9, Sec 9.1 – 9.11, 9.13 - 9.15 2. V.N Vedamurthy & N.Ch.S.N.Iyengar, **Numerical Methods,** Vikas Publishing house, pvt. Ltd, Karnadaka. 2000. 　　　Unit IV: Chapter 11: Sections 11.4 to 11.20. 　　　Unit V: Chapter 12: Sections 12.1 to 12.9.	
	Reference Books: 1. Richard L. Burden & J. Douglas Faires, **Numerical Analysis**, 7th Ed., Thomson Brooks,USA. 2001 2. Biswa Nath Datta, **Numerical Linear Algebra**, 2nd Ed., PHI Learning P Ltd., New Delhi. 2013 3. M. K. Jain, S. R. K Iyengar & R. K. Jain, **Numerical Methods for Scientific and Engineering Computation**, 3rd Edition, Wiley Eastern Edition, New Delhi, 2003. 4. R. L. Burden & J. Douglas Faires, **Numerical Analysis**, Thompson Books, USA, 2005.	

	5. Curtis. F. Gerald, Patrick & O. Wheatley, **Applied Numerical Analysis**, 5th Edition, Pearson Education, New Delhi, 2005.
Course Outcomes	At the end of the course learner will be able to CO1: Apply mathematical concepts and principles in renewable energy technology. CO2: Perform abstract mathematical reasoning. CO3: Understand the application of Fourier transform in engineering application. CO4: Apply conformal mapping for heat flow & fluid flow problems. CO5: Develop Finite difference methods for elliptical and parabolic equations.

Mapping of COs with POs

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	1	3	2	3	3
CO2	1	3	2	3	3
CO3	2	3	2	3	3
CO4	1	3	2	3	3
CO5	2	3	2	3	3

Semester	I	Course Code	24MCAP0104
Course Title	**MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE**		
No. of. Credits	**4**	No. of. contact hours per week	**4**
New Course/ Revised Course	Revised	If revised, Percentage of Revision effected (Minimum 20%)	40%
Category	**Core Course - Minor (MCA)**		
Scope of the Course	● Basic Skill		
Cognitive Levels addressed by the course	• Understanding the concepts of mathematical logics (K-2). • Knowing set theory techniques to solve real life problems (K-1). • Compute solutions of problems using matrices and graphs (K-3).		
Course Objective	This course aims to provide students with a comprehensive understanding and proficiency in fundamental mathematical concepts and their applications.		
Unit	Content		No. of. Hours
I	Mathematical Logic: Statements –Connectives and compound statements - Well Formed Formulas – Tautology - Contradiction – Logical Equivalence – Laws of Logic Duality Principle – Logic Gates: Gates and Boolean Algebra.		13
II	Set Theory: Types of sets - Operations on sets – Venn diagram – Cardinality – Cartesian product of sets – Relation – Properties –		13

	Examples – Types of relations.(Some Portions are deleted)	
III	Functions – Binary operations – Groups: Definition and examples – Properties – Permutation.	13
IV	Matrices: Elementary transformations - Rank of Matrix – Simultaneous linear equations - Cayley Hamilton theorem – Eigen Values and Eigen Vectors -Problems	13
V	Graph as Models – Vertex degrees - Subgraph – Path - Cycle- Matrix Representation of graphs – Trees- Bridges – Spanning Trees.	12
References	**Text Books**: 1. G. Shanker Rao, **Discrete Mathematical Structures**, New Age International Publishers, 2010. Unit 1: Chapter 1: Sections 1.1 – 1.16 Chapter 6: Section 6.2 Unit II: Chapter 2: Sec 2.1 – 2.27, Chapter 3, 3.1 – 3.8 2. Arumugam & Issac, **Modern Algebra**, SCI Tech Publications, Chennai 2008. Unit III: Chapter 2, Sec 2.4, 2.5, Chapter 3: Sec 3.0 – 3.4 Unit IV: Chapter 7, Sec 7.4 – 7.8 3. John Clark, **A First Look at Graph Theory**, Allied Publisher's Ltd. Chennai. 1995 Unit V, Section 1.1 - 1.8 & 2.1 - 2.3	
	References Books: 1. David C. Lay, Steven R. Lay, and Judi J. McDonald, **Linear Algebra and Its Applications,** Pearson, London. 2015. 2. Joseph R. Shoenfield, A K Peters, **Mathematical Logic,** CRC Press, USA. 2001 3. Karel Hrbacek and Thomas Jech, Marcel Dekker**, Introduction to Set Theory**, CRC Press, USA. 1999 4. C. Liu and D. Mohapatra, **Elements of Discrete Mathematics**, McGraw Hill, New Delhi. 2008.	
Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Understand the basic concepts of mathematical logic, including statements, connectives, well-formed formulas, and logical equivalence. **CO2:** Evaluate various operations on sets, utilize Venn diagrams, and understand the cardinality and types of relations. **CO3:** Assess the properties of functions and groups, including binary operations and permutation groups. **CO4:** Solve problems using matrix theory.	

	CO5: Understand fundamental concepts of graph theory.

Mapping of COs with POs

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	3	1	2	3	3
CO2	3	2	2	2	1
CO3	3	3	2	2	1
CO4	3	2	3	2	1
CO5	3	2	3	2	1

Semester	II		Course Code	24MATP02G1
Course Title	NUMERICAL AND STATISTICAL METHODS			
No. of. Credits	3		No. of. contact hours per week	3
New Course/ Revised Course	--		If revised, Percentage of Revision effected (Minimum 20%)	--
Category	Generic Elective			
Scope of the Course	Advanced Skill			
Cognitive Levels addressed by the course	- Understanding the concept of Curve Fitting and finding the solutions of algebraic equations (K1 & K2-Remembering and understanding). - Understanding the concept of Interpolation and Integration (K2 & K4 -Remembering and Analysing). - Evaluating the measures of central tendencies and measures of dispersion (K4 & K5- Analyzing and Evaluating). - Applying correlation and regression ideas to solve many real life problems (K3- Applying). - Evaluating the probability of various problems and analysing distributions (K4 & K5 – Analysing and Evaluating)			
Course Objective	The Course aims to impart basic concepts and skills in the applications of various Numerical and Statistical Methods.			
Unit	Content			No. of. Hours
I	Curve Fitting: Methods of Least Squares- Fitting Straight Line- Fitting a Parabola – Fitting an Exponential Curve. Solution of Numerical and Transcendental Equations: The Bisection method- Method of False Position. Solution of Simultaneous Linear Algebraic Equations: Gauss Elimination Method- Gauss Jordan Method – Jacobi Method of Iteration – Gauss Seidal Method.			10

II	Interpolation: Difference Tables – Newton's Forward and Backward Interpolation Formula for Equal Intervals – Lagrange's Interpolation Formula for Unequal Intervals. Numerical Integration: Trapezoidal Rule – Simpson's $1/3^{rd}$ Rule and Simpson's $3/8^{th}$ Rule.	10
III	Frequency Distribution – Diagramatic Graphical Presentation of Frequency Distributions – Measures of Central Value – Arithmetic Mean – Median – Mode Geometric Mean – Harmonic Mean – Standard Deviation - Coefficient of Variance – Moments – Skewness – Kurtosis.	10
IV	Correlation – Scatter Diagram – Karl Pearson's Coefficient of Correlation – Correlation Coefficient for a Bivariate frequency Distribution – Rank Correlation Coefficient – Regression – Regression Lines.	9
V	Probability – Introduction – Calculation of Probability – Conditional Probability – Bayes' Theorem – Mathematical Expectation – Theoretical Distributions – Binomial Distribution – Poisson Distribution.	9

References	**Text Book:**
	1. M.K. Venkataraman, **Numerical Methods in Science and Engineering**, 2/e, National Publishing Co., Madras, 1987,
	   Unit 1 & Unit 2.
	2. Arumugam S. Issac, **Statistics**, SCI Tech Publications, Chennai, 2011,
	   Unit 3: Chapters 1,2,3,4
	   Unit 4: Chapter 6
	   Unit 5: Chapter 11, Chapter 12- Secs. 12.1-12.4, Chapter 13- Secs. 13.1,13.2.	

	Reference Books: 1. M.K. Jain, S.R.K. Iyengar, R.K. Jain, **Numerical Methods for Scientific and Engineering Computation**, Willey Eastern Limited, New Delhi, 2003. 2. S.S. Sastry, **Introductory Methods of Numerical Analysis,** 4th Edition, Prentice – Hall of India, New Delhi, 2010.	
Course Outcomes	On completion of the course students should be able to do CO1: Discuss various types of curve fitting and finding solutions to algebraic equations. CO2: Analyse interpolation and various integral method to solve many problems. CO3: Apply measures of central tendencies to real life problems. CO4: Realize the applications of correlation and regression. CO5: Outline the techniques of probability theory and distributions.	

Mapping of COs with POs

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	1	2
CO2	3	3	3	3	2
CO3	2	2	3	3	3
CO4	3	3	2	3	1
CO5	1	2	3	3	3

Semester	II	Course Code	24MATP02G2
Course Title	**OPERATIONS RESEARCH**		
No. of. Credits	**3**	No. of. contact hours per week	**3**
New Course/ Revised Course	New Course	If revised, Percentage of Revision effected (Minimum 20%)	20%
Category	**Generic Elective**		
Scope of the Course	• Advanced Skill		
Cognitive Levels addressed by the course	• Knowing the basic concepts of mathematical formulation of LPP and solving the linear programming problems using graphical method, simplex method (K1) • Understanding the concept of duality in Linear Programming, General Primal-Dual pair, formulating a dual problem and dual simplex method. (K2) • Applying the North-West Corner rule and Vogel's approximation method to find an initial basic feasible solution. (K4) • Evaluating the processing 'n' jobs through two machines, processing 'n' jobs through k machines and processing 2 jobs through k machines. (K5) • Analyzing the two-person zero-sum games, the MAXIMIN-MINIMAX principle, graphical solution of $2 \times n$ and $m \times 2$ games and dominance property. (K4)		
Course Objective	The Course aims to impart the basic concepts and applications of linear programming.		

Unit	Content	No. of. Hours
I	Solving Linear Programming Problems: Graphical Solution Method –Insights into the simplex method	10
II	Writing of Dual Linear Programming Problem: General Primal - Dual Pair –Formulating a Dual Problem - Duality and Simplex Method - Dual Simplex Method.	10
III	Transportation Problem (TP): General structure of TP – Methods for Finding Initial Basic Feasible Solution – Optimality Test - MODI Method - Unbalanced Transportation Problems. Modern Formulation of an Assignment Problems (AP): Methods of solving an AP – Hungarian Method	10
IV	Operations Scheduling: Problem of Sequencing – Basic Terminology and Assumptions – Gantt Chart – Criteria and Objective for Scheduling – Methods of Scheduling – Single Processor Scheduling – Flow shop scheduling – Processing of Two jobs through 'm' machines	9
V	Decision Theory – Decision making under conflict (Competitive Game) – Two-Person Zero-Sum Games – Solution of Two Person Zero Sum Game – Arithmetic method for $n \times n$ game -	9

	Dominance Property.	

References	**Text Book:**
	1. Kanti Swarup, P. K. Gupta & Man Mohan, **Operations Research**, Eighteenth Edition, Sultan Chand & Sons, New Delhi, 2020.
	        Unit 1: Chapter 3: Sections 3.1 – 3.4
	        Unit 2: Chapter 5: Sections 5.1 - 5.3, 5.5, 5.8.
	        Unit 3: Chapter 7: Sections 7.9, 7.10 - 2, 7.14, 7.15
	                Chapter 8: Sections 11.2, 11.3, 11.7.
	        Unit 4: Chapter 10: Sections 10.1 - 10.9.
	        Unit 5: Chapter 19: Sections 19.9 – 19.12.

	Reference Books: 1. P. K. Gupta & D. S. Hira, **Operations Research**, S. Chand & Company Ltd., New Delhi, 2013. 2. J. K. Sharma, **Operations Research theory and its applications**, 2nd Edition, Macmillan, New Delhi, 2006. 3. R. Panneerselvam, **Operations Research**, Prentice Hall of India Pvt. Ltd., New Delhi, 2002.

Course Outcomes	On completion of the course students should be able to CO1: formulate a linear programming problem and solve them graphically and simplex method. CO2: explain the concepts of duality programming. CO3: analyze the different aspects of transportation problems and also assignment problems. CO4: develop, organize, evaluate short, long-term processes, and solve problems. CO5: utilize the acquired knowledge of basics in game theory.

Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	3	1	1	2	3
CO2	3	2	3	1	3
CO3	3	2	2	3	1
CO4	3	2	3	2	1
CO5	3	2	1	3	2

Semester	III	Course Code	24MCAP0315
Course Title	OPTIMIZATION TECHNIQUES		
No. of. Credits	4	No. of. contact hours per week	4
New Course/ Revised Course	--	If revised, Percentage of Revision effected (Minimum 20%)	20%
Category	Core Course - Minor (MCA)		
Scope of the Course	● Basic Skill ● Skill Development ● Employability		
Cognitive Levels addressed by theCourse	● Formulating and solving LPP (K-1) ● Finding solutions for transportations and assignments problems (K-2) ● Computing optimal solutions for problems in game theory, inventory and networking models (K-3).		
Course Objective	The Course aim to find the solutions of LPP, transportation, assignment and network problems		
Unit	Content		No. of. Hours
I	Linear Programming Problem (LPP) – Mathematical Formulation: Introduction, Linear Programming Problem- Mathematical Formulation - LLP on Graphics Solution and extension - General LPP, Canonical and Standard Forms of LPP- Simplex Method - Big M Method- Two Phase Method.		14
II	Transportation & Assignment Problems: LP formulation, Existence and Solution of TP- Finding IBFS of TP by NWC, Matrix Minima and VAM- Optimal Solution of TP (MODI - Method)- Mathematical Formulation of AP- Solution Methods of AP		13
III	Games and Strategies: Introduction, Two-Person Zero-Sum Games- Some Basic Terms, MaxMin - MiniMax Principle- Games without Saddle Points – Mixed Strategies-- Graphic Solution of 2xn and mx2Games- Dominance Property		13
IV	Replacement & Inventory Problems: Replacement of Equipment/Asset that Deteriorates Gradually- Replacement of Equipment/Asset that Fail Suddenly- Deterministic Inventory Problems with no shortages- Deterministic Inventory Problems with Shortages		12
V	Network Scheduling by CPM & PERT: Network: Basic Components, Logical Sequencing & Rules of Network Construction- CPM Analysis- PERT Analysis- Distinction between PERT & CPM.		12

	Text Books:
	3. Kanti Swarup, P.K. Gupta & Man Mohan, **Operations Research,** S. Sultan Chand & Sons, New Delhi, 2020.
	Unit 1: Chapter 2, Sec: 2.1- 2.3, Chapter 3, Sec. 3.2, 3.5, Chapter 4, Sec: 4.2 – 4.7,
	Unit 2: Chapter 10, Sec:10.3, 10.9, 10.13 Chapter 11, Sec:11.2, 11.3
	Unit 3: Chapter 17, Sec: 17.1 – 17.7
References	Unit 4: Chapter 18, Sec: 18.1 – 18.3 Chapter 19, Sec: 19.10, 19.11
	Unit 5: Chapter 25, Sec: 25.1 -25.4, 25.6 – 25.8
	References Books:
	1. Hillier and Lieberman, **Introduction to Operations Research,** 10th Edition, McGraw-Hill Education, New Delhi. 2014.
	2. Hamdy A. Taha, **Operations Research: An Introduction**, Pearson Education, New Delhi. 9th Edition, 2011.
	3. A. Ravindran, K.M. Ragsdell, and G.V. Reklaitis, **Operations Research: Principles and Practice**, 2nd Edition, Wiley,USA. 2006.
	4. Wayne L. Winston, **Operations Research: Applications and Algorithms**, 4th Edition, Cengage Learning, Coimbatore. 2003
Course Outcomes	On completion of the course, students will be able to CO1: Able to formulate and solve the LPP in their real life
	CO2: Able to find the shortest path to get minimum transportation cost and optimum job assignment problems
	CO3: Able to identify best strategic game models and its characteristics.
	CO4: Handle inventory theory gives economic orders of quantity in stock of production or sales problems.
	CO5: Identify critical time and best path of a project to complete in minimum time, using PERT & CPM

Mapping of COs with POs

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	3	1	1	2	3
CO2	3	2	3	1	3
CO3	3	2	2	3	1
CO4	3	2	3	2	1
CO5	3	2	1	3	2