THASSIM BEEVI ABDUL KADER COLLEGE FOR WOMEN

A Minority Institution Sponsored by Seethakathi Trust, Chennai.
Recognized by DBT under Star College Scheme, Ministry of Science and Technology, Govt of India.
An Autonomous Institution Affiliated to Alagappa University, Karaikudi.
Accredited by NAAC with "A" Grade [CGPA: 3.16] & ISO 9001:2015 Certified Institution.
Recognized by UGC under 2(f) & 12 (B).
Kilakarai – 623517, Ramanathapuram District

DEPARTMENT OF MATHEMATICS

XXI ACADEMIC COUNCIL

30.05.2025

ANNEXURE - W

Index

Department of Mathematics

(For Students admitted from 2025-26)

Vision:

Providing an environment where students can learn, research and transform their mathematical skill to achieve high standards of excellence in generating and propagating knowledge in Mathematics.

Mission:

- To develop analytical skills and logical acumen for problem solving
- To provide excellent knowledge of Mathematical Science for suitable career and groom them for National recognition
- To provide students with a wide spectrum of valuable courses with rigorous training that enables them to pursue their future

Programme Educational Objectives:

PEO1: To create and strengthen women leaders through disciplinary knowledge, professional skills and ethical sensitivity

PEO2: To transform students as successful entrepreneurs to face the modern challenges

PEO3: To nurture the students to invent, innovate and create solutions for current moral, ecological and economic issues

Programme Outcomes:

PO 1: Disciplinary Knowledge: Acquiring knowledge of different dimensions in the related areas of study and identifying the assumptions that frame thinking and actions

PO 2: Effective Communication: Ability to share thoughts, Ideas and applied skills of communications in its various perspectives

PO 3: Research Skill and Critical Thinking: Ability to plan, execute and report the results of an experiment and to draw conclusions from evidences and the capability to apply analytical thought by following scientific approach to knowledge development

PO 4: Moral Ethical Awareness / Reasoning: Ability to embrace moral / ethical values in conducting one's life, about an ethical issues from multiple perspectives, and use ethical practices in all works and appreciating environmental and sustainability issues; and adopting unbiased and truthful actions in all aspects of work

PO 5: Information / Digital Literacy: Capability to use ICT in case of need and the ability to access, evaluate and use the relevant information

PO 6: Problem Solving: Ability to apply their competence to solve non-familiar everyday problems in real life situations

PO 7: Self – directed and Lifelong Learning: Acquire the ability to engage in independent and lifelong learning through self-paced and self-directed learning to meet out the change in life

M Sc MATHEMATICS

[Two Year Regular Programme]

(For Students Admitted from 2025-26)

Programme Specific Outcomes:

PSO 1: Acquire strong foundation knowledge which will help them to become a good academician

PSO 2: Investigate mathematical problems and solutions in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods

PSO 3: Prepare students for pursuing research or careers in mathematical sciences, industry and allied fields

PSO 4: Understand the impact of solutions in ethical, societal and environmental contexts and demonstrate the knowledge and need for sustainable development

PSO 5: Function as an individual, member or a leader in diverse teams and in Multidisciplinary settings. Become an entrepreneur by acquiring technical, communicative, problem solving and intellectual skills

PSO 6: Investigate, design and apply appropriate methods to solve problems in science, mathematics, technology and/or engineering

PSO 7: Technological advancements in computing and engage in life-long self-learning for personal development in the context of interdisciplinary nature of future endeavors

PREAMBLE

1. The core courses **Real Analysis - I** (Semester I) and **Real Analysis - II** (Semester II) are modified.
2. The DSE papers **Numerical Analysis** (Semester II) and **Optimization Techniques** (Semester III) are assigned as Integrated courses.
3. Unit VI is added in all the courses.

PROGRAMME STRUCTURE Program Code: PMX

Sem	Subject Code	Course	Subject Title	Hours/ Week	Credit	@ SD | ENT | EMP	$ REG | NAT | GLO	CIA	ESE	Total Marks
I	JMMXC11	Core I	Linear Algebra	6	5	SD EMP	NAT GLO	25	75	100
	JMMXC12	Core II	Real Analysis-I	6	5	SD	NAT GLO	25	75	100
	JMMXC13	Core III	Ordinary Differential Equations	6	5	SD EMP	NAT GLO	25	75	100
	JMMXC14	Core IV	Number Theory	6	5	SD EMP	NAT GLO	25	75	100
	JMMXE1A/ JMMXE1B	DSE I	Graph Theory / Stochastic Process	6	5	SD ENT EMP	NAT GLO	25	75	100
	JMMXX1/ JMMXX1O	Extra credit	Fuzzy Sets and Relations / * Online Course		2	SD ENT EMP	NAT GLO		100	100
		Total		**30**	**25+2**			**125**	**375+100**	**500+100**

II	JMMXC21	Core V	Algebra-I	6	5	SD	NAT GLO	25	75	100
	JMMXC22	Core VI	Real Analysis-II	6	5	SD	NAT GLO	25	75	100
	JMMXC23	Core VII	Topology	6	5	SD	NAT GLO	25	75	100
	JMMXC24	Core VIII	Partial Differential Equations	6	5	SD EMP	NAT GLO	25	75	100
	JMMXE2A/ JMMXE2BP	DSE II	o Numerical Analysis / Web Designing Lab	6	5	SD ENT EMP	NAT GLO	25	75	100
	JMMXX2P/ JMMXX2O	Extra credit	Village Placement Programme / * Online Course		2	SD ENT EMP	REG NAT		100	100
		Total		**30**	**25+2**			**125**	**375+100**	**500+100**
III	JMMXC31	Core IX	Algebra-II	6	5	SD	NAT GLO	25	75	100
	JMMXC32	Core X	Complex Analysis	6	5	SD	NAT GLO	25	75	100
	JMMXC33	Core XI	Measure and Integration	6	5	SD	NAT GLO	25	75	100
	JMMXC34	Core XII	# Mathematical Statistics	6	5	SD EMP	NAT GLO	25	75	100
	JMMXE3B/ JMMXE3AP	DSE III	o Optimization Techniques / Statistics through R Tool Lab	6	5	SD ENT EMP	NAT GLO	25	75	100
	JMESX3/ JMMXX3O	Extra credit	Employability Skills/ * Online Course		2	SD ENT EMP	REG NAT	100		100
		Total		**30**	**25+2**			**125+ 100**	**375**	**500+100**
IV	JMMXC41	Core XIII	Differential Geometry	6	5	SD	NAT GLO	25	75	100
	JMMXC42	Core XIV	Functional Analysis	6	5	SD	NAT GLO	25	75	100
	JMMXC43PW	Core XV	Project	12	5	SD ENT EMP	REG NAT GLO	100	100	200
	JMMXX4/ JMMXX4O	Extra credit	Communication Skills / * Online Course		2	SD ENT EMP	REG NAT GLO		100	100
			Library	6		SD EMP	REG NAT GLO			
		Total		**30**	**15+2**			**150**	**250+100**	**400+100**
		Grand total		**120**	**90+8**			**525+ 100**	**1375+ 300**	**1900+ 400**

* For Online certification credit alone will be assigned on submission of certificate obtained through appearing for Online Examination from EDX, Spoken Tutorial, NPTEL or Coursera.

o Integrated Course

Internship Training

DSE COURSE FOR OTHER PG PROGRAMME FOR M Sc IT

Sem	Subject Code	Course	Subject Title	Hours / Week	Credits	@ SD | ENT | EMP	$ REG | NAT | GLO	CIA	ESE	Total
II	JMITE2A	DSE II	Probability and Applied Statistics	6	5	SD ENT EMP	REG NAT GLO	25	75	100

DSE COURSE FOR OTHER PG PROGRAMME FOR MCA

Sem	Subject Code	Course	Subject Title	Hours / Week	Credits	@ SD | ENT | EMP	$ REG | NAT | GLO	CIA	ESE	Total
II	JMCAE2B	DSE I	Probability and Applied Statistics	6	5	SD ENT EMP	REG NAT GLO	25	75	100

DSE - Discipline Specific Elective

Core I – Linear Algebra

(For Students Admitted from 2025-26)

Semester: I **Hours / week : 6**
Subject Code: JMMXC11 **Credit: 5**

Course Objectives:

1. To know the fundamental notions of vector spaces viz linear dependence, basis and dimension and linear transformations on these spaces have to be studied thoroughly.
2. To learn how the subject encompasses the isomorphic theory of matrices and comprehend the key ideas involved in the study of the structure theory of linear maps.

Unit I **(18 hours)**

Vector Spaces: Vector Spaces - Subspaces - Linear Combinations and Systems of Linear Equations - Linear Dependence and Linear Independence - Bases and Dimension - Maximal Linearly Independent Subsets.

Unit II **(18 hours)**

Linear Transformations and Matrices: Linear Transformations, Null Spaces, and Ranges - The Matrix Representation of a Linear Transformation - Composition of Linear Transformations and Matrix Multiplication - Invertibility and Isomorphisms - The Change of Coordinate Matrix.

Unit III **(18 hours)**

Elementary Matrix Operations and Systems of Linear Equations: Elementary Matrix Operations and Elementary Matrices - The Rank of a Matrix and Matrix Inverses - Systems of Linear Equations Theoretical Aspects - Systems of Linear Equations Computational Aspects. **Determinants**: Determinants of Order 2 - Determinants of Order n - Properties of Determinants - Summary - Important Facts about Determinants.

Unit IV **(18 hours)**

Diagonalization: Eigenvalues and Eigenvectors - Diagonalizability – Invariant Subspaces and the Cayley-Hamilton Theorem

Unit V **(18 hours)**

Canonical Forms: The Jordan Canonical Form I - The Jordan Canonical Form II - The Minimal Polynomial.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Analyze the concept of Vector spaces, Subspaces, Bases and Dimension

CO2: Explore the concept of Linear Transformation

CO3: Compute the solution of system of linear Equations

CO4: To find the solutions of Eigen value and Eigen Vectors, Diagonalization of matrices.

CO5: To find the Jordan canonical forms of various linear transformations and thereby able to solve various problems.

Text Book:

1. Stephen H. Friedberg, Arnold J. Insel and Lawrence E. Spence, *Linear Algebra*, Fourth Edition, PHI Learning Private Limited, New Delhi, 2014.

Unit I : Chapter 1
Unit II : Chapter 2 (Sections 2.1 to 2.5)
Unit III : Chapter 3 & Chapter 4 (Sections 4.1 to 4.4)
Unit IV : Chapter 5 (Sections 5.1, 5.2 and 5.4)
Unit V : Chapter 7 (Sections 7.1 to 7.3)

Reference Books:

1. S. Kumaresan, *Linear Algebra*, Prentice-Hall of India Ltd, 2000.
2. K. Hoffman and R. Kunze, *Linear Algebra*, Second Edition, Pearson, 2015.
3. M. Artin, Algebra, Pearson, 2015.

E-Resources:

1. https://www.youtube.com/watch?v=zvRdbPMEMUI
2. https://youtu.be/JYRzEOh1mPU
3. https://mandal.ku.edu/math790/canonForms.pdf
4. https://www.youtube.com/watch?v=uJNQPgYjlQc

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	3	9	9	**45**
CO2	3	9	9	3	3	3	9	**39**
CO3	3	3	3	3	3	1	9	**25**
CO4	3	3	9	3	3	3	9	**33**
CO5	3	1	3	1	3	1	9	**21**
Total	**21**	**19**	**33**	**13**	**15**	**17**	**45**	**163**

Low-1 Medium-3 High-9

Core II – Real Analysis – I

(For Students Admitted from 2025-26)

Semester: I **Hours / week: 6**
Subject Code: JMMXC12 **Credit: 5**

Course Objectives:

1. To deal with the definition of the Riemann integral which depends very explicitly on the order structure of the real line
2. To enable students to learn basic concepts about functions of bounded variation, grasp basic concepts about the total variation, learn about Riemann - Stieltjes integrals, sequences and series of functions

Unit I **(18 hours)**

Functions of Bounded Variation and Rectifiable Curves: Introduction - Properties of monotonic functions - Functions of bounded variation - Total variation - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of two increasing functions - Continuous functions of bounded variation.

Unit II **(18 hours)**

The Riemann-Stieltjes Integral: Introduction - Notation - The definition of the Riemann-Stieltjes integral - Linear properties - Integration by parts - Change of variable in a Riemann-Stieltjes integral - Reduction to a Riemann integral – Step functions as integrators – Reduction of a Riemann-Stieltjes integral to a finite sum - Euler's summation formula - Monotonically increasing integrators. Upper and lower integrals - Additive and linearity properties of upper and lower integrals - Riemann's condition - Comparison theorems.

Unit III **(18 hours)**

The Riemann-Stieltjes Integral: Integrators of bounded variation - Sufficient conditions for existence of Riemann-Stieltjes integrals - Necessary conditions for existence of Riemann-Stieltjes integrals - Mean value theorems for Riemann-Stieltjes integrals – The integrals as a function of the interval – Second fundamental theorem of integral calculus - Change of variable in a Riemann integral - Second Mean-Value Theorem for Riemann integrals - Riemann-Stieltjes integrals depending on a parameter - Differentiation under the integral sign – Interchanging the order of integration – Lebesgue's criterion for existence of Riemann integrals.

Unit-IV **(18 hours)**

Infinite Series and Infinite Products: Introduction – Convergent and divergent sequences of complex numbers – Limit superior and Limit inferior of a real valued sequence - Infinite series – Alternating series – Absolute and conditional convergence - The geometric series – The ratio test and the root test - Dirichlet's test and Abel's test.

Unit V **(18 hours)**

Infinite Series and Infinite Products: Rearrangements of series - Riemann's theorem on conditionally convergent series – subseries - Double sequences - Double series - Rearrangement theorem for double series - A sufficient condition for equality of iterated series - Multiplication of series – Cesaro summability - Infinite products - Euler's product for the Riemann zeta function.

Unit-VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand fundamental concepts of functions of bounded variation, Riemann -Stieltjes integrals, infinite series and infinite products.

CO2: Demonstrate the ability to compute Riemann - Stieltjes integrals, apply summation formulas and use limit theorems in infinite series.

CO3: Analyze the convergence and divergence of sequences and series using tests such as Ratio test, Root test, Dirichlet's test and Abel's test.

CO4: Evaluate various integration techniques, summability methods and conditions for uniform convergence functions.

CO 5: Develop new mathematical arguments and problem – solving strategies handling complex real analysis problems including series rearrangement and differentiation under the integral sign.

Text Book:

1. Tom M. Apostol, Mathematical Analysis (Second Edition) (1981), Addison – Wesley Publishing Company Inc. New York

Unit I : Chapter 6 (Sections 6.1 - 6.8)
Unit II : Chapter 7 (Sections 7.1 - 7.14)
Unit III : Chapter 7 (Sections 7.15 - 7.26)
Unit IV : Chapter 8 (Sections 8.1 - 8.3, 8.5, 8.7, 8.8, 8.11, 8.14, 8.15)
Unit V : Chapter 8 (Sections 8.17 - 8.27)

Reference Books:

1.S.C. Malik, *Principles of Real Analysis*, New Age International Private Limited, Second Edition, 2018.

2.Walter Rudin, *Principles of Mathematical Analysis*, Third Edition, Mcgraw Hill, 2017.

3.V.Ganapathy Iyer, *Mathematical Analysis*, Tata McGraw Hill1985.

E-Resources:

1. https://www.google.co.in/books/edition/Introduction_to_Analysis/lZm8AQAAQBAJ?hl=en&gbpv=1&dq=Analysis+Mathematics&printsec=frontcover
2. https://www.youtube.com/watch?v=kOa6qhgYrI0
3. https://www.youtube.com/watch?v=fh1AQkR_4yU
4. https://www.youtube.com/watch?v=LUKfrjpDHTk

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	1	1	3	3	9	**23**
CO2	3	3	1	1	1	3	9	**21**
CO3	9	9	3	1	3	9	9	**43**
CO4	9	9	3	1	1	3	9	**35**
CO5	9	9	9	1	9	9	9	**55**
Total	**33**	**33**	**17**	**5**	**17**	**27**	**45**	**177**

Low-1 Medium-3 High-9

Core III - Ordinary Differential Equations

(For Students Admitted from 2025-26)

Semester: I **Hours / week: 6**
Subject Code: JMMXC13 **Credit: 5**

Course Objectives:

1. To analyze the solutions of different types of Ordinary Differential Equations
2. To promote critical thinking and problem solving abilities in Ordinary Differential Equations

Unit I **(18 hours)**

Second Order Linear Equations: The General Solution of the Homogeneous Equation - The Use of a known Solution to find Another - The Method of Variation of Parameters. **Power Series Solutions and Special Functions:** Inroduction - A Review of Power Series - Series Solutions of First Order Equations - Second Order Linear Equations. Ordinary Points.

Unit II **(18 hours)**

Power Series Solutions and Special Functions: Regular Singular Points - Gauss's Hypergeometric Equation - The Point at infinity. **Some Special functions of Mathematical Physics:** Legendre Polynomials - Bessel functions. The Gamma Function.

Unit III **(18 hours)**

Systems of First Order Equations: Linear Systems of First - Homogeneous Linear Systems with Constant Coefficients. **The Existence and Uniqueness of Solutions:** The Method of Successive Approximations - Picard's Theorem.

Unit IV **(18 hours)**

Qualitative Properties of Solutions: Oscillations and The Strum Separation Theorem - The Sturm Comparison Theorem.

Unit V **(18 hours)**

Nonlinear Equations: Autonomous Systems. The Phase Plane and Its Phenomena- Types of Critical Points. Stability - Critical Points and Stability for Linear Systems - Stability By Liapunov's Direct Method - Simple Critical Points of Nonlinear Systems.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After completion of this course, student will be able to

CO 1: Find the solutions of differential equations with homogeneous and nonhomogeneous equations

CO 2: Classify the regular singular point, Euler equation and Bessel equation

CO 3: Solve the Initial value problems for first order ordinary differential equation using the method of solutions of successive approximation and Picard's theorem

CO 4: Evaluate the qualitative properties of solutions using Strum comparison theorem

CO 5: Solve the non-linear equations, critical point and stability for linear systems using Liapunov's direct method

Text Books:

1. G.F. Simmons, *Differential Equations with Applications and Historical Notes,* 3rd Edition McGraw Hill, 2017.

Unit I : Chapter 3 (Sections 15, 16 & 19) and Chapter 5 (Sections 26 to 28)

Unit II : Chapter 5 (Sections 29 to 32) and Chapter 8 (Sections 44 to 46)

Unit III : Chapter 10 (Sections 55 & 56) and Chapter 13 (Sections 69 & 70)

Unit IV : Chapter 4 (Sections 24 to 25)

Unit V : Chapter 11 (Sections 58 to 62)

Reference Books:

1. Earl A. Coddington, *An Introduction to Ordinary Differential Equations,* Prentice Hall of India Private Limited, 2001.
2. Ian Sneddon, *Elements of Partial Differential Equations,* McGraw Hill International Edition, 2006.

E-Resources:

1. https://www.youtube.com/watch?v=AWVCi5kgovM
2. https://www.youtube.com/watch?v=oFQXNfHNdqU
3. https://www.youtube.com/watch?v=oKlI_TIFNPU
4. https://www.youtube.com/watch?v=BVKyaEu1FWk

5.https://www.youtube.com/watch?v=XUmw9KZwg4M

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	1	3	9	9	**31**
CO2	3	3	3	1	3	3	3	**19**
CO3	9	9	3	3	9	9	9	**51**
CO4	9	9	3	3	9	9	9	**51**
CO5	9	9	3	3	9	9	9	**51**
Total	**33**	**33**	**15**	**11**	**33**	**39**	**39**	**203**

Low-1 Medium-3 High-9

Core IV - Number Theory

(For Students Admitted from 2025-26)

Semester: I **Hours / week: 6**
Subject Code: JMMXC14 **Credit: 5**

Course Objectives:

1. To know basic concepts such as divisibility, primes, congruences and its solutions
2. To analyses the solutions of Quadratic Residues, Mobius inversion Formula and the Diophantine equations and their solutions have to be introduced.

Unit I **(18 hours)**

Divisibility: Introduction - Divisibility - Primes - The Binomial Theorem.

Unit II **(18 hours)**

Congruences: Congruences - Solutions of Congruences - The Chinese Remainder Theorem - Prime Power Moduli - Primitive Roots and Power Residues - Number Theory from an Algebraic View Point - Groups, Rings and Fields.

Unit III **(18 hours)**

Quadratic Reciprocity and Quadratic Forms: Quadratic Residues - Quadratic Reciprocity - The Jacobi Symbol – Binary Quadratic forms - Equivalence and Reduction of Binary Quadratic Forms - Sum of Two Squares.

Unit IV **(18 hours)**

Some Functions of Number Theory: Greatest Integer Function - Arithmetic Functions - The Mobius Inversion Formula - Recurrence Functions - Combinatorial Number Theory.

Unit V **(18 hours)**

Some Diophantine Equations: The Equation ax + by = c - Simultaneous Linear Equations - Pythagorean Triangles - Assorted Examples.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Solve congruences as application of Chinese remainder Theorem

CO2: Know the concepts of Primitive roots and Power Residue

CO3: Evaluate the Quadratic residue and Jacobi symbol and work on sum of two squares problems.

CO4: Know the fundamentals of greatest integer function and recurrence functions

CO5: Solve simple simultaneous linear Diophantine equations.

Text book:

1. Ivan Niven, Herbert S, Zuckerman and Hugh L, Montgomery, *An Introduction to the Theoryof Numbers,* Fifth edition., John Wiley & Sons Inc, 2008.

Unit I : Chapter 1
Unit II : Chapter 2 (Sections 2.1 to 2.3, 2.6, 2.8, 2.10 and 2.11)
Unit III : Chapter 3 (Sections 3.1 to 3.6)
Unit IV : Chapter 4 (Sections 4.1 to 4.5)
Unit V : Chapter 5 (Sections 5.1 to 5.4)

Reference Books:

1. Gareth A. Jones and J. Mary Jones, *Elementary Number Theory*, Springer Verlag,Indian Reprint, 2005.
2. David M. Burton, *Elementary Number Theory*, 6th edition, McGraw Hill, 2007.
3. George Andrews, *Theory of Numbers*, Saunders, 1971.
4. William, *Fundamentals of Number Theory*, Leveque, Addison-Wesley Publishing Company, Phillipines, 1977

E-Resources:

1.https://en.wikipedia.org/wiki/Euler%27s_theorem
2.https://math.oxford.emory.edu/site/math125/legendresSymbol/
3.https://sites.millersville.edu/bikenaga/number-theory/quadratic-residues/quadratic-residues.pdf
4.https://www.cuemath.com/algebra/greatest-integer-function/
5.https://en.wikipedia.org/wiki/Diophantine_equation

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	3	9	9	**45**
CO2	3	9	9	3	3	3	9	**39**
CO3	3	3	3	3	3	1	9	**25**
CO4	3	3	9	3	3	3	9	**33**
CO5	3	1	3	1	3	1	9	**21**
Total	**21**	**19**	**33**	**13**	**15**	**17**	**45**	**163**

Low-1 Medium-3 High-9

DSE I - Graph Theory

(For Students Admitted from 2025-26)

Semester: I **Hours / week: 6**
Subject Code: JMMXE1A **Credit: 5**

Course Objectives:

1. To know the basic concept of Graph Theory and have an idea of matching in graphs and study the applications of matching in day to day life problems
2. To apply theoretical knowledge acquired to solve realistic problems in real life

Unit I **(18 hours)**

Graphs and Subgraphs: Graphs and Simple Graphs – Graph Isomorphism – The Incidence and Adjacency Matrices – Subgraphs – Vertex Degrees – Paths and Connection - Cycles. **Trees:** Trees - Cut Edges and Bonds – Cut Vertices – Cayley's Formula.

Unit II **(18 hours)**

Connectivity: Connectivity – Blocks. **Euler Tours and Hamilton Cycles:** Euler Tours – Hamilton Cycles.

Unit III **(18 hours)**

Matchings: Matchings – Matchings and Coverings in Bipartite Graphs – Perfect Matchings. **Edge Colourings:** Edge Chromatic Number – Vizing's Theorem.

Unit IV **(18 hours)**

Independent Sets and Cliques: Independent Sets - Ramsey's Theorem. **Vertex Colourings:** Chromatic Number – Brooks' Theorem – Hajos' Conjecture – Chromatic Polynomials – Girth and Chromatic Number.

Unit V **(18 hours)**

Planar Graphs: Plane and Planar Graphs – Dual Graphs – Euler's Formula - Bridges – Kuratowski's Theorem (Proof Omitted) – The Five Colour Theorem and The Four Colour Conjecture – Nonhamiltonian Planar Graphs. **Directed Graphs:** Directed Graphs – Directed Paths – Directed Cycle.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: To understand the basic concept of Graph Theory
CO 2: Apply the concept of path to Euler tour, connectivity, Blocks and Hamilton cycles in the real life.
CO 3: To know the concepts of Matching and perfect matching
CO 4: Prove the theorems in Independent Set
CO 5: Apply the concept of Planner Graphs in real life situations.

Text Book:

1. J.A. Bondy and U.S.R. Murthy, *Graph Theory with applications*, The Macmillan PressLtd, Fifth Printing, 1982.

Unit I : Chapter 1 (Sections 1.1 - 1.7) & Chapter 2 (Sections 2.1 - 2.4)
Unit II : Chapter 3 (Sections 3.1 - 3.2) & Chapter 4 (Sections 4.1 - 4.2)
Unit III : Chapter 5 (Sections 5.1 - 5.3) & Chapter 6 (Sections 6.1 - 6.2)
Unit IV : Chapter 7 (Sections 7.1 - 7.2) & Chapter 8 (Sections 8.1 - 8.5)
Unit V : Chapter 9 (Sections 9.1 - 9.7) & Chapter 10 (Sections 10.1 - 10.3)

Reference Books:

1. R R. Balakrishnan, K. Ranganathan, *A Textbook of Graph Theory*, Springer International
2. Edition, First Indian Reprint2008.
3. John Clark & Derek Allan Holtan, *A First Look at Graph theory*, Allied Publishers Limited,1995.
4. S.A.Choudum, *A First Course in Graph Theory*, Macmillan India Limited, First Edition, 1987.

E-Resources:

1. https://www.csa.iisc.ac.in/~arpita/DS14/Turan.pdf
2. https://www.youtube.com/watch?v=T BYNkgvnU2s
3. https://nptel.ac.in/courses/111/106/111106050/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	9	9	**63**
CO2	9	3	9	3	9	3	3	**39**
CO3	3	3	9	9	9	3	3	**39**
CO4	3	3	3	3	9	3	3	**27**
CO5	9	9	9	9	9	9	9	**63**
Total	**33**	**27**	**39**	**33**	**45**	**27**	**27**	**231**

Low-1 **Medium-3** **High-9**

DSE I - Stochastic Process

(For Students Admitted from 2025-26)

Semester: I **Hours / week: 6**
Subject Code: JMMXE1B **Credit: 5**

Course Objectives:

1. To understand the stochastic models for many real life probabilistic situations
2. To know about the models like birth- death to reorient their knowledge to stochastic analysis

Unit I **(18 hours)**

Random Variables and Stochastic Processes: Generating Functions - Laplace Transform - Laplace Transform of a Probability Distribution or of a Random Variable.

Unit II **(18 hours)**

Random Variables and Stochastic Processes: An Introduction - Specification of Stochastic Process. **Markov Chains:** Definition and Examples - Higher Transition Probabilities.

Unit III **(18 hours)**

Markov Chains: Classification of States and Chains - Determination of Higher Transition Probabilities - Stability of a Markov System - Markov Chain with Denumerable Number of States.

Unit IV **(18 hours)**

Markov Process with Discrete State Space: Poisson Process and Related Distributions - Generalisation of Poisson Process - Birth and Death Process.

Unit V **(18 hours)**

Applications in Stochastic Models: Queueing Systems and Models - Birth and Death Process in Queueing Theory - Reliability Models.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Apply the concepts of Laplace transform of a probability distribution
CO 2: Find the solution of the problems in Markov Chains using stochastic process
CO 3: Discover the most important classification of States and Chains
CO 4: Examine the applications of Poisson process and Related Distributions
CO 5: Analyze the concept of birth and death process in queuing theory

Text Book:

1. J. Medhi, *Stochastic Processes*, New Age International Private Limited, Publishers, Third Edition, 2011.

Unit I : Chapter 1 (Pg. No: 1 - 42)
Unit II : Chapter 1 (Pg. No: 49 – 50) & Chapter 2 (Pg. No: 62 - 73)

Unit III : Chapter 2 (Pg. No: 78 - 99 & 101 - 102)
Unit IV : Chapter 3 (Pg. No: 150 - 170)
Unit V : Chapter 10 (Pg. No: 388 - 395 & 402 - 415)

Reference Books:

1. Arnold O.Allen, *Probability, Statistics, and Queueing Theory with Computer Science Applications*, Elsevier, a division of Reed Elsevier India Private Limited,2005.
2. U.N.Bhat, *Elements of Applied Stochastic Process*, John wiley and Sons Limited, Second Edition, 1984.
3. D.R.Cox and H.D.Miller, *Theory of stochastic process*, Methuen, London, 1965.

E-Resources:

1.https://www.google.co.in/books/edition/Probability_Statistics
2.https://www.google.co.in/books/edition/Theory_of_Stochastic_Processes
3.https://youtu.be/n2y7n6jw5d0
4.https://youtu.be/54yLcoHIAEA

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	9	3	3	3	9	3	**33**
CO2	3	3	3	3	3	9	3	**27**
CO3	3	3	1	3	1	1	3	**15**
CO4	9	9	9	3	9	3	9	**51**
CO5	9	9	9	3	9	9	9	**57**
Total	**27**	**33**	**25**	**15**	**25**	**31**	**27**	**183**

Low-1 Medium-3 High-9

Extra Credit - Fuzzy Sets and Relations

(For Students Admitted from 2025-26)

Semester: I
Subject Code: JMMXX1 **Credit: 2**

Course Objectives:
1. To introduce the concept of fuzzy set theory and their basic operations
2. To understand the concepts and properties of fuzzy relations and fuzzy graphs

Unit I
Crisp Sets and Fuzzy Sets: Introduction - Crisp Sets: An overview - The Notion of Fuzzy Sets.

Unit II
Crisp Sets and Fuzzy Sets: Basic Concepts of Fuzzy Sets - Classical Logic: An overview - Fuzzy Logic.

Unit III
Operations on Fuzzy Sets: General Discussion - Fuzzy Complement - Fuzzy Union.

Unit IV

Operations on Fuzzy Sets: Fuzzy Intersection - Combinations of Operations - General Aggregation Operations.

Unit V

Fuzzy Relations: Crisp and Fuzzy Relations - Binary Relations - Binary Relations on a Single Set.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Categorize the Crisp sets and fuzzy sets
CO 2: Apply the Basic Concepts of fuzzy logic in fuzzy sets
CO 3: Analyze the application of fuzzy logic to real time systems
CO 4: Make use of operations on fuzzy sets
CO 5: Compute fuzzy relations on a single set

Text Book:

1. George J.Klir and Tina A. Folger, *Fuzzy Sets, Uncertainty and Information,* Asoke K.Ghosh Prentice Hall of India Private Limited, 2006.

Unit I : Chapter 1 (1.1 - 1.3)
Unit II : Chapter 1 (1.4 - 1.6)
Unit III : Chapter 2 (2.1 - 2.3)
Unit IV : Chapter 2 (2.4 - 2.6)
Unit V : Chapter 3 (3.1 - 3.3)

Reference Books:

1. George J. Klir and Boyuan, *Fuzzy Sets and Fuzzy Logic Theory and Applications,* Prentice Hall of India Private Limited,2005.
2. Timothy J.Ross, *Fuzzy logic with Engineering Applications,* Wiley India Pvt. Ltd., Second Edition, 2008.
3. James J.Buckley Esfandiar Eslami, *An Introduction to Fuzzy Logic and Fuzzy Sets,* Springer (India) Private Limited, Second Indian Reprint 2009.

E Resources:

1.https://youtu.be/SlBy3bsdE5Q
2.https://youtu.be/a2i-lHS-c_I
3.https://youtu.be/tC3K8RLRIZc0

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	9	9	3	3	3	**33**
CO2	3	3	9	9	3	3	3	**33**
CO3	9	9	9	9	9	9	3	**57**
CO4	3	3	9	3	3	3	3	**27**
CO5	3	3	9	3	3	3	3	**27**
Total	**21**	**21**	**45**	**33**	**21**	**21**	**15**	**177**

Low-1 Medium-3 High-9

Core V - Algebra I

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 6**
Subject Code: JMMXC21 **Credit: 5**

Course Objectives:

1. To learn the fundamental abstract algebraic structures namely groups and rings, the need for the abstract concepts are illustrated with numerous examples.
2. To study in detail the basic concepts of Rings such as Ring homomorphisms and Euclidean domains.

Unit I **(18 hours)**

Groups and Subgroups: Binary Operations – Isomorphic Binary Structures - Groups - Subgroups – Cyclic Groups.

Unit II **(18 hours)**

Permutations, Cosets and Direct Products: Groups of Permutations - Groups of Cosets - Direct Products - Finitely Generated Abelian groups. **Homomorphisms and Factor Groups:** Homomorphisms - Factor Groups.

Unit III **(18 hours)**

Homomorphisms and Factor Groups: Group Action on a Set - Applications of G-Sets to Counting

Unit IV **(18 hours)**

Rings and Fields: Rings and Fields - Integral Domains – Fermat's and Euler's Theorem - The Field of Quotients of an Integral Domain.

Unit V **(18 hours)**

Rings and Fields: Rings of Polynomials - Factorization of Polynomials over a Field.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.
(To be discussed during the Skill Development Course Hour)

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Analyze the nature of Sylow's theorem
CO 2: Explain the concept of direct product and finite abelian groups
CO 3: Infer the concept of Ring Theory
CO 4: Justify the theoretical aspects of vector space
CO 5: Recapitulate the concepts of roots of polynomials

Text Book:
1. John B. Fraleigh, *A First course in Abstract Algebra*, Pearson, 7th Edition, 2013.

Unit I : Chapter I (Pages 20 - 68)
Unit II : Chapter II (Pages 75 - 113) & Chapter III (Pages 125 - 143)
Unit III : Chapter III (Pages 154 - 166)
Unit IV : Chapter IV (Pages 167 - 197)
Unit V : Chapter IV (Pages 198 - 220)

Reference Books:
1. Gallian, *Contemporary Abstract Algebra*, Cenpage Learning India Pvt Ltd., Ninth Edition, 2019.
2. Mark R. Sepanski, *Algebra*, AMS Indian Edition, 2012.
3. David S. Dummit and Richard M. Foote, *Abstract Algebra*, Wiley , Third Edition, 2011.

E-Resources:
1. https://www.youtube.com/watch?v=vTWC6LKBBA0
2. https://www.youtube.com/watch?v=CJhFmWBJ5z0
3. https://www.youtube.com/watch?v=9pqhfDyzbhw

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	3	3	3	9	**45**
CO2	9	9	9	3	9	3	9	**51**
CO3	9	9	9	3	9	3	9	**51**
CO4	3	3	3	1	1	3	3	**17**
CO5	9	9	9	3	9	9	9	**57**
Total	**39**	**39**	**39**	**13**	**31**	**21**	**39**	**221**

Low-1 Medium-3 High-9

Core VI- Real Analysis – II

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 6**
Subject Code: JMMXC22 **Credit: 5**

Course Objectives:
1. To provide a strong foundation in advanced concepts of real analysis
2. To equip students with analytical skills and theoretical knowledge essential for understanding and applying advanced real analysis concepts.

Unit I **(18 hours)**

Sequences of Functions: Pointwise convergence of sequences of functions - Examples of sequences of real-valued functions – Definition of uniform convergence - Uniform convergence and continuity – The Cauchy condition for uniform convergence - Uniform convergence of infinite series of functions – Uniform convergence and Riemann-Stieltjes integration – Nonuniformly convergent sequences that can be integrated term by term - Uniform convergence and differentiation - Sufficient conditions for uniform convergence of a series - Mean convergence.

Unit II **(18 hours)**

Sequences of Functions: Power series - Multiplication of power series –The substitution theorem- Reciprocal of a power series – Real power series - The Taylor's series generated by a function - Bernstein's theorem – The binomial series - Abel's limit theorem - Tauber's theorem.

Unit III **(18 hours)**

Fourier Series and Fourier Integrals: Introduction - Orthogonal systems of functions - The theorem on best approximation - The Fourier series of a function relative to an orthonormal system - Properties of the Fourier coefficients - The Riesz-Fischer theorem - The convergence and representation problems for trigonometric series - The Riemann-Lebesgue Lemma - The Dirichlet Integrals - An integral representation for the partial sums of a Fourier series - Riemann's localization theorem - Sufficient conditions for convergence of a Fourier series at a particular point – Cesaro summability of Fourier series - Consequences of Fejer's theorem - The Weierstrass approximation theorem.

Unit IV **(18 hours)**

Multivariable Differential Calculus: Introduction - The directional derivative - Directional derivatives and continuity - The total derivative - The total derivative expressed in terms of partial derivatives – An application to complex-valued functions - The matrix of a linear function - The Jacobian matrix - The chain rule - Matrix form of the chain rule - The Mean - Value Theorem for differentiable functions - A sufficient condition for differentiability - A sufficient condition for equality of mixed partial derivatives - Taylor's formula for functions from R^n to R^1.

Unit V **(18 hours)**

Implicit Functions and Extremum Problems: Introduction - Functions with non-zero Jacobian determinant – The inverse function theorem - The Implicit function theorem - Extrema of real valued functions of one variable - Extrema of real-valued functions of several variables - Extremum problems with side conditions.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Understand fundamental concepts of sequences of functions, power series, Fourier series, multivariable calculus, and extremum problems.

CO 2: Apply uniform convergence tests, Fourier series expansions, Taylor's theorem, and extremum conditions to solve real analysis problems.
CO 3: Analyze the convergence behavior of function sequences, power series, Fourier series, and differentiability conditions in multiple variables.
CO 4: Evaluate the validity of mathematical theorems such as the Riesz-Fischer theorem, Weierstrass approximation theorem, and the inverse function theorem.
CO 5: Develop new approaches for solving advanced problems in function sequences, power series, Fourier analysis and extremum conditions with constraints.

Text Book:

1. Tom M. Apostol, *Mathematical Analysis* (Second Edition) (1981), Addison - Wesley Publishing Company Inc. New York

Unit I : Chapter 9 (Sections 9.1 - 9.6, 9.8 - 9.11, 9.13)
Unit II : Chapter 9 (Sections 9.14 - 9.23)
Unit III : Chapter 11 (Sections 11.1 - 11.15)
Unit IV : Chapter 12 (Sections 12.1 - 12.14)
Unit V : Chapter 13 (Sections 13.1 - 13.7)

Reference Books:

1. Walter Rudin, *Principles of Mathematical Analysis*, McGraw-Hill International Editions,Third Edition, 1976.
2. V.Ganapathy Iyer, *Mathematical Analysis*, Tata McGraw Hill, 1985.
3. S.C. Malik, *Principles of Real Analysis*, New Age International Private Limited, Second Edition, 2018.
4. Ajit Kumar and S. Kumaresan, *A Basic Course in Real Analysis*, CRC Press, Third Indian Reprint, 2015
5. Tom Apostol, Calculus II, Wilely, 2nd edition,

E-Resources:

1. http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH_REAL_ANALYSIS.PDF
2. http://www.trillia.com/dA/zakon-analysisI-a4-one.pdf
3. https://www.youtube.com/watch?v=QS-zUSu-nxA
4. https://www.youtube.com/watch?v=XzaeYnZdK5o

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	1	3	3	**19**
CO2	3	9	9	3	3	9	9	**45**
CO3	3	3	1	3	3	3	3	**19**
CO4	9	9	3	3	1	3	3	**31**
CO5	9	3	3	3	1	3	3	**25**
Total	27	27	19	15	9	21	21	**139**

Low-1 Medium-3 High-9

Core VII - Topology

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 6**
Subject Code: JMMXC23 **Credit: 5**

Course Objectives:

1. To recognize the concept of connectedness, compactness and countability of topology of real numbers
2. To visualize the construction of topology of real numbers

Unit I **(20 hours)**

Topological Spaces and Continuous Functions: Basis for a Topology - The Order Topology - The Product Topology on $X \times Y$ - The Subspace Topology - Closed Sets and Limit Points.

Unit II **(18 hours)**

Topological Spaces and Continuous Functions: The Product Topology - The Metric Topology - The Metric Topology (Continued).

Unit III **(18 hours)**

Connectedness and Compactness: Connected Spaces - Connected Subspaces of the Real Line - Components and Local Connectedness.

Unit IV **(16 hours)**

Connectedness and Compactness: Compact Spaces - Compact Subspaces of the Real Line - Limit Point Compactness - Local Compactness.

Unit V **(18 hours)**

Countability and Separation Axioms: The Countability Axioms - The Separation Axioms - Normal Spaces - The Urysohn Lemma - The Urysohn Metrization Theorem – The Tietze Extension Theorem.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Categorize the different types of topologies with examples
CO 2: Analyze the concept of continuity on product topology and metric topology
CO 3: Explain the concept of connectedness and components of the real line and able toapply in theorems
CO 4: Infer the aspects of compactness and its related theorems
CO 5: Examine the concept of Countability and separation axioms with illustrations

Text Book:

1. James R. Munkres, *Topology*, PHI Learning Pvt. Ltd, New Delhi, Second Edition, Reprint 2017.

Unit I : Chapter 2 (Sections: 12 - 17)
Unit II : Chapter 2 (Sections: 18 - 21)
Unit III : Chapter 3 (Sections: 23 - 25)
Unit IV : Chapter 3 (Sections: 26 - 29)
Unit V : Chapter 4 (Sections: 30 - 35)

Reference Books:

1. G. F. Simmons, *Introduction to Topology and Modern Analysis*, Tata McGraw-Hill Education Private Limited, Edition, 2004.
2. John L.Kelley, *General Topology*, Springer International Edition, 2nd Edition, Reprint 2008.
3. Seymour Lipschutz, *General Topology*, Schaum's Outline Series, v Mc Graw HillBook Company, 2004.

E-Resources:

1. http://epgp.inflibnet.ac.in/Home/ViewSubject?catid=25
2. https://nptel.ac.in/courses/111/106/111106054/
3. https://www.google.co.in/books/edition/Introduction_to_Topology/n97CAgAAQBAJ?hl=en&gbpv=1&dq=topology+mathematics&printsec=frontcover
4. https://www.google.co.in/books/edition/General_Topology/kgxHDgAAQBAJ?hl=en&gbpv1&dq=topology+mathematics&printsec=frontcover
5. https://www.mathematik.hu-erlin.de/~wendl/Winter2018/Topologie2/lecturenotes.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	3	9	**45**
CO2	9	3	3	1	3	1	3	**23**
CO3	9	9	9	3	3	1	9	**43**
CO4	9	9	3	3	3	1	3	**31**
CO5	9	9	9	3	3	1	1	**35**
Total	**45**	**33**	**33**	**13**	**21**	**7**	**25**	**177**

Low-1 Medium-3 High-9

Core VIII – Partial Differential Equations

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 6**
Subject Code: JMMXC24 **Credit: 5**

Course Objectives:

1. The main objective is to equip students to classify partial differential equationsand solve linear Partial Differential equations using different methods.
2. To give a detailed study of Heat equation, Wave equation and Laplace equation.

Unit I **(22 hours)**

First Order Partial Differential Equations: Curves and Surfaces - Genesis of First Order P.D.E. – Classification of Integrals - Linear Equations of the First Order - Pfaffian Differential Equations - Compatible Systems of first order P.D.E. - Charpit's Method -

Jacobi's Method.

Unit II **(14 hours)**

First Order Partial Differential Equations: Integral Surfaces through a Given Curve - Quasi-Linear Equations - Non-Linear First Order P.D.E.

Unit III **(18 hours)**

Second Order Partial Differential Equations: Genesis of Second Order P.D.E. - Classification of Second Order P.D.E. - One Dimensional Wave Equation - Vibrations of an Infinite String - Vibrations of a Semi-infinite String - Vibrations of a String of Finite Length (Method of separation of variables).

Unit IV **(18 hours)**

Partial Differential Equations: Laplace's Equation - Boundary Value Problems - Maximum and Minimum Principles - The Cauchy Problem - The Dirichlet Problem for the Upper Half Plane - The Neumann Problem for the Upper Half Plane - The Dirichlet Problem for a Circle - The Dirichlet Exterior Problem for a Circle - The Neumann Problem for a Circle - The Dirichlet Problem for a Rectangle - Harnack's Theorem.

Unit V **(18 hours)**

Partial Differential Equations: Heat Conduction Problem - Heat Conduction - Infinite Rod Case – Heat Conduction - Finite Rod Case - Duhamel's Principle - Wave Equation – Heat Conduction Equation.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After completion of this course, student will be able to

CO 1: Evaluate the solutions of first order differential equation using Cauchy's, Charpit's and Jacobi's methods

CO 2: Find the solutions of Quasi-Linear Equations and Non-linear First Order P.D.E.

CO 3: Classify the second order PDE and the solution of one dimensional wave equation

CO 4: Solve the boundary value problems using Caucy's, Dirichlet's and Neumann problem

CO 5: Find the solutions of heat conduction problem in finite rod case and an infinite rod Case

Text Book:

1. T.Amarnath, *An Elementary Course in Partial Differential Equations*, 2nd edn, Narosa Publishing Company, 2010.

Unit I : Chapter 1 (Sections 1.1 - 1.8)
Unit II : Chapter 1 (Sections 1.9 - 1.11)
Unit III : Chapter 2 (Sections 2.1 - 2.3.3, 2.3.5)
Unit IV : Chapter 2 (Sections 2.4.1 - 2.4.10)
Unit V : Chapter 2 (Sections 2.5 - 2.6)

Reference Books:

1. Tyn Myint-U, Lokenath Debnath, *Linear Partial Differential equations for scientists and engineers*, 3rd edn, Birkhauser, 2007 .
2. I.N. Snedden, *Elements of Partial Differential Equations*, Dover, 2006.
3. F. Treves, *Basic Linear Partial Differential Equations*, Dover, 2006.
4. A.K. Nandakumaran and P.S. Datti, *Partial Differential Equations, Classical Theory with a Modern Touch*, Cambridge University Press, 2020.

E-Resources:

1. https://en.wikipedia.org/wiki/First-order_partial_differential_equation
2. https://mathworld.wolfram.com/WaveEquation1-Dimensional.html
3. https://en.wikipedia.org/wiki/Partial_differential_equation
4. https://en.wikipedia.org/wiki/Laplace%27s_equation
5. https://www.geeksforgeeks.org/sample-problems-on-heat-conduction/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	1	3	9	9	**31**
CO2	3	3	3	1	3	3	3	**19**
CO3	9	9	3	3	9	9	9	**51**
CO4	9	9	3	3	9	9	9	**51**
CO5	9	9	3	3	9	9	9	**51**
Total	**33**	**33**	**15**	**11**	**33**	**39**	**39**	**203**

Low-1 Medium-3 High-9

DSE II – Numerical Analysis

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 6**
Subject Code: JMMXE2A **Credit: 5**

Course Objectives:

1. To apply numerical methods to obtain approximate solutions to mathematical problems
2. To develop appropriate numerical methods to solve a differential equation

Unit I **(16 hours)**

Transcendental and Polynomial Equations: Iteration Methods Based on Second Degree Equations - Muller Method, Chebyshev Method, Multipoint Iteration methods - Rate of Convergence - Secant Method, Regula Falsi Method, Newton-Raphson Method, Muller Method.

Unit II **(16 hours)**

System of Linear Algebraic Equations and Eigen Value Problems: Iteration Methods - Jacobi Iteration Method, Gauss Seidel Iteration Method, Successive over Relaxation (SOR), Convergence Analysis of Iterative Methods, Optimal Relaxation Parameter for the SOR Method, Iterative Method to determine A^{-1} - Eigenvalues and Eigenvectors - Bounds on Eigenvalues.

Unit III **(20 hours)**

Interpolation and Approximation: Hermite Interpolation - Piecewise and Spline Interpolation - Piecewise Linear Interpolation, Piecewise Quadratic Interpolation, Piecewise Cubic Interpolation, Piecewise Cubic Interpolation using Hermite Type Data, Spline Interpolation, Quadratic Spline Interpolation - Bivariate Interpolation – Approximation - Least Squares Approximation.

Unit IV **(18 hours)**

Differentiation and Integration: Numerical Differentiation, Optimum Choice of Step - Length, Extrapolation Methods - Partial Differentiation – Numerical Integration - Methods Based on Interpolation.

Unit V **(20 hours)**

Ordinary Differential Equations: Initial Value Problems: Numerical Methods - Euler Methods, Backward Euler Method, Midpoint Method - Singlestep Methods, Runge-Kutta Methods, Implicit Runge-Kutta Methods.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Compute roots of the transcendental and polynomial equations using an appropriate numerical method

CO 2: Inspect various method for solving the system of linear equations

CO 3: Apply the concept of system of linear algebraic equations and Eigen value problems

CO 4: Explain the concept of Numerical differentiation and integrations

CO 5: Compute the numerical solutions of ordinary differential equations by suitablemethods

Text Book:

1. M. K. Jain, S.R.K. Iyengar. R. K. Jain, *Numerical Methods for Scientific and Engineering Computation*, New Age International Private Limited, Publishers, Multicolour Edition, 2019.

Unit I **:** Chapter 2 (Pg. No: 29 -52)
Unit II **:** Chapter 3 (Pg. No: 146 - 165, 170 -179)
Unit III **:** Chapter 4 (Pg. No: 247 - 276, 282 -301)
Unit IV **:** Chapter 5 (Pg. No: 320 -356)
Unit V **:** Chapter 6 (Pg. No: 421 -468)

Reference Books:

1. David Kinciad & Ward Cheney, *Numerical Analysis and Mathematics of Scientific Computing*, Brooks / Cole, 1999.
2. Sastry, S.S. *Introductory Methods of Numerical Analysis*, Fourth Edition, PHI Learning Private Limited, New Delhi, 2005.
3. Shankara Rao K, *Numerical Methods for Scientists and Engineers*, Prentice Hall of India, 2001.

E-Resources:

1. http://csw.uobaghdad.edu.iq/wpcontent/uploads/sites/30/uploads/computer%20science/Lectures/2nd%20year/NUM%20ANALYSIS.pdf
2. https://youtu.be/0rtaUUonwkU
3. https://www.google.com/url?sa=t&source=web&rct=j&url=https://en.m.wikipedia.org/wiki/Numerical_methods_for_ordinary_differential_equations&ved=2ahUKEwj-rdSN9v_wAhU_7HMBHSisD7YQFjAPegQIKhAC&usg=AOvVaw3WOZRQgzKnThjh3zh_UVv4

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	9	9	9	**51**
CO2	9	3	3	3	9	9	9	**45**
CO3	9	9	3	3	9	9	9	**51**
CO4	3	9	3	3	9	9	9	**45**
CO5	3	3	9	3	9	9	9	**45**
Total	**33**	**27**	**27**	**15**	**45**	**45**	**45**	**237**

Low-1 Medium-3 High-9

Core IX - Algebra – II

(For Students Admitted from 2025-26)

Semester: III **Hour / week: 6**
Subject Code: JMMXC31 **Credit: 5**

Course Objectives:

1. To gain expertise in basic ring theory
2. To introduce Galois theory and obtain the fundamental Galois correspondence.

Unit I **(18 hours)**

Prime Ideals and Maximal Ideals - Irreducible Polynomials.

Unit II **(18 hours)**

Classical Formulas - Splitting Fields.

Unit III **(18 hours)**

The Galois Group - Roots of Unity - Solvability by Radicals.

Unit IV **(18 hours)**

Independence of Characters - Galois Extensions.

Unit V **(18 hours)**

The Fundamental Theorem of Galois Theory – Applications – Galois's Great Theorem.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Analyze the nature of ideals and irreducible polynomials
CO 2: Explain the concept of fields
CO 3: Infer the concept of Galois group
CO 4: Justify the theoretical
CO 5: Recapitulate the concepts of roots of polynomials

Text Book:
1. Joseph Rotman, *Galois Theory*, 2nd edition, Springer Verlag, 2001.
Unit I : Pages 31 - 43
Unit II : Pages 44 - 58
Unit III : Pages 59 - 75
Unit IV : Pages 76 - 82
Unit V : Pages 83 - 95

Reference Books:
1. David S. Dummit and Richard M. Foote, *Abstract Algebra*, Wiley , Third Edition, 2011.
2. Serge Lang. *Algebra* - Revised third edition - Springer - Verlag - 2005.
3. Ian Stewart, *Galois Theory*, Chapman and Hall/CRC, Fourth edition 2015.
4. R. Solomon, *Abstract Algebra*, AMS Indian edition, 2010.
5. C. Lanski, *Concepts in Abstract Algebra*, AMS Indian edition, 2010
6. John B. Fraleigh, *A First course in Abstract Algebra*, Pearson, 7th Edition, 2013.
7. M.Artin, *Algebra*, Pearson Education India, New Delhi, 2015.
8. I.N.Herstein, *Topics in Algebra*, John Wiley, 2nd Edition, 2006

E-Resources:
1. https://www.youtube.com/watch?v=vTWC6LKBBA0
2. https://www.youtube.com/watch?v=CJhFmWBJ5z0
3. https://www.youtube.com/watch?v=9pqhfDyzbhw

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	3	3	3	9	**45**
CO2	9	9	9	3	9	3	9	**51**
CO3	9	9	9	3	9	3	9	**51**
CO4	3	3	3	1	1	3	3	**17**
CO5	9	9	9	3	9	9	9	**57**
Total	**39**	**39**	**39**	**13**	**31**	**21**	**39**	**221**

Low-1 Medium-3 High-9

Core X- Complex Analysis

(For Students Admitted from 2025-26)

Semester: III **Hours / week: 6**
Subject Code: JMMXC32 **Credit: 5**

Course Objectives:

1. To understand and introduce the concepts of Analysis, Cauchy-Riemann relations and harmonic functions are then introduced
2. To understand the fundamental concepts of complex variable theory

Unit I **(22 hours)**

Complex Functions: Introduction to the Concept of Analytic Function: Limits and Continuity - Analytic Functions - Polynomials - Rational Functions. **Elementary Theory of Power Series:** Sequences - Series - Uniform Convergence - Power Series – Abel's Limit Theorem. **Analytic Functions as Mappings: Conformality:** Arcs and Closed Curves - Analytic Functions in Regions - Conformal Mapping - Length and Area. **Linear Transformations:** The Linear Group - The Cross Ratio - Symmetry - Oriented Circles - Families of Circles.

Unit II **(18 hours)**

Complex Integration: Fundamental Theorems: Line Integrals - Rectifiable Arcs - Line integrals as Functions of Arcs – Cauchy's Theorem for a Rectangle – Cauchy's Theorem in a Disk. **Cauchy's Integral Formula:** The Index of a Point with Respect to a Closed Curve - The Integral Formula - Higher Derivatives.

Unit III **(16 hours)**

Complex Integration: Local Properties of Analytical Functions: Removable Singularities. Taylor's Theorem - Zeros and Poles - The Local Mapping - The Maximum Principle.

Unit IV **(16 hours)**

Complex Integration: The Calculus of Residues: The Residue Theorem - The Argument Principle - Evaluation of Definite Integrals.

Unit V **(18 hours)**

Series and Product Developments: Power Series Expansions: Weierstrass's Theorem - The Taylor Series - The Laurent Series - **Partial Fractions and Factorization:** Partial Fractions - Infinite Products - Canonical Products. **Entire Functions:** Jensen's Formula – Hadamard's Theorem.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Examine the solution of complex-valued functions, analytic function and conformal mapping

CO 2: Show the series expansions, singularities, Cauchy's theorem and its consequences
CO 3: Identify the location and nature of a singularity of a function and calculate the order and the residue
CO 4: Analyze the results associated to Definite Integrals and Cauchy"s Integral formulae
CO 5: Evaluate the region of convergence by applying Taylor's Series – Laurent's Series

Text Book:

1. Lars V. Ahlfors, *Complex Analysis*, McGraw Hill International, Third Edition, 15th Reprint 2019.

Unit I : Chapter 2 (Sec 1, 2), 3 (Sec.2, 3)
Unit II : Chapter 4 (Sec 1, 2)
Unit III : Chapter 4 (Sec 3)
Unit IV : Chapter 4 (Sec 5)
Unit V : Chapter 5 (Sec 1, 2.1 – 2.3, 3)

Reference Books:

1. V Karunakaran, *Complex Analysis*, Narosa Publishing House, Second Edition, 2005.
2. John M. Howie, *Complex Analysis*, Springer - Verlog London limited, 2003.
3. Liang-shin Hahn, Bernard Epstein, *Classical Complex Analysis*, Jones and Bartlett Publishers Inc, 1996.

E-Resources:

1. https://nptel.ac.in/courses/111/103/111103070/
2. https://www.youtube.com/watch?v=kn-FQvecqU&list=PLbMVogVj5nJTLfYTwvct_SlLaxv1b50Vk&index=2
3. https://math.mit.edu/~jorloff/18.04/notes/topic4.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	1	3	9	**37**
CO2	3	3	3	3	1	3	9	**25**
CO3	9	3	3	3	1	3	9	**31**
CO4	9	9	3	3	1	3	9	**37**
CO5	9	9	3	3	3	3	9	**39**
Total	**39**	**33**	**15**	**15**	**7**	**15**	**45**	**169**

Low-1 Medium-3 High-9

Core XI – Measure and Integration

(For Students Admitted from 2025-26)

Semester: III **Hours / week: 6**
Subject Code: JMMXC33 **Credit: 5**

Course Objectives:

1. To understand the abstract measure theory, definition and main properties of the integral
2. To construct Lebesgue's measure on the real line and in n-dimensional Euclidean space

Unit I **(18 hours)**

Lebesgue Measure: Introduction - Outer measure - Measurable sets and Lebesgue measure - Measurable functions – Littlewood's three principles.

Unit II **(18 hours)**

The Lebesgue Integral: The Riemann integral - The Lebesgue integral of a bounded function over a set of finite measure - The integral of a nonnegative function - The general Lebesgue integral.

Unit III **(18 hours)**

Differentiation and Integration: Differentiation of monotone functions - Functions of bounded variation -Differentiation of an integral - Absolute continuity.

Unit IV **(18 hours)**

Measure and Integration: Measure spaces - Measurable functions - Integration - Signed measures - The Radon-Nikodym Theorem.

Unit V **(18 hours)**

Measure and Outer Measure: Outer measure and measurability - The Extension Theorem - Product measures.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Determine lebesgue integrable and measurable functions
CO 2: Compare the lebsgue integral of a bounded function and a nonnegative function
CO 3: Apply the concept of Measure and integration in theorems
CO 4: Compute integral of derivative with differentiation of an integral
CO 5: Analyze the concepts of measure and outer measure in extension theorem

Text Book:

1. H.L.Royden, *Real Analysis*, Pearson Education Private Limited, 4th Edition, 1988.

Unit I : Chapter 3 (Pg. No: 54 - 64, 66 - 74)
Unit II : Chapter 4 (Pg. No: 75 - 95)
Unit III : Chapter 5 (Pg. No: 97 - 113)
Unit IV : Chapter 11 (Pg. No: 253 - 268, 270 - 282)
Unit V : Chapter 12 (Pg. No: 288 - 299, 303 - 313)

Reference Books:

1. G. De Barra, *Measure Theory and Integration*, New Age International Private Limited, First Edition, 1981.
2. Inter K Rana, *An Introduction to Measure and Integration*, Narosa Publishing House Private Limited, Second Edition, 2005.
3. M.E.Munroe, *Measure and Integration*, Addison – Wesley Publishing Company, Second Edition, 1971.

E-Resources:

1. https://youtu.be/MxjRffbnNYw
2. https://youtu.be/12kFDeN6xuI
3. https://youtu.be/PGPZ0P1PJfw

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	1	3	3	3	**19**
CO2	3	3	3	1	3	3	3	**19**
CO3	9	9	9	3	3	3	3	**39**
CO4	3	3	3	1	3	3	3	**19**
CO5	9	9	3	3	3	3	3	**33**
Total	**27**	**27**	**21**	**9**	**15**	**15**	**15**	**129**

Low-1 Medium-3 High-9

Core XII - Mathematical Statistics

(For Students Admitted from 2025-26)

Semester: III **Hours / week: 6**
Subject Code: JMMXC34 **Credit: 5**

Course objectives:

1. To know the methods to test the hypothesis for large samples
2. To work on chi-square distribution, analysis of variance and test for independence of Attributes

Unit I **(18 hours)**

Sample Moments and Their Functions: The notion of a sample – The notion of a statistic – The distribution of the arithmetic mean of independent normally distributed random variables – The χ^2 distribution – The distribution of the statistic $(\bar{X}, S)$ – Student's t-distribution - Fisher's Z-distribution – The distribution of $\bar{X}$ for some non-normal populations.

Unit II **(18 hours)**

Significance Tests: The concept of a statistical test - Parametric tests for small samples – Parametric tests for large samples - The χ^2 test - Tests of the Kolmogorov and Smirnov type - The Wald-Wolfovitz and Wilcoxon-Mann-Whitney tests - Independence tests by contingency tables.

Unit III **(18 hours)**

The Theory of Estimation: Preliminary notions - Consistent estimates - Unbiased estimates – The sufficiency of an estimate – The efficiency of an estimate - Asymptotically most efficient estimates - Methods of finding estimates - Confidence Intervals.

Unit IV **(18 hours)**

An Outline of Analysis of Variance: One-way classification - Multiple classification. **Theory of Hypotheses Testing:** Preliminary remarks – The power function and the OC

function- Most powerful tests – Uniformly most powerful test - Unbiased tests

Unit V **(18 hours)**

Elements of Sequential Analysis: Preliminary remarks – The sequential propability ratio test - Auxiliary theorems - The fundamental identity – The OC function of the sequential probability ratio test – The expected value E(n) – The determination of A and B - Testing a hypothesis concerning the parameter p of a zero-one distribution - Testing a hypothesis concerning the expected value m of a normal population.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.
(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to
CO 1: Apply the Probability theory for solving the Random Experiment
CO 2: Analyze various measures of central tendency, interval estimation and their characteristics
CO 3: Evaluate the mean and variance of special probability distribution
CO 4: Determine exact and approximate confidence intervals
CO 5: Make use of chi square test to evaluate the best fit of hypothesized distribution

Text book:

1. M. Fisz, *Probability Theory and Mathematical Statistics*, John Wiley and Sons, New York,2012.

Unit I : Chapter 9 (Sections 9.1 to 9.8)
Unit II : Chapter 12 (Sections 12.1 to 12.7)
Unit III : Chapter 13 (Sections 13.1 to 13.8)
Unit IV : Chapter 15 (Sections 15.1 & 15.2) & Chapter 16 (Sections 16.1 to 16.5)
Unit V : Chapter 17 (Sections 17.1 to 17.9)

Reference Books:

1. E.J.Dudewicz and S.N.Mishra, *Modern Mathematical Statistics*, John Wiley and Sons,New York, 1988.
2. V.K.Rohatgi, *An Introduction to Probability Theory and Mathematical Statistics*, WileyEastern Ltd., New Delhi, 1988(3rd Print).
3. G.G.Roussas, *A First Course in Mathematical Statistics*, Addison Wesley PublishingCompany, 1973.
4. B.L.Vander Waerden, *Mathematical Statistics*, G.Allen & Unwin Ltd., London, 19

E-Resources:

1. https://youtu.be/_JVzgkBkfew
2. https://youtu.be/_JVzgkBkfew
3. https://youtu.be/pXVnfUtrhmA

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	9	9	9	3	9	9	**51**
CO2	9	9	9	3	9	9	9	**57**
CO3	3	3	9	3	9	9	9	**45**
CO4	3	3	9	3	9	9	9	**45**
CO5	1	3	9	3	9	9	9	**43**
Total	**19**	**27**	**45**	**21**	**39**	**45**	**45**	**241**

Low-1 Medium-3 High-9

DSE III - Optimization Techniques

(For Students Admitted from 2025-26)

Semester: III **Hours / week: 6**
Subject Code: JMMXE3B **Credit: 5**

Course Objectives:

1. To analyze the formulation and solution of different inventory models and queuing systems
2. To familiarize the implementation of the course content in day - to - day life

Unit I **(18 hours)**

Integer Linear Programming: Illustrative Applications - Integer Programming Algorithms - Branch-and-Bound (B&B) Algorithm - Cutting-Plane Algorithm.

Unit II **(18 hours)**

Deterministic Dynamic Programming: Recursive Nature of Dynamic Programming (DP) Computations - Forward and Backward Recursion - Selected DP Applications - Problem of Dimensionality.

Unit III **(18 hours)**

Queuing Systems: Elements of a Queuing Model - Role of Exponential Distribution - Pure Birth and Death Models (Relationship Between the Exponential and Poisson Distributions) - General Poisson Queuing Model - Specialized Poisson Queues.

Unit IV **(18 hours)**

Inventory Modeling (with Introduction to Supply Chains): Inventory Problem: A Supply Chain Perspective - Role of Demand in the Development of Inventory Models - Static Economic-Order-Quantity (EOQ) Models - Dynamic EOQ Models.

Unit V **(18 hours)**

Nonlinear Programming Algorithms: Unconstrained Algorithms – Direct Search Method – Gradient Method – Constrained Algorithms – Separable Programming – Quadratic Programming – Chance-Constrained Programming - Linear Combinations Method – SUMT Algorithm.

Unit VI

Questions related to the above topics, from various competitive examinations to be

solved.
(To be discussed during the Skill Development Course Hour)

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Formulate and solve pure and mixed integer programming models using Branch and Bound Algorithm and Cutting plane Algorithm
CO 2: Make use of Dynamic programming and its applications to find the solution of the real life problems
CO 3: Analyze Pure Birth and Death Model
CO 4: Determine the solution of the inventory problem using Inventory models
CO 5: To solve the nonlinear programming formulation with various method

Text Book:
1. Hamdy A. Taha, *Operations Research: An Introduction*, Prentice Hall of India, Tenth Edition, 2017.

Unit I : Chapter 9 (Sections 9.1 - 9.2)
Unit II : Chapter 12 (Sections 12.1 - 12.4)
Unit III : Chapter 18 (Sections 18.2 – 18.6)
Unit IV : Chapter 13 (Sections 13.1 – 13.4)
Unit V : Chapter 21 (Sections 21.1– 21.2)

Reference Books:
1. Kanti Swarup, P.K.Gupta, Man Mohan, *Operations Research*, Sultan Chand & Sons Educational Publishers, New Delhi, Thirteenth Edition, 2006.
2. Ravindran, Philips, Solberg, *Operations Research - Principle and Practice*, Wiley India, Second Edition, 2012.
3. Fredrick S.Hillier, Gerald J.Lieberman, *Operations Research Concepts and Cases*, Tata Mc Graw Hill Publishing Company Limited, Eighth Edition, 2009.

E-Resources:
1. https://www.youtube.com/watch?v=dGqsH-1EWmg
2. https://www.youtube.com/watch?v=5ZkYEYsJQvU
3. https://www.youtube.com/watch?v=WG0mhsfcqvk

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	9	3	9	9	3	51
CO2	9	9	9	3	9	9	9	57
CO3	9	9	9	3	3	9	9	51
CO4	9	9	9	3	9	9	9	57
CO5	9	9	9	9	9	9	9	63
Total	45	45	45	21	39	45	39	279

Low-1 Medium – 3 High - 9

Core XIII – Differential Geometry

(For Students Admitted from 2025-26)

Semester: IV **Hours / week: 6**
Subject Code: JMMXC41 **Credit: 5**

Course Objectives:

1. To understand Surfaces, Smooth surfaces, Tangents, Normals and Quadric Surfaces
2. To introduce the concepts of Lengths of Curves on Surfaces, Isometries of Surfaces, Conformal Mappings of Surfaces

Unit I **(20 hours)**

The Theory of Space Curves: Introductory remarks about space curves - Definitions - Arc length - Tangent, normal and binormal - Curvature and torsion of a curve given as the intersection of two surfaces.

Unit II **(16 hours)**

The Theory of Space Curves: Contact between curves and surfaces - Tangent surface, involutes and evolutes - Intrinsic equations, fundamental existence theorem for space curves - Helices.

Unit III **(18 hours)**

The Metric: Local Intrinsic Properties of a Surface: Definition of a surface - Curves on a Surface - Surfaces of revolution - Helicoids - Metric - Direction coefficients - Families of curves - Isometric correspondence - Intrinsic properties

Unit IV **(20 hours)**

The Metric: Local Intrinsic Properties of a Surface: Geodesics - Canonical geodesic equations - Normal property of geodesics - Existence theorems - Geodesic parallels - Geodesic curvature - Gauss-Bonnet theorem - Gaussian curvature.

Unit V **(16 hours)**

The Second Fundamental Form: Local Non-Intrinsic Properties of a Surface: The second fundamental form - Principal Curvatures - Lines of curvature.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Explain the concept of space curves
CO 2: Describe the structures of curves and surfaces and find its involutes and evolutes of the curves
CO 3: Determine the properties of helicoids
CO 4: Make use of Geodesic curvature, to solve the problems
CO 5: Illustrate the fundamental concepts in Normal property of geodesic and intrinsic Values

Text Book:

1. T. J. Willmore, *An Introduction to Differential Geometry*, Oxford University Press, 2006.

Unit I : Chapter 1 (Pg. No: 1 - 18)
Unit II : Chapter 1 (Pg. No: 18 - 27)
Unit III : Chapter 2 (Pg. No: 31 - 54)
Unit IV : Chapter 2 (Pg. No: 54 - 80)
Unit V : Chapter 3 (Pg. No: 95 - 101)

Reference Books:

1. D. Somasundaram, *Differential Geometry A First Course*, Narosa Publishing House, Sixth Reprint, 2014.
2. Christian Bar, *Elementary Differential Geometry*, Cambridge University Press India Pvt., Ltd., First Edition, 2011.
3. D.J.Struik, *Classical Differential Geometry*, Addison Wesley Publishing Company Inc., Massachusetts 1961.

E-Resources:

1. https://www.youtube.com/watch?v=qC5nJzhjDew
2. https://www.youtube.com/watch?v=W94y9IoE8do
3. http://uregina.ca/~mareal/cs8.pdf
4. https://www.youtube.com/watch?v=_-3OpGPD8lc

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	3	3	3	**27**
CO2	3	3	3	3	3	9	3	**27**
CO3	9	3	3	3	3	1	3	**25**
CO4	9	9	3	3	1	9	3	**37**
CO5	3	9	3	3	1	3	3	**25**
Total	**33**	**27**	**15**	**15**	**11**	**25**	**15**	**141**

Low-1 Medium-3 High-9

Core XIV -Functional Analysis

(For Students Admitted from 2025-26)

Semester: IV **Hours / week: 6**
Subject Code: JMMXC42 **Credit : 5**

Course Objectives:

1. To recognize the concept of Hilbert space and its properties
2. To apply the properties of Banach space and Hilbert space for proving some theorems

Unit I **(20 hours)**

Normed Spaces. Banach Spaces: Normed Space. Banach Space - Further Properties of Normed Spaces - Finite Dimensional Normed Spaces and Subspaces - Compactness and Finite Dimension - Linear Operators – Bounded and Continuous Linear Operators - Linear Functionals - Normed Spaces of Operators. Dual Space.

Unit II **(18 hours)**

Inner Product Spaces. Hilbert Spaces: Inner Product Space. Hilbert Space - Further Properties of Inner Product Spaces - Orthogonal Complements and Direct Sums - Orthonormal Sets and Sequences – Series Related to Orthonormal Sequences and Sets - Total Orthonormal Sets and Sequences.

Unit III **(16 hours)**

Inner Product Spaces. Hilbert Spaces: Representation Of Functionals On Hilbert Spaces - Hilbert Adjoint Operator - Self-Adjoint, Unitary and Normal Operators.

Unit IV **(18 hours)**

Fundamental Theorems for Normed and Banach Spaces: Hahn-Banach Theorem - Hahn-Banach Theorem for Complex Vector Spaces and Normed Spaces - Adjoint Operator - Reflexive Spaces - Category Theorem. Uniform Boundedness Theorem.

Unit V **(18 hours)**

Fundamental Theorems for Normed and Banach Spaces: Strong and Weak Convergence - Convergence of Sequences of Operators and Functionals – Open Mapping Theorem – Closed Linear Operators. Closed Graph Theorem

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Illustrate the concept of normed space and Banach space

CO 2: Analyze the concept of orthogonality on Hilbert space

CO 3: Classify the different kinds of operators on Hilbert space

CO 4: Examine the intervention of continuous linear function in proving Hahn Banach theorem

CO 5: Use the concept of strong and weak convergence of sequence of operators and Functional

Text Book:

1. Erwin Kreyszig – *Introductory Functional Analysis with Applications* - John Wiley, 2015.

Unit I : Chapter II (Sec: 2.2 - 2.8 & 2.10)

Unit II : Chapter III (Sec: 3.1 - 3.6)

Unit III : Chapter III (Sec: 3.8 - 3.10)

Unit IV : Chapter IV (Sec: 4.2, 4.3, 4.5 - 4.7)

Unit V : Chapter IV (Sec: 4.8, 4.9, 4.12, 4.13)

Reference Books:

1. George F. Simmons, *Introduction to Topology and Modern Analysis*, Tata McGraw- Hill, 2009.
2. P K. Jain. O P.Ahuja, Khalil Ahmad, *Functional Analysis*, New Age International Private Limited, 1995.
3. S.Ponnusamy, *Foundation of Functional Analysis*, Narosa Publishing House Private

Limited, 2011.
4. D. Somasundaram, *Functional Analysis* S. Viswanathan Private Limited, Chennai, 1994.

E-Resources:

1. https://nptel.ac.in/courses/111/105/111105037/
2. https://www.youtube.com/watch?v=niu20BxClhA
3. https://www.youtube.com/watch?v=nzpEsT40ks0
4. https://www.mit.edu/~9.520/spring09/Classes/mathcamp01.pdf
5. http://calvino.polito.it/~terzafac/Corsi/functional_analysis/pdf/chap1.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	1	1	3	9	**35**
CO2	9	3	9	1	1	3	9	**35**
CO3	3	3	3	1	1	1	3	**15**
CO4	3	3	1	1	1	1	3	**13**
CO5	3	3	3	1	1	3	3	**17**
Total	**27**	**15**	**25**	**5**	**5**	**11**	**27**	**115**

Low-1 Medium-3 High-9

Core XV - Project

(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 12**
Subject Code: JMMXC43PW **Credit: 5**

Course Objectives:

1. To provide skills for high quality research and teaching in the field of Mathematics
2. To develop the knowledge, skills and attitudes necessary to pursue further studies in Mathematics

Project Outline:

1. The students undertake the project during the IV semester after the preliminary steps of student and staff allotment and topic selection in the III semester
2. The student's progress is periodically assessed by the project guide through presentation
3. The significant research work is encouraged for presentations and publications in Conferences and Journals
4. Selection of the field of study, topic & research design
5. Collection of literature review
6. Analysis, Conclusion & Preparation of rough draft

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Make use of research methodology and techniques of the literature applicable to their own research

CO 2: Determine solutions to the unsolved problems

CO 3: Analyze the abilities and techniques in the critical evaluation of current research
CO 4: Apply new ideas in the respective field of study and environment
CO 5: Design innovative projects with the application of mathematical concepts towards scientific and societal development

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	3	1	9	**63**
CO2	9	9	9	1	1	3	9	**41**
CO3	9	9	9	1	3	1	9	**41**
CO4	9	9	9	1	1	1	9	**39**
CO5	9	9	9	1	1	1	9	**39**
Total	**45**	**45**	**45**	**5**	**9**	**7**	**45**	**201**

Low-1 Medium-3 High-9

DSE COURSE FOR OTHER PG PROGRAMME FOR M Sc IT (DSE II) & MCA (DSE I)

Probability and Applied Statistics

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 6**
Subject Code: JMITE2A/ JMCAE2B **Credit: 5**

Course Objectives:

1. To know the methods to test the hypothesis for large samples
2. To work on chi-square distribution, analysis of variance and test for independence of attributes

Unit I **(18 hours)**

Probability Theory: Random Experiment - Mathematical or Apriori Definition of Probability - Statistical or Aposteriori Definition of Probability - Axiomatic Definition of Probability - Conditional Probability - Independent Events - Theorem of Total Probability – Baye's Theorem or Theorem of Probability of Causes. **Random Variables**: Discrete Random Variable – Probability Function – Continuous Random Variable – Probability Density Function – Cumulative Distribution Function (cdf) – Properties of the cdf F(x) – Special Distributions – Discrete Distributions – Continuous Distributions – Two-Dimensional Random Variables – Joint Probability Density Function – Cumulative Distribution Function – Properties of F(x, y) – Marginal Probability Distribution – Conditional Probability Distribution.

Unit II **(18 hours)**

Statistical Averages: Statistical Measures - Measures of Central Tendency - Mathematical Expectation and Moments - Relation Between Central and Non-central Moments –Dispersion - Definisions - The Coefficient of Variation - Skewness – Kurtosis - Pearson's Shape Coefficients - Expected Values of a Two-Dimensional R V - Properties of Expected Values - Conditional Expected Values - Properties.

Unit III **(18 hours)**

Some Special Probability Distributions: Introduction - Special Discrete Distributions - Mean and Variance of the Binomial Distribution - Recurrence Formula for the Central Moments of the Binomial Distribution - Poisson Distribution as Limiting Form of Binomial Distribution - Mean and Variance of Poisson Distribution - Mean and Variance of Geometric Distribution - Standard Normal Distribution - Normal Probability Curve - Properties of the Normal Distribution $N(\mu, \sigma)$ - Importance of Normal Distribution.

Unit IV **(18 hours)**

Tests of Hypotheses: Parameters and Statistics - Sampling Distribution - Estimation and Testing of Hypotheses - Tests of Hypotheses and Tests of Significance - Critical Region and Level of Significance - Errors in Testing of Hypotheses - One-Tailed and Two-Tailed Tests - Critical Values or Significant Values - Procedure for Testing of Hypothesis - Interval Estimation of Population Parameters - Tests of Significance for Large Samples.

Unit V **(18 hours)**

Tests of Hypotheses: Chi-Square Distribution - Properties of χ^2 Distribution - Uses of χ^2 Distribution - χ^2 Test of Goodness of Fit - Conditions for the Validity of χ^2 Test - χ^2 test of Independence of Attributes.

Unit VI

Questions related to the above topics, from various competitive examinations to be solved.

(To be discussed during the Skill Development Course Hour)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Apply the Probability theory for solving the Random Experiment

CO2: Analyze various measures of central tendency, interval estimation and their characteristics

CO 3: Evaluate the mean and variance of special probability distribution

CO 4: Determine exact and approximate confidence intervals

CO 5: Make use of chi square test to evaluate the best fit of hypothesized distribution

Text Book:

1. T.Veerarajan, *Probability, Statistics and Random Processes*, Tata McGraw HillEducation Private Limited, Third Edition, 2009.

Unit I : Chapter 1, 2 (Pg. No: 1 - 17 & 33 - 57)
Unit II : Chapter 4 (Pg. No: 111 - 120)
Unit III : Chapter 5 (Pg. No: 208 - 215 & 246 - 255)
Unit IV : Chapter 8 (Pg. No: 419 - 426)
Unit V : Chapter 8 (Pg. No: 466 - 468)

Reference Books:

1. S. Arumugam and A. Thangapandi Isaac, *Statistics*, New Gamma Publishing House, July 2009.
2. S.C Gupta, *Fundamental of Statistics*, Himalaya Publishing House, Seventh Edition,2012.
3. Mood. A. M. Graybill, F.A & Boes D.G, *Introduction to Theory of Statistics*, McGraw Hill, 1974.

E-Resources:

1. https://youtu.be/_JVzgkBkfew
2. https://youtu.be/_JVzgkBkfew
3. https://youtu.be/pXVnfUtrhmA

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	9	9	9	3	9	9	**51**
CO2	9	9	9	3	9	9	9	**57**
CO3	3	3	9	3	9	9	9	**45**
CO4	3	3	9	3	9	9	9	**45**
CO5	1	3	9	3	9	9	9	**43**
Total	**19**	**27**	**45**	**21**	**39**	**45**	**45**	**241**

Low-1 Medium-3 High-9

B Sc Mathematics

(Three Year Regular Programme)
(For Students Admitted from 2025 -26)

Program Specific Outcomes

PSO 1:Domain Knowledge: Propagate the basic knowledge of the concern discipline and demonstrate practical skills, and technical knowledge along with domain knowledge of different subjects in the science stream.

PSO 2: Scientific Knowledge: Apply scientific reasoning in the approach to handle professional matters, communicate the solutions to stakeholders and enable them to understand and appreciate the outcomes.

PSO 3: Critical Thinking: Able to excel our thinking, and actions which are granted in different perceptive and facilitate the needed actions to manipulate and rectify them.

PSO 4: Social Interaction: realize/ identify/ classify social and environmental problems and contribute the computational expertise to face the challenges and provide sustainable solutions.

PSO 5: Employability Skills: Equip the students for getting prominent careers in industry in mathematical sciences and allied fields.

PSO 6: Self-Learning: Able to adapt oneself to technological advancements in computing and engage in life-long self-learning for personal development in the context of interdisciplinary nature of future endeavors.

PSO 7: Problem Solving Skill: Investigate, design and apply appropriate methods to solve problems in science, mathematics, technology and/or engineering.

PREAMBLE

1. Introduced the Core course I **Advanced Calculus & Fourier Series** (Semester I)
2. Introduced the Ability Enhancement Compulsory Course **Statistics** (Semester I).
3. The Core Courses **Differential Equations (** Semester III) and **Sequence and Series** (Semester II) are interchanged.
4. Modified the syllabus for the Skill Enhancement Course **Theory of Equations with SCILAB** (Semester I).
5. Modified the syllabus for the Core Course **Linear Algebra** (Semester IV).
6. The Core Course **Foundation Course in Mathematics (** Semester III) and **Sequence and Series** (Semester IV) are interchanged.
7. Introduced Multi Disciplinary Courses **Mathematical Aptitude for Competitive Examinations - I** (Semester III) and **Mathematical Aptitude for Competitive Examinations - II** (Semester IV).
8. The Ability Enhancement Compulsory Course **Graph Theory** (Semester III) and **Mathematical Statistics - II** (Semester II) are interchanged.
9. The Core Courses **Astronomy** (Semester V) and **Graph theory** (Semester III) are interchanged.
10. Introduced the Skill Enhancement Courses **Differential Equations with Sage Math** (Semester III) instead of **Fourier Series** and **Linear Algebra with Sage Math** instead of **R Tool Lab** .
11. The Skill Enhancement Course **R Tool Lab** (Semester IV) and **Operations Research Lab – LINDO/ LINGO Packages** (Semester V) are interchanged.
12. The **Fourier and Laplace Transforms** (Semester VI) Changed from DSE III to MD III and interchanged instead of **Astronomy** (Semester V).
13. The **Mathematical Modelling** (Semester VI) Changed from DSE III to MD III.

14. The DSE I **Combinatorics** (Semester V) is removed from Semester V.
15. Introduced the Multi Disciplinary Course **Advanced Statistical Methods** (V Semester) instead of DSE II **Operations Research** (Semester V).
16. Modified and transferred the Core Course **Operations Research** from Semester V to Semester VI instead of **Number Theory** (Semester VI).
17. Introduced the Multi Disciplinary Courses **Verbal and Nonverbal Reasoning** (Semester VI) instead of **Fourier and Laplace Transform** (Semester VI) and **Financial Mathematics** (Semester VI) instead of **Mathematical Modeling** (Semester VI).
18. Introduced the Ability Enhancement Compulsory Course **Statistics** (Semester III) for B Sc IT with Cyber Security.
19. Introduced the Ability Enhancement Compulsory Course **Statistics** (Semester II) for BCA.
20. Offered the Multi Disciplinary Courses **Calculus and Differential Equations** (Semester VI) and **Discrete Mathematics** (Semester V) for B sc Artificial Intelligence and Data Science.
21. Offered the Ability Enhancement Compulsory Courses **Fundamentals of Mathematics** (Semester I), **Mathematical Statistics-I** (Semester II) and **Mathematical Statistics-II** (Semester III) for B sc Artificial Intelligence and Data Science.
22. Offered the Core Course **Operation Research** (Semester IV) for B Sc Artificial Intelligence and Data Science.
23. Offered the Extra Credit Courses **Arithmetic for Competitive Examinations** (Semester II) and **Logical Reasoning** (Semester V) for B Sc Artificial Intelligence and Data Science.

Programme Structure

Programme Code: UMX

Sem	Part	Subjet code	Course	Subject Title	Hours /Week	Credits	@ SD | ENT | EMP	$ REG | NAT | GLO	CIA	ESE	Total
I	I	JBLT11 / JBLA11 / JBLHB11 / JBLHA11	Language I	இக்கால இலக்கியமும் சிற்றிலக்கியமும் / Basic Arabic I/ General Hindi I (Basic)/ Hindi Grammar & Translation (Advanced)	5	3	SD/SD EMP ENT/ SD EMP ENT	GLO/ REG NAT GLO/ GLO	25	75	100
	II	JBLEB12 / JBLEA12	Language II	English for Everyday Communication (Basic) & Literature and Language for Life (Advanced)	5	3	SD EMP ENT	REG NAT GLO	25	75	100
	III	JBMXC11	Core I	Advanced Calculus & Fourier Series	6	6	SD EMP	NAT GLO	25	75	100
		JBMXC12	Core II	Theory of Equations &Trigonometry	6	5	SD	NAT GLO	25	75	100
		JBMXA13	AECC I	Statistics	4	4	SD EMP ENT	NAT GLO	25	75	100
	IV	JBMXS14P	SEC I	Theory of Equations with SCILAB	2	1	SD EMP ENT	REG NAT GLO	-	50	50
				Library/ Browsing	1	-			-	-	-
				Remedial /Games	1	-			-	-	-
		Total			**30**	**22**			**125**	**425**	**550**
II	I	JBLT21 / JBLA21 / JBLHB21 / JBLHA21	Language I	காப்பிய இலக்கியமும் புதினமும் / Basic Arabic II/ General Hindi II (Basic)/ Hindi Prose, Poem & Story (Advanced)	5	3	SD/SD EMP ENT/ SD EMP ENT	GLO/ REG NAT GLO/ NAT	25	75	100
	II	JBLEB22 / JBLEA22	Language II	English for Academic and Social	5	3	SD EMP	REG NAT	25	75	100

				Interaction (Basic) & Critical Reading and Reflective Writing (Advanced)			ENT	GLO			
	III	JBMXC21	Core III	Analytical Geometry – 3D & Vector Calculus	5	5	SD EMP	NAT GLO	25	75	100
		JBMXC22	Core IV	Differential Equations	5	4	SD EMP	NAT GLO	25	75	100
		JBMXA23	AECC II	Graph Theory	4	4	SD EMP ENT	NAT GLO	25	75	100
	IV	JBMXS24P	SEC II	Analytical Geometry with Geogebra	2	1	SD EMP ENT	REG NAT GLO	-	50	50
		JBUI2V	CVAC I	Understanding India	2	2	SD EMP ENT	REG NAT	-	50	50
				Library/ Browsing	1	-			-	-	-
				Remedial /Games	1	-			-	-	-
	V	JBMXX2/ JBMXX2O	Extra Credit	Lattice Theory / * Online Course	-	2			-	100	100
		Total			**30**	**22+2**			**125**	**475 +100**	**600+ 100**
III	I	JBLT31/JBLA 31/ JBLHB31/ JBLHA31	Language I	இடைக்கால இலக்கியமும் இதழியலும் / Classical Arabic Prose / General Hindi III (Basic) / Hindi Literature & Letter Writing (Advanced)	5	3	SD/SD EMP ENT/ SD EMP ENT	GLO/ REG NAT GLO/ NTA	25	75	100
	II	JBLEB32 / JBLEA32	Language II	Workplace English: Foundations of English Communication Skills (Basic) & English for the Corporate World (Advanced)	5	3	SD EMP ENT	REG NAT GLO	25	75	100
	III	JBMXC31	Core V	Sequences and Series	4	4	SD	NAT GLO	25	75	100

		JBMXC32	Core VI	Astronomy	4	3	SD EMP	NAT GLO	25	75	100
		JBMXA33P	AECC III	Programming in“C” Lab	4	4	SD EMP ENT	NAT | GLO	25	75	100
	IV	JBMXS34	SEC III	Differential Equations with Sage Math	2	1	SD EMP ENT	REG NAT GLO	-	50	50
		JBMD31MX	MD I	Mathematical Aptitude for Competitive Examinations - I	2	1	SD EMP	REG NAT	-	50	50
		JBES3V	CVAC II	Environmental Science for Sustainable Development	2	2	SD EMP ENT	REG NAT GLO	-	50	50
	V	JBXTN3	Extension	NSS/CSS	2	2			100		100
		JBMXX3 / JBMXX3O	Extra Credit	Boolean Algebra / *Online Course	-	2	SD EMP	NAT GLO	-	100	100
		Total			**30**	**23+2**			**225**	**525 + 100**	**750+ 100**
IV	I	JBLT41/JBLA 41 / JBLHB41/ JBLHA41	Language I	பண்டைய இலக்கியமும் நாட்டுப்புறப் பாடல்களும் / Hadeeth/ General Hindi IV (Basic)/ Computer and Hindi (Advanced)	5	3	SD/SD EMP ENT/ SD EMP ENT	GLO/ REG NAT GLO/ GLO	25	75	100
	II	JBLEB42 / JBLEA42	Language II	Professional Communication Skills (Basic) & Strategic Communication for Global Careers (Advanced)	5	3	SD EMP ENT	REG NAT GLO	25	75	100
	III	JBMXC41	Core VII	o Linear Algebra	5	5	SD EMP	NAT GLO	25	75	100
		JBMXC42	Core VIII	Foundation Course in Mathematics	4	3	SD EMP	NAT GLO	25	75	100
		JBMXA43P	AECC IV	Programming in	4	4	SD	NAT	25	75	100

				Java Lab			EMP ENT	GLO			
		JBMD41MX	MD II	Mathematical Aptitude for Competitive Examinations – II	3	2	SD EMP	REG NAT	-	50	50
		JBMXS44	SEC IV	Linear Algebra with Sage Math	2	1	SD EMP ENT	REG NAT GLO	-	50	50
	IV	JBDT4V	CVAC III	Digital and Technology Solution	2	2	SD EMP ENT	REG NAT GLO	-	50	50
		JBMXX4/ JBMXX4O	Extra Credit	Applications of Group Theory/ *Online Course	-	2	SD EMP ENT	NAT GLO	-	100	100
		Total			**30**	**23+2**			**125**	**525+ 100**	**650+ 100**
V		JBMXC51	Core IX	Abstract Algebra	6	6	SD EMP ENT	NAT GLO	25	75	100
		JBMXC52	Core X	Real Analysis	6	5	SD EMP	NAT GLO	25	75	100
	III	JBMXC53	Core XI	Mechanics	6	5	SD EMP	NAT GLO	25	75	100
		JBMD51MXA/ JBMD51MXB	MD III	Fourier and Laplace Transform / Mathematical Modeling	4	3	SD EMP ENT	NAT GLO	25	75	100
		JBMD52MXA/ JBMD52MXB	MD IV	# Advanced Statistical Methods / Coding Theory	4	3	SD EMP ENT	NAT GLO	25	75	100
	IV	JBMXS54P	SEC V	R tool Lab	2	1	SD EMP ENT	REG NAT GLO	-	50	50
		JBHW5V	CVAC IV	Health and Wellness	2	2			-	50	50
		JBESX5/ JBMXX5O	Extra Credit	Employability Skills / * OnlineCourse	-	2	SD EMP	REG NAT	100	-	100
		Total			**30**	**25+2**			**125+ 100**	**475**	**600+ 100**
	III	JBMXC61	Core XII	Complex Analysis	6	6	SD EMP	NAT GLO	25	75	100

VI		JBMXC62	Core XIII	Numerical Methods	6	5	SD EMP ENT	NAT GLO	25	75	100
		JBMXC63	Core XIV	Operations Research	6	5	SD EMP ENT	NAT GLO	25	75	100
		JBMXC64PW	Core XV	Project	5	5	SD EMP ENT	REG NAT GLO	25	75	100
		JBMD61MXA/ JBMD61MXB	MD V	Verbal and Non - Verbal Reasoning / o Financial Mathematics	4	3	SD EMP ENT	REG NAT GLO	25	75	100
	IV	JBMXS65P	SEC VI	Numerical Methods Lab using Python	2	1	SD EMP ENT	REG NAT GLO	-	50	50
			Library/ Browsing		1	-			-	-	-
		JBMXX6/JBM XX6O	Extra Credit	Quantitative Techniques / *Online Course	-	2	SD EMP ENT	NAT GLO	-	100	100
		Total			**30**	**25 + 2**			**125**	**425 + 100**	**550 + 100**
		Grand Total			**180**	**140 + 10**			**850 + 100**	**2850 + 400**	**3700 + 500**

*For Online certification credit alone will be assigned on submission of certificate obtained through appearing for Online Examination from EDX, Spoken Tutorial, NPTEL or Coursera.
∘ Integraed Course
Internship Training

AECC for other UG Programme (B Sc Computer Science)

Sem	Part	Subject code	Course	Subject Title	Hours / Week	Credit	@ SD | ENT | EMP	$ REG | NAT | GLO	CIA	ESE	Total Marks
II	III	JBCSA23	AECC II	Statistics	4	4	SD EMP ENT	REG NAT GLO	25	75	100
III	III	JBCSA33	AECC III	Operations Research	4	4	SD EMP ENT	REG NAT GLO	25	75	100

AECC for other UG Programme (B Sc Information Technology)

Sem	Part	Subject code	Course	Subject Title	Hours / Week	Credit	@ SD | ENT | EMP	$ REG | NAT | GLO	CIA	ESE	Total Marks
II	III	JBITA23	AECC II	Statistics	4	4	SD EMP ENT	REG NAT GLO	25	75	100

AECC for other UG Programme (BCA)

Sem	Part	Subject code	Course	Subject Title	Hours / Week	Credit	@ SD | ENT | EMP	$ REG | NAT | GLO	CIA	ESE	Total Marks
II	III	JBCPA23	AECC II	Statistics	4	4	SD EMP ENT	REG NAT GLO	25	75	100

AECC for other UG Programme (B Sc IT with Cyber Security)

Sem	Part	Subject code	Course	Subject Title	Hours / Week	Credit	@ SD | ENT | EMP	$ REG | NAT | GLO	CIA	ESE	Total Marks
I	III	JBICA14	AECC I	Statistics	4	4	SD EMP ENT	REG NAT GLO	25	75	100

AECC for other UG Programme (B Sc Chemistry)

Sem	Part	Subject code	Course	Subject Title	Hours / Week	Credit	@ SD | ENT | EMP	$ REG | NAT | GLO	CIA	ESE	Total Marks
I	III	JBCHA13	AECC I	Mathematics - I	4	4	SD EMP ENT	REG NAT GLO	25	75	100
II	III	JBCHA23	AECC II	Mathematics - II	4	4	SD EMP ENT	REG NAT GLO	25	75	100

AECC for other UG Programme (B Sc Psychology)

Sem	Part	Subject code	Course	Subject Title	Hours / Week	Credit	@ SD | ENT | EMP	$ REG | NAT | GLO	CIA	ESE	Total Marks
III	III	JBSYA33	AECC III	Psychological Statistics -	4	4	SD	REG	25	75	100

				Descriptive			EMP ENT	NAT GLO			
IV	III	JBSYA43	AECC IV	Psychological Statistics - Inferential	4	4	SD EMP ENT	REG NAT GLO	25	75	100

UG Programme (B Sc Artificial Intelligence & Data Sciene)

Sem	Part	Subject code	Course	Subject Title	Hours/ Week	Credit	@ SD | ENT | EMP	$ REG | NAT | GLO	CIA	ESE	Total Marks
I	III	JBADA13	AECC I	Fundamentals of Mathematics	4	3	SD ENT EMP	REG NAT GLO	25	75	100
II	III	JBADA23	AECC II	Mathematical Statistics - I	4	4	SD ENT EMP	REG NAT GLO	25	75	100
II	V	JBADX2	Extra Credit I	Arithmetic For Competitive Examinations		2	SD ENT EMP	REG NAT GLO		100	100
III	III	JBADA33	AECC III	Mathematical Statistics - II	4	4	SD ENT EMP	REG NAT GLO	25	75	100
III	V	JBADX3	Extra Credit II	Logical Reasoning		2	SD ENT EMP	REG NAT GLO		100	100
IV	III	JBADC41	Core VII	Operations Research	5	5	SD ENT EMP	REG NAT GLO	25	75	100
V	IV	JBMD52ADA	MD IV	Discrete Mathematics	4	3	SD ENT EMP	REG NAT GLO	25	75	100
VI	IV	JBMD61ADA	MD V	Calculus and Differential Equations	4	3	SD ENT EMP	REG NAT GLO	25	75	100

AECC – Ability Enhancement Compulsory Course **SEC –** Skill Enhancement Course

MD - Multi Disciplinary **CVAC –** Common Value Added Course

Core I - Advanced Calculus & Fourier series

(For Students Admitted from 2025-26)

Semester: I **Hours / week: 6**

Subject Code: JBMXC11 **Credit: 6**

Course Objectives:

1. To gain basic knowledge in differentiation, integration of different type of functions, double,triple and improper Integrals.

2. To get exposed to the concepts of Fourier Series.

Unit I **(21 hours)**

Envelopes, Curvature of Plane Curves: Envelopes- Method of finding envelopes- Curvature – Circle, radius and centre of curvatures-Cartesian formula for the radius of curvature-The coordinates of the centre of curvature – Evolute and Involute -Radius of curvature when the curve is given in polar coordinates - p-r Equation; pedal Equation of a curve – Chord of curvature.

Linear Asymptotes: Definition -Asymptotes of a plane algebraic curve-Asymptotes parallel to the axis - Special case

Unit II **(18 hours)**

Multiple integrals: Definition - Evaluation of the double Integral - Double Integral in Polar Co-ordinates - Triple Integrals - Applications of Multiple Integrals

Unit III **(18 hours)**

Improper Integral: Beta and Gamma integrals: Definitions- Convergence -Recurrence formula of Gamma functions – Properties of Beta functions- Relation between Beta and Gamma Functions -simple problems

Unit IV **(16 hours)**

Fourier Series: Introduction - Trigonometric series – Problems - Even and odd functions - Properties of odd and even functions.

Unit V **(17 hours)**

Fourier Series: Half range Fourier series - Development in cosine series - Development in sine series – Problems-Change of interval - Combination of series - Harmonic Analysis - Method 1 - Method 2.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Identify the concept of evolutes and envelopes, methods to find curvature in Cartesian and polar forms

CO 2: Compute the area and volume by using double abd triple integrals

CO 3: Analyze the concept of Beta and Gamma functions

CO 4: Evaluate Fourier series using odd and even functions

CO 5: Compute the solution of Harmonic Analysis

Text Books:

1. S. Narayanan, T. K. Manicavachagom Pillay, *Calculus - Volume I*, S. Viswanathan Printers & Publishers Private Limited, 2017.

Unit I : Chapter10 & Chapter11 (Section: 1- 4)

2. S. Narayanan, T. K. Manicavachagom Pillay, *Calculus - Volume II***,** S. Viswanathan Printers & Publishers Private Limited, 2017.

Unit II : Chapter 5 Section: 1-5

Unit III : Chapter 7 Section: 2 -5

3. S. Narayanan, T. K. Manicavachagom Pillay, *Calculus - Volume III*, S. Viswanathan Printers & Publishers Private Limited, 2017.

Unit IV : Chapter 6 (sec 1-3)

Unit V : Chapter 6 (sec 4 - 8)

Reference Books:

1. Dr. S. Arumugam & A. Thangapandi Issac, *Calculus*, New Gamma Publishing House,June 2014.
2. Shanthi Narayan and P. K. Mittal *Differential Calculus*, S. Chand & Company, 2008.
3. George B. Thomas, Jr. & Ross L. Finney, *Calculus*, Pearson Education (Singapore)Private Limited, Indian Branch, Seventh Edition, Reprint, 2004.

E-Resources:

1. https://www.mathcentre.ac.uk/resources/uploaded/mc-ty-tannorm-2009-1.pdf
2. https://nitkkr.ac.in/docs/5-Multiple%20Integrals%20and%20their%20Applications.pdf
3. https://www.khanacademy.org/math/multivariable-calculus/integrating- multivariable-Functions/double-integrals-a/v/polar-coordinates-1

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	1	3	3	3	**19**
CO2	3	3	3	1	3	3	9	**25**
CO3	3	3	3	1	3	3	3	**19**
CO4	3	3	3	3	3	9	9	**33**
CO5	3	3	3	3	3	9	9	**33**
Total	**15**	**15**	**15**	**9**	**15**	**27**	**33**	**129**

Low-1 Medium-3 High-9

Core II- Theory of Equations & Trigonometry

(For Students Admitted from 2025- 26)

Semester: I **Hours / week: 6**
Subject Code: JBMXC12 **Credit: 5**

Course Objectives:

1. To develop the ability and solving different types of algebraic equations.
2. To apply and prove trigonometric identities.

Unit I **(18 hours)**

Theory of Equations: Introduction about polynomials, equations - Remainder theorem - Imaginary roots - Irrational roots - Relation between roots and coefficients of equations - Symmetric functions of the roots - Sum of the powers of the roots of an equation - Newton'sTheorem.

Unit II **(18 hours)**

Theory of Equations: Transformations of equations - Roots with signs changed - Roots multiplied by a given number - Reciprocal roots - Reciprocal equation - Increase and decrease the roots of a given equation by a given quantity - Removal of terms – Equations whose roots are any power of the roots of a given equation.

Unit III **(18 hours)**

Theory of Equations: Descarte's rule of signs–Rolle's theorem - Multiple roots – Strum'stheorem – Newton's method of divisors – Horner's method.

Unit IV **(18 hours)**

Theory of Equations: General solution of cubic equations – Cardon's Method – Solutionof biquadratic equations – **Expansions:** Expansions of sinnθ, cosnθ and tannθ - Exampleson formation of equations.

Unit V **(18 hours)**

Hyperbolic functions: Relation between hyperbolic functions - Inverse hyperbolic functions.
Resolution into factors: Logarithm of complex quantities.

Course Outcomes:

After successful completion of this course, student will be able to
CO 1: Find the nature of the roots of an equation
CO 2: Examine the relation between roots and coefficients of the equations
CO 3: Solve the roots of the given equation by adopting different methods
CO 4: Determine the solutions of cubic equations by applying the suitable methods
CO 5: Evaluate the hyperbolic functions and inverse hyperbolic function

Text Books:

1. T. K. Manicavachagom Pillai, T. Narayanan and K. S. Ganapathy, *Algebra, Volume I,* S.Viswanathan Publishing Company, 2017.

Unit I : Chapter 6 (Sec 1 - 14)
Unit II : Chapter 6 (Sec 15 -20)
Unit III : Chapter 6 (Sec 24–30)
Unit IV : Chapter 6 (Sec 34 - 35)

2. T. K. Manicavachagom Pillai and S. Narayanan, *Trigonometry,* S. Viswanathan Publishing Company, 2017.

Unit IV : Chapter 3(Pg No.: 61 – 76)
Unit V : Chapter 4 and Chapter 5 (Pg. No.:122 – 130)

Reference Books:

1. N.P. Bali, *Golden Maths, Series Algebra,* Laxmi Publications Private Limited, First Edition, 1990.
2. Dr S. Arumugam & A. Thngapndi Issac, *Algebra, Theory of Equations, Theory of Numbersand Trigonometry*, New Gamma Publishing House, Edition2011.
3. K. Khurana and S.B Malik, *Elementary topics in Algebra,* Vikas Publishing House Private Limited, 1994.

E-Resources:

1.https://www.google.co.in/books/edition/Golden_Algebra
2.https://www.google.co.in/books/edition/HIGHER_ALGEBRA
3.https://youtu.be/oXslbssVBgQ
4.https://youtu.be/zSvo9Qy6-vE
5.https://youtu.be/uMXcKY_w3w4

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	1	3	3	3	9	**25**
CO2	3	3	1	3	1	3	3	**17**
CO3	3	3	3	3	3	3	3	**21**
CO4	3	3	1	3	1	3	3	**17**
CO5	3	3	3	3	3	3	3	**21**
Total	**15**	**15**	**9**	**15**	**11**	**15**	**21**	**101**

Low-1 Medium-3 High-9

AECC I – Statistics

(For Students Admitted from 2025-2026)

Semester: I **Hours / week: 4**
Subject Code: JBMXA13 **Credit: 4**

Course Objectives:

1. To acquire knowledge about the theory of attributes and exact sampling distribution.
2. To gain knowledge about the testing of significance for large samples and small samples.

Unit I **(12 hours)**

Correlation and Regression: Bivariate distribution, Correlation - Scatter diagram - Karl Pearson Coefficient of Correlation - Limits for correlation coefficient - Rank Correlation - Repeated Ranks - Regression - Lines of Regression - Regression coefficients - Properties of regression coefficient - Angle between two lines of regression.

Unit II **(12 hours)**

Theory of Attributes: Introduction - Notations - Dichotomy - Classes and Class frequencies - Order of classes and class frequencies - Relation between class frequencies - Class symbols as operators - Consistence of data - Conditions for consistency of data - Independence of attributes - Criterion of independence - Symbols $(AB)_0$ and δ- Association of Attributes - Yule's Coefficient of association - Coefficient of Colligation.

Unit III **(12 hours)**

Sampling and Large Sample Test: Types of Sampling- Parameters and statistics -Sampling distribution - Standard Error: Tests of Significance - Null hypothesis - Errors in sampling - Critical Region and Level of significance - Test of significance for large samples - Test for single proportion - Test of significance for difference of proportions - Test of significance for single mean - Test of significance for difference of means.

Unit IV **(12 hours)**

Exact Sampling Distribution (Chi – Square Distribution): Chi-square variate - M.G.F of χ^2 distribution - Additive property of Chi- square variates - Chi- square test of goodness of fit - Independence of attributes.

Unit V **(12 hours)**

Exact Sampling Distribution (Continued) (t and F Distribution): Student's 't' (Definition) - Derivation of student's t- distribution - Applications of t-distribution - Test for single mean - t-Test for difference of means - t-Test for testing significance of an observed sample correlation coefficient - F-statistic (Definition) - Applications of F - distribution.

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Analyze the concept of correlation and regression
CO 2: Estimate and apply all aspects of theory of attributes
CO 3: Classify the concepts of sampling, testing of hypothesis and critical region
CO 4: Analyze the M.G.F of chi-square distribution
CO 5: Justify the concept of Student‟s t-distribution and F-distribution

Text Book:
1. S.C.Gupta, V.K.Kapoor, *Elements of Mathematical Statistics***,** Sultan Chand and Sons, Third Editon, Reprint 2015.

Unit I : Chapter 10 (10.1-10.3.1, 10.6-10.7.1, 10.7.3-10.7.5)
Unit II : Chapter 11
Unit III : Chapter 12 (12.2-12.8, 12.9.1, 12.9.2, 12.13, 12.14)
Unit IV : Chapter 13 (13.1, 13.3, 13.3.3, 13.5.2, 13.5.3)
Unit V : Chapter 14 (14.2, 14.2.1, 14.2.5-14.3.1)

Reference Books:
1. S. Arumugam and A. Thangapandi Isaac, *Statistics***,** New Gamma Publishing Houses, Edition, 2009.
2. S.C.Gupta, V.K.Kapoor, *Fundamental of Mathematical Statistics***,** Sultan Chand and Sons, Eleventh Edition, Reprint, 2019.

E-Resources:
1. https://udrc.lkouniv.ac.in/Content/DepartmentContent/SM_6dc18628-deb8-41c0-b3e0-7f39c1ca0125_38.pdf
2. https://www.youtube.com/watch?v=ktXwySpRrR8
3. https://www.simplypsychology.org/sampling-distribution.html

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	9	3	9	9	9	**45**
CO2	3	3	3	1	3	9	9	**31**
CO3	3	9	9	9	9	9	9	**57**
CO4	3	3	9	9	9	9	9	**51**
CO5	3	9	9	9	9	9	9	**57**
Total	**15**	**27**	**39**	**31**	**39**	**45**	**45**	**241**

Low-1 Medium-3 High-9

SEC I - Theory of Equations with SCILAB

(For Students Admitted from 2025-26)

Semester: I **Hours / week: 2**
Subject Code: JBMXS14P **Credit: 1**

Course Objectives:
1. To impart knowledge on solving problems on Theory of equations using SCILAB.

2. To use SCILAB for polynomial factorization.

List of Programmes:

1. Programs implementing find the roots using remainder theorem.
2. Programs implementing relations between the roots and coefficients of equations.
3. Programs implementing sum of the powers of the roots of an equation.
4. Programs implementing to determine the nature of the roots of the equation using Descartes' Rule of signs.
5. Programs implementing find the roots using Horner's Method.
6. Programs implementing find the multiple roots of the polynomial.
7. Programs implementing find the real and complex roots of the equation.
8. Programs implementing to determine the nature of the roots of the equation using Rolles' Theorem.
9. Programs implementing to form an equation whose roots are any power of the roots of a given equation.
10. Programs implementing general solution of the cubic equation using Cardon's Method.
11. Programs implementing to solve the cubic equation using Trigonometric Method.
12. Programs implementing to solve the biquadratic equation by Ferrari Method.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Identify the fundamental operations theory of equations.
CO 2: Notice the commands in SCILAB to solve problems in theory of equations
CO 3: Apply the acquired knowledge on SCILAB to find roots of polynomials
CO 4: Determine the nature of roots using mathematical rules and theorems.
CO5: Make use of SCILAB for Horner's Method, Cardon's method, Trigonometric method and Ferrari method of evaluating a real root

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	**35**
CO2	9	1	9	1	3	1	3	**27**
CO3	3	3	3	9	3	1	9	**31**
CO4	3	9	9	9	9	3	9	**51**
CO5	3	9	1	9	9	3	1	**35**
Total	**27**	**23**	**25**	**37**	**27**	**9**	**31**	**179**

Low-1 **Medium-3** **High-9**

Core III - Analytical Geometry - 3D & Vector Calculus

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 5**
Subject Code: JBMXC21 **Credit: 5**

Course Objectives:

1. To develop the skill of solving problems related to plane, straight line, spheres in threedimensional.

2. To understand the fundamental concepts of vector differentiation and integration.

Unit I **(15hours)**

The Plane: Plane Equations - Angle between the planes-Equation to a plane passing throughthe line of intersection of two given planes - Length of the perpendicular.

Unit II **(15 hours)**

The straight line: Symmetrical form – Image of the point - the plane and the straight line – geometrical shapes - Coplanar Lines.

Unit III **(15 hours)**

The Sphere: Equation of a Sphere - Plane section of a sphere - Equation of a circle – The Intersection of two spheres – Tangent and Tangent plane – Orthogonal spheres.

Unit IV **(15 hours)**

Vector Differentiation: Differentiation of a vector - Geometric interpretation of the Derivative - Differentiation of the Dot and Cross products. **Gradient, Divergence & Curl:** The vector differential operator Del – Gradient of a Scalar function - The Divergence of a Vector – Physical Interpretation of the Divergence of a vector - Physical Interpretation of theCurl of a vector.

Unit V **(15 hours)**

Vector Integration: Integration of a vector - The line integral - Green's theorem in twodimensions – Extension of Green's theorem.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Describe the concepts of planes and solve the related problems
CO2: Explain geometrical shapes and coplanar lines
CO3: Explicate the knowledge on the concepts of sphere
CO4: Make use of different operators, explain the different concepts of vectordifferentiations
CO5: Compute vector integration by using Green's theorem and its extension

Text Book:

1. Dr.M.K.Venkataraman & Mrs.Manorama Sridhar**,** *Analytical Geometry– 3D &Vector Calculus,* the National Publishing Company**,** First Edition. Dec 2001.

Unit I : Chapter 2 (2.1 to 2.13)
Unit II : Chapter 3 (3.1to 3.11)
Unit III : Chapter 4 (4.1to 4.12)
Unit IV : Chapter 2, 3(3.1 to 3.10)
Unit V : Chapter 4 (4.1to 4.4)

Reference Books:

1. Dr. S. Arumugam & A. Thangapandi Isaac, *Analytical Geometry-3D and Vector Calculus***,** New Gamma Publishing House**,** 2006.
2. T.K. Manicavachagom Pillay and T. Natarajan, *A Text Book of Analytical Geometry Part II– Three Dimensions,* S.Viswanathan (Printers &Publishers) Private Limited,2010.
3. P.K. Jain and Khalil Ahmad, *Analytical geometry of Three Dimensions***,** Wiley Eastern Limited, 1994.

E-Resources:

1. http://cloudportal.sathyabama.ac.in/coursematerial_staging/uploads/SMT1303.pdf
2. https://www.youtube.com/watch?v=a2mt2L0e06Y
3. https://www.khanacademy.org/math/multivariable-calculus/greens-theorem-and- stokes-theorem/greens-theorem/v/green-s-theorem-example-1
4. https://learn.lboro.ac.uk/archive/olmp/olmp_resources/pages/workbooks_1_50_jan2008/Workbook15/15_1_integrtn_of_vectors.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	3	3	9	**27**
CO2	3	3	1	3	3	3	9	**25**
CO3	3	3	1	3	3	3	9	**25**
CO4	3	3	3	3	1	3	3	**19**
CO5	3	3	3	3	3	3	3	**21**
Total	**15**	**15**	**11**	**15**	**13**	**15**	**33**	**117**

Low-1 Medium-3 High-9

Core IV- Differential Equations

(For Students Admitted from 2025- 26)

Semester: II **Hours / week: 5**
Subject Code: JBMXC22 **Credit**: **4**

Course Objectives:

1. To distinguish ordinary differential equations from partial differential equations
2. To use Lagrange's method and charpit's method to solve partial differentialequations

Unit I **(15 hours)**

Linear Equations with constant coefficients: Definitions - Complementary function of a linear equation with constant coefficients - Particular integral - General method of finding P.I - Special methods for finding P.I.

Unit II **(15 hours)**

Linear Equations with constant coefficients: Linear equations with variable coefficients, Equations reducible to the Linear equations.

Unit III **(12 hours)**

Simultaneous differential equations: Simultaneous equations of the first order and first degree - Simultaneous linear differential equations - Simultaneous equations with variableco-efficient.

Unit IV **(15 hours)**

Linear equations of the second order: Complete solution given a known integral - Reduction to the normal form - Change of the independent variable - Variation of Parameters - Methods of Operational factors.

Unit V **(15 hours)**

Partial Differential equations of the first order: Classification of integral - Derivation of partial differential equations – Lagrange's method of solving the linear equation - Special method: standardforms – Charpit's method.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Select the suitable method and find particular integral
CO 2: Determine the solutions of differential equations by various methods
CO 3: Analyze the concepts of simultaneous differential equations and solve the Problems
CO 4: Compute the solution to the problem of linear equations of second order
CO 5: Use Lagrange's and Charpit's methods to solve the partial differential equations

Text Book:

1. S. Narayanan and T.K. Manicavachagom Pillai, *Differential Equations and its Applications*, S. Viswanathan (Printers & Publishers) Private Limited, 2019.

Unit I : Chapter V (Pg.no: 68 - 88)
Unit II : Chapter V (Pg.no: 89 - 102)
Unit III : Chapter VI (Pg.no: 119 - 134)
Unit IV : Chapter VIII (Pg.no: 145 - 160)
Unit V : Chapter XII (Pg.no: 219 - 249)

Reference Books:

1. K.Venkataraman and Mrs. Manorama Sridhar, *Differential Equations and Laplace Transforms*, the National Publishing Company, 2004.
2. Dr. Arumugam and Mr A. Thangapandi Issac, *Differential Equations and Laplace Transfroms*, New Gamma Publishing House, 2014.
3. Nita H. Shah, *Ordinary and Partial differential equations - Theory and Applications*, PHI Learning Private Limited, New Delhi, 2010.
4. Shepley L. Ross, *Differential Equations*, 3rd Ed., John Wiley and Sons, 1984.

E-Resources:

1. https://ocw.mit.edu/courses/mathematics/18-03-differential-equations-spring-2010/video-lectures/

2.https://solitaryroad.com/c651.html
3.https://youtu.be/VyWBA0THDRk
4.http://people.cs.uchicago.edu/~lebovitz/Eodesbook/lc.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	1	3	1	**29**
CO2	9	9	3	3	1	3	3	**31**
CO3	3	3	3	3	3	3	9	**27**
CO4	3	3	3	3	1	3	9	**25**
CO5	3	3	9	3	3	9	9	**39**
Total	**27**	**27**	**21**	**15**	**9**	**21**	**31**	**151**

Low -1 **Medium – 3** **High – 9**

AECC II – Graph theory

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 4**
Subject Code: JBMXA23 **Credit: 4**

Course Objectives:

1. To understand and apply the fundamental concepts in graph theory.
2. To understand the various graph structures and their properties in solving the underlying physical problems.

Unit I **(11 hours)**

Graphs: Varieties of graphs – Walks and connectedness – Degrees – the problem of Ramsey – Extremal graphs – Intersection graphs – Operations on graphs.

Unit II **(11 hours)**

Blocks: Cutpoints, bridges, and blocks – Block graphs and cutpoint graphs. **Trees:** Characterization of trees – Centers and Centroids – Block cutpoint trees**.**

Unit III **(13 hours)**

Traversability: Eulerian graphs – Hamiltonian graphs. **Planarity:** Plane and planar graphs – Kuratowski's theorem – Genus, thickness, coarseness, cross number.

Unit IV **(13 hours)**

Colorability: The Chromatics Number –The Five Color theorem – The Four Color Conjecture –Critical Graphs – Homomorphisms – The Chromatic Polynomial.

Unit V **(12 hours)**

Digraphs: Digraphs and connectedness – Directional duality and acyclic digraphs – digraphs and matrices – Tournaments.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Classify the properties of different types of graphs and their application
CO 2: Apply the concepts to solve the solution of the problems
CO 3: Explain the concept of the graph and identify its applications to fundamental circuits
CO 4: Analyze the concepts of colouring of a graph
CO 5: Build the real life applications to solve the real life problems

Text Book:

1. Frank Harary, *Graph Theory*, Narosa Publishing House, Tenth Reprint 2001.

Unit I : Chapter 2
Unit II : Chapter 3 & 4 (Pg No: 32 -37)
Unit III : Chapter 7 & 11 (Pg No: 102 - 106, 108 - 113, 116- 125)
Unit IV : Chapter 12 (Pg No: 126 - 135, 141 - 149)
Unit V : Chapter 16

Reference Books:

1. Dr. S. Arumugam, S. Ramachandran**,** *Invitation to graph theory* – Scitech Publications Private Limited, First published July 2015.

2. John Clark & Derek Allan Holtan, A First Look at *Graph theory*, Allied Publishers Limited, 1995.

E-Resources:

1.https://www.maths.ed.ac.uk/~v1ranick/papers/wilsongraph.pdf
2.https://d3gt.com/unit.html
3.https://nptel.ac.in/courses/111/106/111106102/
4.https://www.maths.ed.ac.uk/~v1ranick/papers/wilsongraph.pdf
5.https://d3gt.com/unit.html

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	9	9	3	3	3	3	**33**
CO2	3	3	3	3	3	3	3	**21**
CO3	3	9	9	3	3	3	3	**33**
CO4	3	3	3	3	3	3	3	**21**
CO5	3	3	3	1	1	1	1	**13**
Total	**15**	**27**	**27**	**13**	**13**	**13**	**13**	**121**

Low-1 Medium-3 High-9

SEC II – Analytical Geometry with Geogebra

(For Students Admitted from 2025- 26)

Semester: II **Hours / week: 2**
Subject Code: JBMXS24P **Credit: 1**

Course Objectives:

1. To develop and share classroom materials, and to continually improve and extend the dynamic mathematics software Geogebra.
2. To use the Geogebra software to solve the equations, plane, line and Sphere.

List of Programmes:

1. Programs implementing Equation of a plane
2. Programs implementing Angle between two planes
3. Programs implementing Equation of a line
4. Programs implementing Angle between a line and a plane
5. Programs implementing Two lines are coplanar
6. Programs implementing Equation of a sphere
7. Programs implementing Equation of a circle
8. Programs implementing Intersection of two spheres
9. Programs implementing Equation of a Tangent Plane
10. Programs implementing Length of a Perpendicular line

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Demonstrate and use Geogebra to find the Equations of a plane and angle betweentwo planes

CO 2: Utilize the Geogebra to solve the Equations of a line

CO 3: Compare Angle between a line and a plane
CO 4: Compute the solution of two lines that are coplanar
CO 5: Verify the results of Equation of a circle and Intersection of two spheres

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	**35**
CO2	9	1	9	1	3	1	3	**27**
CO3	3	3	3	9	3	1	9	**31**
CO4	3	9	9	9	9	3	9	**51**
CO5	3	9	1	9	9	3	1	**35**
Total	**27**	**23**	**25**	**37**	**27**	**9**	**31**	**179**

Low-1 **Medium-3** **High-9**

Extra Credit- Lattice Theory

(For Students Admitted from 2025- 26)

Semester: II
Subject Code: JBMXX2 **Credit: 2**

Course Objectives:
1. To know more about Lattices and their usefulness in other areas of mathematics.
2. To develop mathematical foundation to understand, create mathematical arguments and focusing on the formal Languages and Lattices.

Unit I
Posets and Lattices: Diagrammatical representation of a poset - Isomorphism-Duality - Product of two Posets

Unit II
Posets and Lattices: Semi Lattices - Complete Lattices- Sub Lattices.

Unit III
Ideals and Homomorphisms: Dual Ideals – Principal Ideals –Principal Dual Ideals - Prime Ideals.

Unit IV
Ideals and Homomorphisms: Complements – Length and covering condition - Homomorphisms - Quotient Lattices

Unit V
Modular and Distributive Lattices: Modular Lattice - Ideal Lattice - Isomorphism Theorem - Distributive Lattices – Direct Product

Course Outcomes:
After successful completion of this course, student will be able to
CO1: Identify the Posets and product of two Posets

CO2: To know the concept of Lattices
CO3: Examine the properties of ideals and principle Ideals
CO4: Highlight the characteristics of prime Ideals and Modular Lattices
CO5: Categorize the distributive Lattices

Text Book:
1.Vijay K.Khanna, *Lattices and Boolean Algebras,* Vicas Publishing House Private Limited, Second Edition, 2004.
Unit I: Chapter 2 (Pages 11-20)
Unit II: Chapter 2 (Pages 20-37)
Unit III: Chapter 3 (Pages 38-47)
Unit IV: Chapter 3 (Pages 47-69)
Unit V: Chapter 4 (Pages 70 - 95)

Reference Books:
1. Mendelson Elliott, *Theory and Problems of Boolean Algebra,* & Schaums outline Series, NewYork, Mc Graw Hill Publications, 1970.
2. Whitesitt.J Eldon, *Boolean Algebra and its Applications* ,Massachusetts: Adition Wesley,1962
3. P K Agarwal, *Test of Verbal Reasoning for Competitive Examinations,* Edition 2004.

E-Resources:
1. https://www.youtube.com/watch?v=saAkSk_arPA
2. https://www.youtube.com/watch?v=3UkC3sXLqhQ
3. https://www.youtube.com/watch?v=AnZSgCV_QII
4. https://www.youtube.com/watch?v=W0aOoC6rag8

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	1	3	3	3	9	**25**
CO2	3	3	1	3	3	3	9	**25**
CO3	3	3	1	3	3	3	9	**25**
CO4	3	3	3	3	3	3	9	**27**
CO5	3	3	3	3	3	3	9	**27**
Total	**15**	**15**	**9**	**15**	**15**	**15**	**45**	**129**

Low-1 Medium-3 High-9

Core V- Sequence and Series

(For Students Admitted from 2025- 26)

Semester: III **Hours / week: 4**
Subject Code: JBMXC31 **Credits: 4**

Course Objectives:
1. To differentiate a sequence and a series in the mathematical context.
2. To understand the fundamentals of sets and functions on real numbers.

Unit I **(12 hours)**

Sets and Functions: Sets and elements - Set operations - Functions - Direct and inverse images - Special types of functions - Inverse functions - Composition of functions - Restrictions of functions - Finite and infinite sets - Countable sets – Cantor's theorem.

Unit II **(12 hours)**

Real Numbers: The real line - Suprema and infrima - The completeness property of R - Applications of the supremum propert – Functions - Archimedean property - Density of rational numbers in R.

Unit III **(12 hours)**

Sequence and Series: Sequence and their limits - The limit of the sequence – Uniqueness of limits- Limit theorems - Squeeze Theorem - Monotone Sequence - Monotone convergence theorem.

Unit IV **(12 hours)**

Sequence and Series: Subsequences and Bolzano Weierstrass theorem - Divergence criteria - The Cauchy criterion - Cauchy convergence theorem - Introduction to infinite series - The nth term test - Cauchy criterion for series - Comparison test - Limit comparison test.

Unit V **(12 hours)**

Infinite Series: Absolute convergence - Tests for absolute convergence - The root and ratio tests (statements only) - Integral test (statement only) - Raabe's test (statement only) - Tests for non-absolute convergence - Alternating series - Alternating series test - The Dirichlet and Abel tests (statements only) - Problems.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Compute the direct, inverse images and composition of functions

CO 2: Make use of completeness property of R in the real line

CO 3: Evaluate the limit of the sequence

CO 4: Analyze the concepts of subsequences, series and their application in various fields of sciences

CO 5: Apply various tests to find the absolute convergence of an infinite series of real numbers

Text Book:

1. Robert G. Bartle and Donald R. Sherbert, *Introduction to Real Analysis,* John- Wiley & Sons, Inc., Fourth Edition, 2011.

Unit 1: Chapter 1 (1.1.1 -1.1.14 and 1.3.1 -1.3.13)

Unit 2: Chapter 2 (2.2.7-2.2.9, 2.3.1 -2.3.6 and 2.4.1 -2.4.6, 2.4.8)

Unit 3: Chapter 3 (3.1.1-3.1.11, 3.2.1 -3.2.11 and 3.3.1 -3.3.6)

Unit 4: Chapter 3 (3.4.1-3.4.9, 3.5.1-3.5.6, and 3.7.1 -3.7.9)

Unit 5: Chapter 9 (9.1.1 -9.1.2, 9.2.1 -9.2.10, and 9.3.1 -9.3.5)

Reference Books:

1.S. Kumaresan, *Topology of metric spaces*, Alpha Science International Limited First Edition, 2005.

2.K.Viswanatha, *Real Analysis*, Naik-Emerald Publishers -First Edition.

3.Richard RGoldberg, *Methodsof RealAnalysis*, Oxford&IBHPublishing CompanyPrivate Limited, New Delhi, 1970.

E-Resources:

1.https://www.google.co.in/books/edition/Methods_of_Solving_Sequence_and_Series
2.https://www.whitman.edu/mathematics/calculus/calculus11_Sequences and Series
3.https://youtu.be/teM8h3Nk09I
4.https://s2pnd-matematika.fkip.unpatti.ac.id/wp-content/uploads/2019/03/Real-Analysis- 4th-Ed-Royden.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	3	3	3	**21**
CO2	3	3	3	3	3	3	3	**21**
CO3	3	3	3	3	3	3	3	**21**
CO4	9	3	3	3	3	3	3	**27**
CO5	3	9	3	3	1	3	3	**25**
Total	**21**	**21**	**15**	**15**	**13**	**15**	**15**	**115**

Low-1 Medium-3 High-9

Core VI- Astronomy

(For Students Admitted from 2025- 26)

Semester: III **Hours / week: 4**
Subject Code: JBMXC32 **Credit: 3**

Course Objectives:

1. To understand astronomical phenomena of celestial bodies.
2. To visualize and analyze the occurrence of astronomical events.

Unit I **(13 hours)**

Celestial Sphere, Diurnal Motion: Astronomy - Equinox and Solstice – Celestial Coordinates – Sidereal times- Diagram of the Celestial sphere.

Unit II **(13 hours)**

The Earth: Dip of Horizon- Twilight. **Refraction:** Laws of Refraction - Astronomical Refraction - Tangent formula for Refraction- General Effects of Refraction – Cassini's Formula - Horizontal Refraction.

Unit III **(11 hours)**

The Moon: Moon - Sidereal Month and Synodic Month - Successive Phase of Moon - Lunar Librations - Path of the Moon with respect to the sun - Harvest Moon - Surface Structure of Moon- lunar Mountains - Earth Shines - The Tides.

Unit IV **(12 hours)**

Eclipses: Introduction - Umbra and Penumbra - Lunar Eclipse - Solar eclipse - Angle between a direct common tangent and the line of centres of two circles - Angle between a transverse common tangent and the line of centres of two circles - conditions for the occurrence of a lunar

and solar eclipse – Lenth of earth's shadow - Ecliptic limits - Calculate the major and minor ecliptic limits - Synodic period of the nodes of lunar orbit - maximum and minimum number of eclipses in a year – Eclipse Season.

Unit V **(11 hours)**

Cosmology: The Universe: Introduction – The birth of the solar System. **Stars and their lives:** Plotting the stars – A star is born - The life of a star – Death of star - The milky way – Our home Galaxies.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Describe the basic concepts in astronomy and the theory of motion of celestial bodies

CO 2: Understand how the phase of the Moon is controlled by the relative positions of the Sun and Moon in the sky

CO 3: Emphasis on the formation of Universe

CO 4: Assess the application of mathematics in astronomy

CO 5: explain the evolution of stars as well as of the large scale structure of the Universe.

Text Book:

1.S. Kumaravelu, and Susheela Kumaravelu, *Astronomy,* A Bhaskara Selvan, Sivakasi, 2009.

Unit I : Chapter II (Pg.no: 41 – 74, 91 - 93)

Unit II : Chapter III (Pg.no: 135 -152) Chapter IV (Pg.no: 154 – 172)

Unit III: Chapter XII (Pg.no: 373 – 394)

Unit IV: Chapter XIII (Pg.no: 397 – 417 & 425 – 430)

2. John Scalzi, *The Rough Guide to the Universe*, Rough guide Ltd., 2nd edition, 2008

Unit V : Sections 1(Pg.no: 3 -12), 12(Pg.no:169 - 178), 13(Pg.no:184 – 188)

Reference Books:

1. Rukmani Ramachandran, *Astronomy for Under Graduate & Post Graduate Classes*, 1968.
2. G.V. Ramachandran, *Astronomy*, Mission Press, Palayamkottai.
3. Jayant Narlikar, *A Journey through the Universe*, National Book Trust, India, Sixth Edition, 2004.
4. Peter Schneider, *Extragalactic Astronomy and Cosmology*, Springer

E-Resources:

1.https://www.youtube.com/watch?v=yBodZ9LBhRE
2.https://www.youtube.com/watch?v=sr_QJF3Ca48
3.https://www.youtube.com/watch?v=gr5sCrdCfVA
4.http://www.astronomycast.com/2012/03/ep-254-reflection-and-refraction/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	1	1	3	3	**23**
CO2	3	3	3	1	1	3	1	**15**
CO3	3	3	3	1	1	3	1	**15**
CO4	9	9	9	3	3	3	3	**39**
CO5	3	3	9	3	3	3	3	**27**
Total	**27**	**21**	**27**	**9**	**9**	**15**	**11**	**119**

Low-1 Medium-3 High-9

SEC III – Differential Equations with Sage Math

(For Students Admitted from 2025- 26)

Semester: III **Hours / week: 2**

Subject Code: JBMXS34 **Credits: 1**

Course Objectives:

1. To use SageMath to solve first-order ODEs.
2. To formulate differential equations to model real-world situations.

List of Programmes:

1. Solving Complementary function of a linear equation with constant coefficients.
2. Finding particular Integral when x is of the from e^{ax}
3. Finding particular Integral when x is of the from $\cos ax$ or $\sin ax$.
4. Finding particular Integral when x is of the form $e^{ax}V$ where V is any function of x.
5. Solving Linear equations with variable coefficients.
6. To Find Partiular Integral of $x^n \frac{d^n y}{dx^n} + p_1 x^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \cdots + p_n y$
7. Solving equation reducible to the linear equations.
8. Solving simultaneous differential equations of the first order and first degree
9. Solving geometrical imprecation $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$
10. Solving simultaneous equations with variable coefficients
11. Solving linear equations of the second order
12. Solving problems in reduction to the normal form
13. Solving problem in Clairant 's form
14. Solving problem in charpit's method.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Learn basic SageMath commands for defining functions, variables, derivatives, and solving differential equations

CO 2: Use SageMath to solve basic types of differential equations and interpret the results.

CO 3: Analyze the suitable methods for finding particular integrals when the right-hand side is one of these standard forms.

CO 4: Design and implement algorithms for solving specific types of differential equations using SageMath.

CO 5: Justify the choice of solution method for a given problem.

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	1	3	9	3	1	9	35
CO2	9	1	9	1	3	1	3	27
CO3	3	3	3	9	3	1	9	31
CO4	3	9	9	9	9	3	9	51
CO5	3	9	1	9	9	3	1	35
Total	27	23	25	37	27	9	31	179

Low-1 Medium-3 High-9

MD I – Mathematical Aptitude for Competitive Examinations - I

(For Students Admitted from 2025- 26)

Semester: III **Hours / week: 2**

Subject Code: JBMD31MX **Credits: 1**

Course Objectives:

1. To acquire simple techniques for dealing quantities, business transactions, data analytics and geometrical structures.
2. This Aptitude Training helps them to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

Unit I **(6 hours)**

HCF and LCM of numbers: Important facts and Formulae- Solved Examples – Exercise- **Problems on ages** : Solved Examples - Exercise. **Surds and Indices:** Important facts and Formulae- Solved Examples – Exercise.

Unit II **(6 hours)**

Simplification: Important Concepts - Solved Examples – Exercise

Unit III **(6 hours)**

Percentage: Important facts and Formulae- Solved Examples – Exercise

Unit IV **(6 hours)**

Profit and Loss: Important facts - Formulae- Solved Examples – Exercise

Unit V **(6 hours)**

Ratio and Proportion: Important facts and Formulae- Solved Examples – Exercise. **Partnership:** Important facts and Formulae- Solved Examples – Exercise. **Chain Rule:** Important facts and Formulae- Solved Examples – Exercise.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Recall fundamental mathematical concepts, formulas, and numerical techniques.

CO 2: Apply mathematical techniques to solve quantitative aptitude problems efficiently.

CO 3: Analyze different types of competitive exam questions to identify the best solving approach.

CO 4: Evaluate problem-solving strategies for accuracy, speed, and efficiency in aptitude

tests.

CO 5: Develop innovative shortcuts and time-saving techniques for competitive exam preparation.

Text Book:

1. Dr R S Aggarwal, *Quantitative Aptitude for Competitive Examinations,* S. Chand & Company Pvt. Ltd.

Unit I : Chapter 2, 8, 9
Unit II : Chapter 4
Unit III : Chapter 10
Unit IV : Chapter 11
Unit V : Chapter 12, 13, 14

Reference Books:

1. P. Gupta, *Quantitative Aptitude*, Unique publishers pvt. limited – Revised edition – 2015.
2. Sarvesh Kumar Verma, *The Quantitative Aptitude* for CAT Arihant Publications Private Limited, Meerut, Edition 1, 2009.
3. Chand S *Quantitative Aptitude (Mathematics & Statistics)* S.Chand & Company Limited, First Edition, 2008.
4. Mark Alan Stewart, *Master the GMAT*, Edition, 2007.

E-Resources:

1. https://www.youtube.com/watch?v=rHzggZDdtc4
2. https://www.youtube.com/watch?v=FdAkE032ODI
3. https://pdfgoal.com/downloads/quantitative_aptitude_made_easy_ugcportal_pdf
4. https://www.youtube.com/watch?v=_cW7_BUDYcw
5. https://iim-cat-questions-answers.2iim.com/quant/geometry/mensuration/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	3	9	9	**33**
CO2	3	3	3	3	3	9	9	**33**
CO3	3	3	3	3	3	9	9	**33**
CO4	3	3	3	3	3	9	9	**33**
CO5	3	3	3	3	3	9	9	**33**
Total	**15**	**15**	**15**	**15**	**15**	**45**	**45**	**165**

Low-1 Medium-3 High-9

Extra Credit – Boolean Algebra

(For Students Admitted from 2025- 26)

Semester: III
Subject Code: JBMXX3 **Credit: 2**

Course Objectives:

1. To know more about Boolean Algebra and their usefulness in other areas of mathematics.

2. To develop mathematical foundation to understand, create mathematical arguments and focusing on the Boolean Algebra and graph theory.

Unit I
Boolean Algebra: Boolean Algebra – Boolean rings

Unit II
Boolean Algebra: Boolean Functions - Conjunctive Normal Form- Disjunctive Normal Form

Unit III
Boolean Algebra: Switching Circuits - Representation of circuits-Simplification of circuits

Unit IV
Boolean Algebra: Design of Circuits - Don't care conditions –Design of n-terminal circuits

Unit V
Boolean Algebra: Non-Series Circuits - Non-series circuits-Parallel circuits

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Identify the characteristics of Boolean algebra
CO 2: Examine the types of Boolean functions
CO 3: To know the concepts of switching circuits
CO 4: Classify the design of circuits
CO 5: Simplify the parallel circuits

Text Book:
1. Vijay K.Khanna, *Lattices and Boolean Algebras*, Vicas Publishing House Private Limited, Second Edition, 2004.

Unit I : Chapter 5 (Pages 96-110)
Unit II : Chapter 5 (Pages 111-127)
Unit III : Chapter 5 (Pages 127-131)
Unit IV : Chapter 5 (Pages 131-138)
Unit V : Chapter 5 (Pages 138-146)

Reference Books:
1. Mendelson Elliott, *Theory and Problems of Boolean Algebra*, & Schaums outline Series, NewYork, Mc Graw Hill Publications, 1970.
2. Whitesitt.J Eldon, *Boolean Algebra and its Applications* ,Massachusetts: Adition Wesley,1962
3. P K Agarwal, *Test of Verbal Reasoning for Competitive Examinations*, Edition 2004.

E-Resources:
1. https://www.geeksforgeeks.org/boolean-algebra/
2. https://www.youtube.com/watch?v=IQlUxZ9GiVY
3. https://www.youtube.com/watch?v=9RLEt0r0SCs
4. https://www.youtube.com/watch?v=XE_XkPT0pJk

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	9	1	3	1	1	**21**
CO2	3	3	9	1	1	1	1	**19**
CO3	3	3	9	1	1	1	1	**19**
CO4	3	3	9	1	1	1	1	**19**
CO5	3	3	3	1	1	1	1	**13**
Total	**15**	**15**	**39**	**5**	**7**	**5**	**5**	**91**

Low-1 Medium-3 High-9

Core VII- Linear Algebra

(For Students Admitted from 2025-26)

Semester: IV **Hours / week: 5**
Subject Code: JBMXC41 **Credit: 5**

Course Objectives:

1. To gain knowledge on fundamental concepts of the third algebraic system called vector space and linear transformations.
2. To understand inner product spaces and their properties.

Unit I **(15 hours)**

Vector Spaces: Elementary Basic Concepts - Linear Independence and Bases.

Unit II **(15 hours)**

Linear Equations: Matrices and Elementary Row Operations – Row - Reduced Echelon Matrices – Matrix Multiplication – Invertible Matrices.

Unit III **(17 hours)**

Inner Product Spaces: Introduction - Inner products – Linear functions and Adjoints.

Unit IV **(13 hours)**

Inner Product Spaces: Unitary operations – Normal operations.

Unit V **(15 hours)**

Linear transformations: The Algebra of Linear Transformations – Characteristic Roots.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Illustrate the concepts of Vector Space
CO2: Assess the different transforms in matrices
CO3: Analyze the concept of Inner product space
CO4: Justify the implication of unitary operations and Normal operations in inner product space
CO5: Measure the roots of linear transformations

Text Books:

1. I.N. Herstein, *Topics in Algebra*, Wiley India Private Limited, New Delhi, Second Edition,

2015.

Unit I : Chapter 4 (4.1, 4.2)
Unit V : Chapter 6 (6.1 & 6.2)

2. Kenneth Hoffman and Ray Kunze, *Linear Algebra*, Second Edition, Prentice Hall of India Private Limited, New Delhi, 2014.

Unit II : Chapter 1 (1.3- 1.6)
Unit III : Chapter 8 (8.1 – 8.3)
Unit IV : Chapter 8 (8.4 & 8.5)

Reference Books:

1. Surjit Singh, *Linear Algebra***,** Vikas Publishing House Private Limited, First Edition, 1997.
2. Dr M K Venkataraman, *Linear Algebra***,** The National Publishing Company, 1999.
3. Gilbert Strang, *Linear Algebra and its Applications*, Cengage Learning India Private Limited, Fourth Edition, 2014.

E-Resources:

1. https://nptel.ac.in/courses/111/104/111104137/
2. https://www.youtube.com/watch?v=ERfbtPBEYVA
3. https://gacbe.ac.in/pdf/ematerial/18BMA51C-U4.pdf
4. https://nptel.ac.in/courses/111/107/111107105/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	9	3	3	1	3	3	**25**
CO2	3	3	3	3	1	3	3	**19**
CO3	3	3	3	3	1	3	3	**19**
CO4	9	3	3	3	1	3	9	**31**
CO5	9	9	3	3	1	3	9	**37**
Total	**27**	**27**	**15**	**15**	**5**	**15**	**27**	**131**

Low-1 Medium-3 High-9

Core VIII –Foundation Course in Mathematics

(For Students Admitted from 2025-26)

Semester: IV **Hours / week: 4**
Subject Code: JBMXC42 **Credit: 3**

Course Objectives:

1. To explain the fundamental ideas of sets and functions.
2. To introduce basic logic.

Unit I **(12 hours)**

Statements and Logic: Statements - Statements with quantifiers - Compound statements - Implications - Proofs in Mathematics.

Unit II **(12 hours)**

Sets: Basic terminologies - Operations on sets - Family of sets - Power sets - Cartesian product of sets.

Unit III **(12 hours)**

Functions: Basic definitions - One-one, onto functions and bijections - Composition of functions - Inverse of a function - Image of subsets under functions - Inverse image of subsets under functions.

Unit IV **(9 hours)**

Relation: Relations on sets -Types of relations - Equivalence relations - Equivalence classes and partitions of a set.

Unit V **(15 hours)**

Induction Principles: The Induction Principle -The Strong Induction Principle -The Well-ordering Principle -Equivalence of the three principles. **Countability of Sets**: Sets with same cardinality - Finite sets - Countable sets - Comparing cardinality.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Recall some expansions of statements and logic.
CO 2: Classify the variation of sets
CO 3: Explain Basic definitions of functions
CO 4: Analyze the Types of Relations and Solve the Equivalence relations.
CO 5: Evaluate the solution of Induction principles.

Text Book:

1. Ajit Kumar, S. Kumaresan, Bhaba Kumar Sarma, *A Foundation Course in Mathematics*, Alpha Science International Ltd. Oxford, U.K. 2018.

Unit I : Chapter 1
Unit II : Chapter 2
Unit III : Chapter 3
Unit IV : Chapter 4
Unit V : Chapter 5,6

Reference Books:

1. Charles C. , *A Book f Set Theory* ,Dover Publications, Inc. Mineola, New York 2014
2. Paul R. Halmos, *Naive Set theory*, Dover publication.Inc Minelo, New york.

E-Resources:

1. https://youtu.be/oaOm2pnKkyY
2. https://youtu.be/jNcbVOk1P2Y
3. https://youtu.be/oU60TuGHxe0
4. https://youtu.be/jZXHzpq-vmM
5. https://youtu.be/gLT58t2z48A

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	3	3	3	**21**
CO2	3	3	3	3	3	3	3	**21**
CO3	9	9	3	3	3	9	3	**39**
CO4	3	3	3	3	9	3	3	**27**
CO5	3	3	3	3	3	3	3	**21**
Total	**21**	**21**	**15**	**15**	**21**	**21**	**15**	**129**

Low-1 **Medium-3** **High-9**

MD II- Mathematical Aptitude for Competitive Examinations - II

(For Students Admitted from 2025-26)

Semester: IV **Hours / week: 3**
Subject Code: JBMD41MX **Credit: 2**

Course Objectives:

1.To gain the aptitude knowledge required for competitive examination and to provide a well-knitted path to success
2.To enrich their knowledge and to develop their logical reasoning thinking ability

Unit I **(9 hours)**

Time and Work: Important facts and Formulae- Solved Examples – Exercise. **Pipes and Cisterns:** Important facts and Formulae- Solved Examples – Exercise.

Unit II **(9 hours)**

Time and Distance: Important facts and Formulae- Solved Examples – Exercise. **Problems on Trains:** Important facts and Formulae- Solved Examples – Exercise.

Unit III **(9 hours)**

Boats and Streams: Important facts and Formulae- Solved Examples – Exercise. **Alligation or Mixture:** Important facts and Formulae- Solved Examples – Exercise. **Simple Interest:** Important facts and Formulae- Solved Examples – Exercise.

Unit IV **(9 hours)**

Compound Interest: Important facts and Formulae- Solved Examples – Exercise. **Races and Games of Skill:** Important facts and Formulae- Solved Examples – Exercise. **Calendars:** Important facts and Formulae- Solved Examples – Exercise. **Clocks:** Important facts and Formulae- Solved Examples – Exercise.

Unit V **(9 hours)**

Volumes & Surface Areas: Important facts and Formulae- Solved Examples – Exercise. **Odd Man Out & Series :** Important facts and Formulae- Solved Examples – Exercise.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Explain the mathematical principles, formulas, and logical reasoning techniques required for solving aptitude problems.

CO 2: Apply mathematical concepts and problem-solving techniques to solve quantitative aptitude questions efficiently.
CO 3: Analyze different question patterns and logical reasoning problems to determine optimal solving approaches.
CO 4: Assess the effectiveness of various mathematical techniques, identify common pitfalls, and refine strategies to enhance performance in competitive exams.
CO 5: Build a structured approach to allocate time effectively across different sections of competitive exams.

Text Book:

1.Dr R S Aggarwal, *Quantitative Aptitude for Competitive Examinations,* S. Chand & Company Pvt. Ltd.

Unit I : Chapter 15, 16
Unit II : Chapter 17, 18
Unit III : Chapter 19, 20, 21
Unit IV : Chapter 22, 26, 27, 28
Unit V : Chapter 25, 35

Reference Books:

1.P.Gupta, *Quantitative Aptitude,* Unique publisher's pvt. Limited – Revised edition – 2015.
2.Bharat Jhunjhunwala, *Quantitative Aptitude (Mathematics & Statistics) for CA Common proficiency Test (CPT),* S. Chand and Company Limited – First Edition, 2008.
3.Ashish Aggarwal, *Quick Arithmetic,* S.Chand Publications, 2nd Edition, 2007.
4.Dr.R.S. Aggarwal, *Quantitative Aptitude,* S.Chand Publications.7th Edition, 2015.

E-Resources:

1.https://www.youtube.com/watch?v=oGT0AOihPr8
2.https://www.youtube.com/watch?v=jxlWNJ1MghA
3.https://www.youtube.com/watch?v=PfHOs4ukM5g
4.https://www.youtube.com/watch?v=Qz-WBXsLkos
5.https://www.youtube.com/watch?v=JBNUfNpm35Y

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	1	9	9	**31**
CO2	3	3	3	3	1	9	9	**31**
CO3	3	3	3	3	1	9	9	**31**
CO4	3	3	3	3	3	9	9	**33**
CO5	3	3	3	3	3	9	9	**33**
Total	**15**	**15**	**15**	**15**	**9**	**45**	**45**	**159**

Low-1 Medium-3 High-9

SEC IV – Linear Algebra with Sage Math

(For Students Admitted from 2025-26)

Semester: IV **Hours / week: 2**
Subject Code: JBMXS44 **Credit: 1**

Course Objectives:

1. To provide a strong foundation in linear algebra concepts such as vectors, matrices, systems of linear equations, determinants, eigenvalues, and eigenvectors.
2. To develop skills in using SageMath, an open-source mathematics software, for solving linear algebra problems efficiently.

List of Programmes:

1. Defining a Vector Space and Checking Linear Independence using SageMath
2. Finding a Basis and Dimension of a Vector Space using SageMath
3. Finding the Kernel (Null Space) of a Linear Transformation using SageMath
4. Constructing the Dual Space V* using SageMath
5. Solving a Linear System using Matrix Inverse using SageMath
6. Computing the Rank of a Matrix using SageMath
7. Computing the Determinant of a Square Matrix using SageMath
8. Checking if Two Vector Spaces are Isomorphic using SageMath
9. Checking if a Matrix is Invertible using SageMath
10. Computing the Inverse of an Invertible Matrix using SageMath
11. Computing Eigenvalues and Eigenvectors using SageMath
12. Finding the Characteristic Polynomial using SageMath
13. Finding an Orthogonal Complement using SageMath
14. Spectral Theorem for a Self-Adjoint (Hermitian) Matrix using SageMath
15. Checking the Spectral Theorem for a Normal Matrix using SageMath

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Define a vector space and check linear independence using SageMath.
CO 2: Solve a linear system using the matrix inverse method.
CO 3: Analyze eigenvalues, eigenvectors, diagonalization, and transformations using computational tools in SageMath.
CO 4: Evaluate the efficiency and accuracy of SageMath algorithms for solving real-world linear algebra problems.
CO 5: Develop and implement advanced linear algebra solutions using SageMath.

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	3	3	9	3	3	**33**
CO2	3	3	3	3	9	3	3	**27**
CO3	3	9	3	3	3	3	1	**25**
CO4	3	9	3	3	3	3	3	**27**
CO5	3	3	3	3	3	3	1	**19**
Total	**21**	**27**	**15**	**15**	**27**	**15**	**11**	**131**

Low-1 Medium-3 High-9

Extra Credit – Applications of Group Theory

(For Students Admitted from 2025- 26)

Semester: IV
Subject Code: JBMXX4 **Credit: 2**

Course Objectives:
1. To use group theory in information theory
2. To recognize the concept of error correcting group codes

Unit I
Group theory in matrices: Linear transformations and Matrices - Matrix addition - Matrix multiplication - Diagonal, Permutation and Triangular Matrices.

Unit II
Rectangular Matrices - Inverses - Rank and Nullity - Elementary Matrices - General Equivalence Canonical form - Quaternions.

Unit III
Group theory in information theory - Two metric spaces of continuous random variable – Hamming's codes - Groupcodes - Adetectionsscheme forgroupcodes - Slepian's Technique for single - error correcting group codes – Hamming's lemma.

Unit IV
Further notes on group codes - Algebraic operations on group codes.

Unit V
The applications of group theory to parity check coding - Matrix of code words – Error patron vectors an received sequences for a group code.

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Understand the concept of Matrices and linear transformation
CO 2: Apply the concepts of Matrices in applications of group theory
CO 3: Make use of Group theory in Information theory
CO 4: Analyze the concept of linear transformation and matrices

CO 5: Illustrate the concept of rank and nullity

Text Book:

1. P.N. Arora, *Group theory and Mathematics*, Anmol Publishing House, 1995.

Unit I : Part II (Pg.no: 379 – 395)
Unit II : Part II (Pg.no: 395 – 418)
Unit III : Part II (Pg.no: 435 – 450)
Unit IV : Part II (Pg.no: 450 – 458)
Unit V : Part II (Pg.no: 458 – 468)

Reference Books:

1. Dr. M.K. Venkatraman, Dr. N. Sridharan & Dr. N. Chandrasekaran, *Discrete Mathematics*, Edition, 2006.
2. Arumugam S & Issac. A.T, *Modern Algebra*, Scitech Publications (India) Private Limited, 2007.
3. JK Sharma, *Discrete Mathematics*, Macmillan India Limited, Second Edition, 2005.

E-Resources:

1. https://www.youtube.com/watch?v=kYB8IZa5AuE
2. https://www.youtube.com/watch?v=9IVYVtAuuQs
3. https://home.iitk.ac.in/~peeyush/102A/Lecture-notes.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	9	3	9	**33**
CO2	3	3	3	3	9	3	3	**27**
CO3	3	3	3	3	3	3	3	**21**
CO4	3	3	3	3	9	3	9	**33**
CO5	3	3	3	3	9	3	9	**33**
Total	**15**	**15**	**15**	**15**	**39**	**15**	**33**	**147**

Low-1 Medium-3 High-9

Core IX - Abstract Algebra

(For Students Admitted from 2025- 26)

Semester: V **Hours / week: 6**
Subject Code: JBMXC51 **Credit: 6**

Course Objectives:

1. To learn the basic ideas and notions of abstract algebra which includes Group theory and ring theory
2. To analyze and demonstrate examples of ideals and quotient rings, Use the concepts of isomorphism and homomorphism for groups and rings

Unit I **(18 hours)**

Groups: Introduction to Groups - The Dihedral groups- Definition and Examples of groups -

Elementary properties of groups- Subgroups- Cyclic groups - Properties of cyclic groups- classification of subgroups of cyclic groups.

Unit II **(18 hours)**

Groups: Permutation groups - Properties of permutation- Isomorphisms- Definition and Examples- Cayle's theorem- Properties of Isomorphisms and Automorphisms - Cosets and Lagrange's theorem- Properties of cosets- Lagrange's theorem and consequences- An application of cosets to permutation groups.

Unit III **(18 hours)**

Groups: External Direct Products - Definition and Examples- Properties of external direct products - The groups of units modulo n as an external direct product.

Unit IV **(18 hours)**

Rings: Introduction to rings - Examples of rings - Properties of rings – Subrings - Integral domain- Definition and examples – Fields - Characteristics of a rings.

Unit V **(18 hours)**

Rings: Ideals and Factor rings - Ideals- Factor rings - Prime ideals and Maximal ideals - Ring homomorphisms - Definition and Examples - Properties of ring homomorphisms - The field of quotients.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Summarize the concept of groups and subgroups and able to find the groups
CO 2: Make use of the concept of normal subgroups, able to construct Quotient group
CO 3: Analyze the concepts of automorphism and permutation groups
CO 4: Compare the types and elucidate the concept of homomorphism of rings
CO 5: Distinguish the types of rings and establish relationship between various types of ideals

Text Books

Contemporary Abstract Algebra by Joseph A.Gallian, Cengage Learning, 2017
Unit 1 : Chapter 2 Pages 31-81
Unit 2 : Chapter 2 Pages 93 -146
Unit 3 : Chapter 2 Pages 156-243
Unit 4 : Chapter 3 Pages 227 to 243
Unit 5 : Chapter 3 Pages 249 to 270

Reference Books:

1. I.N. Herstein, *Topics in Algebra,* Wiley India Private Limited, New Delhi, Second Edition, 2015.
2. William J. Gilbert, *Modern Algebra with applications,* john Wiley & sons, lnc.2005.
3. Jimmie Gilbert, Linda Gilbert, *Elements of Modern Algebra*, Cengage Learning, 5th Edition, 2004.
4. M.L. Santiago, *Modern Algebra*, Tata McGraw Hill Publishing Company Limited, New Delhi.

E-Resources:

1. https://youtu.be/NJN6cQsu0_o
2. https://youtu.be/_RTHvweHlhE

3. https://youtu.be/RatkBWHUSqo
4. https://www.youtube.com/watch?v=OjvZxxLb_78

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	9	9	3	3	3	9	**39**
CO2	3	9	9	3	1	3	9	**37**
CO3	9	3	9	3	3	3	9	**39**
CO4	9	9	9	3	1	3	9	**43**
CO5	9	3	9	3	1	3	9	**37**
Total	**33**	**33**	**45**	**15**	**9**	**15**	**45**	**195**

Low-1 Medium-3 High-9

Core X – Real Analysis

(For Students Admitted from 2025- 26)

Semester: V **Hours / week: 6**
Subject Code: JBMXC52 **Credit: 5**

Course Objectives:

1. To acquire the knowledge of real functions – Limits of functions and their properties.
2. To recognize the concept of Riemann integral and related theorems.

Unit I **(18 hours)**

Limits: Limits of functions - Limit theorems - Some extensions of the limit concept.

Unit II **(18 hours)**

Continuous functions: Continuous functions - Composition of continuous functions - Continuous functions on intervals - Uniform continuity.

Unit III **(18 hours)**

Differentation: The derivative - The chain rule – Caratheodory's theorem - Inverse functions - The mean value theorem - Interior extremum theorem – Rolle's theorem.

Unit IV **(18 hours)**

Differentation: L'Hospital's rules - Indeterminate forms - Cauchy mean value theorem – L'Hospital's rule I – L' Hospital's rule II - Other indeterminate forms – Taylor's theorem - Applications of Taylor's theorem.

Unit V **(18 hours)**

The Riemann Integral: Riemann Integral - Riemann Integrable Functions - The Fundamental Theorem.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Describe the concepts of limits, continuity, differentiability and integrability of real functions

CO 2: Make use of continuity in Bolzano intermediate value theorem

CO 3: Examine the derivative of L' Hospital's rules and Taylor's theorem

CO 4: Illustrate the concept of Riemann integral and its Properties
CO 5: Differentiate closed set and open set

Text Book:

1. Robert G. Bartle and Donald R. Sherbert, John, *Introduction to Real Analysis*, Wiley & Sons Inc, Fourth Edition, 2011.

Unit I : Chapter IV (Section: 4.1- 4.3)
Unit II : Chapter V (Section: 5.1-5.4**)**
Unit III : Chapter VI (Section: 6.1- 6.2)
Unit IV : Chapter VI (Section: 6.3- 6.4)
Unit V : Chapter VII (Section: 7.1-7.3)

Reference Books:

1. S. Kumaresan, *Topology of metric spaces,* Alpha Science International Limited, 2005.
2. Richard R Goldberg , *Methods of Real Analysis,* Oxford & IBH Publishing Company, Private Limited, NewDelhi,1970.
3. D. Somasundaram, Choudhary D, *A first course in mathematical Analysis,* Narosa Publications, Corrected Edition, 2006.

E- Resources:

1. https://freevideolectures.com/course/2267/mathematics-i/17
2. https://nptel.ac.in/courses/111/106/111106053/
3. https://www.youtube.com/watch?v=kaVXVry47s8
4. https://www3.nd.edu/Inicolae/Hon Calc Lectures.pdf
5. https://www.youtube.com/watch?v=mhi5TdWLUjs

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	1	9	3	3	**37**
CO2	3	3	1	1	3	1	1	**13**
CO3	9	3	1	1	3	3	1	**21**
CO4	3	3	3	1	3	1	3	**17**
CO5	9	9	3	1	9	1	1	**33**
Total	**33**	**27**	**11**	**5**	**27**	**9**	**9**	**121**

Low-1 Medium-3 High-9

Core XI- Mechanics

(For Students Admitted from 2025 - 26)

Semester: V **Hours / week: 6**
Subject Code: JBMXC53 **Credit: 5**

Course Objectives:

1.To understand the concepts of parallel forces, moments of forces and the principles behind them.
2.To determine the resultant of the system of forces acting on the body, moment of forces and the motion of inertia of the body.

Unit I **(18 hours)**

Introduction: Scope and divisions of the subject- Force- Types of force- Equilibrium - Equilibrium of two forces - Principle of the Transmissibility of a force. **Forces Acting at a point:** Resultant and Components - Simple cases of finding the resultant - Parallelogram of Forces - Analytical expression for the resultant of two forces acting at a point - Triangle of forces - Perpendicular triangle of forces- Converse of the triangle of forces – The Polygon of Forces - Lami's theorem- An Extended form of the parallelogram law of forces - Resolution of a force - Components of a force along two given directions -Theorem on Resolved Parts - Resultant of any number of forces acting at a point (Graphical and analytical methods) - conditions of equilibrium of any number of forces acting upon a particle.

Unit II **(18 hours)**

Parallel Forces and Moments: Introduction - Resultant of two like parallel forces acting on a rigid body- Resultant of two unlike and unequal parallel forces acting on a rigid body - Resultant of a number of parallel forces acting on a rigid body - Conditions of equilibrium of three coplanar parallel forces - Center of two parallel forces - Moment of a force - Physical significance of the moment of a force - Geometrical representation of a moment - Sign of the moment- Unit of moment - Varigon's theorem of Moments- Generalized theorem of moments (Principle of Moments) - Moment of a force about an axis – **Couples:** Couples - Equilibrium of two couples - Equivalence of two couples - Couples in parallel planes - Representation of a couple by a vector - Resultant of a Coplanar couples - Resultant of a couple and a force.

Unit III **(18 hours)**

The Laws of Motion: Introduction – Momentum - Newton's Laws of Motion – Explanation and Illustration of the First Law - Explanation of the Second Law of Motion – Composition of Forces : Parallelogram law of Forces - Absolute Unit of Forces – Weight - Gravitational units of forces- Distinction between Mass and weight - Conservation of linear momentum - Explanation of the Third Law of Motion- Force of Friction - Motion of a particle on a rough horizontal plane under the action of a constant forces - Motion of a particle up a rough inclined plane under the action of a constant force - Pressure of a body resting on a moving horizontal plane - Motion of connected particles - Atwood's machine.

Unit IV **(18 hours)**

Projectiles: Definitions - Two fundamental principles - Path of a projectile - Characteristics of the motion of the projectile - A particle projected horizontally from a point at a certain height above the ground - The horizontal range of a projectile is maximum - various possible directions of projection- The velocity of the projectile in magnitude and direction at the end of time t - Range on an inclined plane.

Unit V **(18 hours)**

Moment of Inertia: Definition - Theorem of Parallel Axes - Theorem of perpendicular Axes - Moment of Inertia of some standard geometrical shapes: thin uniform rod - Rectangular lamina - uniform rectangular parallelepiped - Uniform circular ring - Uniform circular disc - Uniform elliptic lamina - Solid sphere - Hollow sphere- solid right circular cone - Hollow cone. Dr. Routh's rule.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Understand and be able to distinguish between various force systems, moments, couple and projectiles

CO 2: Determine the parallel forces and moments of the mechanical problems.
CO 3: Examine the theoretical aspects of Laws of Motion.
CO 4: Evaluate the resulting force and Projectile.
CO 5: Build mechanical models and show how they can be used to solve Moment of Inertia.

Text Book:
1. Dr. M.K Venkataraman, *Statics*, Agasthiar publications, 19th edition, 2018.

Unit I : Chapter I & II
Unit II : Chapter III & Chapter IV

2. Dr. M.K Venkataraman, *Dynamics*, Agasthiar publications, 19th edition, 2018.

Unit III : Chapter IV (Sections 4.1 - 4.23)
Unit IV : Chapter VI (Sections 6.1 - 6.15)
Unit V : Chapter XII (Sections 12.1 - 12.5)

Reference Books:
1. Duraipandiyan, *Mechanics (Vector Treatment)*, S.Chand and Co,2007.
2. S. Ramsey, *Statics*, CBS publishers and Distributers, Delhi, First Indian Edition,1985
3. A.V. Dharmapadam, *Dynamics***,** S.Viswanathan Publishers Private Limited, 2006.
4. P. Duraipandian, Laxmi Duraipandian and Muthamizh Jayapragasam, *Mechanics*, S.Chand& Company Private Limited, First Edition, 2014.

E- Resources:
1. https://www.youtube.com/watch?v=jhGYYlwfkE0
2. https://www.youtube.com/watch?v=UABd38mEzsw
3. https://openstax.org/books/university-physics-volume-1/pages/4-3-projectile-motion
4. https://www.youtube.com/watch?v=JqkwmJtjfBk

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	3	9	1	**37**
CO2	9	9	3	3	3	9	1	**37**
CO3	9	3	3	3	3	9	1	**31**
CO4	9	3	3	3	3	9	1	**31**
CO5	9	3	3	3	3	9	1	**31**
Total	**45**	**27**	**15**	**15**	**15**	**45**	**5**	**167**

Low-1 Medium-3 High-9

MD III – Fourier and Laplace Transforms

(For Students Admitted from 2025-26)

Semester: V **Hours / week: 4**
Subject Code: JBMD51MXA **Credit: 3**

Course Objectives:
1. To solve ordinary differential equations using Laplace transforms
2. To familiarize with Fourier transforms of functions and relation between Laplace and Fourier transforms

Unit I **(10 hours)**

Fourier Transforms: Fourier Integral Theorem - Fourier Transforms - Alternative Form of Fourier Complex Integral Formula - Relationship between Fourier Transform and Laplace Transform - Worked Example.

Unit II **(13 hours)**

Fourier Transforms: Properties of Fourier Transforms, Linearity Property - Change of scale Property - Shifting Property - Modulation theorem - Conjugate symmetry property - Derivative of the transform - Convolution theorem – Parseval's Identity - Worked Example.

Unit III **(13 hours)**

Laplace Transforms: Linearity Property of Laplace and Inverse Laplace Transforms – Laplace Transforms of Some Elementary Functions- Laplace Transforms of Some Special Functions-Properties of Laplace Transforms - Worked Example.

Unit IV **(12 hours)**

Laplace Transforms: Laplace Transform of Periodic Functions - Derivatives and Integrals of Transforms - Worked Example.

Unit V **(12 hours)**

Laplace Transforms: Laplace Transforms of Derivatives and Integrals - Initial and Final Value Theorems- The Convolution - Worked Example.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Diagnose the concept of Fourier transform
CO 2: Apply the Fourier transforms to boundary value problem
CO 3: Make use of properties of Fourier and Laplace transform for solving the problem
CO 4: Determine the Laplace transform of periodic function
CO 5: Analyze the initial and final value theorems of Laplace transforms

Text Books :

1. T. Veerarajan, *Engineering Mathematics (For semester III),* Tata McGraw – Hill Publishing Company Limited, Third Edition, 2008.
   Unit I : Chapter 6(6.1 - 6.5)
   Unit II : Chapter 6(6.6)
2. T. Veerarajan, *Engineering Mathematics-II (For first year),* Tata McGraw – Hill Publishing Company Limited**,** 2014.
   Unit III : Chapter 3 (3.1- 3.5)
   Unit IV : Chapter 3 (3.6 - 3.7)
   Unit V : Chapter 3 (3.8- 3.10 (Example 3.1 - 3.6))

Reference Books:

1. James Ward Brown & Ruel V. Churchill, *Fourier Series and Boundary Value Problems*, McGraw- Hill Education, 2011.
2. Erwin Kreyszig, *Advanced Engineering Mathematics,* Wiley, 10th Edition, 2011.
3. Dr.J. K. Goyal and K. P. Gupta, *Laplace and Fourier Transforms*, Pragati Prakashan Publishers, Meerut 2000.

E- Resources:

1. https://www.youtube.com/watch?v=GkLmyWPpCZA
2. https://www.khanacademy.org/math/differential-equations/laplace- transform/properties- of-laplace- transform/v/laplace-transform-5
3. https://nptel.ac.in/courses/122/104/122104018/
4. https://pages.jh.edu/mzhong5/courses/EN_560_601_S17/homeworks/560_601_HW8.pf
5. http://imageprocessingplace.com/downloads_V3/root_downloads/tutorials/Wavelets--An%20eBook%20by%20Charles%20K.%20Chui.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	1	1	3	3	**21**
CO2	3	3	1	1	1	3	3	**15**
CO3	9	3	3	3	1	3	9	**31**
CO4	9	3	3	3	1	3	3	**25**
CO5	9	3	3	3	1	3	9	**31**
Total	**39**	**15**	**11**	**11**	**5**	**15**	**27**	**123**

Low-1 Medium-3 High-9

MD III – Mathematical Modeling

(For Students Admitted from 2025- 26)

Semester: V **Hours / week: 4**
Subject Code: JBMD51MXB **Credit: 3**

Course Objectives:

1. To provide rigorous instruction in fundamental mathematical concepts and skills presented in the context of real-world applications.
2. To provide analytical methods for approaching problems encountered in future endeavors.

Unit I **(12 hours)**

Mathematical Modeling: Need, Techniques, Classifications and Simple Illustrations: some characteristics of Mathematical Models - Mathematical modeling through Geometry - through Algebra - through Trigonometry - through Calculus - Limitations of Mathematical Modeling.

Unit II **(12 hours)**

Mathematical Modeling Through Ordinary Differential Equations of First Order: Mathematical modeling through differential equations - linear growth and decay models -Non-Linear growth and decay models compartment models - mathematical modeling in dynamics through ordinary differential equations of first order - Mathematical modeling of Geometrical Problems through ordinary differential equations of first order.

Unit III **(12 hours)**

Mathematical Modeling Through Difference Equations: The Need of mathematical modeling through difference equations: Some simple models - Basic theory of linear difference equations with constant coefficients - Mathematical modeling through difference equation in economics and finance - Mathematical modeling through difference equation inprobability theory.

Unit IV **(12 hours)**

Mathematical Modelling Through Partial Differential Equations: Situations Giving Rise to PDE Models – Mass- Balance Equations: First Method of Getting PDE Models – Momentum – Balance Equations: The Second Method of Obtaining PDE Models – Variational Principles: Third Method of Obtaining PDE Models – Model for Traffic Flow on a Highway

Unit V **(12 hours)**

Mathematical modeling through graphs - Situations that can be modeled through graphs - Mathematical models in terms of directed graphs - signed graphs - weighted diagraphs - Unoriented graphs.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Examine the techniques of mathematical modeling

CO 2: Identify appropriate mathematical modeling through ordinary differential equations with relevant parameters and conditions

CO 3: Analyze the concept of mathematical modeling through differential equations in economics and finance

CO 4: Illustrate the concept of mathematical modeling through graph

CO 5: Gain the knowledge on calculus of variations and dynamic programming

Text Book:

1. J.N. Kapur, *Mathematical Modelling***,** New Age International Private Limited, 2008.

Unit I : Chapter 1 (sec 1.4 –1.9)

Unit II : Chapter 2 (sec 2.1 –2.6)

Unit III : Chapter 5 (sec 5.1 – 5.3 & 5.5)

Unit IV : Chapter 6 (sec 6.1 – 6.4 & 6.6)

Unit V : Chapter 7 (sec 7.1 – 7.5)

Reference Books:

1.C.Fowler, *Mathematical Models in the Applied Science*, Cambridge University Press,1997.
2.I.LiangChern, *Mathematical Modelling and Ordinary Differential Equations*, 2016.
3.Prof Sara Billey, *Discrete Mathematical Modeling*, University of Washington, WinterQuarter, 2011.

E- Resources:

1.https://people.maths.bris.ac.uk/~madjl/course_text.pdf
2.https://www.rand.org/content/dam/rand/pubs/reports/2006/R441.pdf
3.https://www.researchgate.net/publication/317888204_Graphbased_Mathematical_Modelling_-_Concepts

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	1	1	3	3	**17**
CO2	3	3	9	1	1	3	3	**23**
CO3	9	3	9	1	1	3	3	**29**
CO4	3	3	3	1	1	3	3	**17**
CO5	3	3	3	1	1	3	3	**17**

Total	**21**	**15**	**27**	**5**	**5**	**15**	**15**	**103**

Low- 1 Medium-3 High-9

MD IV – Advanced Statistical Methods

(For Students Admitted from 2025-26)

Semester: V **Hours / week: 4**
Subject Code: JBMD52MXA **Credit: 3**

Course Objectives:

1. To study deep learning optimization techniques from a statistical perspective.
2. Explore time series analysis and forecasting methods.

Unit I **(12 hours)**

Index Numbers: Introduction - Uses of Index Numbers - Problems in The Construction of Index Numbers - Methods of Constructing Index Numbers - Quantity or Volume Index Numbers - Value Index Numbers - Tests of Adequacy of Index Number Formulae - The Chain Index Numbers - Base Shifting. Splicing and Deflating the Index Numbers.

Unit II **(12 hours)**

Index Numbers: Consumer Price Index Numbers - Index Number of Industrial Production - Miscellaneous Illustration - List of Formulae.

Unit III **(12 hours)**

Analysis of Time Series: Introduction - Utility of Time Series Analysis - Components of Time Series - Preliminary Adjustments Before Analysing Time Series - Measurement of Trend.

Unit IV **(12 hours)**

Vital Statistics: Introduction - Vital Statistics Defined - Uses of Vital Statistics - Methods of Obtaining Vital Statistics - Measurement of Fertility - Reproduction Rates - Measurement of Mortality - Life Tables - Miscellaneous Illustrations.

Unit V **(12 hours)**

Partial and Multiple Correlation: Introduction - Partial Correlation - Multiple Correlation - Multiple Regression Analysis - Reliability of Estimates - Miscellaneous Illustrations.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Recall fundamental concepts of index numbers, time series analysis, vital statistics, and correlation techniques.
CO 2: Apply methods for calculating price and quantity index numbers, trend estimation in time series, and demographic measures in vital statistics.
CO 3: Analyze patterns in time series data using trend, seasonal, cyclical, and irregular components.
CO 4: Evaluate relationships between multiple variables using partial and multiple correlation, regression techniques, and their significance.
CO 5: Develop forecasting models using time series analysis, and design statistical studies for economic, social, and demographic analysis.

Text Book:

1.Dr. S. P. Gupta, *Statistical Methods***,** Sultan Chand & Sons, Educational Publishers, New Delhi, Forty Fifth Revised Edition, reprint, 2018.

Unit I : Volume I Chapter 13 (page no. 535 – 573)
Unit II : Volume I Chapter 13 (page no. 573 – 609)
Unit III : Volume I Chapter 14 (page no. 611 – 644)
Unit IV : Volume I Chapter 16
Unit V : Volume II Chapter 9

Reference Books:

1.S. Arumugam and A. Thangapandi Isaac, *Statistics***,** New Gamma Publishing Houses, Edition, 2009.
2.S.C.Gupta, V. K. Kapoor, *Fundamntals of Mathematical Statistics***,** Sultan Chand and Sons, Twelfth Edition, Reprint 2022.

E-Resources:

1.https://www.nios.ac.in/media/documents/SrSec318NEW/318_Learner_guide_eng/318_LG_E_L11.pdf
2.https://www.iimchyderabad.com/econtent/IndexNumbers.pdf3.
3.https://www.slideshare.net/SaurabhBhapkar2/vital-statistics-249593009#2
4.https://www.sciencedirect.com/science/article/abs/pii/S0924650908705336
5.https://egyankosh.ac.in/bitstream/123456789/20955/1/Unit-3.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	3	3	9	27
CO2	3	3	9	3	3	9	3	33
CO3	3	3	3	3	3	3	9	27
CO4	3	3	9	3	3	9	3	33
CO5	3	3	3	3	3	9	3	27
Total	**15**	**15**	**27**	**15**	**15**	**33**	**27**	**147**

Low-1 Medium-3 High-9

MD IV – Coding Theory
(For Students Admitted from 2025-26)

Semester: V **Hours / week: 4**
Subject Code: JBMD52MXB **Credit: 3**

Course Objectives:

1. To analyse different type of Linear Codes and the Some Good Codes
2. To acquire knowledge in Linear Codes and Some Good Codes

Unit I **(12 hours)**

Mathematical Background: Algebra - Krawtchouk Polynomials - Combinatorial Theory-Introduction- Shannon's Theorem.

Unit II **(12 hours)**

Linear Codes: Block Codes - Linear Codes-Hamming Codes - Majority logic decoding-Weight Enumerators - The Lee metric.

Unit III **(12 hours)**

Some Good Codes: Hadamard Codes and generalization- The binary Golay Code - The ternary Golay Code – Constructing Codes from other Codes – Reed- Muller Code – Kerdock Codes.

Unit IV **(12 hours)**

Bound on Codes: The Gilbert bound – Upper bounds – Cyclic Codes: Generator matrix and polynomial – Zeros of a Cyclic Codes.

Unit V **(12 hours)**

The idempotent of a Cyclic Codes : Other representations of a Cyclic Codes - BCH Codes – Decoding BCH Codes – Binary Cyclic Codes of length 2n (n is odd)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Examine the techniques of Krawtchouk Polynomials and Combinational Theory
CO 2: Identify the appropriate linear Codes, Block Codes and majority logic decoding.
CO 3: Analyze the concept of Hadamard codes and generalizations
CO 4: Illustrate the concept of Bound on codes
CO 5: Gain the knowledge on the idempotent of a Cyclic Codes

Text Book:

1. J. H. Van Lint, *Introduction to Coding Theory***,** New Age International Private Limited, third Edition 2011.

Unit I : Chapter 1 (except 1.4) & Chapter 2 (sec 2.1 –2.2)
Unit II : Chapter 3
Unit III : Chapter 4
Unit IV : Chapter 5(except 5.3)
Unit V : Chapter 6 (except sec 6.8, 6.9 & 6.11)

Reference Books:

1.Gareth A. Jones, *Information and Coding Theory,* Springer, India, Second Edition, 2004.
2.Muralidhar Kulkarni and K.S.Shivaprkasa, *Information Theory and Coding* , Wiley Publishr, Second Edition, 2014.

E-Resources:

1.https://en.wikipedia.org/wiki/ShannonHartley_theorem
2.https://engineerstutor.com/wp-content/uploads/2020/08/Linear-Block-codes-complete-chapter-notes.pdf
3.https://www.researchgate.net/publication/324235062_Generalization_of_Hadamard_ Matrices
4.https://en.wikipedia.org/wiki/Gilbert%E2%80%93Varshamov_bound_for_linear_ Code
5.https://www.sciencedirect.com/science/article/abs/pii/S0924650908705336

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	**35**
CO2	9	1	9	1	3	1	3	**27**
CO3	3	3	3	9	3	1	9	**31**
CO4	3	9	9	9	9	3	9	**51**
CO5	3	9	1	9	9	3	1	**35**
Total	**27**	**23**	**25**	**37**	**27**	**9**	**31**	**179**

Low-1 Medium-3 High-9

SEC V - R Tool Lab

(For Students Admitted from 2025- 26)

Semester: V **Hours / week: 2**
Subject Code: JBMXS54P **Credit: 1**

Course Objectives:

1. To navigate and optimize the R integrated development environment (IDE) R Studio and install and load add-in packages
2. To import external data into R for data processing and statistical analysis, learn the main R data structures and compute basic summary statistics

List of Program

1. Develop a program to implement correlation analysis
2. Develop a program to implement regression analysis
3. Develop a program to implement t-test
4. Develop a program to implement z-test
5. Develop a program to implement f-test
6. Develop a program to implement chi-square test
7. Develop a Program to implement analysis of variance (ANOVA)

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Classify the basics concept in R programming in terms of constructs, control statements and functions
CO 2: Identify data analytics software
CO 3: Enhance the problem solving, programming and debugging skill
CO 4: Apply the R programming from a statistical perspective
CO 5: Learn and implement the various data structures of R

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	1	3	9	3	1	9	**35**
CO2	9	1	9	1	3	1	3	**27**

CO3	3	3	3	9	3	1	9	**31**
CO4	3	9	9	9	9	3	9	**51**
CO5	3	9	1	9	9	3	1	**35**
Total	**27**	**23**	**25**	**37**	**27**	**9**	**31**	**179**

Low-1 Medium-3 High-9

Core XII- Complex Analysis

(For Students Admitted from 2025-26)

Semester: VI **Hours / week: 6**
Subject Code: JBMXC61 **Credit: 6**

Course Objectives:

1. To analyse the different type of transformations and contour integrals
2. To acquire knowledge in series, functions, residues and integrals

Unit I **(22 hours)**

Complex Numbers: Regions in the complex plane - **Analytic Functions:** Functions of a complex variable - Mappings - Mappings by the Exponential function - Limits - Theorems onLimits - Continuity - Derivatives - Differentiation Formulas - Cauchy Riemann Equations - Sufficient conditions for Differentiability - polar co-ordinates - Analytic Functions - Harmonic Functions.

Unit II **(22 hours)**

Integrals: Derivatives of functions w(t) - Definite integrals of functions w(t) - contours - contour Integrals - Some Examples - Examples with branch cuts - upper bounds for moduli ofcontour integrals - Cauchy Integral Formula - An Extension of the Cauchy integral formula – Some consequences of the extension - Liouville"sTheorem and the Fundamental Theorem of Algebra - Maximum modulus Principle.

Unit III **(17 hours)**

Series: Convergence of Sequences and series-Taylor Series-Proof of Taylor's theorem-Examples -Laurent Series - Proof of Laurent's theorem -Examples.

Unit IV **(17 hours)**

Residues and Poles: Isolated Singular Points - Residues – Cauchy's Residue Theorem - Residue at infinity - The Three types of Isolated Singular Points - Residues at Poles - Zerosof analytic functions - Zeros and Poles - Behavior of functions near isolated singular points.

Unit V **(12 hours)**

Mapping by Elementary Functions: Linear Transformations - The transformation w = 1/z - Mappings by 1/z - Linear Fractional Transformations - An implicit form.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Distinguish between Analytic functions and Harmonic functions
CO2: Make use of derivatives of functions to solve the problems
CO3: Compute the series of convergence by using Taylor series and Laurent series
CO4: Analyze the different types of Residues and Poles
CO5: Classify the transformation using mapping and branches.

Text Book:

1. James Ward Brown and Ruel.V. Churchill - *Complex Variables and Applications,* EighthEdition, Mc Graw Hill, Inc, 2016.

Unit I : Chapter 1 (section 11 only) Chapter 2 (sections 12 - 16, 18 - 26)
Unit II : Chapter 4 (sections 37 – 43 & 50 - 54)
Unit III : Chapter 5 (Sections 55 -62)
Unit IV : Chapter 6 (Sections 68 -77)
Unit V : Chapter 8 (sections 90 - 94)

Reference Books:

1. S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, *Complex Analysis,* NewScitech Publications (India) Private Limited, 2002.
2. J. N. Sharma, Krishna Prakasan, *Functions of Complex Variable,* Thirteenth Edition MediaPrivate Limited, 1996-97.

E- Resources:

1.https://people.math.gatech.edu/~cain/winter99/complex.html
2.http://web.math.ku.dk/noter/filer/koman-12.pdf
3.http://www.universityofcalicut.info/SDE/BSc_mathematics_complex_analysis.pdf
4.https://www.youtube.com/watch?v=JOfnCCNj4gQ
5.https://www.youtube.com/watch?v=Mwpz1zjPlzI

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	9	3	3	3	9	**39**
CO2	3	3	3	3	3	3	3	**21**
CO3	3	3	9	3	3	3	3	**27**
CO4	9	3	3	3	3	3	3	**27**
CO5	9	3	3	3	3	3	3	**27**
Total	**33**	**15**	**27**	**15**	**15**	**15**	**21**	**141**

Low-1 Medium-3 High-9

Core XIII- Numerical Methods

(For Students Admitted from 2025-26)

Semester: VI **Hours / week: 6**
Subject Code: JBMXC62 **Credit: 5**

Course Objectives:

1.To derive numerical methods for various mathematical operations and tasks, such as interpolation
2.To derive appropriate numerical methods to solve algebraic and transcendental equations.

Unit I **(18 hours)**

Errors in Numerical Calculations: Introduction – Mathematical Preliminaries - Errors and their Computations - A General Error Formula - Error in a Series Approximation. **Solution of Algebraic and Transcendental equations:** Introduction – The Bisection method – The

Method of False position – The Iteration method.

Unit II **(18 hours)**

Solution of Algebraic and Transcendental equations: - Newton - Raphson method – Ramanujam's method - Secant method – Muller's Method - Graeffe's Root - Squaring method - Lin-Barstow'method – The Quotient - Difference method - Solution to Systems of Nonlinear Equations.

Unit III **(18 hours)**

Interpolation: Introduction - Errors in Polynomial Interpolation - Finite Differences - Detection of Errors by use of Difference Tables - Differences of a Polynomial – Newton's Formulae for Interpolation - Central Difference Interpolation Formulae.

Unit IV **(18 hours)**

Interpolation: Practical Interpolation - Interpolation with Unevenly Spaced Points - Divided Differences and their properties - Inverse Interpolation- Double Interpolation.

Unit V **(18 hours)**

Numerical Differentiation and Integration: Introduction – Numerical Differentiation – Maximum and Minimum Values of a Tabulated Function – Numerical Integration.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Assess the solution of algebraic and transcendental equations by various methods
CO 2: Find the of solution of algebraic and transcendental equations
CO 3: Apply the concept to solve the problems in interpolation
CO 4: Compute the missing values for equal and unequal intervals using divided difference
CO 5: Apply the method of numerical differentiation and integration equation to examine the problem

Text Book:

1. S. S. Sastry, *Introductory Methods of Numerical Analysis*, Prentice Hall of India Private Limited, New Delhi, Fifth Edition, 2012.

Unit I : Chapter 1 (1.3 – 1.5), Chapter 2 (2.1- 2.4)
Unit II : Chapter 2 (2.5 – 2.12)
Unit III : Chapter 3 (3.1 – 3.7)
Unit IV : Chapter 3 (3.8 – 3.12)
Unit V : Chapter 5 (5.1 – 5.4)

Reference Books:

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, *Numerical Methods for Scientific and Engineering Computation*, 6th Edition, New age International Publisher, India, 2007.
2. E. Balagurusamy, *Numerical Method***,** Tata McGraw Hill Private Limited, 2009.
3. Shankara Rao K, *Numerical Methods for Scientists and Engineers*, Prentice Hall of India, 2001.

E- Resources:

1. https://nptel.ac.in/courses/111/107/111107062/
2. https://nptel.ac.in/courses/111/107/111107105/

3. https://www.math.ust.hk/~machas/numerical-methods.pdf

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	3	3	9	9	9	51
CO2	9	9	9	3	9	9	9	51
CO3	3	3	9	3	9	9	9	45
CO4	9	9	9	3	3	9	3	45
CO5	3	3	3	3	9	9	3	33
Total	33	33	33	15	39	45	33	231

Low-1 Medium-3 High-9

Core XIV - Operations Research

(For Students Admitted from 2025-26)

Semester: VI **Hours / week: 6**
Subject Code: JBMXC63 **Credit: 5**

Course Objectives:

1. To apply these techniques constructively to make effective business decisions
2. To impart the knowledge of formulation of practical problems using the linear programming method and its extensions

Unit I **(18 hours)**

Linear Programming Problem – Mathematical formulation: Linear Programing Problem – Mathematical formulation of the Problem - Illustrations on Mathematical Formulation of LPPs – **Linear Programming Problem - Graphical solution and Extension:** Graphical Solution Method – Some Exceptional Cases – General L.P.P – Canonical and Standard Forms of L.P.P.

Unit II **(18 hours)**

Linear Programming – Simplex method: Introduction – Fundamental Properties of Solutions -The Computational Procedure - Use of Artificial Variables – Degeneracy in L.P.P.- **Duality in Linear Programming:** Introduction – General Primal – Dual Pair – Formulating a Dual Problem – Primal - Dual Pair in Matrix Form – Dual Simplex Method.

Unit III **(21 hours)**

Transportation Problem: Introduction - LP Formulation of the Transportation Problem – Existence of Solution in T.P – Duality in Transportation Problem – The Transportation Table – Loops in Transportation Tables – Triangular basis in a T.P – Solution of a Transportation Problem – Finding an Initial Basic Feasible Solution – Test for Optimality – Degeneracy in Transportation Problem – Transportation Algorithm (MODI Method) – Stepping Stone Solution Method. **Assignment Problem:** Introduction – Mathematical Formulation of the Problem – Solution Methods of Assignment Problem – Special Cases in Assignment Problems

Unit IV **(15 hours)**

Games and Strategies: Introduction – Two-Person Zero-Sum Games – Some Basic terms – The Maximin – Minimax Principle – Games Without Saddle Points – Mixed Strategies –

Graphic Solution of 2 x n and m x 2 Games – Dominance Property.

Unit V **(18 hours)**

Network Scheduling by PERT/CPM: Introduction – Network: Basic Components – Logical Sequencing – Rules of Network Construction – Concurrent Activities – Critical Path Analysis – Probability Considerations in PERT – Distinction between PERT and CPM.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the graphical method and to get optimality of Linear Programming Problem

CO2: Apply the LP model to tackle problems from real life.

CO3: Analyze all of the techniques used to acquire Linear Programming and Transportation Problem, when resolving difficulties in the real world.

CO4: Examine the Assignment problem model and network scheduling to get the ideal solution.

CO5: Create networks for a particular plan and PERT/CPM schedule them.

Text Book:

1. Kanti Swarup, P.K. Gupta & Man Mohan, **Operations Research,** Sultan chand & sons. Eighteenth Edition.2015.

Unit I : Chapter 2 (2:3 – 2:4), Chapter 3(3:2 – 3:5)
Unit II : Chapter 4 (4:1 – 4:5), Chapter 5(5:1 – 5:4 & 5:9)
Unit III : Chapter 10 (10:2 – 10:10, 10:12 – 10:14) & Chapter 11(11:1 – 11:14)
Unit IV : Chapter 17 (17:1 – 17:7)
Unit V : Chapter 25(25:1 – 25:8)

Reference Books:

1. Hamdy A. Taha, *Operations Research – An Introduction*, Prentice Hall, Tenth Edition, 2016.
2. S.D. Sharma, *Operations Research*, Dedar Nath Ram Nath, 2009.
3. Srinivasan, *Operations Research – Principles and Appplications*, PHI Learning Private Limited, Second Edition, 2012.

E- Resources:

1. https://www.youtube.com/watch?v=Ypn4yHM1YsU
2. http://www.math.wsu.edu/faculty/genz/364/lessons/l3067.pdf
3. https://www.youtube.com/watch?v=fSuqTgnCVRg
4. Transportation problem||vogel's approximation[VAM]|Northwest corner||Least cost||Using Simple Method – YouTube
5. https://www.youtube.com/watch?v=b1btzVsKp8E

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	3	3	3	**21**
CO2	3	3	3	9	3	3	9	**33**
CO3	3	3	3	3	3	3	9	**27**

CO4	3	3	3	3	3	9	9	**33**
CO5	3	3	3	9	3	3	9	**33**
Total	**15**	**15**	**15**	**27**	**15**	**21**	**39**	**147**

Low-1 Medium-3 High-9

Core XV- Project

(For Students Admitted from 2025-26)

Semester: VI **Hours / week: 5**
Subject Code: JBMXC64PW **Credit: 5**

Course Objectives:

1. To provide skills for high quality research and teaching in the field of Mathematics
2. To develop the knowledge, skills and attitudes necessary to pursue further studies in Mathematics

Project Outline:

1. The students undertake the project during the VI semester after the preliminary steps of student and staff allotment and topic selection in the VI semester
2. The student's progress is periodicallyassessed by the project guide through presentation
3. The significant research work is encouraged for presentations and publications in Conferences and Journals
4. Selection of the field of study, topic & research design
5. Collection of literature review
6. Analysis, Conclusion & Preparation of rough draft

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Make use of research methodology and techniques of the literature applicable to their own research
CO 2: Determine solutions to the unsolved problems
CO 3: Analyze the abilities and techniques in the critical evaluation of current research
CO 4: Apply new ideas in the respective field of study and environment
CO 5: Design innovative projects with the application of mathematical concepts towards scientific and societal development.

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	1	3	1	9	**63**
CO2	9	9	9	1	1	3	9	**41**
CO3	9	9	9	1	3	1	9	**41**
CO4	9	9	9	1	1	1	9	**39**
CO5	9	9	9	1	1	1	9	**39**
Total	**45**	**45**	**45**	**5**	**9**	**7**	**45**	**201**

Low-1 Medium-3 High-9

MD V- Verbal and Non Verbal Reasoning

(For Students Admitted from 2025-26)

Semester: VI **Hours / week: 4**
Subject Code: JBMD61MXA **Credit: 3**

Course Objectives:
1. To practice reasoning questions relevant to exams, interviews, and aptitude tests.
2. To learn time management techniques for solving reasoning problems effectively.

Unit I **(12 hours)**
Blood Relations: Illustrative Examples, Exercise. **Direction Sense Test:** Illustrative Examples, Exercise.

Unit II **(12 hours)**
Logical Sequence of Words: Illustrative Examples, Exercise. **Arithmetical Reasoning:** Illustrative Examples, Exercise.

Unit III **(12 hours)**
Inserting the Missing Character: Illustrative Examples, Exercise. **Data Sufficiency:** Illustrative Examples, Exercise.

Unit IV **(12 hours)**
Analytical Reasoning: Illustrative Examples, Exercise. **Rule Detection:** Illustrative Examples, Exercise.

Unit V **(12 hours)**
Cubes and Dice: Illustrative Examples, Exercise. **Construction of Squares and Triangles**: Illustrative Examples, Exercise. **Figure Formation & Analysis:** Illustrative Examples, Exercise.

Course Outcomes:
After successful completion of this course, student will be able to

CO 1: Define and explain the fundamental concepts of verbal and non-verbal reasoning.
CO 2: Apply appropriate reasoning techniques to solve verbal and non-verbal reasoning problems.
CO 3: Analyze patterns, relationships, and logical deductions in non-verbal reasoning tasks.
CO 4: Evaluate different problem-solving strategies and choose the best approach for reasoning challenges.
CO 5: Create new problem-solving techniques and innovative approaches to complex reasoning scenarios.

Text Book:
1. R.S.Aggarwal, *A Modern approach to Verbal Reasoning*, S.Chand & Company Pvt., Ltd., 2013.
Unit I : Chapter 5, 8
Unit II : Chapter 14, 15
Unit III : Chapter 16, 17
2. R.S.Aggarwal, **A Modern approach to Non-Verbal Reasoning,** S.Chand & Company

Pvt., Ltd., 2014.
Unit IV : Chapter 4, 12
Unit V : Chapter 14, 16, 17

Reference Books:
1. S.N. Prasad, *Competitive Reasoning Verbal and Non-verbal*, kiran institute of career excellence Pvt., Ltd., (kicx) Delhi Presentation, New Edition.
2. P.K. Agarwal, *Test of Verbal Reasoning for Competitive Examinations*, Asian Book, 2012.
3. R.S. Aggarwal, *Test of Verbal and Non-verbal Reasoning for Competitive Examinations*, S.Chand & Company Ltd., 2014.
4. B.S. Sijwali, Indu Sijwali, *Non-verbal Reasoning*, Arihant Publishers, Dec 2014.

E-Resources:
1. https://www.indiabix.com/verbal-reasoning/questions-and-answers/
2. https://testbook.com/reasoning/verbal-reasoning
3. https://www.geeksforgeeks.org/verbal-reasoning-questions-and-answers/
4. https://www.mathcentre.ac.uk/resources/uploaded/non-verbal-reasoning-test-1-questions.pdf
5. https://www.examveda.com/mcq-question-on-non-verbal-reasoning/

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	1	9	9	**31**
CO2	3	3	3	3	1	9	9	**31**
CO3	3	3	3	3	1	9	9	**31**
CO4	3	3	3	3	3	9	9	**33**
CO5	3	3	3	3	3	9	9	**33**
Total	**15**	**15**	**15**	**15**	**9**	**45**	**45**	**159**

Low-1 Medium-3 High-9

MD V- Financial Mathematics

(For Students Admitted from 2025-26)

Semester: VI **Hours / week: 4**
Subject Code: JBMD61MXB **Credit: 3**

Course Objectives:
1. To gain knowledge on Simple Interest, Compound Interest and the rates of return
2. To understand the concept of Mutual funds, decision under risk and uncertainty and capital budgeting

Unit I **(12 hours)**
Single principal sum: Simple Interest rate-Flat rate- Compound Interest rate
Multiple stream of cash flows: Even stream of cash flows – Uneven stream of cash flows.

Unit II **(12 hours)**
The rates of return: The term structure of interest rates -Forecasting interest rates- Interest rate in derivative contracts-rates of return.

Unit III **(12 hours)**

Security valuation: Valuation and yields of Treasury bills and short- term notes -Bond valuation- Preference share valuation-Ordinary share valuation.

Unit IV **(12 hours)**

Cost of Capital: Weighted average cost- Cost of debts - Cost of equity.

Unit V **(12 hours)**

Capital Budgeting: Net present value- Incremental cash flows -Recognition of cash flows.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Illustrate the concepts of Simple Interest and Compound Interest
CO2: Measure the rates of return
CO3: Assess the security valuation
CO4: Analyze the cost of capital and weighted average cost
CO5: Analyze the capital budgeting and incremental cash flows

Text Book:

1. Ambad Nazri Wahidudin, "*Financial Mathematics and its Applications*", Ventus Publishing ApS, 2011, ISBN: 978-87-7681-928-6

Unit I **:** Chapters 1 & 2
Unit II **:** Chapter 3
Unit III **:** Chapter 4 (Sec 4.1 -4.4)
Unit IV **:** Chapter 5
Unit V **:** Chapter 6

Reference Book:

1. Marek Capinski and Tomasz Zastawniak, "Mathematics for Finance"- An introduction to Financial Engineering, 2003, Springer.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc25_ma37/preview
2. https://www.youtube.com/watch?v=jvRq87ZWzIk
3. https://www.youtube.com/watch?v=rISzQMoE9nw
4. https://www.investopedia.com/terms/b/breakevenanalysis.asp
5. https://www.investopedia.com/terms/i/insurance.asp

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	1	3	3	**19**
CO2	3	3	3	3	1	3	3	**19**
CO3	3	3	3	3	1	3	3	**19**
CO4	3	3	3	3	3	3	3	**21**
CO5	3	3	3	3	3	3	9	**27**
Total	**15**	**15**	**15**	**15**	**9**	**15**	**21**	**105**

Low-1 Medium-3 High-9

SEC VI – Numerical Methods Lab using Python

(For Students Admitted from 2025- 26)

Semester: VI **Hours / week: 2**

Subject Code: JBMXS65P **Credit: 1**

Course Objectives:

1.To define the structure and components of a Python program.
2.To build and package Python modules for reusability.

List of Programmes:

1.Solving the problem Using Bisection Method
2.Solving the problem Using Regula Falsi Method
3.Solving the problem Using Newton's interpolation Method
4.Solving the problem Using Lagrange's Method
5.Solve the problem Forward Difference Table
6.Solve the problem Backward Difference Table
7.Solve the problem Trapezoidal Rule
8.Solving the problem Simpson's 1/3 Rule
9.Solving the problem Simpson's 3/8 Rule
10. Solving the problem Euler Method

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Identify the basic concepts of Python
CO 2: work with common Python data types like integers, floats, strings, characters, lists, dictionaries, as well as pandas Data Frames.
CO 3: Apply the proficiency in handling Numbers, Strings and functions to solve computational problems.
CO 4: Analyze and evaluate the accuracy of common numerical methods
CO 5: Design and Develop solution for real-time application using Database operations

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	9	3	1	9	**32**
CO2	9	1	9	1	3	1	3	**27**
CO3	3	3	3	9	3	1	9	**31**
CO4	3	9	9	9	9	3	9	**51**
CO5	3	3	1	9	9	3	1	**32**
Total	**24**	**20**	**25**	**37**	**27**	**9**	**31**	**173**

Low-1 Medium-3 High-9

Extra Credit – Quantitative Techniques

(For Students Admitted from 2025- 26)

Semester: VI
Subject Code: JBMXX6 **Credit: 2**

Course Objectives:

1. To understand operations, research techniques used for planning, scheduling and controlling large andcomplex projects
2. To get motivation to take up a project to solve real life problems by adopting the techniques of operations research

Unit I

Linear programming Problem: Advanced Techniques: Introduction - Revised Simplex Method - Simplex Method Versus Revised Simplex Method - Bounded Variables - Parametric Linear Programming - Linear Fractional Programming - Application of Linear Fractional Programming – Karmarkar Algorithm.

Unit II

Sequencing problem: Introduction - Problem of Sequencing - Basic Terms Used in Sequencing Processing n Jobs Through Two Machines - Processing n Jobs Through k Machines - Processing 2 Jobs Through k machines.

Unit III

Dynamic programming: Introduction - The Recursive Equation Approach - Characteristics of Dynamic Programming - Dynamic Programming Algorithm - Solution of Discrete D.P.P - Some Applications - Solution of L.P.P by Dynamic Programming.

Unit IV

Probability: Introduction - Uncertainty And Probability - Sample Space and Probability -Algebra of Events - Conditional Probability - Random Variables - Expectation of Random Variable - Central Tendency and Dispersion - Some Probability Distributions.

Unit V

Decision analysis: Introduction - Decision Making Problem - Decision Making Process- Decision Making Environment - Decisions under Uncertainty - Decisions under Risk - Decision Tree Analysis - Decision Making With Utilities.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Classify the advanced techniques in linear programming problem.
CO 2: Inspect the real life problems and make use of LP techniques to solve the problems.
CO 3: Identify dynamical programming techniques and determine the solution to the given problems.
CO 4: Compare and contrast the concept of uncertainty and probability and assess the problems on random variables.
CO 5: Able to decide a decision in any critical environment.

Text Book:

1. Kanti Swarup, P. K. Gupta, Man Mohan, *Operations Research*, Sultan Chand & Sons, New

Delhi,Eighteenth Edition, 2015.
Unit I : Chapter 9
Unit II : Chapter 12(Sec 12:1 – 12:6)
Unit III : Chapter 13
Unit IV : Chapter 14
Unit V : Chapter16

Reference Books:
1.P.K.Gupta and Man Mohan, *Problems in Operations Research*, Sultan Chand & Sons, New Delhi, Fourteenth Edition,2002.
2.Prem Kumar Gupta and D.S. Hira, *Operations Research*, Sultan Chand & Sons, New Delhi First Edition,1993.
3.Hamdy A. Taha, *Operations Research - An Introduction*, Prentice Hall, Eighth Edition, 2007.

E-Resources:
1.https://www.analyticsvidhya.com/blog/2017/02/lintroductory-guide-on-linear-programming-explained-in-simple-english/
2.https://www.hackerearth.com/practice/algorithms/dynamic-programming/introduction- to-dynamic- programming-1/tutorial/
3.https://www.verywellmind.com/problems-in-decision-making-2795486

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	3	9	3	**27**
CO2	9	3	9	3	3	9	9	**45**
CO3	3	3	3	3	3	9	3	**27**
CO4	3	3	3	3	3	9	3	**27**
CO5	9	3	9	3	3	3	9	**39**
Total	**27**	**15**	**27**	**15**	**15**	**39**	**27**	**165**

Low-1 Medium-3 High-9

AECC II- Statistics

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 4**
Subject Code: JBCSA23 **Credit: 4**

Course Objectives:
1.To gain knowledge on correlation and regression.
2.To know about index numbers and time series

Unit I **(12 hours)**
Central Tendencies: Introduction - Arithmetic Mean - Mode - Geometric Mean and Harmonic Mean - **Measures of Dispersion**: Introduction - Measures of Dispersion – Relative Advantages of Different Measures of Dispersion.

Unit II **(12 hours)**

Moments, Skewness and Kurtosis: Introduction – Moments - Skewness and Kurtosis. **Curve fitting:** Introduction - Principle of least squares.

Unit III **(12 hours)**

Correlation and Regression: Introduction - Correlation - Rank correlation - Regression - Correlation Coefficient for a Bivariate Frequency Distribution.

Unit IV **(12 hours)**

Interpolation: Introduction - Finite Differences – Newton's Formula – Lagrange's Formula. **Theory of Attributes:** Introduction - Attributes - Consistency of Data - Independence and Association of Data.

Unit V **(12 hours)**

Index Numbers: Index Numbers - Consumer Price Index Numbers – Convertion of Chain Base Index Number into Fixed Base Index and Conversely. **Analysis of Time series**: Introduction - Time series - Components of a Time series - Measurement of Trends.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Build the skills in basic statistical concepts
CO 2: Apply the various measures of statistical parameters in real life
CO 3: Estimate the correlation coefficient for a bivariate frequency distribution and regression
CO 4 : Make use of Newton's and lagrange's formula for solving the finite difference statistical problem
CO 5: Analyze the time series and measure the trends of statistical data

Text Book:

1. Dr. S. Arumugam and A. Thangapandi Isaac, *Statistics*, New Gamma Publishing House, June 2015.

Unit I : Chapter 2, 3
Unit II : Chapter 4, 5
Unit III : Chapter 6
Unit IV : Chapter 7,8
Unit V : Chapter 9, 10

Reference Books:

1. R.S.N. Pillai and Bagavathi, *Statistics - Theory and Practice*, S. Chand and Company Private Limited, New Delhi, 2007.
2. S.C. Gupta & V.K. Kapoor, *Mathematical Statistics*, Sultan Chand & Sons, Eleventh Edition 2007.
3. D.C. Sancheti, V.K. Kapoor, *Statistics (Theory, Methods and Applications)*, Sultan Chand & Sons, 2012.

E-Resources:

1. https://youtu.be/ztIBfKD_eFg
2. https://youtu.be/OfANWrzQE9Q
3. https://youtu.be/F_2GIheAbtI

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	1	9	9	**43**
CO2	9	9	3	3	3	9	9	**45**
CO3	3	9	3	3	1	9	9	**37**
CO4	3	3	9	3	1	9	9	**37**
CO5	3	3	9	3	3	9	9	**39**
Total	**27**	**33**	**27**	**15**	**9**	**45**	**45**	**201**

Low-1 Medium-3 High-9

AECC III - Operations Research

(For Students Admitted from 2025-26)

Semester: III **Hours / week: 4**
Subject Code: JBCSA33 **Credit: 4**

Course Objectives:

1. To apply these techniques constructively to make effective business decisions
2. To impart the knowledge of formulation of practical problems using the linear Programming method and its extensions.

Unit I **(12 hours)**

Linear Programming Problem - Mathematical formulation: Linear Programing Problem – Mathematical formulation of the Problem - Illustrations on Mathematical Formulation of LPP - **Linear Programming Problem - Graphical solution and Extension:** Graphical solution method - some exceptional cases - General L.P.P - Canonical and standard forms of L.P.P.

Unit II **(12 hours)**

Linear Programming - Simplex method: Introduction - Fundamental properties of solutions -The computational procedure- Use of Artificial variables – Big M method – Two phase method- Degeneracy in L.P.P.-

Unit III **(10 hours)**

Duality in Linear Programming: Introduction - General Primal - Dual Pair - Formulating a Dual Problem - Primal-Dual Pair in Matrix Form - Dual Simplex method.

Unit IV **(14 hours)**

Transportation Problem: LP formulation of the Transportation Problem - Existence of solution in T.P - Duality in Transportation problem - The Transportation Table - Loops in Transportation tables - Triangular basis in a T.P - Solution of a T. P - Finding an initial basic feasible solution - Test for optimality - Degeneracy in Transportation Problem - Transportation Algorithm (MODI Method) - Stepping Stone solution method. - **Assignment Problem:** Introduction - Mathematical formulation of the problem - Solution methods of Assignment Problem - Special cases in Assignment Problems

Unit V **(12 hours)**

Network Scheduling by PERT/CPM: Introduction - Network: Basic Components - Logical Sequencing - Rules of Network construction - Concurrent activities - Critical Path Analysis -

Probability Considerations in PERT - Distinction between PERT and CPM.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the graphical method and to get optimality of Linear Programming Problem

CO2: Apply the LP model to tackle problems from real life.

CO3: Analyze the Businesses use duality to price resources effectively and determine which constraints are most restrictive.

CO4: Examine the techniques used to acquire Linear Programming and Transportation Problem, when resolving difficulties in the real world.

CO5: Create networks for a particular plan and PERT/CPM schedule them.

Text Book:

1. Kanti Swarup, P.K. Gupta & Man Mohan, **Operations Research,** Sultan chand & sons. Eighteenth Edition.2015.

Unit I : Chapter 2(2:3 – 2:4), Chapter 3(3:2 – 3:5)
Unit II : Chapter 4(4:1 – 4:5),
Unit III : Chapter 5(5:1 – 5:4 & 5:9)
Unit IV : Chapter 10(10:2 – 10:10, 10:12 – 10:14) Chapter 11(11:1 – 11:14)
Unit V : Chapter 25(25:1 – 25:8)

Reference Books:

1. Hamdy A. Taha, *Operations Research - An Introduction*, Prentice Hall, Tenth Edition, 2016.
2. S.D. Sharma, *Operations Research*, Dedar Nath Ram Nath, 2009.
3. Srinivasan, *Operations Research - Principles and Appplications*, PHI Learning Private Limited, Second Edition, 2012.

E- Resources:

1. https://www.youtube.com/watch?v=YPn4yHM1YsU
2. http://www.math.wsu.edu/faculty/genz/364/lessons/l3067.pdf
3. https://www.youtube.com/watch?v=fSuqTgnCVRg
4. Transportation problem||vogel's approximation[VAM]|Northwest corner||Least cost||Using Simple Method - YouTube
5. https://www.youtube.com/watch?v=b1btzVsKp8E

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	3	3	3	3	3	3	3	21
CO2	3	3	3	9	3	3	9	33
CO3	3	3	3	3	3	3	9	27
CO4	3	3	3	3	3	9	9	33
CO5	3	3	3	9	3	3	9	33
Total	15	15	15	27	15	21	39	147

Low-1 Medium-3 High-9

AECC II- Statistics

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 4**
Subject Code: JBITA23 **Credit: 4**

Course Objectives:
1.To gain knowledge on correlation and regression.
2.To know about index numbers and time series

Unit I **(12 hours)**
Central Tendencies: Introduction - Arithmetic Mean - Mode - Geometric Mean and Harmonic Mean - **Measures of Dispersion**: Introduction - Measures of Dispersion – Relative Advantages of Different Measures of Dispersion.

Unit II **(12 hours)**
Moments, Skewness and Kurtosis: Introduction – Moments - Skewness and Kurtosis. **Curve fitting:** Introduction - Principle of least squares.

Unit III **(12 hours)**
Correlation and Regression: Introduction - Correlation - Rank correlation - Regression - Correlation Coefficient for a Bivariate Frequency Distribution.

Unit IV **(12 hours)**
Interpolation: Introduction - Finite Differences – Newton's Formula – Lagrange's Formula. **Theory of Attributes:** Introduction - Attributes - Consistency of Data - Independence and Association of Data.

Unit V **(12 hours)**
Index Numbers: Index Numbers - Consumer Price Index Numbers – Convertion of Chain Base Index Number into Fixed Base Index and Conversely. **Analysis of Time series**: Introduction - Time series - Components of a Time series - Measurement of Trends.

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Build the skills in basic statistical concepts
CO 2: Apply the various measures of statistical parameters in real life
CO 3: Estimate the correlation coefficient for a bivariate frequency distribution and regression
CO 4 : Make use of Newton's and lagrange's formula for solving the finite difference statistical problem
CO 5: Analyze the time series and measure the trends of statistical data

Text Book:
1.Dr. S. Arumugam and A. Thangapandi Isaac, *Statistics*, New Gamma Publishing House, June 2015.
Unit I : Chapter 2, 3
Unit II : Chapter 4, 5
Unit III : Chapter 6
Unit IV : Chapter 7,8
Unit V : Chapter 9, 10

Reference Books:

1.R.S.N. Pillai and Bagavathi, *Statistics - Theory and Practice*, S. Chand and Company Private Limited, New Delhi, 2007.
2.S.C. Gupta & V.K. Kapoor, *Mathematical Statistics*, Sultan Chand & Sons, Eleventh Edition 2007.
3.D.C. Sancheti, V.K. Kapoor, *Statistics (Theory, Methods and Applications)*, Sultan Chand & Sons, 2012.

E-Resources:

1. https://youtu.be/ztIBfKD_eFg
2. https://youtu.be/OfANWrzQE9Q
3. https://youtu.be/F_2GIheAbtI

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	1	9	9	**43**
CO2	9	9	3	3	3	9	9	**45**
CO3	3	9	3	3	1	9	9	**37**
CO4	3	3	9	3	1	9	9	**37**
CO5	3	3	9	3	3	9	9	**39**
Total	**27**	**33**	**27**	**15**	**9**	**45**	**45**	**201**

Low-1 Medium-3 High-9

AECC II- Statistics

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 4**
Subject Code: JBCPA23 **Credit: 4**

Course Objectives:

1. To gain knowledge on correlation and regression.
2. To know about index numbers and time series

Unit I **(12 hours)**

Central Tendencies: Introduction - Arithmetic Mean - Mode - Geometric Mean and Harmonic Mean - **Measures of Dispersion**: Introduction - Measures of Dispersion – Relative Advantages of Different Measures of Dispersion.

Unit II **(12 hours)**

Moments, Skewness and Kurtosis: Introduction – Moments - Skewness and Kurtosis. **Curve fitting:** Introduction - Principle of least squares.

Unit III **(12 hours)**

Correlation and Regression: Introduction - Correlation - Rank correlation - Regression - Correlation Coefficient for a Bivariate Frequency Distribution.

Unit IV **(12 hours)**

Interpolation: Introduction - Finite Differences – Newton's Formula – Lagrange's Formula. **Theory of Attributes:** Introduction - Attributes - Consistency of Data - Independence and Association of Data.

Unit V **(12 hours)**

Index Numbers: Index Numbers - Consumer Price Index Numbers – Convertion of Chain Base Index Number into Fixed Base Index and Conversely. **Analysis of Time series**: Introduction - Time series - Components of a Time series - Measurement of Trends.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Build the skills in basic statistical concepts
CO 2: Apply the various measures of statistical parameters in real life
CO 3: Estimate the correlation coefficient for a bivariate frequency distribution and regression
CO 4 : Make use of Newton's and lagrange's formula for solving the finite difference statistical problem
CO 5: Analyze the time series and measure the trends of statistical data

Text Book:

1. Dr. S. Arumugam and A. Thangapandi Isaac, *Statistics*, New Gamma Publishing House, June 2015.

Unit I : Chapter 2, 3
Unit II : Chapter 4, 5
Unit III : Chapter 6
Unit IV : Chapter 7,8
Unit V : Chapter 9, 10

Reference Books:

1. R.S.N. Pillai and Bagavathi, *Statistics - Theory and Practice*, S. Chand and Company Private Limited, New Delhi, 2007.
2. S.C. Gupta & V.K. Kapoor, *Mathematical Statistics*, Sultan Chand & Sons, Eleventh Edition 2007.
3. D.C. Sancheti, V.K. Kapoor, *Statistics (Theory, Methods and Applications)*, Sultan Chand & Sons, 2012.

E-Resources:

1. https://youtu.be/ztIBfKD_eFg
2. https://youtu.be/OfANWrzQE9Q
3. https://youtu.be/F_2GIheAbtI

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	1	9	9	**43**
CO2	9	9	3	3	3	9	9	**45**
CO3	3	9	3	3	1	9	9	**37**
CO4	3	3	9	3	1	9	9	**37**
CO5	3	3	9	3	3	9	9	**39**
Total	**27**	**33**	**27**	**15**	**9**	**45**	**45**	**201**

Low-1 Medium-3 High-9

AECC I- Statistics

(For Students Admitted from 2025-26)

Semester: I **Hours / week: 4**
Subject Code: JBICA14 **Credit: 4**

Course Objectives:
1.To gain knowledge on correlation and regression.
2.To know about index numbers and time series

Unit I **(12 hours)**
Central Tendencies: Introduction - Arithmetic Mean - Mode - Geometric Mean and Harmonic Mean.

Unit II **(12 hours)**
Measures of Dispersion: Introduction - Measures of Dispersion – Relative Advantages of Different Measures of Dispersion. **Moments, Skewness and Kurtosis:** Introduction – Moments - Skewness and Kurtosis.

Unit III **(12 hours)**
Curve fitting : Introduction - Principle of least squares. **Correlation and Regression:** Introduction – Correlation - Rank correlation - Regression - Correlation Coefficient for a Bivariate Frequency Distribution.

Unit IV **(12 hours)**
Interpolation: Introduction - Finite Differences – Newton's Formula – Lagrange's Formula

Unit V **(12 hours)**
Index Numbers: Introduction – Index Numbers - Consumer Price Index Numbers. **Analysis of Time series:** Introduction - Time series - Components of a Time series - Measurement of Trends.

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Build the skills in basic statistical concepts
CO 2: Apply the various measures of statistical parameters in real life
CO 3: Estimate the correlation coefficient for a bivariate frequency distribution and regression
CO 4 : Make use of Newton's and lagrange's formula for solving the finite difference statistical problem

CO 5: Analyze the time series and measure the trends of statistical data

Text Book:

1. Dr. S. Arumugam and A. Thangapandi Isaac, *Statistics*, New Gamma Publishing House, June 2015.

Unit I : Chapter 2
Unit II : Chapter 3, 4
Unit III : Chapter 5, 6
Unit IV : Chapter 7
Unit V : Chapter 9, 10

Reference Books:

1.R.S.N. Pillai and Bagavathi, *Statistics - Theory and Practice*, S. Chand and Company Private Limited, New Delhi, 2007.
2.S.C. Gupta & V.K. Kapoor, *Mathematical Statistics*, Sultan Chand & Sons, Eleventh Edition 2007.
3.D.C. Sancheti, V.K. Kapoor, *Statistics (Theory, Methods and Applications)*, Sultan Chand & Sons, 2012.

E-Resources:

1.https://youtu.be/ztIBfKD_eFg
2.https://youtu.be/OfANWrzQE9Q
3.https://youtu.be/F_2GIheAbtI

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	3	3	1	9	9	**43**
CO2	9	9	3	3	3	9	9	**45**
CO3	3	9	3	3	1	9	9	**37**
CO4	3	3	9	3	1	9	9	**37**
CO5	3	3	9	3	3	9	9	**39**
Total	**27**	**33**	**27**	**15**	**9**	**45**	**45**	**201**

Low-1 Medium-3 High-9

AECC I – Mathematics - I

(For Students Admitted from2025-26)

Semester: I **Hours / week: 4**
Subject Code: JBCHA13 **Credit: 4**

Course Objectives:

1.To acquire knowledge about the rank of a matrix
2.To acquire basic knowledge in Algebra and Trigonometry

Unit I **(12 hours)**

Algebra: Partial fraction - Binomial series - Application of the binomial theorem to the summation of series - Approximation and limits.

Unit II **(12 hours)**

Algebra: Exponential series - Logarithmic series.

Unit III **(12 hours)**

Theory of Equations: Nature of Roots - Relation between the coefficients and the roots of an algebraic equation - Transformation of equations - Reciprocal equations.

Unit IV **(12 hours)**

Matrices: Definition and algebraic operations - Rank of matrix.

Unit V **(12 hours)**

Trigonometry: Expansions of $\sin\theta$ and $\cos n\theta$- powers of sines and cosines of θ in terms of functions of multiple of θ- Expansion of $\sin\theta$ and $\cos\theta$ in a series of ascending powers of θ.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Establish the applications of Binomial theorem in terms of series
CO 2: Classify exponential series and logarithmic series
CO 3: Solve the roots of the given equation by adopting different methods
CO 4: Use algebraic operations to find the rank of the matrices
CO 5: Examine the concept of trigonometric function and hyperbolic functions

Text Book:

1.S. Narayanan, R. Hanumantha Rao, T.K. Manicavchagam Pillay and Dr. P. Kandaswamy, *Ancillary Mathematics – Volume –I*, S.Viswanathan (Printers & Publishers) Private Limited, 2015.

Unit I **:** Chapter 1(sec 1.1 - 1.2)
Unit II **:** Chapter 1(sec 1.3 - 1.4)
Unit III **:** Chapter 2(sec 2.1 - 2.4)
Unit IV **:** Chapter 3(sec 3.1- 3.2)
Unit V **:** Chapter 5 (sec 5.1 - 5.3)

Reference Books:

1.K. Thilagavathy, P. Kandaswamy, *Allied Mathematics***,** S. Chand and Company Limited, New Delhi, Second Edition, 2004.
2.Dr. M.K. Venkataraman, Mrs. Manorama Sridhar, *Allied Mathematics*, Agasthiar Publication, First Edition, 2005.
3.Prof. P. Duraipandian, Dr. S. Udayabaskaran, *Allied Mathematics Vol-2*, S. Chand & Company Private Limited, Reprint, 2016.

E- Resources:

1.https://www.youtube.com/watch?v=x6uB4JflJHk
2.https://www.youtube.com/watch?v=5oDdSb9Jv6c
3.https://kanchiuniv.ac.in/coursematerials/expansiontrignometry.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	3	1	3	1	3	1	**21**
CO2	3	3	1	3	1	3	1	**15**
CO3	9	9	1	3	3	3	1	**29**
CO4	9	9	1	3	3	3	3	**31**
CO5	3	3	1	3	3	3	3	**19**
Total	**33**	**27**	**5**	**15**	**11**	**15**	**9**	**115**

Low-1 Medium-3 High-9

AECC II – Mathematics – II

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 4**
Subject Code: JBCHA23 **Credit: 4**

Course Objectives:
1.To acquire knowledge in Differential calculus and integral calculus
2.To solve the basic problems in numerical methods and Laplace Transform

Unit I **(12 hours)**
Finite Differences: Forward difference – Backward difference – Interpolation – Newton's Forward interpolation formula – Newton's backward difference formula.

Unit II **(14 hours)**
Differential Calculus: Higher derivatives - Jacobian - polar coordinates.

Unit III **(12 hours)**
Integration: Integrals of functions containing linear functions of x - Integrals of functions Involving $a^2 \pm b^2$- Integrals of functions of the form $\int f(x^n)\, x^{n-1} dx$ - Integrals of functions Of the form $\int {}^*f(x) + {}^n$f´(x)dx.

Unit IV **(12 hours)**
Fourier series: Introduction - Even and Odd functions – Half range fourier series - Development in cosine series - Development in sine series.

Unit V **(10 hours)**
Fourier series: Change of interval - Combination of series.

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Examine the solutions of problem using forward difference formula and backward difference formula
CO 2: Find the derivatives for higher order equations
CO 3: Simplify different forms of integral concepts
CO 4: Apply the construction of Fourier Series in different environment
CO 5: Describe the different concept of Laplace transformations

Text Books:

1. S. Narayanan, R. Hanumantha Rao, T.K. Manicavchagam Pillay, Dr. P. Kandaswamy, *Ancillary Mathematics - Volume I*, S.Viswanathan Printers and Publishers, Private Limited, 2015.

Unit I : Chapter 4 (Pg.no: 172-202)
Unit II : Chapter 6 (Pg.no: 266 – 295)

2. S. Narayanan, R. Hanumantha Rao, T.K. Manicavchagam Pillay, Dr. P Kandaswamy, *Ancillary Mathematics - Volume II*, S. Viswanathan Printers and Publishers, Private Limited, 2015.

Unit III : Chapter 1 (Pg.no: 1 -18)
Unit IV : Chapter 2 (Pg.no:123-150)
Unit V : Chapter 2 (Pg.no: 150-159)

Reference Books:

1. K. Thilagavathy and P. Kandaswamy, *Allied Mathematics paper I*, S. Chand and Company Limited**,** Reprint, 2010.
2. Dr.M.K. Venkataraman and Mrs. Manorama Sridhar, *Allied Mathematics*, Agasthiar Publications, First Edition, 2015.
3. Prof.P. Duraipandian and Dr.S. Udayabaskaran, *Allied Mathematics Vol-2*, S. Chand & Company Private Limited, Reprint, 2016.

E- Resources

1.https://nptel.ac.in/courses/111/107/111107105/
2.https://www.youtube.com/watch?v=TS9V9OfBggI
3.https://www.youtube.com/watch?v=RDtITuZDZi4
4.https://www.youtube.com/watch?v=Gxr3AT4NY_Q
5.https://www.maths.usyd.edu.au/MATH2065/r/Week9Lect3.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	1	3	3	9	3	**37**
CO2	3	3	1	3	3	3	3	**19**
CO3	9	3	1	3	3	3	3	**25**
CO4	3	3	3	3	3	3	3	**21**
CO5	3	3	3	3	3	3	3	**21**
Total	**27**	**21**	**9**	**15**	**15**	**21**	**15**	**123**

Low-1 Medium-3 High-9

AECC III – Psychological Statistics – Descriptive

(For Students Admitted from 2025-26)

Semester: III **Hours / week: 4**
Subject Code: JBSYA33 **Credit: 4**

Course Objectives:

1. To analyze data pertaining to discrete and continuous variables and to interpret theresults
2. To gain the knowledge of various types of data, their organization and evaluation of

summary measures such as measures of central tendency and dispersion

Unit I **(11 hours)**

Statistics - Meaning and Use: Meaning of statistics - Need and Importance of Statistics in Education and psychology - Prerequisites for studying Statistics. **Organization of Data:** The Meaning of the Terms "Data" - Methods of organizing data.

Unit II **(10 hours)**

Graphical Representation of Data: Meaning of Graphical Representation of Data - Advantages of Graphical Representation of Data - Mode of Graphical Representation of Data - Smoothing of frequency Curve - Polygon and Ogive.

Unit III **(12 hours)**

Measures of Central Tendency: Meaning of the Measures of Central Tendency - Arithmetic Mean, Median & Mode - Computation of Median and Mode from the Curve of Frequency Distribution - When to use the Mean, Median and Mode.

Unit IV **(12 hours)**

Measure of Variability: Meaning and Importance of the Measure of Variability - Types of Measure of Variability - When and Where to use the Various Measure of Variability.

Unit V **(15 hours)**

Linear Correlation: Meaning and Types - Coefficient of Correlation - Construction of Scatter Diagram.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Understand the scales of measurements
CO2: Analyze the results of graphical representation of data
CO 3: Apply the formula to compute the solution of mean, median, mode
CO4: Apply the formula and analyze when and where to use the measures of variability
CO 5: Construct scatter diagram using linear correlation concept

Text Book:

1. Mangal S.K., *Statistics in Psychology and Education*, PH Learning Private Limited, New Delhi, Second Edition, 2016.

Unit I : Chapter1, 2
Unit II : Chapter 3
Unit III : Chapter 4
Unit IV : Chapter 6
Unit V : Chapter 7

Reference Books:

1. Henry E. Garrett**,** *Statistics in Psychology and Education*, Surjeet Publications, Second Edition, 2012.
2. Arthur Aron, Elliot J. Coups, Elaine N. Aron, *Statistics for Psychology*, Sixth Edition, 2019.
3. K.R. Gupta, *Statistical Methods in Education and Psychology*, 2017.

E- Resources:

1. https://www.yourarticlelibrary.com/education/statistics/graphic-representation-of-data-meaning-principles-and-methods/64884
2. https://www.scribbr.com/statistics/central-tendency/
3. https://m.youtube.com/watch?v=qb3X01m4H68

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	1	1	1	3	**11**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	3	3	3	3	3	9	**27**
CO4	3	1	1	1	1	3	9	**19**
CO5	3	1	1	3	3	3	3	**17**
Total	**15**	**7**	**9**	**9**	**11**	**13**	**27**	**91**

Low-1 Medium-3 High-9

AECC IV Psychological Statistics-Inferential

(For Students Admitted from 2025-26)

Semester: IV **Hours / week: 4**
Subject Code: JBSYA43 **Credit: 4**

Course Objectives:

1. To apply large and small sample tests in real life situations
2. To understand the main features and characteristics of normal distributions and the Standard normal distribution

Unit I **(12 hours)**

The Normal Curve and Its Applications: Introduction - Characteristics and Properties of a Normal Curve - Applications of a Normal Curve - Illustration of the Applications of a Normal Curve.

Unit II **(12 hours)**

Significance of the Mean and other Statistics: Introduction - Significance of the Sample Mean and Other Statistics - Significance of Some Other Statistics.

Unit III **(12 hours)**

Significance of the Difference Between Means: Need and Importance - Fundamental Concepts in Determining the Significance of the Difference between Means - How to Determine the Significance of the Difference between Two Means.

Unit IV **(12 hours)**

Chi square and Contingency Coefficient: Use of chi square as a Test of Goodness of Fit - Procedure of Chi Square Testing - Use of Chi Square as a Test of Independence between Two Variables - Contingency Coefficient - Correction for Small Frequencies in a 2x2 Table - Underlying Assumptions, Uses and Limitations of Chi Square Test.

Unit V **(12 hours)**

Analysis of Variance: Need for the Technique of Analysis of Variance – Meaning of the Term "Analysis of Variance" - Procedure for Calculating the Analysis of Variance - Two-way Analysis of Variance - Underlying Assumptions in Analysis of variance.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Examine and apply the concepts of normal curve to problem solving
CO 2: Solve the sample mean of statistics
CO 3: Analyze the concepts of significance between means
CO 4: Test the chi square as a test of independent between two variables
CO 5: Calculate analysis of variance

Text Book:

1.Mangal S.K., *Statistics in Psychology and Education,* PH Learning Private Limited, New Delhi, Second Edition, 2016.

Unit I : Chapter 8
Unit II : Chapter 9
Unit III : Chapter 10
Unit IV : Chapter 11(Page No: 181-196)
Unit V : Chapter 17(Page No: 319 – 334)

Reference Books:

1.Henry E. Garrett, *Statistics in Psychology and Education***,** Surjeet Publications, Second Edition, 2012.
2.Arthur Aron, Elliot J. Coups, Elaine N. Aron, *Statistics for Psychology*, Sixth Edition, 2019.
3.K.R. Gupta, *Statistical Methods in Education and Psychology*, 2017.

E- Resources:

1.https://www.youtube.com/watch?v=wRfL_EhC-E8
2.https://www.youtube.com/watch?v=LXTCbOyDIlo
3.https://www.youtube.com/watch?v=-yQb_ZJnFXw

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	3	3	3	**21**
CO2	3	3	3	1	1	3	3	**17**
CO3	3	3	3	1	1	3	1	**15**
CO4	3	3	3	3	1	3	3	**19**
CO5	3	3	3	3	3	3	3	**21**
Total	**15**	**15**	**15**	**11**	**9**	**15**	**13**	**93**

Low-1 Medium-3 High-9

AECC I - Fundamentals of Mathematics

(For Students Admitted from 2025-26)

Semester: I **Hours/Week: 4**
Subject Code: JBADA13 **Credit: 3**

Course Objective:
1.To develop a strong foundation in the basic concepts of mathematics.
2.To introduce the ideas in differential calculus, set and its relations

Unit I **(12 hours)**
Theory of Sets: Introduction- The Concept of a Set- Set Inclusion – Union of Sets – Intersection of Sets – Difference of Sets – Complement of a Set – Symmetric Difference of Two Sets – Cartesian Product of Sets – **Relations and Mappings:** Relations – Equivalence Relations – Partial order – Functions.

Unit II **(12 hours)**
Vectors Spaces: Linear Transformation – Span of a set – Linear Independence – Basis and Dimension – Rank and Nullity – Matrix of a Linear Transformation - **Theory of Matrices:** Eigen Values and Eigen Vectors.

Unit III **(12 hours)**
Limits and Derivatives: The Derivative as a Function – **Applications of Differentiation:** Maximum and Minimum Values – Optimization Problems.

Unit IV **(12 hours)**
Integrals: The Definite Integral - The Fundamental Theorem of Calculus –**Applications of Integration:** Areas Between Curves – Volumes.

Unit V **(12 hours)**
Distances and Nearest Neighbors: L_p Distances and their Relatives - L_p Distances - Mahalanobis Distance - Cosine and Angular Distance - KL Divergence - Distances for Sets and Strings - Jaccard Distance - Edit Distance - Modeling Text with Distances - Bag-of- Words Vectors - k-Grams –Similarities - Set Similarities - Normed Similarities - Normed Similarities between Sets.

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Recall all aspects of set theory and Analyze the Types of Relations and Solve the Equivalence relations.
CO 2: Justify the theoretical aspects of vector space and eigen values
CO 3: Calculate the Maximum and Minimum values of a function.
CO 4: Evaluate the definite integrals and find area between curves
CO 5: Communicate Mathematical solutions clearly and concisely.

Text Book
1. Arumugam, S. and Thangapandi Isaac. 2008. *Modern Algebra*. Chennai: Scitech Publications (India) Pvt. Ltd.

Unit I : Chapter 1, 2 (Section :1.0 – 1.8, 2.1 – 2.4)

Unit II : Chapter 2, 7 (Section : 5.3 – 5.8 & 7.8)

2. James Stewart, *Calculus: Early Transcendentals* , 7th Edition, Cengage Learning, USA, 2012

Unit III : Chapter 2, 4(Section : 2.8, 4.1, 4.7)

Unit IV : Chapter 5, 6 (Section : 5.2 - 5.3, 6.1 - 6.2)

3.Jeff M. Phillips, *Mathematical Foundations for Data Analysis*, December 2018.

Unit V : Chapter 4 (Section : 4.2 – 4.5)

Reference Books

1.Micheal D. Greenberg, *Foundations of Applied Mathematics*, Dover Publications Inc.,2013.

2.Kenneth Kunen, *The Foundations of Mathematics*, College Publications, 2009.

E-Resources

1.https://youtu.be/fzd0Viu6Qx8?si=vudX1w_hCAfvosl2

2.https://youtu.be/WCq3sRzsJfs?si=f5luzZ-lSMVWklyd

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**TOTAL**
CO1	9	3	9	1	3	3	3	31
CO2	3	1	3	3	1	1	1	13
CO3	9	3	9	1	3	3	3	31
CO4	3	1	3	3	1	1	1	13
CO5	9	3	1	1	1	1	1	17
TOTAL	**33**	**11**	**25**	**9**	**9**	**9**	**9**	**105**

Low-1 Medium-3 High-9

AECC II –Mathematical Statistics – I

(For Students Admitted from 2025-26)

Semester: II **Hours / week: 4**

Subject Code: JBADA23 **Credit: 4**

Course Objectives:

1.To acquire knowledge on moment generating functions and characteristic functions

2.To explain the concept of Probability theory

Unit I **(12 hours)**

Random Variables and Distribution Functions: Random Variable - Distribution Function - Properties of Distribution Function – Discrete Random variable – Probability mass function - Discrete distribution function – Continuous random variable – Probability density function - Continuous distribution function

Unit II **(12 hours)**

Random Variables and Distribution Functions: Joint Probability Mass Function and Marginal and Conditional Probability Function – Joint Probability Distribution Function–

Joint density function, marginal density function – Independent random variables – The conditional distribution function and conditional p.d.f.

Unit III **(12 hours)**

Mathematical Expectation and Generating Functions: Mathematical Expectation – Addition theorem of expectation – Multiplication theorem of expectation – Covariance – Expectation of linear combination of random variables – Variance of a linear combination of random variables – Expectation of a continuous random variable.

Unit IV **(12 hours)**

Theoretical Discrete Distributions: Binomial Distribution - Recurrence relation for the moments of Binomial Distribution – Moments Generating functions of Binomial Distribution - Recurrence relation for the probabilities of Binomial Distribution. **Poisson Distribution:** Moments of the Poisson Distribution – Mode of the Poisson Distribution – Recurrence relation for the moments of the Poisson Distribution – Moment generating function of Poisson Distribution – Recurrence formula for the probability of Poisson distribution.

Unit V **(12 hours)**

Theoretical Continuous Distributions: Normal Distribution - Chief characteristics of the Normal Distribution and Normal probability curve – M.G.F of Normal Distribution – Area property – Fitting of Normal Distribution.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Illustrate and differentiate the basic probability concepts
CO 2: Analyze the probability density function to solve the problems
CO 3: Evaluate relationship between joint p.m.f and joint p.d.f
CO 4: Make use of poison and binomial distribution to solve real life problems
CO 5: Classify the Random variables and determine solution to the given problems by MGF

Text Book:

1. S.C.Gupta, V.K.Kapoor, *Elements of Mathematical Statistics***,** Sultan Chand and Sons, Third Editon, Reprint 2015.

Unit I : Chapter 5(5.1-5.4.1, 5.4.3)
Unit II : Chapter 5 (5.5.1-5.5.5)
Unit III : Chapter 6 (6.1-6.7);
Unit IV : Chapter 7 (7.2, 7.2.2, 7.2.6, 7.2.10, 7.3.1-7.3.5, 7.3.9)
Unit V : Chapter 8 (8.2, 8.2.2, 8.2.5, 8.2.11, 8.2.14)

Reference Books:

1. S. Arumugam and A. Thangapandi Isaac, *Statistics***,** New Gamma Publishing Houses, Edition 2009.
2. S.C.Gupta, V.K. Kapoor, *Fundamental of Mathematical Statistics***,** Sultan Chand and Sons, Eleventh Edition, Reprint 2019.

E-Resources:

1. https://www.youtube.com/watch?v=JCZAVDTU0hU
2. https://www.youtube.com/watch?v=Fvi9A_tEmXQ
3. https://onlinecourses.nptel.ac.in/noc22_mg31/preview

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	9	3	3	3	**27**
CO2	3	3	9	9	3	3	3	**33**
CO3	3	9	9	9	3	9	3	**45**
CO4	9	9	9	9	3	9	9	**57**
CO5	3	9	9	9	3	9	9	**51**
Total	**21**	**33**	**39**	**45**	**15**	**33**	**27**	**213**

Low-1 Medium-3 High-9

Extra Credit I - Arithmetic for Competitive Examinations

(For Students Admitted from 2025-26)

Semester: II
Subject Code: JBADX2 **Credit: 2**

Course Objectives:

1.To introduce the basic concepts of Mathematics
2.To promote the problem solving ability to write the competitive examinations

Unit I

Numbers: Four Fundamental Rules - Solved Problems.

Unit II

Simplification: Solved Problems.

Unit III

Average: Solved Problems**.**

Unit IV

Chain Rules: Solved Problems.

Unit V

Allegation or Mixture: Solved Problems.

Course Outcomes:

After successful completion of this course, student will be able to
CO1: Compute the average of numbers
CO2: Make use of Allegation or Mixture in problems
CO3: Solve and simplify the real life problems
CO4: Apply the chain rule for solving the problem
CO5: Build the analytical and logical skills

Text Book:

1.R.S Aggarwal, *Arithmetic (Subjective & Objective) for Competitive Examinations*, S.Chand and Company Limited, Reprint 2009.
Unit I : Chapter 1(Pg.No: 1 - 29)

Unit II : Chapter 4(Pg.No:73 - 89)
Unit III : Chapter 7(Pg.No: 142-157)
Unit IV : Chapter 10(Pg.No: 205 -223)
Unit V : Chapter 17(Pg.No: 332 – 347)

Reference Books:

1.S.L Gulati, *A Complete Book on Objective Arithmetic* – Cosmos Bookhive(P) Limited, 32nd Edition.
2.R.S Aggarwal, *Objective Arithmetic (Numerical Ability Test) For Competitive Examinations,* S.Chand and CompanyLimited.
3.R.S Aggarwal & S.Chand, *Quantitative Aptitude for Competitive Examination*, Seventh Edition, 2008.

E- Resources:

1.https://www.youtube.com/watch?v=yoGq9IGc74E
2.https://careerdost.in/aptitude-questions/average-problems
3.https://byjus.com/govt-exams/mixture-alligation-questions

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	1	3	3	3	9	**25**
CO2	3	3	1	3	3	3	9	**25**
CO3	3	3	1	3	3	3	9	**25**
CO4	3	3	3	3	3	3	9	**27**
CO5	3	3	3	3	3	3	9	**27**
Total	**15**	**15**	**9**	**15**	**15**	**15**	**45**	**129**

Low-1 Medium-3 High-9

AECC III – Mathematical Statistics – II

(For Students Admitted from 2025-26)

Semester: III **Hours / week: 4**
Subject Code: JBADA33 **Credit: 4**

Course Objectives:

1. To acquire knowledge about the Correlation,Regression and exact sampling distribution
2. To gain knowledge about the testing of significance for large samples and small samples

Unit I **(10 hours)**

Correlation: Introduction – Meaning of Correlation - Scatter diagram - Karl Pearson's Coefficient of Correlation - Rank Correlation.

Unit II **(10 hours)**

Curve Fitting and Regression Analysis: Introduction – Linear Regression – Regression

Coefficients – Properties of Regression Coefficients – Angle between two lines of regression.

Unit III **(14 hours)**

Large Sample Theory: Introduction -Types of Sampling- Parameter and statistic - Tests of Significance – Procedure for Testing of hypothesis - Tests of significance for large samples – Sampling of Attributes – Sampling of Variables – Test of significance for Single Mean – Test of Significance for Difference of Means.

Unit IV **(14 hours)**

Exact Sampling Distributions- I: Introduction – Derivation of the Chi-square Distribution M.G.F of Chi-Square distribution – Additive Property of Chi – Square Variates – Applications of Chi-Square distribution – Goodness of Fit test.

Unit V **(12 hours)**

Exact sampling distributions - II: Introduction – Student's t –Distribution – Derivation of Student's t-distribution – Applications of t-distribution – F-distribution - Applications of F – distribution – F-Test for Equality of Two population Variances.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Understand the concept of Correlation and Regression

CO 2: Estimate and apply all aspects of Statistics

CO 3: Classify the concepts of sampling, testing of hypothesis and critical region

CO 4: Analyze the M.G.F of chi-square distribution

CO 5: Justify the concept of Student's t-distribution and F-distribution

Text Book:

1.S.C.Gupta, V. K. Kapoor, *Fundamntals of Mathematical Statistics***,** Sultan Chand and Sons, Twelfth Edition, Reprint 2022.

Unit I : Chapter 10 (10.1 -10.4, 10.7)

Unit II : Chapter 11 (11.1, 11.2, 11.2.1 -11.2.3)

Unit III: Chapter 14 (14.1-14.8, 14.8.3, 14.8.4)

Unit IV: Chapter 15 (15.1 -15.3, 15.3.5, 15.6, 15.6.2)

Unit V : Chapter 16 (16.1, 16.2, 16.2.1, 16.3, 16.6, 16.7, 16.7.1)

Reference Books:

1.S. Arumugam and A. Thangapandi Isaac, *Statistics***,** New Gamma Publishing Houses, Edition, 2009.

2.S.C.Gupta, V.K.Kapoor, *Elements of Mathematical Statistics***,** Sultan Chand and Sons, Third Editon, Reprint 2015.

E-Resources:

1.https://udrc.lkouniv.ac.in/Content/DepartmentContent/SM_6dc18628-deb8- 41c0-b3e0-7f39c1ca0125_38.pdf

2.https://www.youtube.com/watch?v=ktXwySpRrR8

3.https://www.simplypsychology.org/sampling-distribution.html

Course Outcome	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	9	3	9	9	9	**45**
CO2	3	3	3	1	3	9	9	**31**
CO3	3	9	9	9	9	9	9	**57**
CO4	3	3	9	9	9	9	9	**51**
CO5	3	9	9	9	9	9	9	**57**
Total	**15**	**27**	**39**	**31**	**39**	**45**	**45**	**241**

Low-1 Medium-3 High-9

Extra Credit II - Logical Reasoning

(For Students Admitted from 2025-26)

Semester III

Subject Code: JBADX3 **Credit: 2**

Course Objectives:

1.To correlate an application of acquired knowledge on subjective test questions with Linguistically and structurally appropriate answers

2.To attend for competitive examinations

Unit I

Puzzle Test: Illustrative Examples, Exercise.

Unit II

Logical Venn diagram: Illustrative Examples, Exercise.

Unit III

Alphabet Test: Illustrative Examples, Exercise.

Unit IV

Alpha - Numeric Sequence Puzzle: Illustrative Examples, Exercise.

Unit V

Inserting the Missing Character: Illustrative Examples, Exercise.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Determine the solutions to a range of elementary problems using puzzle test

CO 2: Demonstrate the ability to perform logical Venn diagrams and solve the problem

CO 3: Use analysis of variance techniques to Alphabet test

CO 4: Inspect the alpha numeric sequence puzzle

CO 5: Explicate graph coloring to solve the problems

Text Book:

1.Dr R S Aggarwal, *A Modern Approach to Verbal Reasoning*, S. Chand & Company Private

Limited, Edition, 2013.
Unit I : Chapter 6
Unit II : Chapter 9
Unit III: Chapter 10
Unit IV : Chapter 11
Unit V : Chapter16

Reference Books:
1.Dr R S Aggarwal, *A Modern Approach to Verbal and Non-verbal Reasoning*, S.Chand &Company Private Limited, Edition2012.
2.Dr R S Aggarwal**,** *A Modern Approach to Logical Reasoning*, S. Chand & Company Private Limited, Edition2013.
3.P K Agarwal, *Test of Verbal Reasoning for Competitive Examinations*, Edition2004.

E- Resources:
1.https://youtu.be/3hNmmZBN6jw
2.https://youtu.be/xmSSMH6RDBQ
3.https://youtu.be/aDPu39j-mBY

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	9	1	3	1	3	3	**23**
CO2	3	9	1	3	3	3	3	**25**
CO3	3	9	1	3	1	3	3	**23**
CO4	3	9	1	3	1	3	3	**23**
CO5	3	9	1	3	1	3	3	**23**
Total	**15**	**45**	**5**	**15**	**7**	**15**	**15**	**117**

Low-1 Medium-3 High-9

Core VII– Operations Research

(For Students Admitted from2025-26)

Semester: IV **Hours / week: 5**
Subject Code: JBADC41 **Credit: 5**

Course Objectives:
1.To apply these techniques constructively to make effective business decisions
2.To impart the knowledge of formulation of practical problems using the linear programming method and its extensions

Unit I **(15 hours)**

Introduction -Operations Research Models -Solving the OR Model - Queuing and Simulation Models -Art of Modeling -More than Just Mathematics - Phases of an OR Study - **Modeling with Linear Programming**: Two -Variable LP Model - Graphical LP Solution.

Unit II **(15 hours)**

The Simplex Method: Artificial Starting Solution – Special Cases in the Simplex Method - **Duality and Post-Optimal Analysis:** Definition of the Dual Problem - Primal –Dual Relationships.

Unit III **(15 hours)**

Transportation Model and Its Variants: Definition of the Transportation Model - Nontraditional Transportation Models -The Transportation Algorithm - The Assignment Model.

Unit IV **(15 hours)**

Games and Strategies: Introduction - Two-Person Zero-Sum Games - Some Basic terms- The Maximin - Minimax Principle - Games without Saddle Points - Mixed Strategies - Graphic Solution of 2 x n and m x 2 Games - Dominance Property.

Unit V **(15 hours)**

Network Scheduling by PERT/CPM: Introduction - Network: Basic Components - Logical Sequencing - Rules of Network construction - Concurrent activities - Critical Path Analysis - Probability Considerations in PERT - Distinction between PERT and CPM.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Demonstrate the fundamental terms, principles and elements of operation research

CO 2: Apply graphical and simplex method to get optimally of linear programming

CO 3: Assess optimal solution for the transportation problem and analyze assignment problem to make effective business decisions

CO 4: Estimate the solutions for games and events using different strategies

CO 5: Apply network model and find the shortest path using CPM/ PERT

Text Book:

1.Hamdy A. Taha, *Operations Research - An Introduction***,** University of Arkansas, 10th Edition,2012.

Unit I : Chapter 1 (1.1 – 1.7), Chapter 2 (2.1 &2.2)

Unit II : Chapter 3 (3.3 – 3.5), Chapter 4 (4.1 &4.2)

Unit III: Chapter 5 (5.1 – 5.4)

2.Kanti Swarup, P.K. Gupta & Man Mohan, *Operations Research***,** Sultan Chand &Sons, Eighteenth Edition,2015.

Unit IV: Chapter 17 (17:1 – 17:7)

Unit V : Chapter 25 (25:1 – 25:8)

Reference Books:

1.S.D. Sharma, *Operations Research*, Dedar Nath Ram Nath,2009.

2.Srinivasan, *Operations Research - Principles and Applications*, PHI Learning Private Limited, Second Edition,2012.

E-Resources:

1.https://www.youtube.com/watch?v=YPn4yHM1YsU

2.http://www.math.wsu.edu/faculty/genz/364/lessons/l3067.pdf
3.https://www.youtube.com/watch?v=fSuqTgnCVRg

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	3	9	3	3	3	3	3	27
CO2	3	9	3	3	9	9	3	39
CO3	3	9	3	3	9	9	9	45
CO4	3	9	3	9	9	9	9	51
CO5	3	3	3	9	9	9	9	45
Total	15	39	15	27	39	39	33	207

Low-1 Medium-3 High-9

MD IV- Discrete Mathematics

(For Students Admitted from 2025-26)

Semester: V **Hours / week: 4**
Subject Code: JBMD52ADA **Credit: 3**

Course Objectives:

1.To motivate the students to think logically and apply the techniques in solving problems
2.To analyze the outcomes of mathematical arguments using logical laws

Unit I **(12 hours)**

The Foundations: Logic and Proofs: Propositional Logic – Applications of Propositional Logic – Propositional Equivalences – Predicates and Quantifiers – Nested Quantifiers – Rules of Inference.

Unit II **(12 hours)**

Basic Structures: Sets, Functions, Sequences, Sums and Matrices: Sets – Set Operations – Functions – Sequences and Summations - Cardinality of sets – Matrices.

Unit III **(12 hours)**

Induction and Recursion: Mathematical Induction – Strong Induction and Well-Ordering - Recursive Definitions and Structural Induction. **Counting:** The Basics of Counting – The Pigeonhole Principle - Permutations and Combinations – Generalized Permutations and Combinations.

Unit IV **(12 hours)**

Advanced Counting Techniques: Applications of Recurrence Relations- Solving Linear Recurrence Relations – Divide-and-Conquer Algorithms and Recurrence Relations - Generating Functions – Inclusion-Exclusion.

Unit V **(12 hours)**

Relations: Relations and Their Properties –Representing Relations - Closure of Relations- Equivalence Relations–Partial Orderings.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Construct truth tables and to prove the results

CO 2: Apply the concept of generating functions to solve the relations

CO 3: Use the concepts of induction and recursion to solve problems

CO 4: Analyze counting concepts and apply to solve problems

CO 5: Analyze the concepts of relations and their Properties.

Text Book:

1.Kenneth H. Rosen, *"Discrete Mathematics and its Applications",* The Mc Graw- Hill Companies, New York, Seventh Edition, 2007.

Unit I: Chapter 1(Section 1.1-1.6)

Unit II: Chapter 2(Section 2.1 – 2.6)

Unit III: Chapter 5(Section 5.1 – 5.3) Chapter 6 (Section 6.1 - 6.3, 6.5)

Unit IV: Chapter 8 (Section 8.1 – 8.5)

Unit V: Chapter 9 (Section 9.1, 9.3- 9.6)

Reference Books:

1.R. P. Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Education, Fifth Edition, 2007.

2.Thomas Koshy, "Discrete Mathematics with Applications", Academic Press, 2005.

3.C.L.Liu, "Elements of Discrete Mathematics", Tata McGraw- Hill Publishing Company Limited , 2004.

E-Resources:

1.http://discrete.openmathbooks.org/pdfs/dmoi-tablet.pdf

2.https://www.youtube.com/watch?v=Ungebd-uC-g

3.https://en.wikipedia.org/wiki/Discrete_mathematics

Course Outcomes	Programme Outcomes							
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Total
CO1	9	9	9	3	3	3	3	**39**
CO2	9	3	3	3	1	3	3	**25**
CO3	3	9	3	3	1	3	3	**25**
CO4	3	3	3	3	1	3	3	**19**
CO5	3	9	9	3	3	3	3	**33**
Total	**27**	**33**	**27**	**15**	**9**	**15**	**15**	**141**

Low-1 Medium-3 High-9

MD V – Calculus & Differential Equations
(For Students Admitted from 2025-26)

Semester: VI **Hours / week: 4**
Subject Code: JBMD61ADA **Credit: 3**

Course Objectives:
1. To solve application problems in a variety of setting ranging from physics and biology to Business and economics. Compute limits, derivatives and integrals
2. To recognize the appropriate tools of calculus to solve applied problems

Unit I **(12 hours)**
Limits and Continuity: Rates of Change and Tangent Lines to curves – Limit of a Function and Limit Laws - Continuity - The Fundamental Theorem of Calculus.

Unit II **(12 hours)**
Infinite Sequences and Series : Sequences – Infinite Series - The Integral test – Absolute Convergence - ratio and root tests - Taylor and Maclaurin series.

Unit III **(12 hours)**
Partial Derivatives: Functions of Several Variables - Partial Derivatives - Extreme Values and Saddle Points.

Unit IV **(12 hours)**
Multiple Integral: Double integrals in polar form - Triple Integrals in Rectangular Coordinates - Triple Integrals in Cylindrical and Spherical Coordinates.

Unit V **(12 hours)**
Ordinary Differential Equations: Basic Concepts, Modeling - Exact ODEs, Integrating Factors - Linear ODEs, Bernoulli Equation - Homogeneous Linear ODEs with Constant Coefficients.

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Understand and apply the basic concepts of limit and continuity
CO 2: Make use of the methods to solve the sequence and series problems
CO 3: Examine the methods of partial derivatives to solve theproblems
CO 4: Explicate and solve the examples using multiple integral
CO 5: Evaluate the techniques of ordinary differential equations

Text Books:
1. Hass M. D. J., Giordano Weir F.R. *Thomas Calculus*, Pearson Education,2013
Unit I : Chapter 2, 5 (sec: 2.1, 2.2, 2.5) & (Sec:5.4)
Unit II : Chapter 10 (Sec: 10.1-10.3, 10.5,10.8)
Unit III: Chapter 14 (Sec: 14.1, 14.3, and 14.7)
Unit IV: Chapter 15 (Sec: 15.4, 15.5, and 15.7)
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons,2011.
Unit V : Chapter 1 & 3 (Sec: 1.1, 1.4, 1.5(Page No: 27-33) and 3.2)

Reference Books:

1. Lian, Hungerford, and Holcomb *Mathematics with Applications,* Addison Wesley,2010.
2. Riley K. F., Hobson M. P. and Bence S. J., *Mathematical Methods for Physics and Engineering,* Cambridge University Press,2006.
3. Michael D. Greenberg, *Advanced Engineering Mathematics,* Pearson Education,2014.

E-Resources:

1. https://www.youtube.com/watch?v=_5fVpdOPLEw
2. https://www.youtube.com/watch?v=UvotN4v9L4c
3. https://www.youtube.com/watch?v=PGmVvIglZx8
4. https://www.youtube.com/watch?v=sZP048TJTXE
5. https://www.youtube.com/watch?v=EzzXTIIX_CU

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	1	1	3	3	3	**17**
CO2	3	1	1	1	3	3	3	**15**
CO3	3	3	1	1	3	3	3	**17**
CO4	3	3	1	1	1	3	3	**15**
CO5	3	1	1	1	1	3	3	**13**
Total	**15**	**11**	**5**	**5**	**11**	**15**	**15**	**77**

Low-1 Medium-3 High-9

Value Added Programme in LATEX

(For Students Admitted from 2025- 26)

PROGRAMME STRUCTURE

Subject Code	Course	Subject Title	Hours	Credit	@ SD | ENT | EMP	$ REG | NAT | GLO	ESE
JCLT1P	Core I	Pictures and Colors Lab in Latex	50	5	SD	NAT GLO	100

Core I -Pictures and Colors Lab in Latex

(For Students Admitted from 2025-26)

Subject Code: JCLT1P **Hours / week: 50**
Credit: 5

Course Outcomes:

1. To develop skills to manipulate **colors** in LaTeX using predefined and custom color models.
2. To Enhance document presentation by integrating **graphical elements** with text, equations, and tables.

List of Programmes

1.Create a document using Input Files.
2.Create a document using Special Symbols, Dashes.
3.Create a document using Line Breaks and Foot Notes.
4.Create a document using Sectioning Command.
5.Create a document using Quotations.
6.Create a document using Type Style and Colors.
7.Create a document using Commands and Environments.
8.Create a document using Mathematical formulas and Mathematical Symbols.
9.Create a document using Arrays.
10. Create a document using Table.
11. Create a document using Bibliography and Bibliography Database
12. Create a document using Page Style.
13. Create a document using Pictures.
14. Create a document using Basic of the Math Index.
15. Create a document using Fine Print.
16. Create a document using Math Mode Environment.
17. Create a document using Tabbing Environment.
18. Create a document using Line and Page Breaking.
19. Create a document using Boxes.
20. Create a document using Graphics Packages.

Course Outcomes:

After successful completion of this course, student will be able to

CO 1: Explain the use of LaTeX packages for creating vector graphics, adding images, and customizing colors.

CO 2: Apply different color schemes and picture elements to enhance document presentation.

CO 3: Analyze the effectiveness of color combinations and image placements in technical and academic documents.

CO 4: Evaluate different LaTeX graphic packages to determine the best approach for specific use cases.

CO 5: Design professional-quality visuals, charts, and illustrations using advanced LaTeX techniques.

Course Outcomes	**Programme Outcomes**							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	3	3	3	3	3	3	**21**
CO2	3	3	3	3	3	3	3	**21**
CO3	3	3	3	3	3	3	3	**21**
CO4	3	3	3	3	3	3	3	**21**
CO5	3	3	3	3	3	3	3	**21**
Total	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**105**

Low-1 Medium-3 High-9

Extra Credit-Employability Skills for PG Programme
(For Students Admitted from 2025-26)

Semester: III **Credit: 2**
Subject Code: JMESX3

Course Objectives:
1. Get ready the students for job market with good communication skill
2. Appear for interviews and make presentations confidently

Unit I
Behavioural Skill
Personal Strength Analysis -Perception Management-Social Etiquette.

Unit II
Communication Skill
Self-Introduction- Verbal Communication- Non-Verbal Communication-Campus to Work.

Unit III
I.T. Literacy
MS-Word-File Conversion & Reducing File Size-Web browsers & Search Engines-Email-Mobile Application-Online CV.

Unit IV
Entrepreneurship Skill
Need of becoming Entrepreneur-Ways to become a good Entrepreneur-Different Government Institutions/Schemes Promoting Entrepreneur-Day to day mechanism for maintaining an enterprise.

Unit V
Preparation to the World of Work
Career Plan-Basic Professional Skill-Career Pathways-Search and Apply for a Job.

Self-Study Component:
1. **Learn from the Experts – TED Talks on Career Development**
(Activity: Watch at least two TED Talks or expert interviews related to career building, communication skills, or entrepreneurship like Simon Sinek's "Start with Why" or Amy Cuddy's "Your Body Language May Shape Who You Are").

2. **LinkedIn Profile Creation and Online CV**
(Activity: Students must create or update their LinkedIn profile and generate a professional CV including educational background, skills, and career objectives using an online CV builder like Canva, Zety, or NovoResume).

3. **Skill-Based Micro-Course Completion** - Title: Digital Literacy and Beyond
(**Enrol in a free online course** (1–2 hours) from platforms like SWAYAM, NPTEL on topics such as: Resume writing, Time management, Basic Excel or MS Word)

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Identify a planned approach towards career

CO 2: Associate skills and interests with chosen career path
CO 3: Take part in group discussions
CO 4: Develop thinking ability
CO 5: Perceive personal interviews through mock interviews

Text Books:

1. M Esther, Doug Graham & Deepthi Lamahewa. "Trainer Manual for Soft Skills:Applied for Entry Level Occupation".WUSC-ASSET Project, Srilanka, 2019.
2. Lata, Pushp, and Kumar, Sanjay. *Communication Skills*, 2nd Edition. India, Oxford University Press, 2015.
3. Maluth, John Monyjok. *Basic Computer Knowledge. N.p*., Independently Published, 2016.
4. Khanka, S S. Entrepreneurial Development. S Chand and Company Limited, New Delhi, 2001.
5. *Ann, Mary Bailey. Finding the Right Career Path*: Wetfeet Insider Guide. Wetfeet.Com Publisher, 2006.

Reference Books:

1. Rath, Tom, et al. *Strengths-Based Leadership: Great Leaders, Teams, and Why People Follow.* Philippines, Gallup Press, 2009.
2. Chaturvedi, P. D. *Business Communication: Concepts, Cases and Applications* (for Chaudhary Charan Singh University). N.p., Dorling Kindersley (India), 2011.
3. Morrison, Connie, and Wells, Dolores. *Computer Literacy BASICS*. United States, Cengage Learning, 2012.
4. *Promoting Entrepreneurship and Innovative SMEs in a Global Economy*. France, OECD Publishing, 2008.
5. Janson, Simone. *Wanted! The Job of Your Dreams – Better Career Choice Reorientation Job Application: Develop Your Skills Potential & Self-confidence, Discover Chances & Strategies, Achieve Goals*. Germany, Best of HR – Berufebilder.de®, 2021.

Journals:

1. International Journal on Procedia-Social Sciences and Behaviour
2. e-Journal of Business Education & Scholarship of Teaching
3. Journal of Further and Higher Education

E- Resources:

1. https://opentextbc.ca/organizationalbehavioropenstax/chapter/employee-abilities-and-skills/
2. https://courses.lumenlearning.com/wm-businesscommunicationmgrs/chapter/verbal-and-nonverbal-communication/
3. https://www.avantixlearning.ca/microsoft-word/reduce-file-size-large-word-documents-avoid-bloat-slowness-corruption-crashes/
4. https://support.microsoft.com/en-us/office/video-resumes-in-word-ce00832f-8388-4291-a417-0f70cd2e5914
5. https://gfgc.kar.nic.in/mccw-mysore/FileHandler/410-00295b1f-7b5c-49b1-ae68-3debdd957e67.pdf
6. https://learnenglish.britishcouncil.org/skills/listening

Course Outcomes	Programme Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	9	9	**63**
CO2	9	9	9	9	9	9	9	**63**
CO3	9	9	9	3	9	9	9	**57**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**45**	**45**	**39**	**45**	**45**	**45**	**309**

Low-1 Medium-3 High-9

Extra Credit- Employability Skills for UG Programme
(For Students Admitted from 2025-26)

Semester: V **Credit: 2**
Subject Code: JBESX5

Course Objectives:
1. To create awareness on the skills necessary for getting, keeping and being successful in a profession
2. To expose the students to leadership and team-building skills

Unit I
Introduction to Soft Skill.
Unit II
Self-management.
Unit III
Critical thinking development.
Unit IV
Reflective thinking and writing.
Unit V
Group work and Peer to peer interaction.

Course Outcomes:
After successful completion of this course, student will be able to
CO 1: Recognize prioritizing tasks
CO 2: Construct personal strategies for independent learning
CO 3: Communicate clearly and precisely to interested audience in a range of different contexts
CO 4: Consider and respect others' point of view in offering constructive feedback to others
CO 5: Lead team while working for a task

Text Book:
1. Alfredo, Becky and Alison. *Soft Skills (Academic Guide and Teaching Materials).* Shoo fly publishing, Ukraine, 2015.

Reference Books:
1. Rao, Manchanahalli Satyaranayana. *Soft skills-enhancing employability: connecting campus with corporate*. IK International Pvt Ltd, 2010.
2. Verma, Shalini. *Enhancing employability@ soft skills*. Pearson Education India, 2012.

Journals:
1. International Journal of Trend In Scientific Research and Development
2. International Journal of Evaluation and Research in Education (IJERE)
3. International Journal on Industry and Higher Education

E-Resources:
1.https://www.exeter.ac.uk/ambassadors/HESTEM/resources/General/STEMNET%20Emplo yability%20skills%20guide.pdf
2. http://psydilab.univer.kharkov.ua/resources/ucheba/softskills/Chapter_1_Introduction.PDF

Course Outcomes	Programme Outcomes							Total
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	
CO1	9	9	9	9	9	9	9	**63**
CO2	9	9	9	9	9	9	9	**63**
CO3	9	9	9	9	9	9	9	**63**
CO4	9	9	9	9	9	9	9	**63**
CO5	9	9	9	9	9	9	9	**63**
Total	**45**	**45**	**45**	**45**	**45**	**45**	**45**	**315**

Low-1 **Medium-3** **High-9**

Common Value Added Course I - Understanding India
(For Students Admitted from 2025-2026)

Semester: II **Hours/week: 2**
Subject Code: JBUI2V **Credit: 2**

Course Objective:

1. To introduce students to the historical milestones in India's freedom struggle and Indian knowledge systems.
2. To provide an interdisciplinary understanding of India's geography, social structure, cultural narratives, and political evolution.

Unit I **(6 hours)**

History of India: India's freedom struggle: An introduction to Indian knowledge systems: Indian First War of Independence, Non-Cooperation Movement in Indian Independence, Quit India Movement, Civil Disobedience Movement

Unit II **(6 hours)**

Geography of India: India's Geographical overview with neighbors - India and its relationship with neighbouring countries -Types of diversities in India -Geographical diversities of India

Unit III **(6 hours)**

Communicating Culture: Oral narratives: Myths, tales and folklore- Introduction to the Tribal Cultures of India - Indian Oral narrative, myths, tales & folklore - Tribal cultures of India - Odisha's Special Development Councils

Unit IV **(6 hours)**

Indian Social Structure: Continuity and change of the Indian Social Structure: Caste, Community, Class and Gender - Continuity and change in social structure in India - Caste. Class and Gender in India - Indian Caste and Communities

Unit V **(6 hours)**

Understanding Indian Polity: The evolution of State in India: Nature and origin Interpreting India: Traditional, Modern and Contemporary Constitution as a living document - The evolution of Indian state - changing the Nature of Indian state - The traditional, modern and contemporary India - Constitution of India.

Course Outcomes :

After successful completion of this course, student will be able to

CO1: Identify key events in India's freedom movement and explain their impact on national identity.
CO2: Analyze the geographical diversity of India and its influence on regional and international relations.
CO3: Interpret Indian myths, oral traditions, and tribal cultures as a means of

understanding cultural heritage.

CO4: Evaluate the changing nature of India's social structure in relation to caste, class, community, and gender.

CO5: Demonstrate knowledge of the Indian Constitution and understand the evolution of India's polity from traditional to contemporary governance.

Text Books:

1. **Chandra, B.***India's Struggle for Independence*, 1st Ed., Penguin Books India, 2000.
2. **Dikshit, Ramesh Dutta.***Political Geography: Politics of Place and Spatiality of Politics*, 1st Ed., Macmillan Education, 2020.
3. **Thapar, Romila.***Interpreting Early India: A Historical Perspective*, 1st Ed., Oxford University Press, 1992.
4. **Deshpande, Satish.***Contemporary India: A Sociological View*, 1st Ed., Penguin Books, 2003.
5. **Basu, D.D.***Introduction to the Constitution of India*, 21st Ed., LexisNexis, 2013.

Reference Books:

1. Ramesh Dutta Dikshit, Political Geography: Politics of Place and Spatiality of Politics,Macmillan Education, 2020.
2. **Austin, Granville.***The Indian Constitution: Cornerstone of a Nation*, 1st Ed., Oxford University Press, 1999.
3. **Uberoi, Patricia.***Family, Kinship and Marriage in India*, Oxford University Press, 1993.
4. **Blackburn, Stuart H.***Oral Epics in India*, University of California Press, 1986.
5. **Grover, B.L. & Mehta, A.***A New Look at Modern Indian History*, Revised Ed., S. Chand Publishing, 2006.
6. **Ambedkar, B.R.***Annihilation of Caste*, Self-published, 1936.

Journals:

1. Caste in Contemporary India" – *Sociological Bulletin*
2. Indian Journal of Political Science
3. Economic and Political Weekly (EPW)

E-Resources:

1. https://iksindia.org
2. https://ndl.iitkgp.ac.in/
3. https://epgp.inflibnet.ac.in/
4. https://legislative.gov.in/constitution-of-india
5. https://bharatavani.in

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	3	9	9137	3	29
CO2	1	3	3	9	1	3	9	29
CO3	3	1	9	3	9	1	3	29
CO4	3	1	3	9	1	3	1	21
CO5	1	9	3	1	3	1	3	21
Total	**11**	**15**	**19**	**25**	**23**	**17**	**19**	**129**

Low-1 Medium-3 High-9

COMMON VALUE ADDED COURSE II– ENVIRONMENTAL SCIENCE FOR SUSTAINABLE DEVELOPMENT

(For Students Admitted from 2025-26**)**

Semester: III **Hours / week: 2**
Subject Code: JBES3V **Credits: 2**

Course Objectives:

1. To introduce students to the principles of sustainable development, environmental conservation, and the global efforts supporting ecological balance and human well-being.
2. To develop awareness and practical understanding of biodiversity, pollution control, natural resource management, and the role of institutions in promoting sustainability.

Unit I **(6 hours)**

Sustainable Development Goals (SDGs) – Introduction, History, 17 SDGs, Agenda 21, Earth Summit, eight Millennium Development Goals (MDGs), UN Sustainable Development Summit, Paris Agreement on Climate Change.- On ground activity: Plant and maintain a sapling

Unit II **(6 hours)**

The concept of Environmental Science – Introduction, Definition, Scope and importance Natural Resources – Forest, Marine, Wet land, Water and Land Resources, Food resources; changes caused by agriculture and overgrazing; effects of fertilizer and pesticide. Energy resources – use of alternate energy resources; Role of individual in conservation of natural resources. **Ecosystems –** Concept – Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow; food chains; food webs and ecological pyramids.

Unit III **(6 hours)**

Land and Marine Biodiversity conservation - Introduction**,** Definition, biodiversity- Land and marine, threats to biodiversity: habitat loss, poaching of wildlife, endangered and endemic species of India, In- situ and Ex- situ conservation of biodiversity (Turtle Hatchery), Wildlife Protection Act, Forest Conservation Act. Birds Sanctuary in Ramanathapuram, Gulf of

Mannar Bioreserve, Mangrove Forest and Ecotourism in Ramanathapuram district
Field trip: Gulf of Mannar National Park

Unit IV **(6 hours)**

Environmental Pollution and its Prevention – Definition, causes, effects and control measures of air, water, and soil pollution. Climate change, global warming, acid rain, ozone layer depletion. Environment Protection Act – Air and Water (Prevention and Control of Pollution) Act, Solid Waste management
On-ground activity: Coastal clean up

Unit V **(6 hours)**

Role of research institutes in sustainable livelihood – Population growth; Education for Women, Balanced Diet, Menstrual hygiene, Role of ICAR-CMFRI, CSIR-MARS, KVK, and UNICEF in the development of sustainable food resources.

Course Outcomes:

After successful the completion of the course, the students will be able to

CO1: Understand the history, goals, and importance of the Sustainable Development Goals (SDGs) and related global initiatives
CO2: Recognize the value of natural resources and ecosystems
CO3: Learn why biodiversity matters, what harms it, and how to protect plants and animals, especially in places like the Gulf of Mannar.
CO4: Understand what causes pollution and how we can prevent it through laws and personal actions.
CO5: Know how research centers and organizations help people live better through food, health, and education programs.

TextBooks:

1. Erach Bharucha, *Environmental studies for undergraduate courses,* University Grant commission, New Delhi, 202
2. Kumaraswamy K., *Environmental Studies,* Jazym Publications, 2013.

References Books:

1. Arumugam N. and Kumaresan B., *Environmental Studies*, Saras publications, 2012.
2. Dr. Biswarup Mukherjee., *Fundamentals of Environmental Biology*, Silver line Publications, 2008
3. Dr. D. K. Asthana & Dr. Meera Asthana, *A Text Book of Environmental Studies*, S Chand & Co Ltd, Revise Edition, 2006.

Journals:

1. Journal of Environmental Studies and Sciences
2. Journal of environmental sciences
3. Nature climate change

E- Resources:

1. https://nptel.ac.in/courses/127/105/127105018/
2. https://sdgs.un.org/goals
3. http://eprints.cmfri.org.in/14270/
4. https://nios.ac.in/online-course-material/sr-secondary-courses/enviornmental-science-(333).aspx

5. https://rajneeshrajoria.weebly.com/uploads/4/9/0/6/49069889/environmental_science_birm301.pdf
6. https://nios.ac.in/media/documents/srsec314newE/PDFBIO.EL24.pdf
7. https://nios.ac.in/media/documents/srsec314newE/PDFBIO.EL25.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	1	3	9	9137	3	29
CO2	1	3	3	9	1	3	9	29
CO3	3	1	9	3	9	1	3	29
CO4	3	1	3	9	1	3	1	21
CO5	1	9	3	1	3	1	3	21
Total	11	15	19	25	23	17	19	129

Low-1 Medium-3 High-9

COMMON VALUE-ADDED COURSE III – Digital and Technology Solution

(For Students Admitted from 2025-26)

Semester: IV **Hours/week: 2**
Subject Code: JBDT4V **Credit: 2**

Course Objectives:

1. To introduce key concepts in operating systems, communication systems, digital tools, and emerging technologies.
2. To equip students with skills in e-commerce, cybersecurity, and innovative technologies for effective problem-solving and governance.

Unit I **(6 Hours)**

Operating Systems: Types and Functions. Problem Solving: Algorithms and Flowcharts. Communication Systems: Principles, Model & Transmission Media, Computer Networks & Internet: Concepts & Applications, WWW, Web Browsers, Search Engines, Messaging, Email, Social Networking.

Unit II **(6 Hours)**

Computer Based Information System: Significance & Types. E-commerce & Digital Marketing: Basic Concepts, Benefits & Challenges. Digital India & e-Governance: Initiatives, Infrastructure, Services and Empowerment.

Unit III **(6 Hours)**

Digital Financial Tools: Unified Payment Interface, Aadhar Enabled Payment System, USSD, Credit/Debit Cards, e-Wallets, Internet Banking, NEFT/RTGS and IMPS, Online Bill Payments and PoS. Cyber Security: Threats, Significance, Challenges, Precautions, Safety Measures, & Tools, legal and ethical perspectives.

Unit IV **(6 Hours)**

Emerging Technologies & their applications: Overview of Cloud Computing, Big Data, Internet of Things, and Virtual Reality.

Unit V **(6 Hours)**

Emerging Technologies & their applications: Blockchain & Cryptocurrency, Robotics, Machine Learning & Artificial Intelligence, 3-D Printing. Digital Signatures

Course Outcomes:

After successful completion of this course, students will be able to

CO1: Understand key digital concepts
CO2: Apply e-commerce and digital marketing concepts
CO3: Analyze digital financial tools and cyber security
CO4: Explain emerging technologies and their applications
CO5: Evaluate the impact of emerging technologies

Text Books:

1. Pramod Kumar, Anuradha Tomar, R. Sharmila, "*Emerging Technologies in Computing - Theory, Practice, and Advances*", Chapman and Hall / CRC, 1st Edition, 2021
2. V. Rajaraman, "*Introduction to Information Technology*", PHI, 3rd Edition, 2018
3. E. Balagurusamy, *"Fundamentals of Computers"*, Tata Mc GrawHill, 2nd Edition, 2011
4. Behrouz A. Forouzan, "*Data Communications and Networking*", McGraw Hill, 4 Edition, 2007,

Reference Books:

1. Rajkumar Buvya, James Broberg, and Andrzej Gosciniski, "*Cloud Computing-Principals and Paradigms"*, Wiley, 2011
2. Stuart Russel and Peter Norvig, "*Artificial Intelligence - A Modern Approach"*, Pearson Education, 3rd Edition, 2010
3. Samuel Greengard, *"Internet of Things"*, The MIT Press, 2015
4. C.S.V. Murthy, "*E-Commerce Concept, Models & Strategies*", Himalaya Publishing House, 2015
5. Hurwith, Nugent Halper, Kaufman, "*Big Data for Dummies*", Wiley & Sons, 1st Edition, 2013

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	3	1	3	1	3	3	3	**17**
CO2	3	1	3	1	3	3	3	**17**
CO3	3	1	3	1	3	3	3	**17**
CO4	3	1	3	1	3	3	3	**17**
CO5	3	1	3	1	3	3	3	**17**
Total	**15**	**5**	**15**	**5**	**15**	**15**	**15**	**85**

Low-1 Medium-3 High-9

COMMON VALUE-ADDED COURSE IV- Health and Wellness

(For Students Admitted from 2025-2026)

Semester : V **Hours/week: 2**
Subject Code: JBHW5V **Credit: 2**

Course Objectives:

1. To understand the importance of a healthy lifestyle and familiarize students on physical and mental health
2. To increase awareness of various diseases associated with lifestyle and enable understanding of stress management

Unit I **(6 hours)**

Introduction to health & wellness: Define, differentiate health and wellness, Importance of health and wellness education, Local, demographic, societal issues, factors affecting health and wellness.

Unit II **(6 hours)**

The Role of Essential Nutrients in a Balanced Diet: Diet and nutrition for health & wellness, Essential components of balanced diet for healthy living, Specific reference to the role of carbohydrates, proteins, fats, vitamins & minerals. Malnutrition.

Unit III **(6 hours)**

Unhealthy Eating Habits, and Lifestyle Factors on Body Systems: Processed foods, unhealthy eating habits, Body systems, common diseases, Sedentary lifestyle and its risk of disease, stress, anxiety, and depression.

Unit IV **(6 hours)**

Management of health and wellness: Healthy foods for prevention, progression of Cancer, Hypertension, Cardiovascular, Types of Physical Fitness and its Health benefits.

Unit V **(6 hours)**

Spirituality and mental health: Role of Yoga, asanas, meditation in maintaining health and wellness, Role of sleep in maintenance of physical, mental health.

Course Outcomes:

After successful completion of this course, student will be able to

CO1: Explain the principles of physical, mental, and emotional well-being and their role in overall health.

CO2: Assess the impact of diet, physical activity, and lifestyle habits on health and disease prevention.

CO3: Identify stressors and implement effective coping mechanisms to enhance mental and emotional well-being.

CO4: Apply knowledge of health policies, disease prevention, and wellness programs to advocate for community health.

CO5: Explore alternative and complementary health practices, including mindfulness, fitness, and self-care techniques.

Text Books:

1. Raheena, S. *Health and Wellness: A Practical Approach*. CBS Publishers & Distributors, 2nd Edition.2019
2. Tariq, M. *Food and Health: The Interlinking of Nutrition and Wellness*. Springer, 1st

Edition,2020.
3. Pood, V., & Gopinath, S.,*Foundations of Health and Wellness*. Wiley-Blackwell, 1st Edition,2021.

Reference Books:

1. Bouchard, C., Blair, S. N., & Haskell, W. L, *Physical Activity and Health*. Human Kinetics,2007
2. Attached, E., & Fernandez, M., *Mental Health Workbook*. Independently published,2021.
3. Lorick, N.*Mental Health Workbook for Women: Exercises to Transform Negative Thoughts and Improve Wellbeing*. Rockridge Press,2022
4. Nyambichu, C., & Lumiri, J. *Lifestyle Diseases: Lifestyle Disease Management*. Independently published,2018.

Journals:

1. Journal of Nutrition and Health Sciences
2. Health Promotion International
3. American Journal of Health Promotion

E-Resources:

1. https://www.who.int/health-topics
2. https://www.nimh.nih.gov/
3. https://pmc.ncbi.nlm.nih.gov/
4. https://pmc.ncbi.nlm.nih.gov/
5. https://portal.ct.gov/-/media/DMHAS/SkillBuilding/Dana/Health-and-Wellness-FULL-Revised.pdf

Course Outcomes	Programme Outcomes							
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**Total**
CO1	9	9	9	9	9	9	9	63
CO2	9	9	9	9	9	9	3	57
CO3	9	9	9	9	9	9	9	63
CO4	9	9	9	9	9	9	9	63
CO5	9	9	9	9	9	9	9	63
Total	**45**	**45**	**45**	**45**	**45**	**45**	**39**	**309**

Low-1 **Medium-3** **High-**

Curriculum Cell Recommendations

CIA MARKS EVALUATION REFORMS (2025-26)

CIA COMPONENTS FOR UG & PG (THEORY)

CIA SPLIT FOR UG	Marks	CIA SPLIT FOR PG	Marks
Test Average	15	Test Average	15
Attendance	5	Attendance	5
Quiz I Year / Assignment II Year / Seminar III Year	2.5	Seminar	2.5
Classroom participation	2.5	Classroom participation	2.5
Total	**25**	**Total**	**25**
Note: Conduct two internal tests for each course paper			

CIA COMPONENTS FOR UG & PG (PRACTICAL)

CIA SPLIT FOR UG & PG	Marks
Test Average	15
Record	5
Attendance	5
Total	**25**
Note: Conduct two internal tests for each course	

EVALUATION CRITERIA FOR E-QUIZ

e-Quiz	No. of Questions : 20 MCQs
Game-based software application	2.5 Marks
Google Forms	
ERP software	
Note: Conduct the e-quiz anyone mode of the above method. One e-quiz assessments for each course	

EVALUATION CRITERIA FOR ASSIGNMENT -UG I YEAR & II YEAR

Assignment	2.5 Marks
Scrapbook preparation	
Model making	
Poster making	
Case study with certificate	
Note: Anyone mode of the above method & one assignment for each course	

EVALUATION CRITERIA FOR SEMINAR PG I & II YEAR, UG III YEAR

Seminar	2.5 Marks
Video making	
Audio integration with PPT	
YouTube upload	
Note: Anyone mode of the above method & one seminar for each course	

Evaluation criteria for Classroom participation - All UG & PG classroom participation

Classroom Participation	2.5 Marks
Extempore activity	
Group discussion	
Tutorial learning	
Note: Anyone mode of the above method	