SadakathullahAppa College
(Autonomous)
(Reaccredited by NAAC at an 'A' Grade. An ISO 9001:2015 Certified Institution)
Rahmath Nagar, Tirunelveli- 11.
Tamil Nadu.

DEPARTMENT OF MATHEMATICS

Draft CBCS SYLLABUS
For
M.SC MATHEMATICS
(Applicable for students admitted in June 2021 and onwards)
(Submitted before the Department of Mathematics BOS Meeting
to be held on 16.3.2021)

POST GRADUATE DEPARTMENT OF Mathematics
CBCS SYLLABUS FOR M.Sc., Mathematics
COURSE STRUCTURE
(Applicable for students admit
ted in June 2021 and onwards)

SEMESTER			II SEMESTER		
COURSE	H/W	C	COURSE	H/W	C
Groups, Rings and Fields	5	4	Topology	5	4
Real Analysis I	5	4	Real Analysis II	5	4
MATLAB	5	4	Graph Theory	5	4
Ordinary Differential Equation	4	4	LaTeX	4	4
DSE (A) Differential Geometry	4	3	DSE (A) Calculus of Variations and integral equations	4	3
DSE (B) Discrete Mathematics			DSE (B) Java programming		
DSE(C) Classical Mechanics			DSE(C) Combinatorics		
MATLAB Practical	4	2	LaTeX Practical	4	2
IDC-I-Discrete structure – I	2	2	SEC-(MOOC NPTEL Course)	2	2
Library Reading hour	1		Library Reading hour	1	
TOTAL	30	23	TOTAL	30	23
III SEMESTER			IV SEMESTER		
Linear Algebra	5	4	Complex Analysis	5	4
Measure Theory	5	4	Functional Analysis	5	4
Research Methodology	5	4	R –Programming	4	4
Optimization Technique	4	4	Project	8+4*	4
DSE(A)Mathematical Statistics	4	3	DSE (A) Partial Differential Equation	4	3
DSE(B) Analytical number theory			DSE (B) Numerical Analysis		
DSE(C)Fuzzy set theory			DSE(C) Representation theory of finite group		
Optimization Technique in Java Programming	4	2	R-Programming practical	4	2
IDC-II- Discrete structure –II	2	2			
Library Reading hour	1				
TOTAL	30	23	TOTAL	30	21

DISTRIBUTION OF HOURS, CREDITS, NO. OF PAPERS, & MARKS				
SUBJECT	HOURS	CREDITS	NO. OF PAPERS	MARKS
Core Theory + Project	79+4[*]	64	16	1600
Practical	16	8	4	200
DSE	16	12	4	400
IDC	4	4	2	200
SEC	2	2	1	100
Library Hours	3	-	-	-
TOTAL	**120+4[*]**	**90**	**27**	**2500**

CBCS Syllabus – M.Sc., Mathematics
(2021-22 onwards)

SEM	P	Title of the paper	S. Code	H/W	L	T	P	C	Marks I	Marks E	Marks T
I	DSC-I	Groups, Rings and Fields		5	4	1	-	4	40	60	100
	DSC-II	Real Analysis I		5	4	1	-	4	40	60	100
	DSC-III	MATLAB		5	4	1	-	4	40	60	100
	DSC-IV	Ordinary Differential Equation		4	3	1	-	4	40	60	100
	DSE-I	A-Differential Geometry B-Discrete Mathematics C-Classical Mechanics		4	3	1	-	3	40	60	100
	P-I	MATLAB Practical		4	-	-	4	2	40	60	100/2
	IDC-I	Discrete Structure –I		2	2	-	-	2	40	60	100
		Library Reading hour		1	-	-	-	-	-		
II	DSC-V	Topology		5	4	1	-	4	40	60	100
	DSC-VI	Real Analysis II		5	4	1	-	4	40	60	100
	DSC-VII	Graph Theory		5	4	1	-	4	40	60	100
	DSC-VIII	LaTeX		4	3	1	-	4	40	60	100
	DSE-II	A-Calculus of Variations and integral equations B- Java programming C- Combinatorics		4	3	1	-	3	40	60	100
	P-II	LaTeX Practical		4	-	-	4	2	40	60	100/2
	SEC-II	MOOC NPTEL course		2	2	-	-	2	40	60	100
		Library Reading hour	1								
III	DSC-IX	Linear Algebra		5	4	-	-	4	40	60	100
	DSC-X	Measure Theory		5	4	1	-	4	40	60	100
	DSC-XI	Research Methodology		5	4	1	-	4	40	60	100
	DSC-XII	Optimization Technique		4	3	1	-	4	40	60	100
	DSE-III	A-Mathematical Statistics B-Analytical Number Theory C- Fuzzy set theory		4	3	1	-	3	40	60	100
	P-III	Optimization Technique in Java Programming		4	-	-	4	2	40	60	100/2
	IDC-2	Discrete Structure –II		2	2	-	-	2	40	60	100
		Library Reading hour	1								
IV	DSC-XIII	Complex Analysis		5	4	1	-	4	40	60	100
	DSC-XIV	Functional Analysis		5	4	1	-	4	40	60	100

	DSC-XV	R- Programming		4	3	1	-	4	40	60	100
	P	Project		8				4	40	60	100
	DSE-4	A-Partial Differential Equation B - Numerical Analysis C- Representation theory of finite group		4	3	1	-	3	40	60	100
	P-IV	R-Programming practical		4	-	-	4	2	40	60	100/2
			Total	**120**				**90**			**2500**

Programme Learning Outcomes (PLO)

(Aligned with Graduate Attributes) for

Master of Science (M.Sc.)

in Mathematics, Physics, Chemistry, Zoology, Computer Science, Microbiology and Molecular Modelling and Drug Design

The students Postgraduating with the Degree M.Sc. will be able to:

PLO 1: Disciplinary Knowledge

- Acquire in-depth scientific knowledge in the core areas of study.

PLO 2: Creative Thinking and Practical Skills / Problem Solving Skills

- Enrich skills of observation to draw logical inferences from scientific experiments/ programming and skills of creative thinking to develop novel ideas.

- Hone problem solving skills in theoretical, experimental and computational areas and to apply them in real life situations.

PLO 3: Sense of inquiry and Skilled Communicator / Research, Innovation and Entrepreneurship

- Develop the capability for raising appropriate questions relating to the current/emerging issues encountered in the scientific field and to plan, execute and express the results of experiments / investigations through technical writings as well as through oral presentations.

- Design innovations for exploring the unexplored areas in diverse fields to accomplish socially relevant and economically beneficial innovative research projects.

- Become a skilled entrepreneur for launching start-up / business ventures to improve the economy of the nation.

PLO 4: Ethical Awareness / Team Work / Environmental Conservation and Sustainability

- Equip them for conducting work as an individual / as a member, or as a leader in diverse teams upholding values such as honesty and precision, and thus preventing unethical behaviours such as fabrication, falsification, misrepresentation of data, plagiarism etc. to ensure academic integrity.

- Realise that environment and humans are dependent on one another and to know about the responsible management of our ecosystem for survival, and for the well-being of the future generation as well.

6

PLO 5: Digital Literacy/Self-Directed Learning/Usage of ICT/Lifelong Learning

- Get access to digital resources, to use them judiciously for updation of knowledge and also to engage in remote/ independent learning.

- Inculcate the habit of learning continuously through the effective adoption of ICT to update knowledge in the emerging areas in Sciences for inventions/discoveries so that the knowledge transferred from laboratory to land would yield fruitful results for the betterment of global society.

Programme Specific Outcomes

PSO	Upon completion of B.Sc. Mathematics Degree Programmes, the students will be able to:	PLOs Mapped
PSO – 1	Understanding of the fundamental axioms in mathematics and capability of developing ideas based on them	1,2
PSO – 2	Demonstrate capability in using mathematical and computational skills to model, formulate and solve real life applications.	1,2,3
PSO – 3	Prepare and motivate students for research studies in mathematics and research fields.	1,2,3,5
PSO – 4	Provide a systematic understanding of the concepts and theories of mathematics and their application in the real world to an advanced level and enhance career prospects in a huge array of fields.	1,2,3,4
PSO – 5	Recognize the need to engage in lifelong learning through continuing education and research.	1,3,5

Course Title	DSC 1: Groups, Rings and Fields
Total Hrs.	75
Hrs./Week	5
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objective:

      To give in-depth knowledge about the fundamental algebraic structures like groups, rings and field and to introduce Galois theory.

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	Understand the class equation of the group and the converse of Lagrange's theorem.
CO-2	Identify finite abelian groups for a given order.
CO-3	Understand polynomial rings and discuss the polynomial's irreducibility.
CO-4	Explain the roots of the polynomial in extension fields.
CO-5	Understand the fundamental theorem of Galois theory and the structure of the finite fields.

Unit – I : A Counting Principle - Another Counting Principle - Sylow's Theorem (2nd proof only).

Unit – II: Direct Products - Finite Abelian groups.

Unit – III: Euclidean Rings - A Particular Euclidean Ring - Polynomial Rings -Polynomials over the rational fields.

Unit – IV : Extension Fields – Roots of Polynomials- More About Roots.

Unit – V : The Elements of Galois Theory (Fundamental Theorem of Galois theory statement only) and Finite fields.

Textbooks:

      I.N. Herstein, Topics in Algebra, Wiley India (P.)Ltd, 2nd Edition, 2013.

UNIT-I: Chapter 2(Section 2.5, 2.11, 2.12)
UNIT-II: Chapter 2(Section 2.13, 2.14)
UNIT-III : Chapter 3(Section 3.7 to 3.10)
UNIT-IV : Chapter 5(Section 5.1 ,5.3 and 5.5)
UNIT-V : Chapter 5(Section 5.6) and Chapter 7 (Section 7.1)

Reference Books:
1. Joseph A. Gallian, Contemporary Abstract Algebra, Narosa Publishing House, Fourth Edition.
2. V.K. Khanna & S.K. Bhamri, A course in Abstract Algebra, Fourth Edition, Vikas Publishing House.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Summarize the class equation of Groups and the converse of Lagrange's theorem.	1,3,5	U
CO-2	Apply the direct product of groups to list out the finite abelian groups for given order..	1,3,5	Ap
CO-3	Analyze the structure of Euclidean Ring and irreducibility of the polynomial.	1,2,5	An
CO-4	Evaluate the extension of the field and its degrees.	1,2,5	Ev
CO-5	Describe the Galois Field of the irreducible polynomial.	1,5	R

Relationship Matrix

Semester	Course Code	Title of the Course		Hours	Credit
I	---	Groups,Rings & Fields		5	4

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P		P	P		P		p
CO-2	P	P	P		P	P		P		P
CO-3	P	P	P		P	P	P			P
CO-4	P	P	P		P	P	P			P
CO-5	P	P	P		P	P				P

Number of matches (✓) = 34

Relationship = High

Low (If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

Name : S.Jamal Fathima   Head of the Department

Signature :

Course Title	DSC 2: Real Analysis I
Total Hrs	75
Hrs/Week	5
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objectives:

To interpret real number system and its properties and relate the sequences and series with their examples.

Course Objectives: The learner will be able to

CO	Course Objectives
CO-1	know the fundamental definitions of basic topology.
CO-2	distinguished numerical sequences and series.
CO-3	get a clear ideas about series of non negative terms.
CO-4	gain more ideas in continuity and discontinuities of functions.
CO-5	know about the differentiation of vector valued functions.

Unit – I

Basic topology:Finite, countable and uncountable sets – Metric spaces –compact sets.

Unit – II

Numerical sequences and Series: Convergent sequences – Subsequences – Cauchy sequences –Upper and lower limits – Some special sequences.

Unit – III

Series – Series of Non negative terms – The number e – The Root and Ratio tests – Power series – Summation by parts – Absolute convergence –Addition and Multiplication of Series – Rearrangements.

Unit – IV

Continuity: Limits of functions – Continuous functions – Continuity and compactness – Continuity and connectedness.

Unit – V

Differentiation: The Derivative of a Real Function – Mean Value Theorems – The Continuity of Derivatives – L'Hospital's Rule – Derivatives of Higher order –Taylor's Theorem – Differentiation of vector-valued functions.

Textbooks:

Walter Rudin - "Principles of Mathematical Analysis" – 3rd Edition, McGraw Hill International Editions.

   Unit I   : Chapter2 (section 2.1-2.42)

Unit II : Chapter 3 (section 3.1-3.20)
Unit III : Chapter 3 (section 3.21-3.55)
Unit IV : Chapter 4 (section 4.1-4.24)
      Unit V : Chapter 5 (full)

Reference Books:

1. **H.L.Roydon & P.M.Fitz patrick**-"Real Analysis" –Fourth Edition, PHI Learning Private Limited 2012.
2. **D.Somasundaram, B.Choudhary** - "First Course in Mathematical Analysis.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	understand the concepts of metric spaces and compact sets.	1,2,4	U
CO-2	remember the different types of sequences and its properties.	1,2,3,4	R
CO-3	understand the types of series like convergent, bounded and monotone.	1,2,4	U
CO-4	analyze the limit functions, continuous functions and compactness of a set.	1,2,3,4	A
CO-5	evaluate the derivatives of real functions and vector valued functions.	1,2,3,5	E

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit	
I	---		Real Analysis I		5		4	
Course Outcomes (COs)	**Programme Learning Outcomes (PLOs)**					**Programme Specific Outcomes (PSOs)**			
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P		P	P	P		P	
CO-2	P	P	P		P	P	P	P	P	
CO-3	P	P	P			P	P		P	
CO-4	P	P	P		P	P	P	P	P	
CO-5	P	P	P		P	P	P	P		P

Number of matches (✓) = 37
Relationship = High
Low (If the No. of matches are less than 25)
Medium (If the No. of matches are between 25 and 33)
High (If the No. of matches are more than 33)

Prepared by   Checked by
Name :R.HEPZIBAH ANITA   Head of the Department
Signature :

Course Title	DSC-3 Matlab
Total Hrs.	75
Hrs./Week	5
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objective:

To understand the matrix based language allowing most computational mathematics and Numerical computation with Matlab Software.

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	understand the elementary concept to execute the Matlab program.
CO-2	demonstrate the process of plot simple graphs.
CO-3	identify the solution of Numerical integrations.
CO-4	discover the result of higher order differential equations.
CO-5	understand the tangent of curves by its visualization.

Unit – I   Introduction **–** What is MATLAB - The Basics of MATLAB – Matrices and Vectors – Matrix and Array operations.

Unit – II   Interactive computations: Character strings – A special note on array operations – Command Line Function – Using Built in Functions and Online Help – Saving and Loading Data – Plotting simple graphs.

Unit – III   Programming in MATLAB : Scripts and Functions **–** Script Files – Function Files - Language- specific Features.

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Unit – IV   Application: Linear Algebra – Curve Fitting and Interpolation – Data Analysis and Statistics – Numerical Intergration – Ordinary Differential Equation : A first order linear ODE and A second order non-linear ODE.

Unit – V   Applications : Non-linear Algebraic Equations. Graphics : Basic 2-D Plots – Using subplot for Multiple Graphs – 3-D Plots.

Textbooks:

Rudra Pradap, Getting started with MATLAB – A quick introduction for Scientist and Engineer, Oxford University, Press 2003.

Unit I: Chapter 1 (Section 1.1,1.6) and Chapter 3 (Section 3.1,3.2)
Unit II: Chapter 3 (Section 3.3 – 3.8)

Unit III: Chapter 4 (Section 4.1 – 4.3)
Unit IV: Chapter 5 (Section 5.1,- 5.4, 5.5 (5.5.1 ,5.5.2 only))
Unit V: Chapter 5 (Section 5.6) and Chapter 6 (Section 6.1 – 6.3)

Reference Books:

Delores M. Etter, David C. Kuncicky and Holly Moore, Introduction to MATLAB, Dorling Kindersley (India) Pvt Ltd, New Delhi (2009).

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	understand how to interpret matrix,vectors etc in MATLAB Software.	1,2	U
CO-2	remember the process of defining command line functions.	1,2,4	R
CO-3	analyse the nested function how to apply MATLAB Program.	1,2,4	U,An
CO-4	solve the matrix for eigen value and eigen vector.	1,3,5	U,Ev
CO-5	interpret various dimensional functions images in graphs	1,2,3,5	U, Ap

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit	
I			Matlab		5		4	
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)			
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P			P	P			
CO-2	P	P	P	P		P	P		P	
CO-3	P	P	P	P		P	P		P	
CO-4	P	P	P		P	P		P		P
CO-5	P	P	P		P	P	P	P		P
	Number of matches (✓) = 34									
	Relationship = High									
	Low (If the No. of matches are less than 25)									
	Medium (If the No. of matches are between 25 and 33)									
	High (If the No. of matches are more than 33)									

Prepared by   Checked by

Name : Dr. A. Mallika   Head of the Department

Signature :

Course Title	DSC 4: Ordinary Differential Equations
Total Hours	60
Hours / Week	4
Code	
Course type	Theory
Credits	3
Marks	100

General Objectives:

To discuss several methods for finding power series solutions to differential equations of first and second order and with regular singular points.

Course Objectives: The learner will be able to

CO NO.	Course Objectives
CO 1	analyse the method of variation of parameters to find the solution of homogeneous equation.
CO 2	apply power series to solve first and second differential equations.
CO 3	remember the ordinary and regular singular point
CO 4	understand the properties of Legendre polynomial and Bessel Function
CO 5	evaluate the homogeneous linear differential equations with constant coefficient.

UNIT I

Introduction -The general solution of the homogeneous equation – The use of a known solution to find another – The Homogeneous equation with constant coefficients - The method of undetermined coefficients- The method of variation of parameters.

UNIT II

Introduction: A review of power series - Series solutions of first order equations - Second Order Linear equations and Ordinary points.

UNIT III

Regular singular points - Regular singular point (continued) - Gauss Hyper Geometric equation.

UNIT IV

Legendre Polynomials- Properties of Legendre Polynomials - Bessel functions. The Gamma Function.

UNIT V

<mark>Properties of Bessel Functions - Linear Systems – Homogeneous linear equations with constant coefficients.</mark>

TEXT BOOK :

1. George F. Simmons, Differential Equations with Applications and Historical Notes, Tata McGraw Hill Publishing Company Limited, New Delhi, Second Edition 2003.

UNIT I : Chapter 3 (Section 14 -19)
UNIT II : Chapter 5 (Section 25 to 28)
UNIT III : Chapter 5 (Section 29,30)
UNIT IV : Chapter 8 (Section 44 to 46)
UNIT V : Chapter 10 (Section 55, 56)

Reference Book:
1. Earl A. Coddington, An Introduction to Ordinary Differential Equations, Prentice-Hall of India, New Delhi, 1992.
2. Williams E. Boyce and Richard C. DI Prima, Elementary differential equations and boundary value problems, John Wiley and sons, New York , 1967 .

Course Outcomes: The learner will be able to

CONo.	Course Outcomes	PSOs Addressed	Cognitive Level
CO 1	understand the general solution of homogeneous equation with constant coefficient.	1,2	U
CO 2	evaluate first and second order differential equation using power series method.	1,3	U, E
CO 3	apply Gauss hyper geometric series to solve the problems.	1,3,5	A, E
CO 4	remember the knowledge of Bessel and gamma function.	1,3	R
CO 5	analyze the concept of Linear system of equation with constant coefficient.	1,4,5	An

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit	
I	---		Ordinary Differential Equations		4		3	
Course Outcomes (COs)	**Programme Learning Outcomes (PLOs)**					**Programme Specific Outcomes (PSOs)**				
	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO-1	P	P			P	P	P			
CO-2	P	P				P		P		
CO-3		P	P			P		P		P
CO-4	P	P	P			P		P		
CO-5	P	P	P		P	P			P	P

Number of matches (P) = 26

Relationship = Medium

Low (If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

Name :U.Jerseena   Head of the Department

Signature :

Course Title	DSE – I (A):DIFFERENTIAL GEOMETRY
Total Hrs	60
Hrs / Week	4
Sub. Code	
Course Type	Theory
Credits	3
Marks	100

General Objectives:

     To introduce the concept of a parameterized surface with the help of examples and to compute the curvature and torsion of space curves. Also, gain knowledge about the metric of a surface and get clear idea to find a geodesic curvature on various surfaces.

Course Objectives: The learner will be able to

Co. No.	Course Objectives
CO - 1	understand the basic concept of tangent, normal and binormal vectors in space curve.
CO – 2	determine the contact between curves and surfaces.
CO – 3	understand the concept of surface of revolution and anchor ring in easiest way.
CO – 4	understand the concept of Geodesics and its properties.
CO – 5	execute the problems using the normal property of Geodesics.

UNIT I

The theory of space curves – Definitions, Arc length – Tangent – Normal and Binormal - Curvature and Torsion .

UNIT II

Contact between curves and surfaces – Tangent Surface – Involutes and evolutes .

UNIT III

Definition of a surface – Curves on a surface –Surface of Revolution - Helicoids.

UNIT IV

Metric – Direction Coefficients - Families of curves - Geodesics .

UNIT V

Canonical geodesic equation, Normal Property of geodesics (Christoffel symbols not included). Geodesic curvature.

TEXT BOOKS:

T.J.Willmore- An Introduction to Differential Geometry, Oxford University Press, (17th Impresssion), New Delhi, 2002, (Indian Print)

Unit I: Chapter 1: Section: 1.1 – 1.4, problem:chapter1:1-4

Unit II:Chapter 1: Section: 1.5- 1.7, problem:chapter1:9-12

Unit III:Chapter 2: Section: 2.1, 2.2, 2.4,Example Problem only.

Unit IV:Chapter 2: Section: 2.5-2.7, 2.10, problem: chapter 2:1-4

Unit V:Chapter 2: Section: 2.11, 2.12,2.15, problem: chapter 2:8,10-12

REFERENCE BOOK:

D. Somasundaram, Differential Geometry: A First Course.

Course Outcomes(CO)

Co. No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO - 1	Evaluate the problem using tangent, normal and binormal vectors.	1,2	E
CO – 2	Analyse the contact between curves and surfaces.	1,2,4	An
CO – 3	Remember and apply the concept of helicoid, right helicoid and pitch in various applications.	1,2,4,5	R, E
CO – 4	Understand and apply differential geometry techniques to specific research problems in mathematics	1,2,3	U, E
CO – 5	Understand the Geodesic condition and its properties.	1	U

Relationship Matrix

Semester	Course Code	Title of the Course				Hours	Credit
I		DES – I (A): DIFFERENTIAL GEOMETRY				4	3

Course Outcomes (COS)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO - 1	*P*	*P*	*P*		*P*	*P*	*P*			
CO - 2	*P*	*P*			*P*	*P*	*P*		*P*	
CO - 3	*P*	*P*	*P*			*P*	*P*		*P*	*P*
CO - 4	*P*	*P*	*P*			*P*	*P*	*P*		
CO - 5	*P*	*P*	*P*		*P*	*P*				

Number of Matches(*P*) = 30

Relationship = Medium

Low(If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

Dr. S. Angelin Kavitha Raj   Head of the Department

Mathematics(Unaided)

Course Title	DSE1B - DISCRETE MATHEMATICS
Total Hrs	60
Hrs/Week	4
Sub.Code	
Course Type	Theory
Credits	3
Marks	100

General Objectives:

To apply logical reasoning to solve a variety of real life problems and analyze basic discrete structures and algorithms.

Course Objectives: The learner will be able to

CO	Course Objectives
CO-1	know about the proportional logic and equivalence.
CO-2	understand the pigeonhole principle in basics of counting.
CO-3	discuss the relation and their properties with n-ary.
CO-4	acquire the proper idea about Boolean functions and their representations.
CO-5	acquire an idea in minimization of circuits.

Unit – I

Propositional Logic – Propositional equivalence.

Unit – II

The Basics of counting – The Pigeonhole principle.

Unit – III

Relation and their properties – n-ary relations and their applications.

Unit – IV

Boolean functions – Representing Boolean functions.

Unit – V

Logic Gates –Minimization of circuits.

Textbooks:

Discrete Mathematics and its Applications (Sixth Edition) – Kenneth H. Rosen, WCB/McGraw Hill Publications.

Unit I : Section :1.1,1.2 Problems: Section 1.1(1-38),Section 1.2(1-35)
Unit II: Sections:5.1,5.2 Problems: Section 5.1(1-40),Section 5.2(1-22)
Unit III: Section: 7.1,7.2 Problems: Section 7.1(All exercise problems), Section 7.2(1-27)
Unit IV: Section: 10.1,10.2
Unit V :Section: 10.3,10.4

Reference Books:

1. J.P.Tremblay and R.Manohar,"Discrete Mathematical Structures with Applications to Computer Science",McGraw-Hill International Edition,2008.
2. Kolman-Busby-Ross," Discrete Mathematical Structures",(Sixth Edition).

Course Outcomes:

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	understand the fundamental concepts of proportional logics and equivalents in systematic way.	1,2,4	U
CO-2	analyze the pigeonhole principle in basics of counting.	1,2,3,5	A
CO-3	evaluate n-ary relations and their properties.	1,2,4,5	E
CO-4	remember the Boolean functions and their properties.	1,2,5	R
CO-5	understand the concepts of logic gates and minimization of circuits.	1,2,4	U

Relationship Matrix

Semester	Course Code	Title of the Course	Hours	Credit
I		DSE1B : DISCRETE MATHEMATICS	4	3

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P			P	P	P		P	
CO-2	P	P	P		P	P	P	P		P
CO-3	P	P			P	P	P		P	P
CO-4	P	P				P	P			P
CO-5	P	P			P	P	P		P	

Number of matches (✓) =32

Relationship = Medium

Low (If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

Name :R.HEPZIBAH ANITA   Head of the Department

Semester –I

Course Title	DSE(C) Classical Mechanics
Total Hrs.	60
Hrs./Week	4
Sub.Code	
Course Type	Theory
Credits	3
Marks	100

General Objective:

Obtain the knowledge to demonstrate the fundamental concepts in mechanics of a system of particles, motion of rigid body, Lagrangian and Hamiltonian formulation in simple technique.

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	Understand the concepts of linear, angular and energy conservation theorem for a particle and a system of particle.
CO-2	Apply their knowledge in Maxwell equation.
CO-3	Analyse the variational principles and Lagrange's equation.
CO-4	Analyze the equation of motion using two body central force problem.
CO-5	Derive the equation of motion for circular orbit.

UNIT I

Survey of the Elementary Principles: Mechanics of a particle - Mechanics of a system of particles – Constraints - D'Alembert's principle and Lagrange's Equations.

UNIT II

Velocity-dependent potentials and the dissipation functions - Simple applications of the Lagrangian formulation - single particle in space (Cartesian co-ordinates,plane polar co-ordinates)-Atwood's machine-bead sliding on rotating wire.

UNIT III

Variational Principles and Lagrange's Equations: Hamilton's principle - Some techniques of the calculus of variations - Derivation of Lagrange's equations from Hamilton's principle - Extension of Hamilton's principle to nonholonomic systems - Advantages of a variational principle formulation – Conservation theorems and symmetry properties.

UNIT IV

The Two-Body Central Force Problem: Reduction to the equivalent one-body problem - The equations of motion and first integrals - The equivalent one-dimensional problem, and classification of orbits – The virial theorem – The differential equation for the orbit, and integrable power-law potentials.

UNIT V

Conditions for closed orbits (Bertrand's theorem) - The Kepler problem: Inverse Square law of force -The motion in time in the Kepler problem - The Laplace-Runge-Lenz vector-scattering in a central force field.

TEXT BOOK:
        Herbert Goldstein- Classical Mechanics-Second Edition-Narosa Publishing House Pvt.Ltd

Unit I: Chapters 1 (Section 1.1 to 1.4)
Unit II: Chapters 1 (Section 1.5 to 1.6)
Unit III: Chapters 2 (Section 2.1 to 2.6)
Unit IV: Chapters 3 (Section 3.1 to 3.5)
Unit V: Chapters 3 (Section3.6 to 3.10)

Reference Books:

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the concept of linear, angular and energy conservation theorem for a particle and a system of particle.	1,5	Understanding
CO-2	Evalute the Lagrangian equation using Hamilton's principle.	1,3,5	Evaluating
CO-3	Apply their skills in Hamilton's principle for various coordinate systems.	1	Applying
CO-4	Determine central force field in real life application.	1,2,4	Evaluating
CO-5	Analyzsis conic and orbital motion using kepler law of planetary motion.	1,2,4,5	Analyzing

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit	
			Classical mechanics					

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	✓	✓	✓	✓	✓	✓				✓
CO-2	✓	✓	✓	✓	✓	✓		✓		✓
CO-3	✓	✓				✓				
CO-4	✓	✓	✓	✓		✓	✓		✓	
CO-5	✓	✓	✓	✓		✓	✓		✓	
	Number of matches (✓) = 32 Relationship = Medium									

Prepared by   Checked

by

Name : V.P. Asan Nagoor Meeran   Head of the Department

Signature :

Course Title	P-I : Matlab Practical
Total Hrs.	60
Hrs./Week	4
Sub.Code	
Course Type	Practical
Credits	4
Marks	100

General Objective:

To learn the fundamental application of MATLAB software and to workout

Mathematical calculations.

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	understand the simple calculation to work on Matlab.
CO-2	Know to create and print simple plots.
CO-3	utilize the tools to create custom plots.
CO-4	grasp to do matrix computation and manipulations.
CO-5	make out calculation in equations and polynomials easily.

1. Write a MATLAB coding to some simple calculation in MATLAB
2. Write a MATLAB coding to creating and working with arrays of Numbers.
3. Write a MATLAB coding to creating and Printing simple plots.
4. Write a MATLAB coding to creating, saving and Executing a Script file
5. Write a MATLAB coding to creating and Executing a Function File
6. Write a MATLAB coding to working with arrays and Matrices
7. Write a MATLAB coding to create a Simple inline function and Anonymous function and compute its value,
8. Write a MATLAB coding to symbolic computations
9. Write a MATLAB coding to find the addition, subtraction and multiplication of any two matrix.
10. Write a MATLAB coding to delete and display the rows and columns of a Matrix.
11. Write a MATLAB coding to distinguish Matrix functions and array functions.
12. Write a MATLAB coding to find the determinant, inverse and Eigen value of given matrix.
13. Write a MATLAB coding to importing and exporting data.
14. Write a MATLAB coding to solve a linear system of three equations.
15. Write a MATLAB coding to find the roots of the polynomial.
16. Write a MATLAB coding to draw a line.
17. Write a MATLAB coding to draw a curve.
18. Write a MATLAB coding to plot the various graphs.

19. Write a MATLAB coding to solve the partial fraction.
20. Write a MATLAB coding to display 2-D plots
21. Write a MATLAB coding to display specialized 2-D plots
22. Write a MATLAB coding to display 3-D plots
23. Write a MATLAB coding to display specialized 3-D plots
24. Write a MATLAB coding to interpolated surface plots

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	experiment with matrix manipulations.	1,2	U,Ev
CO-2	calculate the eigen values and vectors of higher order matrices.	1,2,3,5	Ev
CO-3	analyze the complicated equation by partial fractions.	1,2,4	U,An
CO-4	understand the difference between the image of 2D and 3D surfaces.	1,2,4	U,Ap
CO-5	evaluate the roots of the linear and Non-linear ordinary differential equations.	1,2,3,5	U, Ev

Relationship Matrix

Semester	Course Code	Title of the Course	Hours	Credit
I		P-I : Matlab Practical	4	4

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P			P	P			
CO-2	P	P	P		P	P	P		P	P
CO-3	P	P	P	P		P	P		P	
CO-4	P	P	P	P		P	P		P	
CO-5	P	P	P	P	P	P	P	P		P

Number of matches (✓) = 36

Relationship = High

Low (If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

Name : Dr. S. Mallika   Head of the Department

Signature:

Course Title	IDC I: Discrete Structure I
Total Hrs.	30
Hrs./Week	2
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objective:

To introduce the methods of analytical and critical thinking , deductive reasoning, and logical and mathematical tools.

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	Understand the elements of propositional logic such as statements and operations.
CO-2	Represent the logic statements in mathematics by predicates and quantifiers.
CO-3	Recognize nested quantifiers and interferences rules for propositional statements.
CO-4	Define a set operation and relation on it.
CO-5	Define an equivalence relation on the set to discuss the partition for a given set.

Unit – I : Propositional Logic - Propositional Equivalence.
Unit – II : Predicate Logic - Normal Forms.
Unit – III : Nested Quantifiers - Rules of Inferences.
Unit – IV : Set Operations - Representation and Properties of Relations
Unit – V : Equivalence Relations - Partially Ordering...

Textbooks:

Kennath H Rosen, Discrete Mathematics & its Applications with Combinatorics and Graph Theory, Tata mcgraw- Hill Publishing Company Limited, sixth Edition.

UNIT-I: Chapter 1 (Section 1.1, 1.2)

UNIT-II: Chapter 1 (Section 1.3)
UNIT-III : Chapter 1 (Section 1.4, 1.5)
UNIT-IV : Chapter 2 (Section 2.2) and Chapter 7 (Section 7.1, 7.3)
UNIT-V : Chapter 7 (Section 7.5,7.6)

Reference Books:

Susanna S. Epp, Discrete Mathematics with Applications, Brooks/Cole, Fourth Edition, 2011.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Describe the components of propositional logic, including statements and operations.	2,4	R
CO-2	Apply predicate logic and quantifiers to express the logic statements in mathematics.	2,4	Ap
CO-3	Give examples of various sets operations.	1,2	U
CO-4	Interpret the complicated arguments by applying rules of inferences for propositions and quantified statements.	2,4	Ap
CO-5	Understand the partially ordered sets and equivalence relations.	1,2	U

Relationship Matrix

Semester	Course Code	Title of the Course		Hours	Credit
I	---	Discrete Structure I		2	4

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P	P			P		P	
CO-2	P	P	P	P			P		P	
CO-3	P	P	P			P	P			
CO-4	P	P	P	P			P		P	
CO-5	P	P	P			P	P			
	Number of matches (✓) = 28 Relationship = Medium Low (If the No. of matches are less than 25) Medium (If the No. of matches are between 25 and 33) High (If the No. of matches are more than 33)									

Prepared by   Checked by

Name : S.Jamal Fathima   Head of the Department

Signature :

Course Title	DSC 5 : Topology
Total Hours	75
Hours / Week	5
Code	
Course type	Theory
Credits	4
Marks	100

GENERAL OBJECTIVES:

To reformulate the concepts of Real Analysis to topological spaces and develop analytical thinking and gain knowledge in countability axioms and separation axioms.

Course Objectives: The learner will be able to

CO NO.	Course Objectives
CO 1	understand basic definitions and theorems related to topology.
CO 2	formulate new topological space such as product space and quotient space.
CO 3	discuss the concept of connected, compact and Locally connectedness in topological spaces.
CO 4	analyze the local compactness and countability axiom.
CO 5	familiarize the concepts of Urysohn lemma.

UNIT I

Topological spaces – Basis for a Topology – Order Topology – The product Topology on $X \times Y$ – The Subspace Topology – Closed sets and Limit points.

UNIT II

Continuous functions – The Product Topology - The Quotient Topology.

UNIT III

Connected spaces, components and local connectedness - compact spaces.

UNIT IV

Local compactness - The Countability axioms - The Separation axioms.

UNIT V (e-PG Pathashala)

Normal Spaces – Urysohn lemma – Urysohn metrization theorem.

TEXT BOOKS:

  J.R. Munkres – Topology-2nd Edition, Eastern Economy Edition – Prentice-Hall of India Pvt Ltd, New Delhi.

UNIT I: Chapter 2 (12 to 17).
UNIT II: Chapter 2(18, 19, 22).
UNIT III: Chapter 3 (23, 25, 26).
UNIT IV: Chapter 3 (29), Chapter 4 (30, 31).
UNIT V: Chapter 4 (32, 33, 34)

Reference Book :

1. G.F.Simmons, Introduction to Topology and Modern Analysis. Tata McGraw-Hill Publishing Company Ltd, New Delhi.
2. https://youtu.be/azbVpX5y8k82. https://youtu.be/azbVpX5y8k8.

COURSE OUTCOMES:

CONo.	Course Outcomes	PSOs Addressed	Cognitive Level
CO 1	Understand how to construct the topology from bases and subbases.	1,2	U, R
CO 2	Analyze the continuous and Homeomorphism function between topological spaces.	1,2,3,5	An
CO 3	Apply the properties of connectedness, local connectedness and compactness.	1,3,4,5	A
CO 4	Remember the importance of first countable and second countable space.	1,3	R
CO 5	Analyse the Urysohn lemma and the Urysohn metrization theorem.	1,3,5	An, R

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit		
II	---		Topology		5		4		

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P			P	P			
CO-2	P	P	P		P	P	P	P		P
CO-3	P	P	P		P	P		P		P
CO-4	P	P	P		P	P		P	P	
CO-5	P	P	P		P	P		P		P

Number of matches (P) = 34

Relationship = High

Low (If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

Name :U.Jerseena   Head of the Department

Signature :

Course Title	DSC 6 : REAL ANALYSIS II
Total Hrs	75
Hrs/Week	5
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objectives:

To recognize the basic properties of the field of real numbers and formulate the proofs and structures of mathematical arguments.

Course Objectives: The learner will be able to

CO	Course Objectives
CO-1	understand the importance of Riemann –Stieltjes Integral and its properties.
CO-2	study about the sequence and series of functions.
CO-3	apply the uniform convergence in differentiation and integration.
CO-4	gain the knowledge about the power series, the exponential and logarithmic functions.
CO-5	know the significance of contraction principle, Inverse function theorem, The implicit function theorem.

Unit – I

The Riemann–Stieltjes Integral: Definition and Existence of the Integral – Properties of the Integral–Integration and differentiation.

Unit – II

Sequences and Series of Functions:Discussion of main problem–Uniform convergence–Uniform convergence and continuity–Uniform convergence and integration.

Unit – III

Uniform convergence and Differentiation - Equicontinuous Families of functions.

Unit – IV

Some Special Functions:Power Series–The Exponential and Logarithmic Functions–The trigonometric Functions–The Algebraic Completeness of the Complex Field-Fourier series.

Unit – V

Functions of Several Variables: Differentiation– The Contraction principle – The Inverse function Theorem–The Implicit function theorem.

Textbooks:

Walter Rudin–"Principles of Mathematical Analysis" – 3rd Edition, McGraw Hill

International Editions.

Unit I :Chapter 6(section 6.1-6.22)

Unit II :Chapter 7 (section 7.1-7.16)

Unit III :Chapter 7(section 7.17-7.25)

Unit IV : Chapter 8(section 8.1-8.12)

Unit V : Chapter 9 (section 9.10-9.29)

Reference Books:

1. **H.L.Roydon & P.M.Fitz patrick**-"Real Analysis" – Fourth Edition, PHI Learning Private Limited 2012.
2. **D.Somasundaram, B.Choudhary** -"First Course in Mathematical Analysis.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	remember the importance of Riemann – Stieltjes Integral and its properties.	1,2,4	R
CO-2	analyze the uniform convergence for sequence of function.	1,2,3,4	A
CO-3	understand the conditions which belongs to equicontinuous families of functions.	1,2,3,4	U
CO-4	analyses the concept of power series like Exponential, Logarithmic functions and Trigonometric functions.	1,2,3,4	A
CO-5	evaluate the derivatives of functions of several variables using contraction principle and the inverse function theorem.	1,2,5	E

Relationship Matrix

Semester	Course Code	Title of the Course	Hours	Credit
II	---	REAL ANALYSIS II	5	4

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P		P	P	P		P	
CO-2	P	P	P		P	P	P	P	P	
CO-3	P	P	P			P	P	P	P	
CO-4	P	P	P		P	P	P	P	P	
CO-5	P	P	P		P	P	P			P
	Number of matches (✓) =37 Relationship = High Low (If the No. of matches are less than 25) Medium (If the No. of matches are between 25 and 33) High (If the No. of matches are more than 33)									

Prepared by   Checked by

Name : R.HEPZIBAH ANITA   Head of the Department

Signature :

Course Title	**DSC-7:** Graph Theory
Total Hrs	**75**
Hrs/Week	**5**
Sub. Code	**-**
Course Type	
Credits	**4**
Marks	100

General Objectives:

To understand fundamental concepts in graph theory so as to solve day-to-day life problems besides improving the proof writing skills.

Course Objectives: The learner will be able to

CO	Course Objectives
CO-1	Understand the basic concepts of trees and their properties.
CO-2	Identify Eulerian and Hamiltonian graphs.
CO-3	Understand and prove the theorems/lemmas in matching and factorization.
CO-4	Analyse the necessary condition for planar graphs.
CO-5	Recall the edge colouring of graphs.

UNIT I

Trees: Bridges – Trees. Connectivity: Cut vertices - Connectivity.

UNIT II

Traversability: Eulerian graphs – Hamiltonian graphs.

UNIT III

Matchings and Factorizations: Matchings – Factorization

UNIT IV

Planarity: Planar graphs –Embedding Graphs on surfaces. Coloring: Vertex coloring.

UNIT V

Edge coloring – The Heawood Map coloring theorem, Distance: The centre of a graph.

Textbooks:

Gary Chartrand and Ping Zhang – Introduction to Graph Theory, Edition 2006. Tata McGraw-Hill Publishing Company Limited, New Delhi.

UNIT I: Chapter 4 (4.1, 4.2), Chapter 5 (5.1, 5.3).
UNIT II: Chapter 6 (6.1, 6.2),
UNIT III: Chapter 8 (8.1, 8.2,)
UNIT IV: Chapter 9 (9.1, 9.2), Chapter 10(10.2).
UNIT V: Chapter 10 (10.3, 10.4), Chapter 12 (12.1).

Reference Books:

J.A. Bondy and U.S.R. Murty – Graph Theory with applications, Department of Combinatorics and Optimization, Elsevier Science Publishing 1976.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the concept of vertex and edge connectivity	1, 5	Understanding & Creating
CO-2	Analyse the various characterization of Eulerian and Hamiltonian graphs	1, 3, 4	Understanding &Analyzing
CO-3	Apply Hall's Marriage theorem to justify the graph have a perfect matching or not.	1, 4, 5	Understanding, Analyzing
CO-4	Understand the interpretation of non-planar graphs in higher dimension surfaces.	1, 5	Understanding & Creating
CO-5	Evaluate the edge colouring of graphs, centre of a graph	1, 2, 4, 5	Evaluating

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit	
II			DSC-7: Graph Theory		5		4	

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P	P	P	P				P
CO-2	P	P	P	P	P	P		P	P	
CO-3	P			P	P	P			P	P
CO-4	P	P	P	P		P				P
CO-5	P		P	P		P	P		P	P
	Number of matches = 35 Relationship = High Low (If the No. of matches are less than 25) Medium (If the No. of matches are between 25 and 33) High (If the No. of matches are more than 33)									

Prepared by   Checked by
J. A. AfraaNuhaa   Head of the Department

Course Title	DSC 8: LATEX
Total Hrs.	60
Hrs./Week	4
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objective:

LaTeX is a software system for document preparation.

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	Write the coding to prepare journal format and beamer presentation.
CO-2	Understand advanced typesetting of mathematics with AMS-LaTeX.
CO-3	Find the automatic generation of table of contents, bibliographies and indexes.
CO-4	Control over large documents containing sectioning, cross-references, tables and figures.
CO-5	Create chapters with subheadings and reference chapters or sections in the text.

Unit – I

Introduction: Basics of a Latex file- **Texts, Symbols and Commands:** Commands names and arguments –Environments – Declarations – Lengths - Special Characters – **Document Layout and Organization:** Document Class – Page Style – Parts of the document – Table of Contents.

Unit – II

Displaying Text: Changing font style – Centering and indenting – Lists – Generalized Lists – Theorem like-declarations - **Text in Boxes:** Boxes – Footnotes and Marginal notes – **Tables:** Tabular stops – Tables.

Unit – III

Mathematical Formulas: Mathematical environments – Main elements of math mode – Mathematical symbols – Additional Elements – Fine tuning mathematics – **Floating tables and figures:** Float placement – Postponing floats – style parameters for floats – float captions – float examples – References to figures and tables in text – Some float packages.

Unit – IV

Graphics Inclusion and Color: The graphics packages – Adding color – **Drawing with Latex:** The picture environment – Extended pictures.

Unit – V

Math Extensions with AMS-Latex: <mark>Invoking AMS-Latex – Standard features of AMS-Latex- Further AMS-Latex Packages – The AMS fonts **Presentation Material:** Slide production with slides class- Slide production with seminar - Slide Production with the prosper class - Electronic documents for screen viewing – Special effects with PDF.</mark>

Textbooks:

Helmut Kopka and Patrick W. Daly – Guide to LATEX (Fourth Edition) Addison Wesley

UNIT I: Chapter 1 (Section 1.5 Only), Chapter 2 (Section 2.1 to 2.5) and Chapter (Section 3.1 to 3.4)

UNIT II: Chapter 4 (Section 4.1 to 4.5), Chapter 5 (Section 5.1 to 5.2) and Chapter (Section 6.1 to 6.2)

UNIT III: Chapter 7 (Section 7.1 to7.5) and Chapter 9 (Section 9.1 to 9.7)

UNIT IV: Chapter 8 (Section 8.1 to 8.2) and Chapter 16 (Section 16.1 to 16.2)

UNIT V: Chapter 15(Section 15.1 to 15.4) and Chapter 17 (Section 17.1 to 17.5)

Reference Books:

Latex Beginner's Guide, Stefan Kottwitz, Published by Packt Publishing Ltd.32 Lincoln Road Old on Birmingham.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the basics of Latex like text, symbols and commands.	1,4	Understanding
CO-2	Analyze the interpretation of boxes, nested boxes and minipages.	1,4	Analyzing
CO-3	Summarize the techniques in Latex for preparation of floating tables and figures.	1,4	Evaluating
CO-4	Apply the picture environment to draw graphs and all kinds of images.	1,4	Applying
CO-5	Understand the math Extensions with AMS-Latex and Apply their Knowledge in preparing presentation material.	1,4	Understanding, Appling

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit		
II			**DSC8: Latex**		**4**		**4**		
Course Outcomes (COs)	**Programme Learning Outcomes (PLOs)**					**Programme Specific Outcomes (PSOs)**				
	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO-1	P	P	P			P			P	
CO-2	P	P	P			P			P	
CO-3	P	P	P			P			P	
CO-4	P	P	P			P			P	
CO-5	P	P	P		P	P			P	
	Number of matches (✓) = 26 Relationship = Medium									

Prepared by   Checked by

Name : V.P.Asan Nagoor Meeran   Head of the Department

Signature :

Course Title	DSE – II (A):CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS
Total Hrs	60
Hrs / Week	4
Sub. Code	
Course Type	Theory
Credits	3
Marks	100

General Objectives:

To obtain knowledge for finding maxima and minima of functionals and to give exact analytical techniques to find the shortest distance between two given points on a surface and get clear idea about the relationship between differential equation and Integral equations.

Course Objectives: The learner will be able to

Co. No.	Course Objectives
CO – 1	understand the concept of Euler's equation in different form.
CO – 2	known the concept with variational problems.
CO – 3	differentiate the relation between differential and integral equations.
CO – 4	execute the successive approximation method in simple way.
CO – 5	gain knowledge about Fredholm equation of first, second and third kind.

UNIT I

Calculus of Variations and Applications: Maxima and minima - The simplest case - Illustrative examples - Natural boundary conditions and transition conditions.

UNIT II

Constraints and Lagrange multipliers - Variable end points - Sturm-Liouville problems - Lagrange's equations.

UNIT III

Integral Equations: Introduction - Relation between differential and integral equations - Illustrative example.

UNIT IV

The Green's function – Abel's Theorem – Bessel's function - Fredholm equations with separable kernels - Illustrative example.

UNIT V

Iterative methods for solving equations of the second kind –Neumann Series - Fredholm theory.

TEXT BOOK:

Francis B.Hildebrand, Methods of Applied Mathematics, Second Edition, Prentice Hall, INC. Englewood Cliffs, New Jersey.

UNIT I: Chapter 2 (Section 2.1 to 2.4)

UNIT II: Chapter 2 (Section 2.7 to 2.9 & 2.11)

UNIT III: Chapter 3 (Section 3.1 to 3.2)

UNIT IV: Chapter 3 (Section 3.3, 3.6 & 3.7)

UNIT V: Chapter 3 (Section 3.9, 3.10, 3.11)

REFERENCE BOOK:

1. Calculus of Variations by I. M. Gelfand and S.V. Fomin, Prentice Hall. Inc.,1963.
2. Integral Equations and their applications, M. Rahman, WIT Press, Boston, 2007.

Course Outcomes(CO)

Co. No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO – 1	Understand the concept of maxima and minima of functionals.	1,2,4	U
CO – 2	Evaluate the problems using Strum Liouville problems and Lagrange's equations.	1,2	E
CO – 3	Analyse the relation between differential and integral equations, convert it from one to another.	1,4,5	An
CO – 4	Understand the difference between Fredholm equations and Volterra equations.	1	U
CO – 5	Remember the Fredholm theory concept and evaluate the problems.	1,3,4	R & E

Relationship Matrix

Semester	Course Code	Title of the Course					Hours	Credit
II		DES – II (A):CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS					4	3

Course Outcomes (COS)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO - 1	*P*	*P*	*P*		*P*	*P*	*P*		*P*	
CO - 2	*P*	*P*	*P*			*P*	*P*			
CO - 3	*P*	*P*	*P*		*P*	*P*			*P*	*P*
CO - 4	*P*	*P*	*P*		*P*	*P*				
CO - 5	*P*	*P*	*P*			*P*		*P*	*P*	
	Number of Matches(P) = 30									
	Relationship = Medium									
	Low(If the No. of matches are less than 25)									
	Medium (If the No. of matches are between 25 and 33)									
	High (If the No. of matches are more than 33)									

Prepared by   Checked by
Dr. S. Angelin Kavitha Raj   Head of the Department
Mathematics(Unaided)

Course Title	Java Programming
Total Hrs	60
Hrs/Week	4
Sub. Code	
Course Type	DSE-2B
Credits	4
Marks	100

General Objectives:

Apply Java programming to solve simple problems in scientific fields, including mathematics, statistics and economics.

Course Objectives: The learner will be able to

CO	Course Objectives
CO-1	Gain knowledge about basic Java language syntax and semantics to write Java programs.
CO-2	Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.
CO-3	Understand the principles of inheritance, packages and interfaces.
CO-4	Secure the flow of a program by Exception handling.
CO-5	Know the basic concepts of applet architecture.

UNIT I

An Overview of Java Language: Object oriented programming–A first simple program–A second short program–Two control statements–Using blocks of code – Lexical issues– The java class libraries.

UNIT II

Data types, variables & Arrays: The primitive types – Integers – Floating –point types – Characters – Booleans – A closer look at Literals – Variables – Type conversion and casting – Arrays.

UNIT III

Control statements: Java's selection statements – Iteration statements –Jump statements. Introducing Classes: Class fundamentals – Declaring objects –Assigning object Reference Variables – Introducing methods – Constructors–The this keyword –Garbage collection– The finalize ( ) method.

UNIT IV

Inheritance: Inheritance Basics – using super –creating a multi-level hierarchy – when constructors are called– method overriding –The object class. Packages and Interfaces: Packages - Access protection – importing packages–Interfaces.

UNIT V

Exception handling: Exception handling fundamentals – Exception types –Uncaught Exceptions– Using try and catch-Multiple catch clauses– Nested try statements – throw – throws – finally. The Applet class: Two types of Applets – Applet basics – Applet architecture.

Textbooks:

Herbert Schildt- JAVA–2, The Complete reference (7th edition), Tata McGraw Hill 2001.

Unit I: Chapter 2 (full)

Unit II: Chapter3 (2 to 9, 11)

Unit III: Chapter 5 (full)

Unit IV: Chapter 6 (1 to 8), Chapter 8(1-5)

Unit V: Chapter 9(1 -5) 21 (1-3)

Reference Books:

Harry H Chaudhary-- Introduction to Java programming, Second Edition. OD Publishing, LLC, USA, Second Edition

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the Java features in program structure.	2 ,4	U
CO-2	Understand the concept of array and multi-dimensional array.	2, 4, 5	U & A
CO-3	Remember the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods and exception handling mechanisms.	2. 4, 5	R & U
CO-4	Analyse the concepts of packages and interfaces.	4, 5	A
CO-5	Analyse the error handling techniques using Exception handling.	2, 4, 5	A & C

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit	
II			**DSE-2B : Java Programming**		**60**		**4**	
Course Outcomes (COs)	**Programme Learning Outcomes (PLOs)**					**Programme Specific Outcomes (PSOs)**			
	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO-1	P	P	P		P		P		P	
CO-2	P	P	P		P		P		P	P
CO-3	P	P	P		P		P		P	P
CO-4	P	P	P		P				P	P
CO-5	P	P	P		P		P		P	P

Number of matches (✓) = 33

Relationship = Low/Medium/High

Low (If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

J. A. AfraaNuhaa   Head of the Department

Course Title	DSE(C)Combinatorics
Total Hrs.	60
Hrs./Week	4
Sub.Code	
Course Type	Theory
Credits	3
Marks	100

General Objective:
To comprehend the theory of various types of distinct objects and generating functions

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	Recall the permutation and combinations theory
CO-2	Discuss the distribution of distinct objects into non distinct cells
CO-3	Understand the recurrence relation application in Tower of Hanoi problem
CO-4	Realize the number of arrangements of N objects by the Principle of inclusion and exclusion
CO-5	Apply the Polya's Theory to solve the puzzles problem

UNIT I
Permutations and combinations - distributions of distinct objects ~
distributions of non distinct objects - Stirlings formula.
UNIT II
Generating functions. - generating function for combinations - enumerators for
permutations - distributions of distinct objects into non-distinct cells -
partitions of integers – the Ferrer's graphs - elementary relations.
UNIT III
Recurrence relation - linear recurrence relations with constant coefficients
solutions by the technique of generating functions - a special class of nonlinear
difference equations - recurrence relations with two indices.
UNIT IV
The principle of inclusion and exclusion - general formula - permutations with

restriction on relative positions - derangements - the rook polynomials -
permutations with forbidden positions.

UNIT V

Polya's theory of counting - equivalence classes under a permutation group
Burnside theorem - equivalence classes of functions - weights and inventories
of functions - Polya' s fundamental theorem – generation of Polya's theorem.

Textbooks:

Introduction of Combinatorial Mathematics, C.L. Liu, McGraw Hill,1968.
Unit I: Chapter 1
Unit II: Chapter 2
Unit III: Chapter 3
    Unit IV: Chapter 4
    Unit V: Chapter 5

Reference Books:

1. Combinatorial Theory, Marshall Hall Jr.,John Wiley & Sons, second edition.
2. Combinatorial Mathematics, H.J. Rayser, Carus Mathematical Monograph,No.14.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the derivation of Stirling formula	1,2	Understanding
CO-2	Analyse the Ferrers Graphs construction from the partition of integers	1,2,3	Analysising
CO-3	Apply recurrence relation to calculate the determinant of a matrix	1,2,4	Understanding, Applying
CO-4	Apply the principle of inclusion and exclusion to solve the puzzles	1,3,5	Understanding, Applying
CO-5	Analyse the Generalization of Polyas theory	1,2,3	Understanding, Analysising

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit	
III			Combinatorics				4	
Course outcome so	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)			
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	✓	✓	✓			✓	✓			

	1	2	3	4	5	6	7	8	9	10
CO-2	✓	✓	✓	✓	✓	✓	✓	✓		
CO-3	✓	✓	✓	✓		✓	✓		✓	
CO-4	✓	✓	✓		✓	✓		✓		✓
CO-5	✓	✓	✓			✓	✓			

Number of matches (✓) = 32
Relationship = Medium
Low (If the No. of matches are less than 25)
Medium (If the No. of matches are between 25 and 33)
High (If the No. of matches are more than 33)

Prepared by   Checked by

Name : Dr. A. Mallika.   Head of the Department

Signature :

Course Title	P-II: Latex Practical
Total Hrs.	60
Hrs./Week	4
Sub.Code	
Course Type	Practical
Credits	4
Marks	100

General Objective:

LaTeX is a document typesetting system that is used to produce high quality scientific documents like articles, books, technical reports, thesis, etc.

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	Understand the basic concepts of Typesetting in Latex.
CO-2	Improve their skills in Latex through various packages.
CO-3	Analyze the concepts of floating tables.
CO-4	Compose a Latex program using picture environment.
CO-5	Create various art designs using Latex Programs.

1. Write a LaTeX coding for Basic Mathematical Equation.
2. Write a LaTeX coding for Mathematical Equation with Mathematics Formulae.
3. Write a LaTeX coding for Mathematical Equation with Delimiters.
4. Write a LaTeX coding for Chess Board.
5. Write a LaTeX coding for Rangoli.
6. Write a LaTeX coding for Lotus.
7. Write a LaTeX coding for Natural Scene with Home.
8. Write a LaTeX coding for Tamil letters.
9. Write a LaTeX coding for your name in Colour & Tamil letters.
10. Write a LaTeX coding for Different types of Graphs in Graph Theory
11. Write a LaTeX coding for Time Table.
12. Write a LaTeX coding for Class Schedule Time Table.
13. Write a LaTeX coding for Draw different types of Boxes.
14. Write a LaTeX coding for preparing a paper in Journal.
15. Write a LaTeX coding for Beamer presentation with lists.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the basics structures of an article.	1,4	Understanding
CO-2	Apply their skills to class files of some journals.	1,4	Applying
CO-3	Analyze the page styles using the text in boxes.	1,4	Analyzing
CO-4	Remembering the concepts to write documents containing mathematical formulas.	1,4	Remembering
CO-5	Understand the concepts of how to draw graphs.	1,4	Understanding

Relationship Matrix

Semester	Course Code		Title of the Course			Hours			Credit	
			Latex Practical			4			4	
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P			P			P	
CO-2	P	P	P		P	P			P	
CO-3	P	P	P		P	P			P	
CO-4	P	P	P		P	P			P	
CO-5	P	P	P		P	P			P	
	Number of matches (✓) = 29 Relationship = Medium									

Prepared by   Checked by

Name : V.P.Asan Nagoor Meeran   Head of the Department

Signature :

Course Title	Linear Algebra
Total Hrs.	75
Hrs./Week	5
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objective:

Prove statements of an algebraic nature concerning linear transformations.

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	Relate the column space of matrix transformation with three possibilities of system Ax=b having unique solution, infinitely many solution and No solution
CO-2	Find the kernel, range, rank and nullity of a Linear Transformation
CO-3	Analyze the linear functions defined on a finite dimensional vector space.
CO-4	Find the relation between characteristic polynomial and Annihilating polynomial.
CO-5	Determine the matrix which is diagonalizable, Triangulizable.

UNIT I

Linear Equations: Fields- systems of Linear Equations- Matrices and Elementary Row Operations – Row reduced Echelon Matrices – Matrix multiplication – Invertible Matrices. **Vector Spaces:** Vector Spaces – Subspaces-Bases and Dimension.

UNIT II

Linear Transformations: Linear Transformation – The Algebra of Linear Transformations- Isomorphism –Representation of Transformations by Matrices.

UNIT III

Linear Transformations: Linear functional – The double dual – The transpose of Linear Transformation. **Determinants:** Commutative Rings – Determinant functions – Permutations and Uniqueness of Determinants.

UNIT IV

Determinants: Additional Properties of Determinants. **Elementary Canonical Forms:** Introductions – Characteristic Values – Annihilating Polynomials- Invariant Subspaces.

UNIT V

Elementary Canonical Forms : Simultaneous Triangulations ; Simultaneous Diagonalizations – Direst Sum Decomposition – Invariant Direct sums.

Textbooks:

Kenneth Hoffman and Ray Kunze – Linear Algebra Second Edition Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

UNIT I: Chapter 1 (Section 1.1 to 1.6) and Chapter 2 (Section 2.1 to 2.3)

UNIT II: Chapter 3 (Section 3.1 to 3.4)
UNIT III: Chapter 3 (Section 3.5 to 3.7) and Chapter 5 (Section 5.1 to 5.3)
UNIT IV: Chapter 5 (Section 5.4) and Chapter 6 (Section 6.1 to 6.4)
UNIT V: Chapter 5(Section 6.5 – 6.7)
Reference Book

      I.N. Herstein - Topics in Algebra (Second Edition) - Wiley India (P.)Ltd, New
Delhi.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the basic techniques for solving the system of linear equations and properties of vector spaces.	1,2,5	U
CO-2	Compute the matrix associated to the linear transformation.	1,2,5	E
CO-3	Analyze the formation of the determinant function.	1,3,4,5	AN
CO-4	Apply the nature of the characteristic roots for the justification of the diagonalizable operator.	1,3,4,5	AP
CO-5	Evaluate the vector space decomposition of the operator by minimal polynomial.	1,3,4,5	E

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit	
			Linear Algebra		5		4	
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P				P	P			P
CO-2	P	P	P			P	P			P
CO-3	P	P	P			P		P	P	P
CO-4	P	P				P		P	P	P
CO-5	P	P	P		P	P		P	P	P
	Number of matches (P) = 32 Relationship = Medium Low(If the No. of matches are less than 25) Medium (If the No. of matches are between 25 and 33) High (If the No. of matches are more than 33)									

Prepared by   Checked by

Name : V.P. Asan Nagoor Meeran   Head of the Department

Signature :

Course Title	Measure Theory and Integration
Total Hrs.	75
Hrs./Week	5
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objective:
Understand the concept of an Outer Measure of a set and their properties to realize the
   Riemann Integral's extension

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	introduce the new concepts of Lebesgue Measure
CO-2	develop the Lebesgue integrable from Riemann Integral
CO-3	understand the characterization of Measurable functions
CO-4	discuss about the measure on arbitrary spaces.
CO-5	realize the importance of Outer measurability in Extended space.

Unit – I   Lebesgue Measure: Introduction - Outer Measure - Measurable
              Sets and Lebesgue Measure–A non Measurable set.
Unit – II   Measurable Functions - LittleWood's three principles. The
               Lebesgue Integral: Riemann Integral – The Lebesgue Integral of
             a bounded function over a set of finite measure.
Unit – III   The Integral of a non negative function - The general Lebesgue
              Integral. Differentiation and Integration: Differentiation of
              monotone functions.
Unit – IV   Functions of bounded variation - Differentiation of an integral –
              Absolute continuity. Measure and Integration: Measure Spaces- Measurable
              functions.
Unit – V   Integration - General convergence Theorems - Signed Measures - The
                Radon Nikodym Theorem. Measure and Outer Measure: Outer
                Measure and Measurability – The Extension Theorem.

Textbooks:

   H.L.Royden – Real Analysis, Dorling Kindersley (India) Pvt. Ltd - Third Edition, Pearson Education.

   Unit I: Chapter 3 (Section 1 to 4)
   Unit II: Chapter 3(Section 5,6) and Chapter 4(Section 1,2)
   Unit III: Chapter 4 (Section 3,4) and Chapter 5(Section 1)
   Unit IV: Chapter 5 (Section 2 to 4) and Chapter 11(Section 1,2)
   Unit V: Chapter 11 (Section 3 to 6) and Chapter 12(Section 1,2)

Reference Books:

   Debarra G, Measure Theory and integration, New Age International Publishers (Second Edition) New Delhi.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the theory of Outer measure associated with real line.	1,2	U
CO-2	Remember the Riemann Integral Theory to learn about Lebesgue Integral	1,2,4	R
CO-3	Analyse the properties of Absoulte Continuity with the different types of functions such as Integrable and Measurable functions.	1,2,4	U,Ap
CO-4	Analyze the measure of arbitrary space	1,3	U,An
CO-5	Apply the Radon Nikodym Theorem to learn the properties of Outer measure of Arbitrary space	1,2,3,5	U, An

Relationship Matrix

Semester	Course Code		Title of the Course			Hours		Credit
III			MEASURE THEORY AND INTEGRATION			5		4

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P			P	P			
CO-2	P	P	P	P		P	P		P	
CO-3	P	P	P	P		P	P		P	
CO-4	P	P	P		P	P		P		
CO-5	P	P	P		P	P	P			P

Number of matches (P) = 32
Relationship = Medium
Low (If the No. of matches are less than 25)
Medium (If the No. of matches are between 25 and 33)
High (If the No. of matches are more than 33)

Prepared by   Checked by

Name : Dr. A. Mallika   Head of the Department

Signature :

Course Title	DSC - 11 Research Methodology
Total Hrs.	75
Hrs./Week	5
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objective:

To expand the student's knowledge in basic method of research and to build their credibility for good foundations.

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	Understand the process of research and its significance.
CO-2	Realize the important concepts relating to research design.
CO-3	Compare the different phases of teaching methods.
CO-4	Formulate the ways for effective presentation by using ICT tools.
CO-5	Discuss the importance of cognitive and physical development.

Unit – I

General introduction to research methodology: Meaning and objective of scientific research – Motivation of Research -Types and significance of research, Methods of scientific research, Research process and criteria for good research, Stages of research..

Unit – II

Defining the Research Problem: Selecting the problem – Necessity of Defining the Problem – Technique Involved in Defining a Problem – An Illustration. Research Design: Meaning of Research Design – Need for Research Design – Features of Good Design – Important Concepts Relating to Research Design – Basic Principles of Experimental Designs.

Unit – III

Objectives of Teaching - Phases of Teaching - Methodology of Teaching: Lecture method – Discussion method – Inquiry method – Discovery method - Problem Solving method, Project method of teaching, Seminar method.

Unit IV

Integrating ICT in Teaching: Instruction system - Individual instruction - Ways for Effective presentation with power point –Evaluation – Need, Importance and Characteristics: Principles of evaluation – Approaches to evaluation -Continuous and Comprehensive Evaluation.

Unit V

Later Adolescent Psychology: Physical development during adolescence – Cognitive development during adolescence – Emotional development during adolescence – Social development. Teaching Late Adolescents: Characteristics of late adolescents – Problems of adolescents – Teaching Strategies for late adolescents – Important tips for teaching late adolescents.

Textbooks:
1. C.R. Kothari, Research Methodology – Methods and Techniques, Second revised Edition, New Age International Publishers, 2004.
2. Study material for the course of Research and Teaching Methodology.(Reference from R.B 1, 2, 3)

   Unit I: TB 1- Chapter 1Full
   Unit II: TB 1- Chapter 2 & 3
   Unit III: TB 2 –Chapter 5 (5.1 – 5.3)
   Unit IV: TB 2 - Chapter 5 (5.4 ,5.5)
   Unit V: TB 2 - Chapter 5 (5.6 ,5.7 (5.7.1 – 5.7.4))

Reference Books:
1. Sampath K., Pannerselvam A & Santhanam S (1984), Introduction to Educational Technology, New Delhi: Sterling Publishers.
2. Sharma S R (2003), Effective classroom teaching modern methods, tools & techniques. Jaipur: Mangal Deep.
3. Vedanayam, E.G. (1989) Teaching Technology for College Teachers New York: Sterling Publishers.
4. G. M. - Teaching Methodology, Independently Published, 2018.
5. J. C. Aggarwal – Principles, Methods & Techniques of Teaching, Vikas Publishing House, 2nd Revised Edition.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the components of research articles	3,5	U
CO-2	Create the research articles.	3,5	C
CO-3	Apply the different method of teaching to perform the effective way.	3,5	Ap
CO-4	Understand to improve teaching and learning process by evaluation.	3,5	U
CO-5	Analyze the physical and cognitive development during adolescence.	3,5	An

Relationship Matrix

Semester	Course Code		Title of the Course			Hours		Credit	
III	---		RESEARCH METHODOLOGY			5		4	
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P		P			P		p
CO-2	P	P	P		P			P		P
CO-3	P	P	P		P			P		P
CO-4	P	P	P		P			P		P
CO-5	P	P	P		P			P		P

Number of matches (P) = 30

Relationship = Medium

Low (If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

Name :Dr. S. Jamal Fathima   Head of the Department

Signature :

Course Title	DSC – 12: OPTIMIZATION TECHNIQUE
Total Hrs	60
Hrs / Week	4
Sub. Code	
Course Type	Theory
Credits	4
Marks	100

General Objectives:

        Operation research model is an idealised representation of the real life situation and represents one or more aspects of reality and also, identify the situation and make good decision in real life. Queueing models are used for minimising the waiting time and idle time together with the costs associated herewith.

Course Objectives: The learner will be able to

Co. No.	Course Objectives
CO – 1	understand the simplex method to solve the LPP in TORA
CO – 2	familiarize the concept of Integer Programming problems.
CO – 3	make good decision in day to day life.
CO – 4	identify the shortest distance and evaluating projects using CPM and PERT.
CO – 5	understand the strength and weakness of Queueing models.

UNIT I

The Simplex Method: LP Solution space in Equation form – Simplex Iterations with

TORA – Artificial starting solution. Simplex Method Application – Degeneracy.

UNIT II

Integer Programming: Introduction – Pure and Mixed Integer Programming Problems – Gomory's All I.P.P Method – Construction of Gomory's constraints – Fractional Cut Method – All Integer LPP.

UNIT III

Decision Analysis: Introduction - Decision making Problem - Decision making Process - Decision making Environment - Decision making under uncertainty - Decision making under risk.

UNIT IV

Network Scheduling by PERT / CPM: Introduction – Network: Basic Components – Logical Sequencing – Rules of Network Construction – Concurrent Activities – Critical Path Analysis – Probability Construction in PERT.

UNITV

Queuing theory: Elements of Queuing Model – Role of Exponential distribution -

single and Multi Server Models.

Theory: Problem = 60: 40

TEXT BOOK:

1. **Kanti Swarup, P.K. Gupta and Man Mohan**, Operation Research, Eleventh Edition,

Sultan Chand & Sons, New Delhi.

2. HAMDY A. TAHA, Operations Research An Introduction, 7th Edition, MacMillan

Publishing Company, New York.

UNIT I: TB - 2: Chapter 2 (2.2,2.3)

UNIT II: TB - 1Chapter 7 (7.1 - 7.5)

UNIT III: TB - 1 Chapter 16 (16.1 – 16.6)

UNIT VI: TB - 1Chapter 25 (25.1 – 25.7)

UNIT V: TB - 2 Chapter 17 (17.2,17.3,17.6.1- 17.6.)

REFERENCE BOOK:

Prem Kumar Gupta, D S Hira, Operations Research – S Chand and Company Limited

Course Outcomes(CO)

Co. No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO - 1	Understand the simplex method to solve the LPP in TORA	1,2,4	U
CO – 2	Analyse the problems and find best optimal solution using Gomory's All I.P.P Method.	1,2,4	An
CO – 3	Remember and develop critical thinking in decision process.	1,2,4,5	R
CO – 4	Understand and analyse the simple models of CPM.	1,2	U, An
CO – 5	Evaluate the problems in Queueing theory for the Research field.	2,3,5	E

Relationship Matrix

Semester	Course Code	Title of the Course								Hours	Credit
III		DSC – 12: OPTIMIZATION TECHNIQUE								4	4

Course Outcomes (COS)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO – 1	P	P	P		P	P	P		P	
CO – 2	P	P	P		P	P	P		P	
CO – 3	P	P	P	P		P	P			
CO – 4	P	P	P		P	P	P			
CO – 5	P	P	P				P	P		P

Number of Matches(P) = 32

Relationship = Medium

Low(If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

Dr. S. Angelin Kavitha Raj   Head of the Department

Course Title	Mathematical Statistics
Total Hrs	60
Hrs/Week	4
Sub. Code	
Course Type	DSC-3A
Credits	3
Marks	100

General Objectives:

Demonstrate knowledge of probability, fixed sample and large sample statistical properties and the standard statistical distributions.

Course Objectives: The learner will be able to

CO	Course Objectives
CO-1	Understand the concept of stochastic processes model of a system.
CO-2	Know about the parameters and statistics in distribution.
CO-3	Optimize analytical measurement problem in sampling theory.
CO-4	Estimate the location and scale parameters of a distribution in order statistics.
CO-5	Evaluate the distribution of random variables in a limiting distribution.

UNIT I

Conditional Probability and Stochastic Independence: Conditional Probability – Marginal and Conditional distributions – The correlation coefficient – Stochastic Independence.

UNIT II

Some Special Distributions: The Binomial, The Poisson distribution - The Gamma distribution & chi-square distribution –The normal distribution –The Bivariate distribution.

UNIT III

Distributions of functions of Random variables: Sampling Theory –Transformation of variables of the discrete type – Transformation of variables of the continuous type-The t and F distribution.

UNIT IV

Extensions of the Change of variable Technique – Distribution of order statistics –The moment generating function technique – Distributions of and nS^2/σ^2 and $\overline{X}$.

UNIT V

Limiting Distributions: Limiting Distributions – Stochastic convergence – Limiting moment generating functions – The central limit theorem – Some theorems on Limiting Distributions.

Textbooks:

Robert V. Hogg and Allen T. Craig – Introduction to Mathematical Statistics **-** Pearson Education Asia, Chapters2, 3, 4 and 5.

Unit I: Chapter2 (Section 2.1to2.3)

Unit II: Chapter 3(Section 3.1, 3.2, 3.3, 3.4)

Unit III: Chapter4 (Section 4.1to 4.4)

Unit IV: Chapter 4 (Section 4.5 to 4.8)

Unit V: Chapter5 (Section5.1 to 5.5)

Reference Books:

 1. Lee. J. Bain, Max Engel-Hardt– Introduction to probability and Mathematical Statistics. Duxbury Learning, Second Edition

2. Richard J Larsen, Morris L. Marx- Introduction to Mathematical statistics and its Applications, fifth Edition, Prentice Hall.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the concept of conditional probability to estimate the number of possible outcomes with different conditions	1, 2, 4	U
CO-2	Remember the basic distribution theory to learn about special distributions.	1, 2	R & U
CO-3	Analyse the change in transformations of variables in discrete and continuous type.	2, 4	U & A
CO-4	Evaluate the distributions of $\overline{X}$ and $\dfrac{nS^2}{\sigma^2}$ by applying moment generating function technique.	3, 4	Ap & Ev
CO-5	Apply the concept of central limit theorem to find the value of the probability.	3	Ap

Relationship Matrix

Semester	Course Code		Title of the Course		Hours	Credit
III			MATHEMATICAL STATISTICS		4	4

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P		P	P	P		P	
CO-2	P	P	P		P	P	P			
CO-3	P	P	P		P		P		P	
CO-4	P	P	P		P			P	P	
CO-5	P	P	P		P			P		

Number of matches (P) = 30

Relationship = Medium

Low (If the No. of matches are less than 25)

Medium If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

J. A. Afraa Nuhaa   Head of the Department

Course Title	Analytical Number Theory
Total Hrs	60
Hrs/Week	4
Sub. Code	
Course Type	DSE-3B
Credits	4
Marks	100

General Objectives:

Understand the concept of number theory using analytical tools besides enhancing the focus on studying distribution of prime numbers.

Course Objectives: The learner will be able to

CO	Course Objectives
CO-1	Understand the arithmetic functions and their utility in analytic theory of numbers.
CO-2	Remember the concept of Fundamental Theorem of Arithmetic.
CO-3	Analyse the existence of primes by Dirichlet's multiplication.
CO-4	Evaluate the average order of $\mu(n)$ and $\lambda(n)$
CO-5	Understand the concept of some Elementary theorems on the distribution of primes.

UNIT I

The Fundamental Theorem of Arithmetic: Introduction – Divisibility - Greatest Common Divisor – Prime Numbers –Fundamental Theorem of Arithmetic.

UNIT II

The Fundamental Theorem of Arithmetic: The Euclidean Algorithm – The greatest common divisor of more than two numbers. Arithmetical Function and Dirichlet multiplication: Introduction – The Mobius Function $\mu(n)$ – The Euler Totient Function $\varphi(n)$.

UNIT III

Arithmetical Function and Dirichlet multiplication: Multiplicative functions – Multiplicative functions and Dirichlet multiplication –The inverse of a completely multiplicative functions – Liouville's function $\lambda(n)$.

UNIT IV

Averages of Arithmetical Functions: The average order of d(n)–The average order of the divisor functions $\sigma\alpha(n)$ –The average order of $\varphi(n)$ –An application to the distribution of lattice points visible from origin –The average order of $\mu(n)$ and of $\Lambda(n)$.

UNIT V

Some Elementary Theorems on the distribution of Prime Numbers: Introduction–Chebyshev's function $\Psi(n)$ and $\upsilon(n)$ – Relations connecting $\upsilon(x)$ and $\pi(x)$

Textbooks:

Tom M. Apostol – Introduction to Analytical Number Theory.

Unit I: Chapter 1 Section :(1.1-1.5).

Unit II: Chapter 1 Section: (1.7 & 1.8) and Chapter 2 Section: (2.1-2.3)

Unit III: Chapter 2 Section: (2.9– 2.12)

Unit IV: Chapter 3 Section :(3.5 -3.9)

Unit V: Chapter 4 Section :(4.1 -4.3)

Reference Books:

1. W. A. Coppel –Number Theory: An Introduction to Mathematics, Springer Publication Second Edition,

2. William J. Levenque –Topics in Number Theory, Volume I and II, Reading Mass, Addison-Wesley Publication 1956

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the fundamental theorem of Arithmetic to decompose the numbers.	1, 4	U, A
CO-2	Apply Euler phi functions formula to find out the generators of a finite group.	2,3	Ap
CO-3	Recognize Big O notation to express bound on arithmetic functions.	2, 3	U, Ap
CO-4	Analyse the distribution of lattice points visible from origin.	4, 5	A & C
CO-5	Remember the prime number theorem and Chebyshev's function.	2, 4, 5	R & U

Relationship Matrix

Semester	Course Code	Title of the Course					Hours		Credit
III		ANALYTICAL NUMBER THEORY					4		4
Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P		P	P			P	
CO-2	P	P	P		P		P	P		
CO-3	P	P	P		P		P	P		
CO-4	P	P	P		P				P	P
CO-5	P	P	P		P		P		P	P

Number of matches (P) = 31

Relationship = Medium

Low (If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

J. A. Afraa Nuhaa   Head of the Department

Course Title	DSE(C):Fuzzy Set Theory
Total Hrs	60
Hrs/Week	4
Sub. Code	-
Course Type	Theory
Credits	3
Marks	100

General Objectives:

To teach the fundamental concepts in Fuzzy Set theory and develop problems solving skills on lattices of Fuzzy number, characteristics of fuzzy logic, fuzzy norms besides the proof technique.

Course Objectives: The learners will be able to:

CO	Course Objectives
CO-1	Understand the basic concepts of fuzzy sets.
CO-2	Apply their knowledge to grasp the relations between fuzzy sets and crisp sets in application.
CO-3	Categorize the logical disjunction in fuzzy logic and union of fuzzy sets by t-conorms.
CO-4	Acquire the knowledge in Fuzzy Arithmetic.
CO-5	Evaluate different methods for construction of fuzzy sets.

Unit I**: Fuzzy sets:**
Fuzzy sets-Basic types-Basic concepts-Characteristics-Significance of the paradigm shift-Additional properties of α-cuts.

Unit II**: Fuzzy Sets versus CRISP Sets**:
Representation of Fuzzy sets- Extension principle of Fuzzy sets- Operation on Fuzzy sets-Types of Operation- Fuzzy complements.

Unit III: **Operations on Fuzzy Sets:**
Fuzzy intersection- t norms, Fuzzy unions- t Conorms- Combinations of Operations-Aggregation operations.

Unit IV**: Fuzzy Arithmetic**:
   Fuzzy numbers- Linguistic variables- Arithmetic operation on intervals-Lattice of Fuzzy numbers.

Unit V**: Constructing Fuzzy sets:**
   Methods of Construction: An overview – Direct methods with one expert-Direct method with multiple experts-Indirect methods with multiple experts and one expert- Construction from sample data.

Text Book:

G.J. Klir and Bo Yuan, Content and treatment as in the book Fuzzy set and Fuzzy logic: Theory and Applications, Prentice Hall of India Ltd, New Delhi, 2005.

   Unit-I   Chapter 1: Sections 1.3 to 1.5 and Chapter 2.1.
   Unit II: Chapter2: Sections 2.2 to 2.3, Chapter 3: Sections 3.1, 3.2
   Unit III: Chapter 3: Section 3.3 to 3.6
   Unit IV: Chapter 4: Section 4.1 to 4.4
   Unit V: Chapter 10: Section 10.1 to 10.7.

Reference Books:

1. H.J. Zimmermann , Fuzzy Set Theory and its Applications, Allied Publishers, Chennai,1996
2. V. Novak, Fuzzy Sets and their Applications, Adam Hilger, Bristol, 1969.

Course Outcomes: The learner will able to

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the properties of α-cuts by fuzzy set theory.	1,5	Understanding
CO-2	Identify the difference between the crisp and fuzzy sets by using extension principle.	1,3.	Remembering
CO-3	Apply the concept of operation of fuzzy sets.	1,4,5	Applying
CO-4	Analyze the notion of lattices of Fuzzy numbers by fuzzy Arithmetic.	1,2,3.	Analyzing
CO-5	Evaluate the construction of Fuzzy sets by different methods.	1,2,5	Evaluating

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit		
	DSC-		Fuzzy Set Theory				5		
Course Outcomes (COs)	**Programme Learning Outcomes (PLOs)**					**Programme Specific Outcomes (PSOs)**				
	PLO1	PLO2	PLO3	PLO4	PLO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO-1	✓	✓	✓	✓	✓	✓				✓
CO-2	✓	✓	✓	✓	✓	✓		✓		
CO-3	✓			✓	✓	✓			✓	✓
CO-4	✓	✓	✓	✓		✓	✓	✓		
CO-5	✓		✓	✓		✓	✓			✓
	Number of matches = 33 Relationship = Medium									

Prepared by   Checked by

J.A. Afraa Nuhaa   Head of the Department

Course Title	P-III: OPTIMIZATION TECHNIQUE IN JAVA PROGRAMMING PRACTICAL
Total Hrs	60
Hrs / Week	4
Sub. Code	
Course Type	Practical
Credits	2
Marks	100

General Objectives:

Acquire knowledge for read and write files in Java and to design applications with threads in Java and get clear idea about the extend Java class in Optimization Problems. Also, understand the concept how to write Java code in one platform and run it in another platform.

Course Objectives: The learner will be able to

Co. No.	Course Objectives
CO - 1	understand the concept for problem solving in mathematics.
CO – 2	formulate programs using Java programming standard class library.
CO – 3	evaluate the optimization problem using the concept of inheritance.
CO – 4	understand how to write, compile and execute the Java programs.
CO – 5	read and write data using Java streams.

1. Write a JAVA program using simple arithmetic calculation.

2. Write a JAVA program using one dimensional array.

3. Write a JAVA program using classes and objects.

4. Write a JAVA program for payroll using interface.

5. Write a JAVA program for matrix addition & multiplication.

6. Write a JAVA program to find NCR value using Recursion.

7. Write a JAVA program to find the volume of sphere & cone.

8. Write a JAVA program to solve the quadratic equation.

9. Write a JAVA program to find the factorial of a number.

10. Write a JAVA program to find the simple interest.

11. Write a JAVA program to display calendar details.

12. Write a JAVA program to find the area and perimeter of triangle, circle.

13. Write a JAVA program to draw lines, rectangles and ovals in Applet.

14. Write a JAVA program to implement smiley face using Applet.

15. Write a JAVA program to create animation using Applet.

16. Write a JAVA program to create a frame window in Applet.

Course Outcomes(CO)

Co. No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO – 1	Understand the construction of the Java programming language.	1,4	U
CO – 2	Acquire knowledge in Java programming and evaluate the program in simple way.	1,2	E, An
CO – 3	Evaluate the problems using the knowledge of programming and operating system.	1,2,4	E
CO – 4	Remember the Java based software code of medium – to – high complexity level.	1,2,5	R
CO – 5	Understand and gain knowledge to write, compile and debug programs in Java programming.	1,2,4	U

Relationship Matrix

Semester	Course Code	Title of the Course					Hours	Credit
III		P-III: OPTIMIZATION TECHNIQUE IN JAVA PROGRAMMING PRACTICAL					4	2

Course Outcomes (COS)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO – 1	*P*	*P*	*P*		*P*	*P*			*P*	
CO – 2	*P*	*P*			*P*	*P*	*P*			
CO – 3	*P*	*P*			*P*	*P*	*P*		*P*	
CO – 4	*P*	*P*			*P*	*P*	*P*			*P*
CO – 5	*P*	*P*	*P*		*P*	*P*	*P*		*P*	

Number of Matches (P) = 30

Relationship = Medium

Low(If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

Dr. S. Angelin Kavitha Raj   Head of the Department

Mathematics(Unaided)

Course Title	IDC II: Discrete Structure II
Total Hrs.	30
Hrs./Week	2
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objective:

        To solve the counting problems by using counting principles and to understand the fundamental concept of probability.

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	discuss the two basic counting principles and the pigeonhole principle.
CO-2	understand the selection and arrangement of objects of a set of particular size.
CO-3	explain the fundamental concepts of probability.
CO-4	understand the Baye's theorem.
CO-5	understand the Karnaugh maps for the sum-of-product expansion.

Unit I

        Basics of Counting –Pigeonhole Principle.

Unit II

        Permutations and Combinations - Inclusion and Exclusion Principle..

Unit III

        Probability - Baye's Theorem .

Unit IV

        Boolean Functions and its Representation.

Unit V

        Simplifications of Boolean Functions.

Textbooks:

1. Kennath H Rosen, Discrete Mathematics & its Applications with Combinatorics and Graph Theory , Tata McGraw- Hill Publishing Company Limited, sixth Edition

2. S.Arumugam and A.Thangapandi Issac, Statistics, New Gamma Publishing House, 2015.

   Unit I: TB1 Chapter 5 (5.1,5.2)
   Unit II: TB1 Chapter 5 (5.3) and Chapter 6 (6.5)
   Unit III: TB2 Chapter 11
   Unit IV: TB1 Chapter 10 (10.1, 10.2)
   Unit V: TB1 Chapter 10 (10.4)

Reference Books:

Susanna S. Epp, Discrete Mathematics with Applications, Brooks/Cole, Fourth Edition, 2011.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Summarize the concept of pigeonhole principle.	1,2,4	U
CO-2	Identify the solution for problem related with permutation and combination.	1,2,4	R
CO-3	Illustrate the varies example for Inclusion and Exclusion principle.	1,2,4	Ap
CO-4	Calculaate the solution for Baye's theorem.	1,2	An
CO-5	Apply K-maps to simplify sum-of-products expansions.	1,2	Ap

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit		
III	---		Discrete Structure II		2		4		

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P	P		P	P		P	
CO-2	P	P	P	P		P	P		P	
CO-3	P	P	P	P		P	P		P	
CO-4	P	P	P			P	P			
CO-5	P	P	P			P	P			

Number of matches (P) = 31
Relationship = Medium
Low (If the No. of matches are less than 25)
Medium (If the No. of matches are between 25 and 33)
High (If the No. of matches are more than 33)

Prepared by   Checked by

Name : Dr. S. Jamal Fathima   Head of the Department

Signature :

Course Title	DSC13 : Complex Analysis
Total Hrs.	75
Hrs./Week	5
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objective:

To give the detailed information about analytic functions and to evaluate the definite integral by using fundamental theorems

Course Objectives: The learner will be able to:

CO	Course Objectives
CO-1	understand the basic properties of Analytic functions and radius of convergence of the series.
CO-2	explain the geometrical properties of the curves and conformal mappings.
CO-3	apply the Cauchy's theorem and Cauchy's integral formula for evaluating contour integral.
CO-4	understand the general form of the Cauchy's theorem and identify the number of zeros and poles of the analytic function.
CO-5	apply Cauchy's Residue theorem to evaluate the definite integral.

Unit – I

Complex Functions**:** Introduction to the Concept of Analytic Function - Elementary Theory of Power Series.

Unit – II

Conformality: Arcs and closed curves - Analytic functions in Regions-Conformal Mapping - Length and Area. Linear Transformations: The Linear Group - The cross ratio - Symmetry.
.
Unit – III

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 - IV

Local properties of Analytic Functions: Removable Singularities and Taylor's Theorem – Zeros and Poles - The Local Mapping–The maximum principle. The General forms of Cauchy's Theorems: Chains and cycles – simple connectivity –Homology – The general statement of Cauchy's Theorem.

Unit - V

Calculus of Residues : The residue Theorem – Argument Principle – Evaluation of definite integral. Harmonic functions: Definition and Basic properties – Mean value property – Poisson formula – Schwarz's Theorem.

Textbooks:

Lars V. Ahlfors, Complex Analysis, McGraw- Hill International Company, Third Edition.

UNIT I: Chapter 2(1.1 to 1.4 and 2.1 to 2.5)
UNIT II: Chapter 3(2.1 to 2.4 and 3.1 to 3.3)
UNIT III: Chapter 4(1.1 to 1.5 and 2.1 to 2.3)
UNIT IV: Chapter 4(3.1 to 3.4 and 4.1 to 4.4)
UNIT V: Chapter4 (5.1 to 5.3 and 6.1 to 6.4).

Reference Books:

1. V. Karunakaran, Complex Analysis, Alpha Science International Ltd, Second Edition, 2005.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Summarize properties of Analytic function and power series.	1,5	R
CO-2	Discuss the cross ratio of the Linear Transformation	1,5	U
CO-3	Calculate a contour integral applying fundamental theorems of Cauchy's	1,2,4,5	Ap
CO-4	Analyze the local properties of analytic functions such as removable singularity, essential singularity and Poles	1,5	An
CO-5	Evaluate the definite integral of the meromorphic functions.	1,2,4,5	Ev

Relationship Matrix

Semester	Course Code	Title of the Course		Hours	Credit
III		COMPLEX ANALYSIS		5	4

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P		P	P				P
CO-2	P	P	P		P	P				P
CO-3	P	P	P	P	P	P	P		P	P
CO-4	P	P	P		P	P				P
CO-5	P	P	P	P	P	P	P		P	P
	Number of matches (P) = 36 Relationship = High Low (If the No. of matches are less than 25) Medium (If the No. of matches are between 25 and 33) High (If the No. of matches are more than 33)									

Prepared by   Checked by

Name : Dr. S. Jamal Fathima   Head of the Department

Course Title	Functional Analysis
Total Hrs.	75
Hrs./Week	5
Sub.Code	
Course Type	Theory
Credits	4
Marks	100

General Objective:

To give in-depth knowledge about Banach Space, Hilbert Space, various types of operators and their Eigen values.

Course Objectives: The learner will be able to

CO	Course Objectives
CO-1	understand the Real and complex spaces for Banach space
CO-2	analyze the concepts of open mapping theorem.
CO-3	characterize Hilbert space in terms of Banach space
CO-4	gain knowledge to study the properties of Adjoint operators
CO-5	evaluate the spectrum corresponding to an operator.

Unit – I Banach Spaces: The definition and some examples – Continuous linear transformation – The Hahn Banach Theorem.

Unit – II The natural imbedding of N in N** - The open mapping theorem – The conjugate of an operator.

Unit – III Hilbert Spaces: The definition and some simple properties - Orthogonal complements - Orthonormal sets - The Conjugate space H^* (without proof).

Unit – IV The adjoint of an operator – Self adjoint operator - Normal and Unitary Operator – Projections.

Unit – V Finite dimensional Spectral Theory: Matrices – Determinants and the spectrum of an operator – The spectral Theorem.

Textbooks:

George F.Simmons – Introduction to Topology and Modern Analysis, Tata

McGraw-Hill Publishing Company Ltd, New Delhi.

UNIT I: Chapter 9(Section 46 to 48)

UNIT II: Chapter 9(Section 49 to 51)
UNIT III: Chapter 10(Section 52 to 55)
UNIT IV: Chapter 10(Section 56 to 59)
UNIT V: Chapter 11(Section 60 to 62)

Reference Books:
Erwin Kreyszig, Introductory Functional Analysis with Applications, Wiley Classics Library
Edition Published, Singapore, 1989.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the structure of Linear space with different norms.	1,2	U
CO-2	Apply the knowledge of weak* topology on Normed linear space.	1,4	R, Ap
CO-3	Evaluate the orthonormal basis for the Hilbert Space.	1,2,4	E
CO-4	Analyze the different types of operator on linear space.	1,3,4	A
CO-5	Remember the properties of an operator to evaluate Eigen value.	1,2,5	R, Ev

Relationship Matrix

Semester	Course Code		Title of the Course		Hours	Credit
IV			**FUNCTIONAL ANALYSIS**		5	4

Course Outco mes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO-1	P	P	P			P	P			
CO-2	P	P	P	P		P			P	
CO-3	P	P	P	P		P	P		P	
CO-4	P	P	P	P	P	P	P		P	
CO-5	P	P	P		P	P	P			P
	Number of matches (P) = 33 Relationship = Medium Low (If the No. of matches are less than 25) Medium (If the No. of matches are between 25 and 33) High (If the No. of matches are more than 33)									

Prepared by   Checked by

Name : Dr.A.Mallika   Head of the Department

Signature :

Course Title	DSC – 15: R – PROGRAMMING
Total Hrs	60
Hrs / Week	4
Sub. Code	
Course Type	Theory
Credits	4
Marks	100

General Objectives:

Create the R-studio, identify the console and scripts in easiest way. Using the API, the learner can type their own R code, also remember the R Syntax easily

Course Objectives: The learner will be able to

Co. No.	Course Objectives
CO – 1	understand the data types in R-Programming.
CO – 2	create, find and remove data in R-Programming.
CO – 3	study about the operators like mathematical and logical.
CO – 4	acquire knowledge to create the loops for vectors in their own way.
CO – 5	gain knowledge in creating data as a list using loops.

UNIT I

Introduction: Introducing to R – R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all() and any() – Vectorized operations – NA and NULL values – Filtering – Vectorised if-then else – Vector Equality – Vector Element names

UNIT II

Matrices and arrays: Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays.

UNIT III

Lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists. Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames

UNIT IV

Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions.

UNIT V

Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues – Writing Upstairs - Recursion – Replacement functions – Tools for composing function code.

TEXT BOOKS:

Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.

REFERENCE BOOKS:

Matthias Kohl, Introduction to statistical data analysis with R, bookboon.com – The eBook company 2015, 1st edition.

Reference Links:

1. https://youtu.be/ChtfaUeCHKc
2. https://youtu.be/Hrwe8AsIy5U
3. https://youtu.be/OskXqFhEJ0w
4. https://youtu.be/XRlQh4YtD-k
5. https://youtu.be/TX6SE5IjkWQ
6. https://youtu.be/-dYq4BEcrkQ
7. https://youtu.be/1Xew90NCrpk
8. https://youtu.be/6LP1IlPjfFw
9. https://youtu.be/5pjBaPgGhyk

UNIT I – Chapter: 1 & 2

UNIT II – Chapter: 3;   UNIT III – Chapter: 4 & 5

UNIT IV – Chapter: 6;   UNIT V – Chapter: 7 (7.1 – 7.11)

Course Outcomes(CO)

Co. No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO – 1	Understand the concept, how to download & install R studio to work with data structures.	1,3,5	U
CO – 2	Analyse and explore data sets using matrices and arrays.	1,4,5	An
CO – 3	Remember and apply the main R data structures-vector and data frames.	1,2,3	R, Ap
CO – 4	Analyse the basics in R – Programming to form a factors	1,4,5	An

	and tables.		
CO – 5	Evaluate the external data into R for statistical analysis and recursion.	1,2	E

Relationship Matrix

Semester	Course Code	Title of the Course					Hours	Credit
IV		**DSC – 15: R – PROGRAMMING**					4	4
Course Outcomes (COS)	Programme Learning Outcomes(PLOs)					Programme Specific Outcomes (PSOs)				

Course Outcomes (COS)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO – 1	*P*	*P*	*P*			*P*		*P*		*P*
CO – 2	*P*	*P*	*P*			*P*			*P*	*P*
CO – 3	*P*	*P*	*P*		*P*	*P*	*P*	*P*		
CO – 4	*P*	*P*	*P*		*P*	*P*			*P*	*P*
CO – 5	*P*	*P*	*P*		*P*	*P*	*P*			

<div align="center">

Number of Matches(P) = 32

Relationship = Medium

</div>

Low(If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

Dr. S. Angelin Kavitha Raj   Head of the Department

Mathematics (Unaided)

Course Title	Project
Total Hrs.	120
Hrs./Week	8
Sub.Code	
Course Type	
Credits	8
Marks	100

General Objective:

To acquire knowledge about the nature, concepts, methods, techniques and objectives of advanced fields of Algebra, Analysis, Geometry, Topology and applied Mathematics.

Course Objectives: The learner will be able to

CO	Course Objectives
CO-1	To develop an enhanced skill in research field.
CO-2	To gain knowledge in current trends.
CO-3	To understand the different types of research.
CO-4	To develop oral and written presentation skills
CO-5	To prepare the documents using Latex software.

GUIDELINES:

The following are the guidelines to be adhered to

• The project should be an individual one.

• The language for the project is English.

• The Minimum number of pages should be 60.

• The project should be typed using Latex.

• Project observations, suggestions and conclusion must form an inevitable part of the

 project.

• Marks for the project report will be 200 divided as 100 for Internal and 100 for external.

• Average of two marks will be taken totally for 100.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the various stages of the project.	1,2,4,5	U
CO-2	Analyse the learning and understand the techniques for project.	1,2,3,4,5	A
CO-3	Analyse the types of research review and data collection.	1,2,3,4,5	A
CO-4	Evaluate a qualitative and intuitive understanding many of the big ideas of mathematics.	1,2,3,5	E
CO-5	Understand the ways that mathematical knowledge is established and validated through proof is also important as well as limitation of the proof.	1,2,4,5	U

Relationship Matrix

Semester	Course Code		Title of the Course		Hours		Credit	
IV	---		PROJECT		8		8	

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P		P	P	P		P	P
CO-2	P	P	P			P	P	P	P	P
CO-3	P	P	P			P	P	P	P	P
CO-4	P	P	P	P	P	P	P	P		P
CO-5	P	P	P		P	P	P		P	P

Number of matches (P) =41

Relationship = High

Low (If the No. of matches are less than 25)
Medium (If the No. of matches are between 25 and 33)
High (If the No. of matches are more than 33)

Prepared by   Checked by

R.HEPZIBAH ANITA   Head of the Department

Course Title	DSE 4A: Partial Differential Equations
Total Hours	60
Hours / Week	4
Code	
Course type	Theory
Credits	3
Marks	100

General Objectives:

To acquire knowledge of solving partial differential equations using various methods and equation of second order with constant and variable coefficient.

Course Objectives: The learner will be able to

CO NO.	Course Objectives
CO 1	understand the concept of first order partial differential equation.
CO 2	analyze the Cauchy's method of characteristics in first order partial differential equation.
CO 3	acquire the idea in special type of first order equations.
CO 4	evaluate the problems using second order partial differential equation
CO 5	compute the characteristic curves of second order equations with three variables.

UNIT I

Partial Differential Equations - Origin of First order Partial Differential Equations Cauchy's problem for first order equations- Linear equations of the first order –Integral surfaces passing through a given curve.

UNIT II

Surfaces orthogonal to a given system of surfaces – Cauchy's method of characteristics - Compatible systems of first order equations.

UNIT III

Charpit's method - Special type of first order equations- Solution satisfying the given conditions - Jacobi's Method.

UNIT IV

Partial differential equations of second order-Linear PDE with constant coefficients- Equations with variable coefficients.

UNIT V

Characteristic curves of second order equations-Characteristics of equations in three variables-The solution of linear hyperbolic equations-Separation of variables in a PDE.

TEXT BOOK :

Ian N. Sneddon – Elements of Partial Differential Equations – Dover Publications, Inc-Mineola, New York.

UNIT I: Chapter 2 (Section 1 to 5)
UNIT II: Chapter 2 (Section 6, 8, 9)
UNIT III: Chapter 2(Section 10 to 13)
UNIT IV: Chapter 3(section 1, 4, 5)
UNIT V: Chapter 3(section 6-9)

Reference Book:

1. E. T. Copson, Partial Differential Equations Second edition, Cambridge University,1975.
2. K.SankaraRao, Introduction to Partial differential equations (Third edition), Prentice- Hall of India Ltd, New Delhi, 2016.

Course Outcomes

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO 1	Evaluate the linear equation of First order Partial Differential Equations	1,2,5	U,E
CO 2	Understand how to construct Cauchy's problem for first order partial differential equation.	1,2	U
CO 3	Remember the concept of the compatible systems of first order equations	1,2	R
CO 4	Apply the charpit's and Jacobi'sMethod to solve the problem	1,2,3,5	A,E
CO 5	Understand the concept of Linear partial differential with constant and variable coefficient.	1,3,5	U

Relationship Matrix

Semester	Course Code		Title of the Course		Hours	Credit
IV			**PARTIAL DIFFERENTIAL EQUATIONS**		4	3

Course Outcomes (CO)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P			P	P	P			P
CO-2	P	P				P	P			
CO-3	P	P				P	P			
CO-4	P	P	P		P	P	P	P		P
CO-5	P	P			P	P		P		P
	Number of matches (P) = 28 Relationship = Medium Low (If the No. of matches are less than 25) Medium (If the No. of matches are between 25 and 33) High (If the No. of matches are more than 33)									

Prepared by   Checked by

Name: U. Jerseena   Head of the Department

Signature :

Course Title	DSE 4B : Numerical Analysis
Total Hrs	60
Hrs/Week	4
Sub.Code	
Course Type	Theory
Credits	3
Marks	100

General Objectives:

　　　　To Apply numerical methods to obtain approximate solutions to mathematical problem.

Course Objectives: The learner will be able to

CO	Course Objectives
CO-1	evaluate the algebraic and transcendental equation.
CO-2	study the basic concepts of interpolation in various methods.
CO-3	understand the notion of Numerical differentiation and integration.
CO-4	know the concept of matrices of linear system of equations.
CO-5	get a clear idea in Taylor's series, Euler's and Runge Kutta Methods.

Unit – I

　　　　Solution of Algebraic and Transcendental equations – Introduction, The Bisection Method, Method of False position, Iteration Method.

Unit – II

　　　　Interpolation: Finite differences - Forward differences, Backward differences, Central differences, Symbolic relations, Newton formula for interpolation.

Unit – III

　　　　Numerical Differentiation and Integration – Introduction - Numerical Differentiation - Errors in Numerical Differentiation - Cubic spline method - maximum and minimum values of a tabulated function, Numerical integration -Trapezoidal Rule and Simpson's 1/3 and3/8 rules.

Unit – IV

Matrices of Linear System of Equations - Gaussian Elimination method, Gauss-Jordan method, Modification of the Gauss method to compute the inverse.

Unit – V

Numerical Solution of Ordinary differential equations - Solution by Taylor Series, Picard's method of Successive approximations, Euler method, Modified Euler method - Runge-Kutta Method.

Textbooks:

Introductory Methods of Numerical Analysis, (4th Edition) by **S. Sastry**, PHI Learning Pvt Ltd, New Delhi,2009.
Unit I: Chapter II (Section 2.1-2.4)
Unit II: Chapter III (Section 3.3(3.3.1-3.3.4),3.6).
Unit III: Chapter V (Section 5.1,5.2(5.2.1,5.2.2),5.3,5.4(5.4.1-5.4.3))
Unit IV: Chapter VI (Section 6.3.2,6.3.3,6.3.4)
Unit V: Chapter VII (7.2-7.4,7.4.2,7.5)

Reference Books:

1. **Kandasamy. P, Thilagavathi. K and Gunavathi. K "Numerical methods"** – S. Chand and Company Ltd, New Delhi – Revised Edition 2007.
2. **Venkataraman M. K.,"Numerical Methods in Science and Engineering"** National Publishing company V Edition 1999.

Course Outcomes

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the fundamental concepts of algebraic and transcendental equations.	1,2	U
CO-2	Analyze the common interpolation formula to solve Newton's interpolation.	1,2,3,4	A
CO-3	Evaluate any problems in numerical differentiation and integration.	1,2,4	E
CO-4	Remember the concept of matrices in Linear System and its types.	1,2,5	R
CO-5	Understand the numerical solutions of ordinary differential equations by the Taylor's series, Euler's and Runge Kutta Methods.	1,2	U

Relationship Matrix

Semester	Course Code		Title of the Course		Hours	Credit
IV			DSE 4B: NUMERICAL ANALYSIS		4	3

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	P	P	P	P		P	P			
CO-2	P	P	P		P	P	P	P	P	
CO-3	P	P	P		P	P	P		P	
CO-4	P		P		P	P	P			P
CO-5	P	P	P	P		P	P			
	Number of matches (P) = 33 Relationship = High Low (If the No. of matches are less than 25) Medium (If the No. of matches are between 25 and 33) High (If the No. of matches are more than 33)									

Prepared by   Checked by

R.HEPZIBAH ANITA   Head of the Department

Signature :

Course Title	Representation Theory of Finite Groups
Total Hrs.	60
Hrs./Week	4
Sub.Code	
Course Type	Theory
Credits	3
Marks	100

General Objective:

To present the ideas of group characters and basic properties of irreducible characters, as well as their connection to group algebras' ring structure.

Course Objectives: The learners will be able to:

CO No.	Course Objectives
CO-1	Understand the concepts of G-Module and group algebras
CO-2	Explain FG – Homomorphism and Machke's theorem
CO-3	Comprehend irreducible modules and conjugacy classes
CO-4	Know about characters and inner characters of $\mathbb{C}$G-module.
CO-5	Understand the character table and orthogonal relation

Unit – I :

Group representations - FG Modules - FG - submodules and Reducibility - Group algebras

Unit – II:

FG-homomorphisms – Maschke's theorem – Consequences of Maschke's theorem – Schur's lemma.

Unit – III:

Irreducible modules and the group algebra - More on the group algebra - Conjugacy classes.

Unit – IV :

Characters - Inner product of characters.

Unit – V :

The number of irreducible characters - Character Tables and Orthogonality relations - Normal subgroups and Lifted characters.

Textbook:

G.James and M.Liebeck, "Representations and Characters of Groups", 2nd Edition, Cambridge University Press, London, 2001.

UNIT-I: Chapter 3 to 6
UNIT-II: Chapter 7 to 8 and Chapter 9 (Sec 9.1,9.2)
UNIT-III : Chapter 10 to 11 and Chapter 12 (Sec 12.1,12.2)

UNIT-IV : Chapter 13 and Chapter 14 (Sec 14.1, 14.2)
UNIT-V : Chapter 15, Chapter 16 (Sec 16.1, 16.2) and Chapter 17 (Sec 17.1, 17.2)

Reference Books:

1. C.W. Curtis and I.Reiner, "Methods of Representation Theory with Applications to Finite Groups and Orders", Volume 1, Wiley – Interscience, New York, 1981.
2. J.P. Serre, "Linear Representation of Finite Groups", Springer-Verlag, New York, 1977.
3. W.Fulton and J. Harris, "Representation Theory – A First Course", Graduate Texts in Mathematics 129, Springer – Verlag, New York, 1991.

Course Outcomes

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Recognize the connection between RG-module and representation of group	1,2,5	Understanding
CO-2	Apply Schur's lemma to determine irreducible representation of finite abelian groups	1,5	Applying
CO-3	Analyze the structure of the group algebra $\mathbb{C}G$.	1,2,5	Analyzing
CO-4	Calculate the dimension of Hom(V,W) over $\mathbb{C}G$.	1,4,5	Evaluating
CO-5	Find all the normal subgroups of G by character table`	1,3,5	Evaluating

Relationship Matrix

Semester	Course Code	Title of the Course	Hours	Credit
I	---	Groups, Rings & Fields	5	4

Course Outcomes (COs)	Programme Learning Outcomes (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	✓	✓			✓	✓	✓			✓
CO-2	✓	✓			✓	✓				✓
CO-3	✓	✓			✓	✓	✓			✓
CO-4	✓			✓	✓	✓	✓		✓	✓
CO-5	✓		✓		✓	✓	✓	✓		✓
	Number of matches (✓) = 31 Relationship = Medium									

Prepared by   Checked by

Name : S.Jamal Fathima   Head of the Department

Signature :

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Course Title	P-IV: R – PROGRAMMING PRATICAL
Total Hrs	60
Hrs / Week	4
Sub. Code	
Course Type	Practical
Credits	2
Marks	100

General Objectives:

To obtain knowledge for downloading the R studio and install it and able to work in a workspace containing an R data frame. Also gain knowledge to Run, edit and save the script from R studio.

Course Objectives: The learner will be able to

Co. No.	Course Objectives
CO - 1	compose R data into external files.
CO – 2	study about basic math functions like sum(), Avg(), etc.
CO – 3	display the results using graphs.
CO – 4	create and change the data in vectors, matrices and arrays using loops.
CO – 5	save the customize graphs in different ways.

1. Introduction to R

2. Identifying Types of Variables: Level of Measurement.

3. Univariate Statistics

4. Introduction to Probability.

5. The Normal curve.

6. Measures of Central Tendency and Dispersion.

7. Standard Deviations, Standard Scores and the Normal Distribution

8. Sampling

9. Hypothesis Testing: Testing the Significance of the difference between two means.

10. Hypothesis testing: One and Two tailed Tests.

11. Bivariate Statistics for Normal Data.

12. Bivariate Statistics for Ordinal Data.

13. Bivariate Statistics for Interval / Ratio Data.

14. OLS Regression – Modelling Continuous Outcomes.

Course Outcomes(CO)

Co. No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO – 1	Understand the programming language for statistical analysis.	1,2,5	U
CO – 2	Evaluate the problems in probability and statistics.	1,2,4	E
CO – 3	Analyse and explore data sets to create test table.	1,2	An
CO – 4	Understand how to find the regression values using R-Programming.	1,2,4	U
CO – 5	Remember the program and find the value easily for sampling.	1,2,5	R, E

Relationship Matrix

Semester	Course Code	Title of the Course								Hours	Credit
IV		**P-IV: R – PROGRAMMING PRATICAL**								4	2

Course Outcomes (COS)	Programme Learning Outcome (PLOs)					Programme Specific Outcomes (PSOs)				
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO – 1	P	P	P		P	P	P			P
CO – 2	P	P			P	P	P		P	
CO – 3	P	P	P		P	P	P			
CO – 4	P	P	P		P	P	P		P	
CO – 5	P	P	P		P	P	P			P

Number of Matches(P) = 33

Relationship = Medium

Low(If the No. of matches are less than 25)

Medium (If the No. of matches are between 25 and 33)

High (If the No. of matches are more than 33)

Prepared by   Checked by

Dr. S. Angelin Kavitha Raj   Head of the Department
Signature: