SRI SARADA COLLEGE FOR WOMEN
(AUTONOMOUS),
SALEM-16

DEPARTMENT OF MATHEMATICS

COURSES SCHEME
&
SYLLABUS
FOR
PG MATHEMATICS

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS) SALEM-16

DEPARTMENT OF MATHEMATICS

M.Sc. MATHEMATICS COURSE STRUCTURE UNDER CBCS

(Applicable to the candidates admitted from the academic year 2020 - 2021 onwards)

Total Credits: 90 +17*

I SEMESTER

COURSE	COURSE TITLE	CODE	HRS/ WEEK	CREDITS
Core - I	Algebra	20PMAC1	6	5
Core – II	Real Analysis	20PMAC2	6	5
Core – III	Ordinary Differential Equations	20PMAC3	6	4
Core – IV	Classical Dynamics	20PMAC4	6	5
Elective I			6	4
Extra Skills Productive Preparation for CSIR NET/ SET /JRF – I (Self – study–1 Credit extra) Articulation and Idea Fixation Skills – 6 Hours per Semester (out of college hours - 1 Credit extra) Life Skills Promotion – 2 Hours per Semester (out of college hours – 1 Credit extra) Physical Fitness Practice – 20 Hours per Semester (out of college hours – 1 Credit extra)				
Total			**30**	**23 + 4***

II SEMESTER

COURSE	COURSE TITLE	CODE	HRS/ WEEK	CREDITS
Core -V	Linear Algebra	20PMAC5	6	5
Core – VI	Measure and Integration	20PMAC6	5	3
Core – VII	Partial Differential Equations	20PMAC7	5	4
Core – VIII	Differential Geometry	20PMAC8	6	5
Elective II			6	5
Human Rights	Human Rights	20PHRSC	2	2
Extra Skills Productive Preparation for CSIR NET/ SET /JRF – II (Self – study–1 Credit extra) Articulation and Idea Fixation Skills – 6 Hours per Semester (out of college hours – 1 Credit extra) Life Skills Promotion – 2 Hours per Semester (out of college hours – 1 Credit extra) Physical Fitness Practice – 20 Hours per Semester (out of college hours – 1 Credit extra)				
Total			**30**	**24 + 4***

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS) SALEM-16
DEPARTMENT OF MATHEMATICS
M.Sc. MATHEMATICS COURSE STRUCTURE UNDER CBCS
(Applicable to the candidates admitted from the academic year 2019 - 2020 onwards)

III SEMESTER

COURSE	COURSE TITLE	CODE	HRS/ WEEK	CREDITS
Core – IX	Complex Analysis	19PMAC9	5	4
Core – X	Topology	19PMAC10	6	4
Core – XI	Number Theory	19PMAC11	5	4
Core – XII	Mathematical Statistics	19PMAC12	5	4
Elective III			5	3
Extra Disciplinary Course			4	4
Extra Skills Productive Preparation for CSIR NET/ SET /JRF – III (Self – study–1 Credit extra) Articulation and Idea Fixation Skills – 6 Hours per Semester (out of college hours – 1 Credit extra) Life Skills Promotion – 2 Hours per Semester (out of college hours – 1 Credit extra) Physical Fitness Practice – 20 Hours per Semester (out of college hours – 1 Credit extra) Preparation for the project – 5 Hours per Week (out of college hours)				
Total			**30**	**23 + 3***

IV SEMESTER

COURSE	COURSE TITLE	CODE	HRS/ WEEK	CREDITS
Core – XIII	Functional Analysis	19PMAC13	6	4
Core – XIV	Mathematical Modeling	19PMAC14	6	4
Elective IV			6	4
Core (Practical)	Core Practical – MATLAB	19PMAQC	6	3
Core – XV	Project and project viva-voce	19PMAPC	6	5
Extra Skills Productive Preparation for CSIR NET/ SET /JRF – IV (Self – study–1 Credit extra) Articulation and Idea Fixation Skills – 6 Hours per Semester (out of college hours – 1 Credit extra) Life Skills Promotion – 2 Hours per Semester (out of college hours – 1 Credit extra) Physical Fitness Practice – 20 Hours per Semester (out of college hours – 1 Credit extra) Certificate course on Latex – 30 Hours (out of college hours – 1 Credit extra)				
Total			**30**	**20 + 5***

ELECTIVES OFFERED

Elective – I

COURSE TITLE	CODE	HOURS/WEEKS	CREDITS
Numerical Analysis	20PMAEC1	6	4
Calculus of Variation and integral equations	20PMAESC1	6	4

Elective – II

COURSE TITLE	CODE	HOURS/WEEK	CREDITS
Fuzzy sets and their applications	20PMAEC2	6	5
Difference equations	20PMAESC2	6	5

Elective – III

COURSE TITLE	CODE	HOURS/WEEKS	CREDITS
Fluid dynamics	19PMAEC3	5	3
Graph theory	19PMAESC3	5	3

Elective – IV

COURSE TITLE	CODE	HOURS/WEEK	CREDITS
Optimization techniques	19PMAEC4	6	4
Representation Theory	19PMAESC4	6	4

Extra Disciplinary Course

COURSE TITLE	CODE	HOURS/WEEK	CREDITS
Quantitative Aptitude for Competitive Examination	19PMAEDC	4	4

Programme Title: M.Sc. Mathematics

Programme Outcomes:

At the end of the programme, the students will be able to

PO Number	PO Statement
PO1	To enhance mathematical and computational strategies in order to solve mathematical problems.
PO2	To construct logical arguments for solving the abstract or applied mathematical problems based on ethical principles.
PO3	To identify the accurate solutions for the society oriented problems via various mathematical models.
PO4	To demonstrate various specialised areas of advanced mathematics and its applications using modern tools.
PO5	To know the use of computers both as an aid and as a tool to study problems in Mathematics.
PO6	To present papers in seminars and conferences in order to defend their mathematical skills on various topics in the curriculum.
PO7	To train the students as professional mathematicians either in academia or elsewhere.
PO8	To inculcate the knowledge of formulation and apply the mathematical concepts which are suitable for real life applications.
PO9	To prepare the students for eligibility tests affirmed by UGC like CSIR-NET and SET.

Programme Specific Outcomes:

PSO Number	PSO Statement
PSO1	Develop the mathematical skills and knowledge for their intrinsic beauty, for proficiency in analytical reasoning, utility in modeling and solving the real world problems by using the concepts of Algebra, Analysis, Dynamics, Differential Equations, Geometry, Topology, Operations Research, Fuzzy Sets & Fuzzy Logic, Fluid Dynamics and Matlab.
PSO2	Develop computational and logical thinking and the habit of making conclusions based on quantitative information.
PSO3	Work efficiently and constructively as a part of a team and do project individually.
PSO4	Do projects related to emerging Social and Environmental issues.
PSO5	Join in various Universities and Institutions like IMSC, IISc, etc., in order to do summer research projects on Algebra, Analysis, Topology, Mechanics, Fluid Dynamics, Differential Equations, Number Theory, Matlab, Differential Geometry and Fuzzy sets.

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16

M.Sc. MATHEMATICS - SEMESTER - I

CORE I – ALGEBRA (20PMAC1)

For candidates admitted from 2020 - 2021 onwards (Under CBCS)

6 Hours / week **5 Credits**

Course Objectives: The course aims to

1. introduce the basic concepts of abstract algebra.
2. make them understand the theory and applications on various algebraic structures.

Syllabus

Unit - I **No. of Hours : 18**

Group Theory-Another Counting Principle, Sylow's Theorem & Direct Products
Chapter-2-sec: 2.11, 2.12 & 2.13 (Page No: 82 - 108)

Unit - II **No. of Hours : 18**

Group Theory - Finite Abelian Groups. Fields -Extension Fields & Roots of Polynomials.
Chapter2-Sec:2.14(Page No:109 - 115) Chapter-5-sec:5.1& 5.3(Page No: 207-215,219 -227)

Unit - III **No. of Hours : 18**

Fields- More About Roots, The Elements of Galois Theory & Solvability of Radicals.
Chapter 5-Sec: 5.5, 5.6 & 5.7 (Page No: 232 - 256)

Unit - IV **No. of Hours : 18**

Selected Topics -Finite Fields, Wedderburn'sTheorems on Finite Division Rings &A Theorm of Frobenius.
Chapter-7-Sec: 7.1, 7.2 & 7.3(Page No: 355 - 370)

Unit - V **No. of Hours : 18**

Modules and vector spaces- Definitions and examples, Submodules and direct sums, R-homomorphisms and Quotient modules, Completely reducible modules & Free modules.
Chapter-14-Sec: 1, 2, 3, 4 & 5 (Page No: 246 - 268)

Text Book:

1. Topics in Algebra (Second edition) by **I.N.Herstein,** Vikas publishing house Pvt.Ltd (For Units: I - IV)
2. Basic Abstract Algebra (Second edition) by **P.B.Bhattacharya, S.K.Jain and S.R.Nagpaul,** Cambridge University Press,1997.
   (For Unit: V)

Books for Reference:

1. Algebra by **M.Artin,** Prentice Hall of India, 1991.
2. Algebra,Vol.I-Groups, Vol.II Rings by **I.S. Luther and I.B.S.Passi**, Narosa Publishing House, New Delhi,1999.
3. Basic Algebra Vol.I&II by **N.Jacobson,** Hindustan Publishing Company , New Delhi.

Web Resources:

1. https://books.google.co.in/books?id=eOUIBQAAQBAJ&printsec=frontcover&dq=algebra+books&hl=en&sa=X&ved=0ahUKEiylJrc_4fbAhXIOI8KHWXrAboQuwUILTAB#v=onepage&q=algebra%20books&f=false
2. www.math.tifr.res.in>~publ>pamphlets
3. www.Math.uchicago.edu>REUPapers>Idelhaj
4. www.math.clemson.edu>classes>slides

Note: Questions to be taken only from the Text Books.

Course Outcomes (CO): On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand Sylows theorem and its applications	K-3
CO2	Acquire knowledge on extension fields and roots of polynomials	K-4
CO3	Analyze the elements of Galois theory and Galois Groups over the rationals	K-4
CO4	Explain Wedderburn's Theorem on Finite Division Rings and a theorem of Frobenius	K-3
CO5	Understand the basic concepts of modules	K-2

K-1: Recall; K-2: Understand; K-3: Apply; K-4: Analyze; K-5: Evaluate; K-6: Create.

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	L	M	L	S	-	M	S	-	S	S	L	S	-	S
CO2	M	M	L	S	-	M	S	-	S	S	L	S	-	S
CO3	L	M	-	S	-	M	S	-	S	S	-	S	-	S
CO4	S	S	L	S	-	M	S	-	S	S	L	S	-	S
CO5	L	M	-	M	-	M	S	-	S	S	-	S	-	S

S - Strong, M - Medium, L - Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.Sc. MATHEMATICS - SEMESTER - I

CORE -II REAL ANALYSIS (20PMAC2)

For candidates admitted from 2020 - 2021 onwards (Under CBCS)

6 Hours / week **5 Credits**

Course Objectives : The course aims to

1. understand the concepts of functions of bounded variation
2. describe the Reimann – Stieltjes integral.
3. to acquire knowledge about the Inverse function theorem and Implicit function theorem

Unit - I **No. of Hours: 18**

Functions of bounded variation - Introduction - Properties of monotonic functions - Functions of bounded variation - Total variation - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of two increasing functions - Continuous functions of bounded variation.
Chapter 6 (Sec 6.1 to 6.8)

Unit - II **No. of Hours:18**

The Riemann - Stieltjes Integral - Introduction - Notation - The definition of the Riemann - Stieltjes integral - Linear Properties - Integration by parts- Change of variable in a Riemann - Stieltjes integral - Reduction to a Riemann Integral - Euler's summation formula - Monotonically increasing integrators, Upper and lower integrals - Additive and linearity properties of upper and lower integrals - Riemann's condition - Comparison theorems.
Chapter 7 (Sec 7.1 to 7.14)

Unit - III **No. of Hours:18**

The Riemann-Stieltjes Integral - Integrators of bounded variation-Sufficient conditions for the existence of Riemann-Stieltjes integrals-Necessary conditions for the existence of Riemann-Stieltjes integrals- Mean value theorems for Riemann - Stieltjes integrals - The integrals as a function of the interval - Second fundamental theorem of integral calculus- Change of variable in a Riemann integral-Second Mean Value Theorem for Riemann integral-Riemann-Stieltjes integrals depending on a parameter-Differentiation under the integral sign-Lebesgue criteriaon for the existence of Riemann integrals.
Chapter 7 (Sec 7.15 to 7.26)

Unit - IV **No. of Hours:18**

Multivariable Differential Calculus - Introduction - The directional derivative - Directional derivative and continuity - The total derivative - The total derivative expressed in terms of partial derivatives - The matrix of Linear function - The Jacobian Matrix- The chain rule - Matrix form of chain rule -The mean - value theorem for differentiable functions - A sufficient condition for differentiability - A sufficient condition for equality of mixed partial derivatives - Taylor's theorem for functions of $R^n$to R^1
Chapter 12 (Sec 12.1 to 12. 14)

Unit - V **No. of Hours:18**

Implicit Functions and Extremum Problems: Functions with non-zero Jacobian determinants-The inverse function theorem-The Implicit function theorem-Extrema of real valued functions of severable variables-Extremum problems with side conditions.
Chapter 13 (Sec 13.1 to 13.7)

Text Book:

Mathematical Analysis by **T.M.Apostol,** Narosa Publ., New Delhi, 1985.

Books for References

1. Mathematical Analysis by **Walter Ruidin,** Tata McGraw-Hill Publishing Company Ltd., New Delhi (Third Edition)
2. **RoydonH.L**, Real Analysis, Macmillan Publishing Company, New York,1988.

Web Resources :

1. https://libgen.pw/item/detail/id/24548
2. http://tutorial.math.lamar.edu/Classes/Calcl/HospitalsRules.aspx
3. http://www.math.iitb.ac.in/~aars/week7-8.pdf

Note: Questions to be taken only from the Text Book

Course Outcomes(CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire sufficient knowledge of functions of bounded variation	K - 1
CO2	Develop Proficiency in the analysis of properties of Reimann – Stieltjes integral	K - 2
CO3	Applying Reimann – Stieltjes integral to Mean value theorem, Fundamental Theorem of Calculus	K - 3
CO4	Distingush the role of directional derivative, total derivative ,and the partial derivative	K - 4
CO5	Appraise the requisite of Inverse and Implicit function theorems.	K - 5

K-1: Recall ; K-2: Understand; K-3: Apply; K-4: Analyse; K-5: Evaluate; K-6: Create.

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	M	S	M	S	-	S	M	S	S	M	S	M	M	S
CO2	M	S	M	S	-	M	M	S	S	S	S	M	M	S
CO3	M	S	M	S	-	M	M	S	S	S	S	M	M	S
CO4	S	S	M	M	-	M	M	S	S	S	S	M	M	M
CO5	S	S	M	M	-	M	M	S	S	S	S	M	M	M

S - Strong, M - Medium, L - Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16

M.Sc. MATHEMATICS - SEMESTER - I

CORE - III ORDINARY DIFFERENTIAL EQUATIONS (20PMAC3)

For candidates admitted from 2020 - 2021 onwards (Under CBCS)

6 Hours / week **4 Credits**

Course Objectives: The course aims to

1. acquire the knowledge of various types of ordinary differential equations (O.D.E)
2. understand the methods of finding solutions of O.D.E.
3. analyse the solutions of different types of O.D.E.
4. promote critical thinking and problem solving abilities in O.D.E.

Syllabus

Unit - I **No. of Hours : 18**

Linear Equations with Constant Coefficients

The second order homogeneous equation - Initial value problems for second order equations - Linear dependence and independence - A formula for the Wronskian - The non-homogeneous equation of order two.

Chapter 2 (Sections 2 to 6 only)

Unit - II **No. of Hours : 18**

Linear Equations with Constant Coefficients

The Homogeneous equation of order n- Initial value problems for n-th order equations - Equations with real constants - The non-homogenous equation of order n - A special method for solving the non-homogeneous equation.

Chapter 2 (Sections 7 to 11 only)

Unit - III **No. of Hours : 18**

Linear Equations with Variable Coefficients

Initial value problems for the homogeneous equation - Solutions of the homogeneous equation - The Wronskian and linear independence - Reduction of the order of a homogeneous equation - The non-homogeneous equation - Homogeneous equations with analytic Coefficients - Legendre equation.

Chapter 3 (Sections 2 to 8 only)

Unit - IV **No. of Hours : 18**

Linear Equations with Regular Singular Points

The Euler equation - Second order equations with regular singular points - The exceptional Cases - The Bessel equation - Regular singular points at infinity.

Chapter 4 (Sections 2,3,4, 6 to 9 only)

Unit - V **No. of Hours : 18**

Existence and Uniqueness of Solutions to First Order Equations

Equations with Variables separated - Exact equations - The method of successive approximations - The Lipschitz condition - Convergence of the successive approximations - Non-local existence of solutions - Approximations to, and uniqueness of solutions

Chapter 5 (Sections 2 to 8 only)

Text Book:

An Introduction to Ordinary Differential Equations by **E.A. Coddington,** Prentice-Hall of India Private Limited New Delhi - 2005.

Books for Reference:

1. Ordinary Differential Equations by **P. Hartman,**John Wiley, 1964.
2. Essentials of Ordinary Differential Equations by **R.P. Agarwal** and **Ramesh C.Gupta,** , McGraw, Hill, 1991

Web Resources :

1. https://libgen.pw/item/detail/id/6174
2. https://www.math.psu.edu/shen_w/250/Notes/NotesDiffEqn.pdf
3. http://staff.um.edu.mt/jmus1/diffeq1.pdf

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire adequate knowledge about linear dependence and independence of the solutions of differential equations based on Wronskian value.	K-1
CO2	Solve numerous initial value problems of homogenous and non-homogenous equations of n-th order.	K-2
CO3	Gain understanding on the reduction of order of a homogenous equation, nature of the same with analytic coefficients and relate them on a Legendre equation.	K-3
CO4	Examine the computations of Euler equations, equations with regular singular points along with the exception – The Bessel equation.	K-4
CO5	Conclude the idea of Convergence of the successive approximations employing the Lipschitz condition.	K-5

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	S	S	M	M	L	M	S	S	S	S	M	S	S	S
CO2	S	S	S	S	L	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	L	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	L	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	L	S	S	S	S	S	S	S	S	S

S - Strong, M - Medium, Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.Sc. MATHEMATICS - SEMESTER - I
CORE IV- CLASSICAL DYNAMICS (20PMAC4)
For candidates admitted from 2020 – 2021 onwards (Under CBCS)
6 Hours / week **5 Credits**

Course Objectives: The course aims to

1. understand the concepts of generalized coordinates, virtual work, Lagrange's equations and Hamilton's Principle. To discuss the applications of the above concepts with suitable examples.
2. gain knowledge about canonical transformations, Lagrange and Poisson brackets.
3. develop flexibility and creativity of the students in applying mathematical ideas and techniques to unfamiliar problems arising in everyday life.

Syllabus

Unit - I **No. of hours:18**

Introductory concepts - The mechanical system - Generalized coordinates- Constraints - Virtual work - Energy and momentum

Chapter 1 (Sections 1.1 to 1.5)

Unit - II **No. of hours:18**

Lagrange's Equation: Derivation and examples - Integrals of the motion.

Chapter 2 (Sections 2.1 to 2.3 only)

Unit- III **No. of hours:18**

Hamilton's equations: Hamilton's principle (Exclude Non holonomic systems and Multipliers) - Derivation of Hamilton's equations only - Other variational principles.

Chapter 4 (Sections 4.1 to 4.3 only)

Section 4.1 Exclude Non holonomic systems and Multipliers

Section 4.2 Derivation of Hamilton's equations only

Unit - IV **No. of hours:18**

Hamilton - Jacobi theory: Hamilton's principal function. The Hamilton Jacobi equation - Separability

Chapter 5 (Sections 5.1 to 5.3)

Unit - V **No. of hours:18**

Canonical Transformations: Differential forms and generating functions - Lagrange and Poisson brackets - The bilinear covariant.

Chapter 6 (Sections 6.1 and 6.3 only)

Section 6.1 - Exclude further comments on the Hamilton's Jacobi method - Examples

Book for Study:

Classical Dynamics by **Donald T. Greenwood.**Prentice Hall of India, New Delhi, 1990.

Books for Reference

1. Classical Machanics by **H. Goldstein**, Narosa Publishing House, New Delhi, 2001.
2. Principles of Mechanics by **J.L. Synge** and **B.A. Griffth**, McGraw Hill Book Co. New York, 1970.

Web Resources:

1. http://math.ucr.edu/home/baez/classical/texfiles/2005/book/classical.pdf.
2. http://www.engr.iupui.edu/~skoskie/ECE680/ECE680_l3notes.pdf.
3. http://people.sissa.it/~bianchin/Lectures/aperturadottorato.pdf.
4. http://cds.cern.ch/record/384018/files/9904012.pdf.
5. http://hitoshi.berkeley.edu/221a/classical2.pdf.

Note: Questions to be taken only from the Text Books.

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	understand the basic concepts of the mechanical system, generalized coordinates, work, energy and momentum	K-1
CO2	solve and analyze the Lagrange's equations and integrals of motion with examples	K-3
CO3	understand the Hamilton's Principle and other variational principles and gain ability to analyze those principles to the problems arising in practical situations	K-4
CO4	gain knowledge about the differential forms and generating functions in canonical transformations, the bilinear covariant and compare the Lagrange's and Poisson brackets	K-5
CO5	understand and develop the Hamilton's Principal function and Hamilton Jacobi equation	K-6

K-1 Recall; K-2 Understand; K-3 Apply; K-4 Analyse; K-5 Evaluate; K-6 Create

Mapping of COs with POs and PSOs :

PO/PSO / CO	PO									PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	-	-	L	S	-	M	S	S	S	S	S	M	-	S
CO2	S	S	M	S	-	S	S	S	S	S	S	S	-	S
CO3	S	S	M	S	-	S	S	S	S	S	S	S	-	S
CO4	S	S	M	S	-	S	S	S	S	S	S	S	-	S
CO5	S	S	M	S	-	S	S	S	S	S	S	S	-	S

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.Sc. MATHEMATICS - SEMESTER - I
ELECTIVE-I: NUMERICAL ANALYSIS (20PMAEC1)
For candidates admitted from 2020 - 2021 onwards (Under CBCS)

6 Hours / week **4 Credits**

Course Objectives: The course aims to

1. acquire knowledge about the concept of numerical solutions of equations.
2. know the various types of solving different systems of equations.
3. develop the ability of solving boundary value problems and eigen value problems.

Syllabus

Unit - I **No. of Hours : 18**

Solution of algebraic and transcendental equations: Newton - Raphson method, LIN - Bairstow's method. Numerical differentiation and integration: Numerical differentiation, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Romberg integration.
Chapter 2 (2.5, 2.10) Chapter 5 (5.2, omitting 5.2.2 only, 5.4.1, 5.4.2, 5.4.3 and 5.4.6)

Unit - II **No. of Hours : 17**

Solution of linear systems : Gauss elimination method, Gauss - Jordan method, Lu decomposition, Lu decomposition from Gauss elimination, Iterative methods.
Chapter 6 (6.3.2, 6.3.3, 6.3.6, 6.3.7 and 6.4)

Unit - III **No. of Hours : 19**

Numerical solution of ordinary differential equations : Solution by Taylor's series, Euler's method, Modified Euler's methods, Runge-Kutta methods, Predictor - corrector methods, Adams – Moulton method, Milne's method.
Chapter 7 (7.2, 7.4 (Omitting 7.4.1 only), 7.5, 7.6).

Unit - IV **No. of Hours : 18**

Boundary - value problems :Finite difference method, The shooting method, The cubic spline method. The Eigen value problem: Eigen values of a symmetric tridiagonal matrix, House holder's method.
Chapter 7 (7.10, 7.10.1, 7.10.2 and 7.10.3)
Chapter 6 (6.5, 6.5.1, 6.5.2)

Unit - V **No. of Hours : 18**

Numerical solution of partial differential equations : Finite - difference approximataion to derivatives, Laplace's equations, Jacobi's method, Gauss -Seidel method, Successive over - relaxation, Parabolic equations, Iterative methods for the solution of equations, Hyperbolic equations.
Chapter 8 (8.2, 8.3, 8.3.1, 8.3.2, 8.3.3, 8.4, 8.5 and 8.6)

Text Book:

Introductory methods of Numerical Analysis, Fourth Edition by **S.S.Sastry**, Prentice - Hall of India, New Delhi.

Books for Reference:

1. Introduction to Numerical Analysis, Second Edition by **Devi Prasad,**Narosa Publishing House.

2. Numerical Analysis in Engineering by **Rama B.Bhat, S.Chakravarthy,**Narosa Publishing House.

Web Resources :

1. http://www.ece.mcmaster.ca/~xwu/part6.pdf
2. http://www.cis.upenn.edu/~cis515/cis515-12-sl2.pdf
3. https://wiki.math.ntnu.no/_media/tma4215/2012h/note.pdf
4. http://www.ehu.eus/aitor/irakas/fin/apuntes/pde.pdf

Note: Questions to be taken only from the text book

Course Outcomes (CO) : On completion of the course, students should be ableto

CO Number	**CO Statement**	**Knowledge Level**
CO1	Acquire knowledge about solving algebraic and transcendental equations	K-1
CO2	Understand and apply direct and iterative methods to obtain solutions of linear systems	K-3
CO3	Apply different methods and solve ordinary differential equations	K-3
CO4	Determine the solutions of boundary and eigen value problems	K-4
CO5	Evaluate the solutions of partial differential equations using numerical methods	K-5

K-1: Recall, K-2:Understand, K-3: Apply, K-4: Analyse, K-5: Evaluate, K-6: Create

Mapping of COs with POs and PSOs:

PO/ PSO CO	**PO**									**PSO**				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	S	S	S	S	-	S	S	S	S	S	S	S	S	S
CO2	S	M	M	S	-	S	S	M	S	M	M	S	M	S
CO3	S	S	L	S	-	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	-	S	S	S	S	S	S	S	S	S
CO5	S	S	L	S	-	S	S	S	S	S	S	S	S	S

S- Strong, M- Medium, L- Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.Sc. MATHEMATICS - SEMESTER - II
ELECTIVE I - CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS (20PMAESC1)
For candidates admitted from 2020 - 2021 onwards (Under CBCS)

6 Hours / week **4 Credits**

Course Objectives: The course aims to

1. understand the concepts of constraints and Lagrange's multipliers, Hamilton's Principles and Green's functions,
2. know about Strum Liouville problems, Rayleigh- Ritz method and Fredholm theory.
3. gain knowledge about small vibrations about equilibrium, Hubert Schemidt theory and special devices.

Syllabus

Unit – I : **No. of Hours : 18**

Calculus of variations - Maxima and Minima - Simplest case - Natural and Transition boundary conditions - Variational notations - general case - Constraints and Lagrange's multipliers - Variable end points - Strum Lioville problems.

Unit – II : **No. of Hours : 18**

Hamilton's Principle - Lagrange's equation - Generalised dynamical entities - Constraints in dynamical systems - Small Vibrations about equilibrium - Variational problems for deformable bodies - Rayliegh - Ritz method.

Unit – III : **No. of Hours : 18**

Integral Equation - Relations between differential and integral equations - Green's functions - Fredholm equations with separable Kernels.

Unit – IV : **No. of Hours : 18**

Hubert - Schemidt theory - Iterative methods for solving equations of the second kind. Neumann Series - Fredholm Theory - Singular integral equations.

Unit – V: **No. of Hours : 18**

Special devices - Iterative approximations to characteristic equations - Approximation of Fredholm equations by sets of algebraic equations.

Book for Study:

Method of Applied Mathematics, **Francis B. Hilderbrand**, II Edition, PH I, ND 1972.

Books for Reference:

1. Calculus of Variations with Appication, **A.S. Gupta,** Prentice Hall of India, New Delhi, 2005
2. Integral Equations and Boundary Value Problems, **Sudir. K Pundir** and **RimplePundir**, Pragati Prakasam, Meerut, 2005

Web Resources :

1. http://www.physics.usu.edu/Torre/3550_Fall_2012/Lectures/06.pdf
2. http://www.mcs.st-and.ac.uk/~rac/MT5802/Integral%20equations.pdf

Note: Questions to be taken only from the Text Book.

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand underlying notions behind types of boundary conditions and Sturm-Liouville problems	K-2
CO2	Acquire a comprehension on Hamilton's principle, Lagrange's equation and Rayleigh-Ritz method along with problems on disparity for deformable bodies	K-2
CO3	Implement various problems on differential and integral equations with special reference to Fredholm equations	K-3
CO4	Resolve the utilisation of Hilbert-schmidt theory, Neumann series and Fredholm theory on various integral equations	K-4
CO5	Evaluate approximation problems through sets of algebraic equations	K-5

K-1: Recall ; K-2: Understand; K-3: Apply; K-4: Analyse; K-5: Evaluate; K-6: Create.

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	L	M	S	M	-	M	S	S	S	M	M	S	S	S
CO2	M	S	S	M	-	S	S	S	S	S	S	S	S	S
CO3	M	S	S	S	-	S	S	S	S	S	S	S	S	S
CO4	M	S	S	S	-	S	S	S	S	S	S	S	S	S
CO5	M	S	S	S	-	S	S	S	S	S	S	S	S	S

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16

M.Sc. MATHEMATICS - SEMESTER - II

CORE V - LINEAR ALGEBRA (20PMAC5)

For candidates admitted from 2020 - 2021 onwards (Under CBCS)

6 Hours / week **5 Credits**

Course Objectives: The course aims to

1. introduce the basic concepts of Linear Algebra.
2. make them understand the theory and applications in almost every science and pseudoscience.

Syllabus

UNIT - I **No. of Hours : 18**

Linear Transformations-Linear Transformations, The Algebra of Linear Transformations, Isomorphism & Representations of Transformations by Matrices

Chapter-3-sec: 3.1, 3.2, 3.3& 3.4 (Page No: 67- 97)

UNIT - II **No. of Hours : 18**

Polynomials- Algebras, The Algebra of Polynomials, Lagrange Interpolation, Polynomial Ideals & The Prime Factorization of a Polynomial.

Chapter-4-sec: 4.1, 4.2, 4.3, 4.4& 4.5 (Page No: 117 – 139)

UNIT - III **No. of Hours : 18**

Determinants-Commutative Rings, Determinant Functions, Permutations and the Uniqueness of Determinants, Additional Properties of Determinants.

Chapter-5-sec: 5.1, 5.2, 5.3& 5.4 (Page No: 140 – 162)

UNIT - IV **No. of Hours : 18**

Linear Transformations-Canonical Forms: Nilpotent Transformations, Canonical Forms: A Decomposition of *V*: Jordan Form, Canonical Forms: Rational Canonical Form.

Chapter-6-sec: 6.5, 6.6& 6.7 (Page No: 292 – 312)

UNIT - V **No. of Hours : 18**

Linear Transformations-Trace and Transpose, Hermitian, Unitary, and Normal Transformations, Real Quadratic Forms.

Chapter-6-sec: 6.8, 6.10& 6.11 (Page No: 313 – 321, 336 – 354)

Text Book:

1. Linear Algebra(Second Edition) by **Kenneth Hoffman and Ray Kunze**, Prentice Hall of India Pvt. Ltd.

(For units I - III)

2. Topics in Algebra (Second edition) by **I.N.Herstein**, Vikas publishing house Pvt. Ltd

(For Units: IV and V)

Books for Reference:

1.Algebra by **M.Artin**, Prentice Hall of India, 1991.

2. Algebra,Vol.I-Groups,Vol.II Rings by **I.S. Luther and I.B.S.Passi**, Narosa Publishing House, New Delhi,1999.

3. Basic Algebra, Vol.I&II by **N.Jacobson,** Hindustan Publishing Company , New Delhi.

Web Resources:

1. download1.libgen.io/ads.php?md5=4AF6D11E892440380955427176 9AC7CE
2. www.math.niu.edu>courses>canon07
3. https://www.maths.tcd.ie>~mozgovoy
4. https://www.khanacademy.org/math/linear-algebra/matrix-transformations/linear-transformations/v/linear-transformations
5. https://www.coursera.org/learn/galois/lecture/vlGql/4-2-tensor-product-of-modules

Note: Questions to be taken only from the Text Books.

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement0	Knowledge Level
CO1	Understand the basic concepts of Linear transformations, characteristic roots and matrices of linear transformation and its applications.	K-3
CO2	Explain about the algebra of polynomials, polynomial ideals and prime factorization of a polynomial.	K-4
CO3	Understand the basic concepts of determinents and its additional properties.	K-3
CO4	Analyse canonical Form, Jordan Form and Rational canonical Form.	K-4
CO5	Acquire the knowledge on Hermitian, Unitary and Normal Transformations.	K-4

K-1:Recall; K-2:Understand; K-3:Apply; K-4:Analyze; K-5:Evaluate; K-6:Create.

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	M	M	M	-	M	S	L	S	S	M	S	-	S
CO2	M	M	-	M	-	M	S	-	S	S	-	S	-	S
CO3	M	M	M	M	-	M	S	L	S	S	M	S	-	S
CO4	L	M	-	S	-	-	S	-	S	S	-	S	-	S
CO5	M	M	M	M	-	M	S	L	S	S	M	S	-	S

S- Strong, M- Medium,L- Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.Sc. MATHEMATICS - SEMESTER - II
CORE VI - MEASURE AND INTEGRATION (20PMAC6)
For candidates admitted from 2020 - 2021 onwards (Under CBCS)

5 Hours / week **3 Credits**

Course Objectives: The course aims to

1.acquire knowledge about the concept of Measurable sets and its functions.
2. know about the concept of Lebesgue integral.
3. understand the concept Outer measure.

Syllabus

Unit - I **No. of Hours : 15**

Lebesgue Measure

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

Chapter 3 (Sections 3.2, 3.3, 3.5 & 3.6)

Unit - II **No. of Hours : 15**

Lebesgue Integral

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

Chapter 4 (Sections 4.1, 4.2, 4.3, 4.4)

Unit - III **No. of Hours : 15**

Differentiation and Integration

Differentiation of monotone functions - Differentiation of an integral - Absolute continuity.

Chapter 5 (Sections 5.1, 5.3, 5.4)

Unit - IV **No. of Hours : 15**

Measure and Integration

Measure Spaces - Measurable functions - Integration - The Radon - Nikodym Theorem.

Chapter 11 (Sections 11.1, 11.2, 11.3, 11.6)

Unit - V **No. of Hours :15**

Measure and Outer Measure

Outer measure and measurability - The Extension theorem

Chapter 12 (Sections 12.1, 12.2)

Book for Study:

1.Real Analysis by **H.L. Royden**. Macmillan Publishing Co., New York, Third Edition.

Books for Reference:

1. Real Analysis by**G. B. Folland,**- Modern Techniques and Their Applications" Wiley lnterscience Publications, 1984.
2. Real and Complex Analysis by **W. Rudin,** third edition, McGraw Hill International Edition, 1986.

Web Resources:

1. https://books.google.co.in/books?id=R0o8DQAAQBAJ&printsec=frontcover&dq=real+analysis+with+measure+and+integration&hl=en&sa=X&ved=0ahUKEwiRoeHUk57bAhWHPI8KHbcoAEoQ6AEIJDAA#v=onepage&q=real%20analysis%20with%20measure%20and%20integration&f=false
2. http://people.math.ethz.ch>PREPRINTS
3. Math.ucsd.edu>Lecture_Notes>measurep

Note: Questions to be taken only from the Text Book.

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge about Measurable sets and Lebesgue measure	K-1
CO2	Acquire knowledge on Lebesgue Integral	K-2
CO3	Understand the concepts of differentiation of monotone functions and absolute continuity	K-2
CO4	Analyse Measure and Integration and applying in the Radon Theorem	K-4
CO5	Extending the concept of measurability	K-6

K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.
Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	M	S	M	S	-	M	M	M	S	M	M	M	M	S
CO2	M	M	M	S	-	M	M	S	S	S	M	M	M	S
CO3	M	S	M	S	-	M	M	S	S	S	M	M	M	S
CO4	M	M	M	S	-	M	M	S	S	M	M	M	M	S
CO5	S	M	M	M	-	M	M	S	S	S	M	M	M	S

S - Strong, M - Medium, L - Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.SC. MATHEMATICS - SEMESTER - II
CORE VII - PARTIAL DIFFERENTIAL EQUATIONS (20PMAC7)
For candidates admitted from 2020 - 2021 onwards (Under CBCS)

5 Hours / week **4 Credits**

Course Objectives: The course aims to

1. acquire the knowledge of various types of second order partial differential equations (P.D.E)
2. understand the methods of finding solutions of P.D.E.
3. analyse the solutions of different types of P.D.E.
4. promote critical thinking and problem solving abilities in P.D.E.

Syllabus

Unit - I **No. of Hours : 15**

Fundamental concepts

Classification of second order partial differential equations - Canonical forms - Adjoint operators - Riemann's Method.

Chapter 1 (Sections 1.2 to 1.5)

Unit - II **No. of Hours : 15**

Elliptic Differential Equations

Occurrence of the Laplace and Poisson equations - Boundary Value Problems - Some important Mathematical Tools - Properties of Harmonic functions - Separation of Variables.

Chapter 2 (Sections 2.1 to 2.5)

Unit - III **No. of Hours : 15**

Dirichlet Problem for a Rectangle - The Neumann Problem for a Rectangle - Interior Dirichlet problem for a Circle - Exterior Dirichlet problem for a Circle - Interior Neumann Problem for a Circle - Occurrence of the Diffusion Equation - Boundary conditions - Elementary Solutions of the Diffusion Equation – Dirac Delta Function.

Chapter 2 (Sections 2.6 to 2.10), Chapter 3 (Section 3.1 to 3.4)

Unit - IV **No. of Hours : 15**

Hyperbolic Differential Equations

Occurrence of the Wave equation - Derivation of one dimensional Wave equation - Solution of one dimensional Wave equation by Canonical reduction - The Initial Value Problem; D'Alembert's solution - Vibrating string - Variables separable solution - Forced vibrations - Solution of Non-homogeneous Equation.

Chapter 4 (Section 4.1 to 4.6)

Unit - V **No. of Hours : 15**

Green's Function

Introduction - The Methods of Images - The Eigen function Method - Green's Function for the Diffusion Equation.

Chapter 5 (Section 5.1, 5.3, 5.4 and 5.6)

Text Book:

Introduction to Partial Differential Equations by **K. Sankara Rao**, Prentice Hall of India private Limited, New Delhi (Ninth print – May 2008)

Books for Reference:

1. Partial Differential Equations for Scientists and Engineers by **S.J. Farlow,** John Wiley Sons, New York 1982.
2. Elements of Partial Differential Equations by **I.N. Sneddon,** McGraw Hill, 1964.

Web Resources :

1. http://www.cmap.polytechnique.fr/~jingrebeccali/frenchvietnammaster2_files/Lectures_JRL/Classification_PDEs_2.pdf.
2. https://www.iist.ac.in/sites/default/files/people/IN08026/Canonical_form.pdf.
3. http://home.iitk.ac.in/~tmk/courses/mth424/main.pdf.
4. http://www.math.tifr.res.in/~publ/ln/tifr10.pdf.

Note: Questions to be taken only from the Text Books.

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental concepts of classification of second order partial differential equations, canonical forms, adjoint operators and Riemann's method	K-2
CO2	Determine the occurence of the laplace and poisson equations, Boundary value problems and develop the properties of harmonic functions and apply the concpt of separation of variables	K-3
CO3	Analyse the Dirichlet problem, interior and exterior Dirichlet problem, Neumann problems and find the solutions of some types of laplace equations	K-4
CO4	Develope the knowledge about some kinds of parabolic differential equations. Create and solve the biological problems using the partial differential equations	K-6
CO5	Acquire the knowledge about Green's function for the differential equations and gain the ability to evaluate some real life mathematical problems	K-5

K-1 Recall; K-2 Understand; K-3 Apply; K-4 Analyse; K-5 Evaluate; K-6 Create

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	S	S	-	M	-	M	S	L	S	L	S	S	M	S
CO2	S	S	S	S	-	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	-	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	-	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	-	S	S	S	S	S	S	S	S	S

S- Strong, M- Medium,L- Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16

M.Sc. MATHEMATICS - SEMESTER - II

CORE VIII - DIFFERENTIAL GEOMETRY (20PMAC8)

For candidates admitted from 2020 - 2021 onwards (Under CBCS)

6 Hours / week **5 Credits**

Course Objectives: The course aims to

1. gain knowledge about curves and its characterizations.
2. get sufficient knowledge on Elementary Theory of surfaces.
3. make the students to familiarize with space curves and curves on surfaces.

Syllabus

Unit - I **No. of Hours : 18**

Curves:

Introductory remarks about space curves – Definitions - Arc length - Tangent, normal and binormal - Curvature and torsion of a curve given as the intersection of two surfaces - Contact between curves and surfaces - Tangent Surface, involutes and evolutes - Helices.

Chapter 1: (Section 1.1 - 1.7 & 1.9)

Unit - II **No. of Hours : 18**

Elementary Theory of Surfaces:

Definition of a surface - Curves on a surface - Surfaces of revolution - Helicoids - Metric - Direction Coefficients - Families of curves

Chapter 2: (Section 2.1 -2.7)

Unit - III **No. of Hours : 18**

Isometric correspondence - Intrinsic properties - Geodesics- Canonical geodesic equations - Normal property of geodesics - Existence theorems

Chapter 2: (Section 2.8 - 2.13)

Unit - IV **No. of Hours : 18**

Geodesic Parallels - Geodesic Curvature - Gauss - Bonnet theorem - Gaussian Curvature - Surfaces of Constant Curvature

Chapter 2: (Section 2.14 - 2.18)

Unit - V **No. of Hours : 18**

The Second Fundamental form - Principal curvatures - Lines of Curvature - Developables - Developables associated with space Curves - Developables associated with curves on surfaces - Minimal surfaces.

Chapter 3: (Section 3.1 - 3.7)

Text books:

Differential Geometry by **T.J. Willmore**, Oxford University Press (Seventeenth Impression - 2002).

Books for Reference:

1. Differential Geometry by **Dirk.J. Struik.** II Edition, Addsion -Wesley Publication.
2. Differential Geometry by A First Course by **D. Somasundaram,** Narosa Publishing House, Reprint 2008.

Web Resources :

1. https://libgen.pw/item/detail/id/8184
2. http://pages.uoregon.edu/koch/math433/Final.pdf
3. https://www.math.cuhk.edu.hk/~martinli/teaching/4030lectures.pdf

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Define and understand basic notions of the theory of curves and surfaces.	K-1
CO2	Interpret the notions of surface of revolution and direction coefficients.	K-2
CO3	Possess adequate knowledge about isometric correspondence between curves and the underlying notions about geodesics.	K-3
CO4	Apprehend the role of geodesics and it is emphasized on Gauss-Bonnet theorem.	K-4
CO5	Assess a thorough grounding in Principal Curvatures impact on developable of a curve and minimal surface.	K-5

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	L	S	L	M	-	M	S	S	-	S	S	L	L	S
CO2	S	S	M	S	-	M	S	S	-	S	S	M	M	S
CO3	S	S	S	S	-	S	S	S	-	S	S	S	S	S
CO4	S	S	S	S	-	S	S	S	-	S	S	S	S	S
CO5	S	S	S	S	-	S	S	S	-	S	S	S	S	S

S - Strong, M - Medium, L - Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.Sc. MATHEMATICS - SEMESTER - II
ELECTIVE II - FUZZY SETS AND THEIR APPLICATIONS (20PMAEC2)
For candidates admitted from 2020 - 2021 onwards (Under CBCS)
6 Hours / week **5 Credits**

Course Objectives: The course aims to

1. gain knowledge about fuzzy sets and types of operations.
2. know about fuzzy numbers and fuzzy morphishms.
3. understand the concept of fuzzy logic with relevent examples.

Syllabus

Unit - I **No. of Hours:18**

Fuzzy Sets: Basic types - Fuzzy Sets: Basic concepts - Additional properties of α-cuts – Representation of Fuzzy Sets - Extension principle for fuzzy sets.
(Sections 1.3, 1.4, 2.1, 2.2., 2.3)

Unit - II **No. of Hours:18**

Types of operations - Fuzzy complements - Fuzzy intersections : t-Norms - Fuzzy unions : t-conomrs - Combinations of operations.
(Sections 3.1, 3.2, 3.3, 3.4., 3.5)

Unit - III **No. of Hours:18**

Fuzzy numbers - Arithmetic operations on intervals - Arithmetic operations on Fuzzy numbers.
(Sections 4.1, 4.3, 4.4)

Unit - IV **No. of Hours:18**

Projections and cylindric extensions - Binary fuzzy relations - Binary relations on a single set - Fuzzy equivalence relations - Fuzzy compatibility relations - Fuzzy ordering relations - Fuzzy morphisms - Sup - i - compositions of fuzzy relations, inf ωI compositions of fuzzy relations.
(Sections 5.2 – 5.10)

Unit - V **No. of Hours:18**

Three valued logics - Infinite valued logics - Fuzzy logics - Fuzzy propositions and their interpretations in terms of fuzzy sets - Fuzzy rules and their interpretations in terms of fuzzy relation - Generalized modus ponens - Fuzzy inference mechanism (FIM) - Fuzzy modus tollens - Generalizations of fuzzy logics.
Chapter 8 (Sections 8.2, 8.4 – 8.8, 8.9.1, 8.10)

Books for Study

1. Fuzzy Sets and Fuzzy Logic by **G. J. Klir** and **B. Yuan,** Prentice Hall of India, New Delhi. 2004. (Unit I, II, III and IV only)
2. Introduction to fuzzy sets and fuzzy logic by **M. Ganesh,** Introduction to fuzzy sets and fuzzy logic, Prentice Hall of India Private Limited, New Delhi (Unit V only)

Book for Reference

Fuzzy Set Theory and its Applications by **Zimmermann**, Hans-Jurgen, Springer Publication

Web Resources:

https://giocher.wordpress.com/chapter-2-par-2-2-fuzzy-relations-and-the-extension-principle/

Note: Questions to be taken only from the text books

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO 1	Gain knowledge about the basic types of fuzzy sets and the difference between crisp sets and fuzzy sets	K-1
CO 2	Understand the concept of operations on fuzzy sets	K-2
CO 3	Acquire knowledge about the concepts of fuzzy arithmetic and gain knowledge to solve the related problems	K-3
CO 4	Discriminate relations and fuzzy relations	K-4
CO 5	Create a fuzzy model and solve social, environmental and biological problems	K-6

K-1: Recall, K-2: Understand, K-3: Apply, K-4: Analyse, K-5: Evaluate, K-6: Create

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	-	-	M	L	-	-	M	M	-	L	M	-	L	L
CO2	S	S	S	S	-	S	S	S	-	S	S	S	S	L
CO3	S	S	S	S	-	S	S	S	-	S	S	S	S	L
CO4	S	S	S	S	-	S	S	S	-	S	S	S	S	L
CO5	S	S	S	S	-	S	S	S	-	S	S	S	S	L

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.Sc. MATHEMATICS - SEMESTER - II
ELECTIVE II - DIFFERENCE EQUATIONS (20PMAESC2)
For candidates admitted from 2020 - 2021 onwards (Under CBCS)

6 Hours / week **5 Credits**

Course Objectives: The course aims to

1. acquire the knowledge in linear difference equations, stability theory and asymptotic methods.
2. understand the fundamentals of the difference calculus, basic theory for linear difference equations.
3. analyse stability results for linear and non-linear systems.

Syllabus

Unit – I : **No. of Hours : 18**

The Difference calculus – The Difference operator – Summation, Generating function and approximate summation.

Chapter 2 (Sections : 2.1 to 2.3)

Unit – II : **No. of Hours : 18**

Linear Difference Equations – First order equations, General results for linear equations, Solving linear equations – Applications.

Chapter 3 (Sections : 3.1 to 3.4)

Unit – III : **No. of Hours : 18**

Equations with variable coefficients, Nonlinear equations that can be linearized, the z-transform.

Chapter 3 (Sections : 3.5 to 3.7)

Unit – IV : **No. of Hours : 18**

Stability Theory – Initial value problems for linear systems, stability of linear systems.

Chapter 4 (Sections : 4.1 and 4.2)

Unit – V: **No. of Hours : 18**

Asymptotic methods – Asymptotic analysis of sums Linear equations, Non-linear equations.

Chapter 5 (Sections : 5.2 to 5.4)

Book for Study:

W.G.Kelley and **A.C.Peterson**, Difference Equations - An Introduction with Application, Second Edition, Academic Press, New York, © 2001, 1991.

Books for Reference:

1. **SaberN.Elayadi,**An Introduction to Difference Equations, Springer, 1995.
2. **R.Mickens,** Difference Equations, Van Nostrand Reinhold, New York,1990.
3. **R.P. Agarwal,** Difference Equations and Inequalities, Marcel Dekker, New York, 1992.
4. **S. Goldberg,** Introduction to Difference Equations, Dover, New York, 1986.

Web Resources :

1. http://people.math.aau.dk/~matarne/11-imat/notes2011a.pdf
2. https://nile.northampton.ac.uk/bbcswebdav/courses/CFAP02R/Guest%20access%20files/HELM_new/pages/workbooks_1_50_jan2008/Workbook21/21_3_z_trnsfm_n_difrnce_eqn.pdf

Note: Questions to be taken only from the Text Book

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Evoke the basic concepts behind the theory of difference operators	K-1
CO2	Interpret the notion of solving linear difference equations of first order	K-2
CO3	Perceive the idea of converting nonlinear equations into linear and their applications on z-transform	K-3
CO4	Resolve various initial value problems for linear systems	K-4
CO5	Appraise the methods of Asymptotic analysis and non-linear equations	K-5

K-1: -Recall ; K-2: Understand; K-3: Apply; K-4: Analyse; K-5: Evaluate; K-6: Create.

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	L	M	S	M	-	M	S	S	S	M	M	S	S	S
CO2	M	S	S	M	-	S	S	S	S	S	S	S	S	S
CO3	M	S	S	S	-	S	S	S	S	S	S	S	S	S
CO4	M	S	S	S	-	S	S	S	S	S	S	S	S	S
CO5	M	S	S	S	-	S	S	S	S	S	S	S	S	S

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.Sc. MATHEMATICS - SEMESTER - III
CORE IX - COMPLEX ANALYSIS (19PMAC9)
For candidates admitted from 2019 - 2020 onwards (Under CBCS)

5 Hours / week **4 Credits**

Course Objectives: The course aims to

1. gain knowledge about the theory and applications of analytic functions and harmonic functions.
2. know the concept of power series expansion and canonical products.
3. develop the ability of evaluating definite integrals of numerical methods.

Syllabus

Unit – I **No. of Hours: 15**

Cauchy's integral formula

The index of a point with respect to a closed curve, The integral formula, Higher derivatives.

The General Form of Cauchy's Theorem

Chains and Cycles, Simple connectivity, Homology, The general statement of Cauchy's Theorem, Proof of Cauchy's theorem, Locally exact differentials, Multiply connected regions.

Chapter 4 (Sections 2.1 to 2.3 and 4.1 to 4.7)

UNIT – II **No. of Hours:14**

The Calculus of Residues

The Residue theorem, The Argument principle, Evaluation of definite integrals.

Harmonic Functions

Definition and basic properties, The Mean-value property, Poisson's formula, Schwarz's theorem, The Reflection principle.

A closer look at Harmonic functions

Functions with the mean - value property, Harnack's principle.

Chapter 4 (Sections 5.1 to 5.3 and 6.1 to 6.5), Chapter 6 (Sections 3.1 & 3.2)

Unit – III **No. of Hours:15**

Power Series Expansions

Weierstrass's theorem, The Taylor's series, The Laurent series,

Partial Fractions and Factorization

Partial fractions, Infinite products, Canonical products, The gamma functions

Chapter 5 (Sections 1.1 to 1.3, 2.1 to 2.4)

Unit – IV **No. of Hours:15**

Entire Functions

Jensen's Formula, Hadamard's Theorem.

The Riemann Zeta Functions

The Product Development, Extension of $\zeta(s)$ to the Whole Plane, The functional equation, The zeros of the Zeta Function

The Riemann MappingTheorem

Statement and proof, Boundary Behavior

Chapter 5 (Sections 3.1 & 3.2, 4.1 to 4.4), Chapter 6 (Sections 1.1, 1.2)

Unit – V **No. of Hours:16**

Simply Periodic Functions

Representation by Exponentials, The Fourier development, Functions of finite order

Doubly Periodic Functions

The Period module, Unimodular transformations, The canonical basis, General properties of Elliptic Functions

Weierstrass Theory

The Weierstrass p - function, The functions $\zeta(z)$ and $\sigma(z)$, The differential equation, The modular function $\lambda(\tau)$, The Conformal mapping by $\lambda(\tau)$.

Chapter 7 (Sections 1.1& 1.3, 2.1 to 2.4, 3.1 to 3.5

Book for Study:

Lars V. Ahlfors "Complex Analysis - Third Edition McGraw - Hill International Editions.

Books for Reference

1. **J.B. Conway,** Functions of one complex variable Narosa Publishing House, 1980.
2. **S. Ponnusamy,** Foundations of Complex Analysis, Narosa Publishing House, 1997.

Web Resources :

1. https://www.math.ucdavis.edu/~romik/data/uploads/notes/complex-analysis.pdf
2. https://www.math.lsu.edu/~neubrand/notes.pdf
3. http://www.maths.lth.se/matematiklu/personal/olofsson/CompHT06.pdf
4. https://www.researchgate.net/publication/280722238_Complex_Analysis_Problems_with_solutions.

Note: Questions to be taken only from the text book

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO 1	Know to apply Cauchy's integral formula and to know the General form of Cauchy's theorem	K-3
CO 2	To provide a bird's eye view of Calculus of residues and Harmonic functions	K-4
CO 3	Analyse Power Series expansion, Partial fractions and Factorizations	K-5
CO 4	Analyse the concepts of entire functions, Riemann Zeta functions and Riemann Mapping theorem	K-5
CO 5	Discuss and analyse the Simple periodic functions and doubly periodic functions, Weierstrass Theory	K-5

K-1: Recall, K-2: Understand, K-3: Apply, K-4: Analyse, K-5: Evaluate, K-6: Create

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	L	S	-	S	S	S	S	S	M	S	M	S
CO2	S	M	M	S	-	S	S	S	S	S	M	S	M	S
CO3	S	M	M	S	-	S	S	S	S	S	M	S	M	S
CO4	S	M	M	S	-	S	S	S	S	S	M	S	M	S
CO5	S	M	M	S		S	S	S	S	S	M	S	M	S

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.Sc. MATHEMATICS - SEMESTER III
CORE -X TOPOLOGY (19PMAC10)
For Candidates Admitted From 2019 – 2020 onwards (Under CBCS)

6 Hours / Week **4 Credits**

Course Objectives: The course aims to

1. gain knowledge about topological spaces and various types of topologies.
2. discuss the concepts of connectedness and compactness of topological spaces.
3. inculcate the knowledge about countability and separation axioms.

Syllabus

Unit- I **No. of Hours: 18**

Topological Spaces

Topological spaces, Basis for a topology, The order topology, The product topology on X x Y, The subspace topology, Closed sets and limit points

Chapter 2 (Sections 12 to 17)

Unit – II **No. of Hours: 18**

Continuous Functions

Continuous functions, The product topology, The metric topology.

Chapter 2 (Sections 18 to 20)

Unit- III **No. of Hours: 18**

Connectedness

Connected spaces, Connected subspaces of the real line, Components and Local connectedness.

Chapter 3 (Sections 23 to 25 only)

Unit – IV **No. of Hours: 18**

Compactness

Compact spaces, Compact subspaces of the real line, Limit point compactness, Local compactness.

Chapter 3(Sections 26 to 29)

Unit – V **No. of Hours:18**

Countability and Separation Axioms

The countability axioms, The separation axioms, Normal spaces, The Urysohn Lemma, The Urysohn Metrization theorem.

Chapter 4 (Sections 30 to 34)

Book for Study:

Topology: A first course, by **James R. Munkres**, Prentice Hall of India. II Edition.

Books for Reference:

1. Topology, **J. Dugundji**, Prentice Hall of India, New Delhi, 1975.
2. Introduction to Topology and Modern Analysis, **G.F. Simmons**, Mc Graw Hill Book Co, New York, 1963.
3. Elements of General Topology, **S.T. Hu**, Holden Day, Inc, New York, 1965.

Web Resources :

1. http://www.uio.no/studier/emner/matnat/math/MAT4500/h13/topology.pdf
2. http://nptel.ac.in/courses/111106054/Topology%20complete%20course.pdf
3. http://home.iitk.ac.in/~chavan/topology_mth304.pdf
4. https://thomasjohnbaird.files.wordpress.com/2011/11/pointsetlecturenotes.pdf

Note: Questions to be taken only from the text book

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO 1	obtain the basic knowledge in topology	K-1
CO 2	understand the concepts of continuous functions and construct the topology by using the metric	K-2
CO 3	examine the connectedness of topological space	K-4
CO 4	demonstrate fundamental outcomes about compactness within topological structures	K-4
CO 5	characterize; categorize and compare the separation axioms and create a model and solve biological problems	K-6

K-1: Recall, K-2: Understand, K-3: Apply, K-4: Analyse, K-5: Evaluate, K-6: Create

Mapping of COs with POs and PSOs:

PO/ PSO / CO	PO									PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	S	S	M	M	-	M	S	L	S	L	M	S	M	S
CO2	S	S	S	S	-	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	-	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	-	S	S	S	S	S	S	S	S	S
CO5	S	S	M	S	-	S	S	L	S	L	S	S	L	S

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.SC. MATHEMATICS SEMESTER - III
CORE XI - NUMBER THEORY (19PMAC11)
For Candidates Admitted From 2019 - 2020 Onwards (Under CBCS)

5 Hours / Week **4 Credits**

Course Objectives: The course aims to

1. know about the basic concepts of number theory.
2. get a complete grip of various concepts to present modern Mathematics in elementary terms.
3. develop the skill of solving problems in number theory.

Syllabus

Unit- I **No. of Hours: 15**

Divisibility - Primes - Congruence's - Solutions of Congruences - Congruences of degree 1.

Chapter 1 (Sec 1.2 & 1.3)
Chapter 2 (Sec 2.1 to 2.3)

Unit – II **No. of Hours: 16**

The function $\varphi(n)$ - Congruences of higher degree - Prime power moduli - Prime modulus – Congruences of Degree Two, Prime Modulus - Power residues.

Chapter 2 (Sec 2.4 to 2.9)

Unit – III **No. of Hours: 16**

Quadratic residues - Quadratic reciprocity - The Jacobi symbol - Greatest integer function.

Chapter 3 (Sec 3.1 to 3.3)
Chapter 4 (Sec 4.1)

Unit- IV **No. of Hours: 13**

Arithmetic functions - The Moebius Inversion formula - The multiplication of arithmetic functions

Chapter 4 (Sec 4.2 to 4.4)

Unit – V **No. of Hours: 15**

Diophantine equations - The equation ax+by = c - Positive solutions - Others linear equations - The equation $x^2 + y^2 = z^2$ - The equation $x^4 + y^4 = z^2$ - Sums of four and five squares - Waring's problem - Sum of fourth powers - Sum of two squares.

Chapter 5 (5.1 -5.10)

Text Book:

Ivan Niven and **Herbert S Zuckerman**, An introduction to the Theory of numbers, 3rd edition, Wiley Eastern Limited, New Delhi, 1989, Sixth Wiley Eastern reprint, July 1991.

Books for Reference:

1. **D.M. Burton,** Elementary number theory, Universal Book Stall, New Delhi - 2004.
2. **Tom Apostol,** Analytic Number Theory Springer - Verlag, New York, 1989.

Web Resources:

1. http://www2.math.uu.se/~lal/kompendier/Talteori.pdf

Note: Questions to be taken only from the text book

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO 1	Know the concepts of primes and congruences	K-1
CO 2	Solve the problems of congruences of higher degree	K-3
CO 3	Gain knowledge and analyze the concepts of quadratic residues, the Jacobi symbol and greatest integer function	K-4
CO 4	Understand the notion of Arithmetic function and evaluate the positive division, the sum of positive divisions and the sum of the k^{th} power of the positive divisions of a positive integer	K-5
CO 5	Develop a deeper conceptual understanding to solve the equations $x^2 + y^2 = z^2$ and $x^4 + y^4 = z^2$	K-6:

K-1: Recall, K-2: Understand, K-3: Apply, K-4: Analyse, K-5: Evaluate, K-6: Creat

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	L	M	M	S	-	M	S	S	-	S	S	M	M	S
CO2	S	S	M	S	-	M	S	S	-	S	S	M	M	S
CO3	S	S	S	S	-	S	S	S	-	S	S	S	S	S
CO4	S	S	S	S	-	S	S	S	-	S	S	S	S	S
CO5	S	S	S	S	-	S	S	S	-	S	S	S	S	S

S - Strong, M - Medium, L – Low

SRI SARADACOLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.Sc. MATHEMATICS - SEMESTER III
CORE XII - MATHEMATICAL STATISTICS (19PMAC12)
For Candidates Admitted From 2019 - 2020 Onwards (Under CBCS)

5 Hours / Week **4 Credits**

Course Objectives: The course aims to

1. know the brief and proper introduction to modern probability theory and Mathematical Statistics.
2. gain knowledge about the possible applications of these theories, accompanied by descriptive concrete examples.
3. discussing the stochastic convergence in various theorems

Syllabus

Unit - I : **No. of Hours : 15**

Preliminary remarks - Random events and operations performed on them - The system of axioms of the theory of probability - Application of combinatorial formulas for computing probabilities - Conditional probability - Bayes theorem - Independent events.
Chapter 1 (Sections 1.1 to 1.7)

Unit - II : **No. of Hours : 15**

The concept of a random variable - The distribution function - Random Variables of the discrete type and the continuous type - Functions of random variables - Multi-dimensional random variables - Marginal distributions - Conditional distributions - Independent random variables - Functions of multidimensional random variables - Expected values - Moments - The Chebyshev inequality - Absolute moments - Order parameters - Moments of random vectors - Regression of the first type - Regression of the second type.
Chapter 2 and 3 (Sections 2.1 to 2.9, 3.1 to 3.8)

Unit - III : **No. of Hours : 15**

Properties of characteristic functions - The characteristic function and moments - Semi-invariants - The characteristic function of the sum of independent random variables - Determination of the distribution function by the characteristic function - The characteristic function of multidimensional random vectors- Probability - generating functions.
Chapter 4 (Sections 4.1 to 4.7)

Unit - IV : **No. of Hours : 15**

One-point and two-points distributions - The Bernoulli's scheme - The Binomial distribution - The Poisson scheme - The Generalized Binomial distribution - The polya and hypergeometric distributions - The Poisson distribution - The uniform distribution - The normal distribution.
Chapter 5 (Sections 5.1 to 5.7)

Unit - V: **No. of Hours : 15**

Preliminary remarks - Stochastic convergence - Bernoulli's law of large numbers - The convergence of a sequence of distribution functions - The Riemann-Stieltjes integral - The Levy - Cramer theorem - The De Moivre - Laplace theorem - The Lindeberg-Levy theorem - The Lapunov theorem - Poisson's Chebyshev's, and Khintchin's laws of large numbers -The Strong law of large numbers - The notion of a stochastic process - Markov process and processes with independent increments - The poisson process.
Chapters 6 and 8 (Sections 6.1 to 6.9, 6.11, 6.12, 8.1, 8.2, 8.3)

Book for Study:

Probability Theory and Mathematical statistics by **Marek Fisz.** Krieger Publishing Company.

Books for Reference:

1. An introduction to Probability Theory and Mathematical Statistics by **V.K.Rohatgi,** Wiley Eastern Ltd, Delhi.
2. Third Edition, Introduction to theory of statistics, Alexander **M. Mood, Frauklin A. Gray Bill, Duano C. Boes,** Tata McGraw Hill publishers.

Web Resources:

1. https://books.google.co.in/books?id=QTQk8tXrHKUC&printsec=frontcover&dq=probability+theory+and+mathematical+statistics+book&hl=en&sa=X&ved=0ahUKEwjWhp-Nlp7AhVCLo8KHTo_A4sQ6AEITjAI#v=onepage&q=probability%20theory%20and%20mathematical%20statistics%20book&f=false
2. www2.imperial.ac.uk>~ayoung
3. http://kurser.math.su.se>resource>view

Note: Questions to be taken only from the Text Book.

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Recall the concepts of Random events, axioms of probability and Independent events	K-1
CO2	Gain knowledge about the Marginal distributions, Conditional distributions, Moments, Regressions	K-2
CO3	Understand the concepts of characteristic functions and Probability generating functions	K-3
CO4	Analyse about the one-point, two-point distributions, Binomial distribution, Poisson distribution, Uniform distribution and Normal distribution	K-4
CO5	Analyze about the stochastic convergence	K-4

K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	M	-	M	M	S	S	M	M	M	S	S
CO2	S	S	S	S	-	M	M	S	S	M	M	M	S	S
CO3	S	S	M	S	-	M	M	S	S	S	M	M	M	S
CO4	S	M	M	M	-	M	M	S	S	S	S	S	M	S
CO5	S	M	M	M	-	M	M	S	S	M	M	M	M	S

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16
M.Sc. MATHEMATICS - SEMESTER III
ELECTIVE III - FLUID DYNAMICS (19PMAEC3)
For Candidates Admitted From 2019 – 2020 Onwards (Under CBCS)

5 Hours / Week **3 Credits**

Course Objectives: The course aims to

1. know the concepts of real fluids, velocity potential, equations of continuity, Euler's equation of motion and vortex motion with examples.
2. gain knowledge about sources, sinks, doublets and axi-symmetric flows with examples.
3. discuss the Milne - Thomson circle theorem, the Theorem of Blasius and the Navier-stokes's equation of motion of a viscous fluid.
4. develop flexibility and creativity of the students in applying the Mathematical ideas and techniques to solve unfamiliar problems arising in everyday life.

Syllabus

Unit - I **No. of Hours: 14**

Kinematics of Fluids in Motion

Real fluids and ideal fluids - Velocity of a fluid at a point, stream lines, path lines, steady and unsteady flows - Velocity potential - The vorticity vector - Local and particle rates of changes - Equations of continuity - Worked examples - Accelaration of a fluid - Conditions at a rigid boundary.

Chapter 2 (Sections 2.1 to 2.10)

Unit- II **No. of Hours: 16**

Equations of Motion of a Fluid

Pressure at a point in a fluid at rest - Pressure at a point in a moving fluid - Conditions at a boundary of a two inviscid immiscible fluids - Euler's equation of motion - Worked examples - Discussion of the case of steady motion under conservative body forces - Some potential theorems - Some further aspects of vortex motion

Chapter 3 (Sections 3.1 to 3.8, 3.12)

Unit – III **No. of Hours: 14**

Some Three Dimensional Flows

Introduction - Sources, sinks and doublets - Images in a rigid infinite plane - Images in solid spheres - Axi - symmetric flows; stokes's stream function - Some special forms of the stream function for Axi - symmetric irrotational motions.

Chapter 4 (Section 4.1 to 4.5)

Unit- IV **No. of Hours: 16**

Some Two Dimensional Flows

Meaning of two dimensional flow - Use of cylindrical polar coordinates - The stream function - The complex potential for two dimensional, irrotational, incompressible flow - Complex velocity potential for standard two-dimensional flows, uniform stream, line sources and line sinks, line doublets, line vortices - Some worked examples - Two dimensional image systems - The Milne - Thomson circle theorem - some application of the circle theorem - The theorem of Blasius.

Chapter 5 (Sections 5.1 to 5.9)

Unit – V **No. of Hours: 15**

Viscous Flows

Stress components in a real fluid - Relations between cartesian components of stress - Translational motion of fluid elements - The rate of strain quadric and principal stresses - Some further properties of the rate of strain quadric - stress analysis in fluid motion - Relations between stress and rate of strain - The coefficient of viscosity and Laminar flow - The Navier – Stokes's equations of motion of a viscous fluid

Chapter 8 (Sections 8.1 to 8.9)

Book for Study:

Text book of fluid dynamics, **F. Chorlton,** CBS publications, Delhi, Second Edition.

Books for Reference:

1. Theoretical Hydrodynamics, **L.M.Milne Thomson,** The MACMILLAN Press Ltd.,
2. Fluid Dynamics, **M.D. Raisinghania,** S. Chand & Company Ltd., New Delhi.

Web Resources :

http://www.msubbu.in/ln/fm/

Note: Questions to be taken only from the text books

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO 1	Gain knowledge about real fluids, equations of continuity and vorticity vector	K-1
CO 2	Understand the notions of fluid pressure and derive Euler's equations of motion	K-2
CO 3	Know and apply the concepts of sources, sinks and doublets	K-3
CO 4	Examine the force and moment of the given flow of incompressible fluid using the theorem of Blasins	K-4
CO 5	Evaluate pressure of a viscous fluid by using Navier-Stokes equations of motion of a viscous fluid and create a fluid dynamics model and solve the problems in Physics, Biology and Engineering	K-6

K-1 :Recall, K-2 :Understand, K-3 :Apply, K-4 :Analyse, K-5 :Evaluate, K-6 :Create

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	L	S	S	S	-	S	S	S	-	S	S	S	S	S
CO2	L	S	S	S	-	S	S	S	-	S	S	S	S	S
CO3	L	S	S	S	-	S	S	M	-	M	S	S	S	S
CO4	L	S	S	S	-	S	S	S	-	S	S	S	S	S
CO5	L	S	S	S	-	S	S	S	-	S	S	S	S	S

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM-16.
M.Sc. MATHEMATICS - SEMESTER III
ELECTIVE-III - GRAPH THEORY (19PMAESC3)
For candidates admitted from 2019 - 2020 onwards (Under CBCS)

5 Hours / Week **3 Credits**

Course Objectives : The course aims to

1. acquire the basic knowledge of various types of Graphs
2. know about the applications of the graph theory

Syllabus

Unit - I **No. of Hours:14**

Graphs and Subgraphs:

Graphs and Simple graphs - Graphs Isomorphisms - Incidence and Adjacency Matrices - Subgraphs - Vertex Degrees - Paths and Connections - Cycles - Application - The shortest path problem

(Chapter - 1 : Sections 1.1 to 1.8)

Unit - II **No. of Hours:15**

Trees and connectivity:

Trees - cut edges and bonds - cut vertices - Cayley's Formula - Application - Connector problem - Connectivity - blocks - Application - Reliable Communication Networks

(Chapter - 2 : Sections 2.1 to 2.5 and Chapter - 3 : Sections 3.1 to 3.3)

Unit - III **No. of Hours:15**

Euler Tours and Matchings:

Eulers Tours - Hamilton Cycles - Application - Chinese Postman Problem - Traveling Salesman Problem - Matchings - Matching and Coverings in Bipartite Graphs - Perfect Matchings - Applications - Personal Assignment Problem - Optimal Assignment Problem.

(Chapter - 4 : Sections 4.1 to 4.4 and Chapter - 5 : Sections 5.1 to 5.5)

Unit - IV **No. of Hours:16**

Edge Colouring and Independent Sets:

Edge Colouring - Edge Chromatic Number - Vizings Theorem - Application - Timetabling Problem - Independent Sets - Ramsey's Theorem - Turan's Theorem.

(Chapter - 6 : Sections 6.1 to 6.3 and Chapter - 7 : Sections 7.1 to 7.3)

Unit - V **No. of Hours:15**

Vertex Colourings:

Vertex Colourings - Chromatic Number - Brook Theorem - Hajos Conjecture - Chromatic Polynomials - Girth and Chromatic Number - A storage problem.

(Chapter – 8 : Sections 8.1 to 8.6)

Book for Study:

Graph Theory with Applications, **J.A.Bondy** and **U.S.R.Murty**, North Holland, New York, 1982.

Books for Reference:

1. Graph Theory with Application to Engineering and Computer Science, **Narasing Deo**, Prentice Hall of India, New Delhi. 2003.
2. Graph Theory, **F. Harary**, Addison-Wesely Pub. Co. The Mass. 1969
3. Graph Theory Application, **L.R.Foulds**, Narosa Publ. House, Chennai, 1933.

Note: Questions to be taken only from the text book

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO 1	Know the basic definitions and concepts of Graphs and Subgraphs.	**K-1**
CO 2	Get acquainted with the concepts of Trees, Connectivity and its applications.	**K-2**
CO 3	Recoganize the concepts and properties of Euler Tours and Matchings and study its applications.	**K-3**
CO 4	Assimilate the knowledge about many different coloring problems for Graphs, Formulate applied problems as coloring problems and understand the notations of independent Sets.	**K-3**
CO 5	Acquire the knowledge about the concepts of Vertex colorings colourings and model in the real life problem.	**K-4**

K-1 :Recall, K-2 :Understand, K-3 :Apply, K-4 :Analyse, K-5 :Evaluate, K-6 :Create

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	L	M	M	M	M	L	L	M	M	L	L	L	L	L
CO2	S	S	S	S	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	M	S	S

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM-16.
SEMESTER - III
EXTRA DISCIPLINARY COURSE
QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS
(19PMAEDC)
For Candidates Admitted From 2019 - 2020 Onwards (Under CBCS)

4 Hours / Week **4 Credits**

Course Objectives: The course aims to

1. acquire the knowledge of basic Mathematics.
2. understand the basic concepts of numbers, logarithms, permutations and combinations and probability.
3. promote the problem solving ability using short-cut methods.

Syllabus

Unit – I : **No. of Hours :12**

Numbers – HCF and LCM of Numbers – Decimal Fractions – Square Roots and Cube Roots.

Section 1 (1, 2, 3, 5)

Unit – II: **No. of Hours :12**

Average – Problems on Numbers – Problems on Ages-Surds and indices

Section 1 (6 to 9)

Unit – III: **No. of Hours : 12**

Profit and Loss – Ratio and Proportion – Partnership – Chain Rule.

Section 1 (11 to 14)

Unit – IV: **No. of Hours : 12**

Time and Distance – Problems on Trains – Boats and Streams – Logarithms

Section 1 (17, 18, 19, 23)

Unit – V: **No. of Hours :12**

Permutations and Combinations – Probability – Heights and Distances – Odd Man Out and Series.

Section 1 (30, 31, 34, 35)

Book for Study:

Quantitative Aptitude for Competitive Examinations (Fully Solved) – **R.S.Aggarwal,** S.Chand and company Ltd.,

Books for Reference:

Quantitative Aptitude for All Competitive Examinations by **Abhijit Guha**, McGraw Hill Education; Sixth edition.

Web Resources :

1. https://www.careerride.com/Tips-tricks-and-formulae-on-H.C.F-and- L.C.M.pdf
2. http://www.mahendraguru.com/2017/08/important-notes-problem-based-on-ages.html
3. http://www.mahendraguru.com/2017/08/important-notes-percentage.html
4. http://www.mahendraguru.com/2017/07/profit-and-loss.html.

Note: Questions to be taken only from the Text Books.

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Perform basic computations in numbers, HCF and LCM of numbers, decimal fractions and square and cubic roots	K-1
CO2	Analyze the real world scenarios to recognize and solve the problems on averages, problems on numbers and ages, surds and indices	K-3
CO3	Acquire knowledge about the problems of profit and loss, ratio and proposition, partnership and chain rule and gain ability to solve them	K-3
CO4	Relate ideas and concepts of problems on trains, boats streams and logarthims	K-4
CO5	Understand the concepts of permutations and combinations, probability, height and distances and odd man out and series and gain ability to evaluate the related problems	K-5

K-1 Recall; K-2 Understand; K-3 Apply; K-4 Analyse; K-5 Evaluate; K-6 Create

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM - 16
M.SC. MATHEMATICS - SEMESTER IV
CORE XIII - FUNCTIONAL ANALYSIS (19PMAC13)
For Candidates Admitted From 2019-2020 Onwards (Under CBCS)

6 Hours / Week **4 Credits**

Course Objectives: The course aims to

1. understand the theory of Hilbert spaces and Banach spaces and their operators.
2. form a bridge between abstract Mathematics and Applied Mathematics.
3. generalize many concepts of classical Mathematics.

Syllabus

Unit- I **No. of Hours:18**

Banach Spaces - The definition and some examples - Continuous linear transformations - The Hahn Banach Theorems.
Chapter 9 (Sections 46 to 48)

Unit – II **No. of Hours:18**

Banach Spaces - The natural imbedding of N in N** - The open mapping theorem - The conjugate of an operator.
Chapter 9 (Sections 49 to 51)

Unit – III **No. of Hours:18**

Hilbert Spaces - The definition and some Simple Properties - Orthogonal Complements - Orthonormal sets - The conjugate space H*
Chapter 10 (Sections 52 to 55)

Unit – IV **No. of Hours:18**

Hilbert Spaces - The adjoint of an Operator - Self adjoint Operators - Normal and Unitary Operators - Projections
Chapter 10 (Sections 56 to 59)

UNIT-V **No. of Hours:18**

General Preliminaries on Banach Algebras - The definition and some examples - Regular and singular elements - Topological divisors of Zero - The spectrum - The formula for the Spectral radius - The radical and Semi - Simplicity.
Chapter 12 (Section 64 to 69)

Book for Study:

G.F. Simmons - Introduction to topology and Modern Analysis - International Students edition - Mcgraw - Hill Book Company - New York - 1963.

Books for Reference

1. **W. Rudin** - Functional Analysis Tata McGraw Hill publishing Company – New Delhi – 1973.
2. **H.C. Goffman** and **G. Fredrick** First Course in Functional Analysis – Prentice Hall of India – New Delhi – 1987.
3. Functional Analysis, – **Balmohan V. Limaye** Professor of Mathematics, Indian Institute of Technology, – Bombay – Second edition – New Age – International Ltd – Publishers.
4. Functional Analysis – **Dr. D. Somasundaram,** S. Viswanathan (Printers and Publishers) Pvt. Ltd.

Web Resources :

1. https://ocw.mit.edu/courses/mathematics/18-102-introduction-to-functional-analysis-spring-2009/lecture-notes/
2. http://nptel.ac.in/courses/111105037/
3. https://people.math.ethz.ch/~salamon/PREPRINTS/funcana.pdf

Note: Questions to be taken only from the text book

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO 1	Learn and analyse the central concepts of Banach Space, continuous linear transformation, Hahn-Banach Theorem and its applications	K-1
CO 2	Know about Natural imbedding, open mapping theorem and anayse its properties	K-2
CO 3	Analyse axiomatic knowledge of the properties of a Hilbert space, including orthogonal complements, orthonormal sets, complete orthonormal sets together with related identities and inequalities and relate	K-4
CO 4	Master the relevance of Operator Theory.	K-4
CO 5	Discuss analyse about preliminaries on Banach algebras and spectrum of an operator	K-4

K-1: Recall; K-2: Understand; K-3: Apply; K-4: Analyze; K-5: Evaluate; K-6: Create.

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	-	S	S	S	S	S	S	S	M	S
CO2	S	M	S	S	-	S	S	S	S	S	S	S	M	S
CO3	S	M	S	S	-	S	S	S	S	S	S	S	M	S
CO4	S	M	S	S	-	S	S	S	S	S	S	S	M	S
CO5	S	M	S	S	-	S	S	S	S	S	S	S	M	S

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM-16
M.Sc. MATHEMATICS – SEMESTER IV
CORE XIV - MATHEMATICAL MODELING (19PMAC14)
For candidates admitted from 2019-2020 onwards (under CBCS)

6 Hours / Week **4 Credits**

Course Objectives: The course aims to

1. comprehend mathematical modeling ideas

2. acquire the knowledge of mathematical modeling through ordinary differential equations of first and second order.

3. build up the capacity of tackling this present reality issues through mathematical modeling.

Unit – I **No. of hours: 18**

Mathematical Modeling: Need, Techniques, Classifications and Simple Illustrations

Simple Situations Requiring Mathematical Modeling - The Technique of Mathematical Modeling - Classification of Mathematical Models - Some Characteristics of Mathematical Models

Mathematical Modeling Through Ordinary Differential Equations of First Order

Mathematical Modeling Through Differential Equations - Linear Growth and Decay Models - Non-Linear Growth and Decay Models - Compartment Models

Chapter 1 (Sec 1.1 to 1.4), Chapter 2 (Sec 2.1 to 2.4)

Unit – II **No. of hours: 18**

Mathematical Modeling Through Systems of Ordinary Differential Equations of First Order

Mathematical Modeling in Population Dynamics - Mathematical Modeling of Epidemics Through Systems of Ordinary Differential Equations of First Order - Compartment Models Through Systems of Ordinary Differential Equations - Mathematical Modeling in Economics Through Systems of Ordinary Differential Equations of First Order

Chapter 3 (Sec 3.1 to 3.4)

Unit – III **No. of hours: 18**

Mathematical Modeling Through Systems of Ordinary Differential Equations of First Order

Mathematical Models in Medicine, Arms Race, Battles and International Trade in Terms of Systems of Ordinary Differential Equations

Mathematical Modeling Through Ordinary Differential Equations of Second Order

Mathematical Modeling of Planetary Motions - Mathematical Modeling of Circular Motion and Motion of Satellites

Chapter 3 (Sec 3.5), Chapter 4 (Sec 4.1 & 4.2)

Unit – IV **No. of hours: 18**

Models for Blood Flows

Some Basic Concepts of Fluid Dynamics - Basic Concepts about Blood, Cardiovascular System and Blood Flows - Steady Non-Newtonian Fluid Flows in Circular Tubes - Basic Equations for Fluid Flow - Flow of Power-law Fluid in Circular Tube - Flow of Herschel-Bulkley Fluid in Circular Tube - Flow of Casson Fluid in Circular Tube – Flow of m Immiscible Power-law Fluids in a Circular Tube - Blood Flow through Artery with Mild Stenosis.

Chapter 11 (Sec 11.1, 11.2, 11.3 (11.3.1-11.3.5), 11.5)

Unit – V **No. of hours: 18**

Models for Optimal Control of Water Pollution

Water Quality Management Models - Water Quality Management Model 1 - Water Quality Management Model 2 - Water Quality Management Model 3 - Water Quality Management Model 4 - Other Models for Water Quality Management - Other Optimal Pollution Control Models - Optimal Air Pollution Control Models - Control Models for Solid Waste Disposal - Noise Pollution Control Model

Chapter 14 (Sec 14.3 - 14.3.1 to 14.3.6) (Sec 14.4 - 14.4.1 to 14.4.4)

Contents and treatments as in

1. Mathematical modeling by **J. N. Kapur**, New Age International (P) Limited, Publishers, New Delhi, First Edition (Unit I - Unit III)
2. Mathematical Models in Biology & Medicine by **J. N. Kapur**, Affiliated East-West Press Private Limited, New Delhi (Unit IV and Unit V)

Books for References

1. **D.N. Burghes** - Modeling through Differential Equation, Ellis Horwood and John Wiley.
2. **C**. **Dyson** and **E. Levery**, Principle of Mathematical Modeling, Academic Press New York.
3. **Giordano, Weir, Fox,** A First Course in Mathematical Modeling 2nd Edition, Brooks/ Cole Publishing Company, 1997.
4. **B. Barnes, G. R. Fulford,** Mathematical Modeling with Case Studies, A Differential Equation Approach using Maple and Matlab, 2nd Ed., Taylor and Francis group, London and New York, 2009.

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO 1	Understand the classification and characteristics of mathematical models	**K-2**
CO 2	Apply mathematical models in differential equations to solve real world problems	**K-3**
CO 3	Analyze the planetary and circular motion of satellites through mathematical modeling	**K-4**
CO 4	Analyze the fluid dynamics of blood flows through mathematical models	**K-4**
CO 5	Evaluate the solution for reducing pollution through mathematical models	**K-5**

K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	M	S	L	L	-	L	M	M	-	M	S	S	M	S
CO2	S	S	M	S	-	S	S	S	-	S	S	S	S	S
CO3	S	S	S	S	-	S	S	S	-	S	S	S	S	S
CO4	S	S	S	S	-	S	S	S	-	S	S	S	S	S
CO5	S	S	S	S	-	S	S	S	-	S	S	S	S	S

S-Strong, M-Medium, L-Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM-16
M.Sc. MATHEMATICS – SEMESTER IV
ELECTIVE IV – OPTIMIZATION TECHNIQUES(19PMAEC4)
For candidates admitted from 2019-2020 onwards (under CBCS)

6 Hours / Week **4 Credits**

Course Objectives: The course aims to

1. learn the method of solving the real-world mathematical programming problems applying minimal spanning tree, shortest route and maximal flow algorithms.
2. gain knowledge about deterministic dynamic programming.
3. gain knowledge about the formulation and solution of inventory models.
4. acquire knowledge about the three categories of decision making process.
5. gain knowledge about different queuing systems.

Syllabus

UNIT – I **No. of Hours: 18**

Network Models: Network definitions, Minimal spanning tree algorithm, Shortest-route problem: Examples of the shortest-route applications, Shortest-route algorithms, Maximal flow model: Enumeration of cuts, Maximal flow algorithm.

Chapter 6 (Sections: 6.1, 6.2, 6.3 (6.3.1, 6.3.2), 6.4 (6.4.1, 6.4.2).

UNIT –II **No. of Hours: 17**

Deterministic Dynamic Programming: Recursive nature of computations in DP, Forward and Backward recursion, Selected DP applications: Knapsack/Flyaway Kit/Cargo-loading model, Workforce size model, Equipment replacement model.

Chapter 10 (Sections: 10.1, 10.2, 10.3(10.3.1, 10.3.2, 10.3.3))

UNIT –III **No. of Hours: 19**

Deterministic Inventory Models: General inventory model, Static EOQ models: Classic EOQ model, EOQ with price breaks, Multi-item EOQ with storage limitation.

Probabilistic Inventory Models: Continuous review models: "Probabilitized" EOQ model, Probabilistic EOQ model, Single-period models: No setup model, Setup model(s-S policy).

Chapter 11 (Sections: 11.1, 11.2(11.2.1, 11.2.2, 11.2.3)

Chapter 16 (Sections: 16.1(16.1.1, 16.1.2), 16.2(16.2.1, 16.2.2).

UNIT – IV **No. of Hours: 17**

Decision Analysis: Decision making environments, Decision making under certainty, Decision making under risk: Expected value criterion, Variations of the expected value criterion, Decision under uncertainty.

Chapter 14 (Sections: 14.1, 14.2 (14.2.1, 14.2.2),14.3)

UNIT –V **No. of Hours: 19**

Queuing Systems: Elements of a queuing model, Role of exponential distribution, Pure birth and death models (Relationship between the exponential and poisson distributions): Pure birth model, Pure death model, Specialized poisson queues: Steady state measures of performance, Single-server models, Muliple-server models (excluding self service model), (M / G / I) : (GD/ ∞ / ∞)Pollaczek - Khintchine(P-K) formula.

Chapter 17 (Sections: 17.2, 17.3, 17.4(17.4.1, 17.4.2), 17.6(17.6.1, 17.6.2, 17.6.3(excluding self service model)), 17.7)

Text book:

"Operations Research" by **Hamdy A. Taha** , Seventh Edition, Prentice Hall of India Private limited, New Delhi.

Books for Reference :

1. "Introduction to Operations Research" by **Frederick S. Hillier, Gerald J. Lieberman, Bodhibrata Nag, Preetam Basu,** Nineth Edition, Tata- Mc Graw Hill Publications Company, New Delhi.
2. "Operations Research" by **Kantiswarup, P.K.Gupta, Man Mohan,** Tenth Edition, Sultan Chand & Sons, New Delhi.

Web Resources :

1. http://www.pondiuni.edu.in/storage/dde/downloads/mbaii_qt.pdf
2. *https://www.netlab.tkk.fi/opetus/s383143/kalvot/E_bdpros.pdf*
3. https://www.alameen.ac.in/images/QUESTIONBANK/CSE/IIYEAR/MA6453PQTLecture-Notes.pdf

Note: Questions to be taken only from the text book

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the different decision making criterions and their applications.	K-2
CO2	Acquire knowledge about solving real world problems by applying minimal spanning tree, shortest route and maximal flow algorithms.	K-3
CO3	Analyse the deterministic and probabilistic inventory models.	K-4
CO4	Evaluate the optimum solution of multivariable problems and study some selected DP applications.	K-5
CO5	Formulate different queuing systems and emphasize the implementation of the queuing results in practice.	K-6

K-1: Recall, K-2: Understand, K-3: Apply, K-4: Analyse, K-5: Evaluate, K-6: Create

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	S	-	S	S	S	-	S	S	S	S	S
CO2	S	S	M	S	-	S	S	M	-	M	S	M	M	S
CO3	S	S	S	S	-	S	S	S	-	S	S	S	S	S
CO4	S	S	M	S	-	S	S	M	-	M	S	M	M	S
CO5	S	S	S	S	-	S	S	S	-	S	S	S	S	S

S-Strong, M-Medium, L-Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM - 16
M.Sc. MATHEMATICS SEMESTER - IV
ELECTIVE IV - REPRESENTATION THEORY (19PMAESC4)
For candidates admitted from 2019-2020 Onwards (Under CBCS)

6 Hours / Week **4 Credits**

Course Objectives: The course aims to

1. understand the concepts of Group representations and Group algebra.
2. gain knowledge about Irreducible characters and Character tables.

Syllabus

Unit - I : **No. of Hours : 18**

Group representations, FG modules, FG submodules and reducibility, Group algebras.

Unit - II **No. of Hours : 18**

FG- homomorphisms, Maschike's Theorem, Schur's Lemma, Irreducible modules and the group algebra.

Unit - III **No. of Hours : 18**

More on the group algebra, Conjugacy classes, Characters.

Unit - IV **No. of Hours : 18**

Inner product of characters, The number of irreducible characters.

Unit - V **No. of Hours : 18**

Character tables and orthogonality relations, Normal subgroups and lifted characters, Some elementary character tables.

Book for Study:

Representations and Characters of Groups by **G. James** and **M. Liebeck** (Second edition), Cambridge University Press, London, 2001.

Book for Reference :

Methods of Representation Theory with Applications to Finite Groups and Orders,Volume 1 by **C.W. Curtis** and **I. Reiner**, Wiley – Interscience, New York,1981.

Web Resource :

1. https://people.math.ethz.ch/~wilthoma/docs/grep.pdf
2. http://www.maths.gla.ac.uk/~abartel/docs/reptheory.pdf

Note: Questions to be taken only from the text books

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO 1	Recall the basic properties of groups and gain the knowledge of group representations, FG modules and reducibility and group algebras	K-1
CO 2	Understand the concepts of FG- homomorphisms, Maschike's theorem, Schur's lemma and irreducible modules	K-2
CO 3	Understand the notions of inner product of characters and the number of irreducible characters	K-2
CO 4	Analyse the dimensions and characters of representations of symmetric groups, dihedral groups and conjugacy classes	K-4
CO 5	Create the character tables and orthogonality relations and gain knowledge about some elementary character table	K-6

K-1 Recall, K-2 Understand, K-3 Apply, K-4 Analyse, K-5 Evaluate, K-6 Create

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	**S**	**S**	**S**	**S**	L	M	**S**	M	**S**	**S**	L	**S**	L	**S**
CO2	**S**	**S**	**S**	**S**	L	M	**S**	M	**S**	**S**	L	**S**	L	**S**
CO3	**S**	**S**	**S**	**S**	L	M	**S**	**S**	**S**	**S**	L	**S**	L	**S**
CO4	S	S	S	S	L	M	S	S	S	S	L	S	L	S
CO5	S	S	S	S	L	M	S	S	S	S	L	S	L	S

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM - 16
M.Sc. MATHEMATICS - SEMESTER IV
CORE (Practical) - MATLAB PRACTICALS (19PMAQC)
For Candidates Admitted From 2019 - 2020 Onwards (Under CBCS)

6 Hours / Week **3 Credits**

Course Objectives: The course aims to

1. gain knowledge about numerical computations and display information graphically in 2D and 3D.
2. perform computationally intensive tasks faster than the traditional programming languages such as C, C++, and Fortran.

Suggested list of problems (Source code to be written and executed in Matlab)

1. Solving a linear system
2. Gaussian elimination
3. Finding eigen values and eigen vectors
4. Matrix factorizations
5. Polynomial curve fitting on the fly
6. Curve fitting with polynomial functions
7. Least squares curve fitting
8. Interpolation.
9. Numerical solutions of the heat equation

Course Outcomes (CO) : On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO 1	Getting acquainted with fundamental operations in Matlab, solving linear systems and Gauss elimination	K-1
CO 2	Familiar with performing statistical data analysis, data interpolation, polynomial curve fitting and least square curve fitting by Matlab	K-3
CO 3	Apply Matlab to solve ordinary differential equations and non-linear system of equations	K-3
CO 4	Apply Matlab to solve Partial differential equations and non-linear system of equations	K-3
CO 5	Create fuzzy model using Fuzzy Relations and apply in practical situations	K-6

K-1 Recall, K-2 Understand, K-3 Apply, K-4 Analyse, K-5 Evaluate, K-6 Create

Mapping of COs with POs and PSOs :

PO/ PSO / CO	PO									PSO				
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	**S**	**S**	**S**	**S**	S	S	**S**	S	**-**	**S**	S	**S**	S	**S**
CO2	**S**	**S**	**S**	**S**	S	S	**S**	S	**-**	**S**	S	**S**	S	**S**
CO3	**S**	**S**	**S**	**S**	S	S	**S**	**S**	**-**	**S**	S	**S**	S	**S**
CO4	S	S	S	S	S	S	S	S	-	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	-	S	S	S	S	S

S - Strong, M - Medium, L – Low

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM-16.
II M.Sc. Mathematics - IV SEMESTER
CORE-XV PROJECT REPORT AND VIVA (19PMAPC)
(For students admitted from 2019-2020 onwards)

6 Hours / Week **5 Credits**

Guidelines for Project Work

(a) Topic

The topic of the Project work shall be assigned to the candidate at the beginning of the 3rd Semester.

(b) No. of copies of the Project Report

The students should prepare two copies of the project report and submit the same for the evaluation by Examinations. After evaluation, one copy is to be retained in the college library and one copy can be returned to the student.

(c) Format to be followed

Format for the preparation of project report should include

1. Title page
2. Bonafide Certificate
3. Declaration
4. Acknowledgement
5. Table of Contents
6. Chapters
7. Bibliography

SCHEME OF EXAMINATION

Dissertation	-	70 Marks
Viva	-	30 Marks