SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS)

SALEM - 16

Reaccredited with 'B++' Grade by NAAC

Affiliated to Periyar University

PG & RESEARCH DEPARTMENT OF MATHEMATICS

Outcome Based Syllabus

M.Sc. MATHEMATICS

(For the students admitted in 2022 - 23)

M.Sc. MATHEMATICS
PROGRAMME OUTCOMES

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.

SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS) SALEM - 16
PG & RESEARCH DEPARTMENT OF MATHEMATICS
M.Sc. MATHEMATICS
PROGRAMME STRUCTURE UNDER CBCS
(For the students admitted in 2022 - 2023)
Total Credits: 92 + Extra Credit(Maximum 16)
I SEMESTER

Course	Course Title	Code	Hrs/ Week	Credits
Core - I	Algebra	22PMAC1	6	5
Core - II	Real Analysis	22PMAC2	6	5
Core - III	Ordinary Differential Equations	22PMAC3	6	5
Core - IV	Classical Dynamics	22PMAC4	6	5
Elective I	Numerical Analysis/ Calculus of Variation and Integral Equations	22PMAEC1/ 22PMAESC1	6	4
	Total		**30**	**24**
Extra Skills	• *Value Education* • *Physical Fitness Practice* • *Life Skills Promotion* • *Productive Preparation for CSIR NET/SET/JRF - I(22PMASC1) (Self - Study - 1 Extra Credit)*			

II SEMESTER

Course	Course Title	Code	Hrs/ Week	Credits
Core - V	Linear Algebra	22PMAC5	6	5
Core - VI	Measure and Integration	22PMAC6	5	3
Core - VII	Partial Differential Equations	22PMAC7	5	4
Core - VIII	Differential Geometry	22PMAC8	6	5
Elective II	Fuzzy sets and their applications/ Difference equations	22PMAEC2/ 22PMAESC2	6	5
Human Rights	Human Rights	22PHRSC	2	2
	Total		**30**	**24**
Extra Skills	• *Value Education - 1 Extra Credit* • *Physical Fitness Practice - 1 Extra Credit* • *Life Skills Promotion - 1 Extra Credit* • *Productive Preparation for CSIR NET/SET/JRF - II (22PMASC2) (Self - Study - 1 Extra Credit)* • *Extension Activity - 1Extra Credit*			

- ***Extra credits are given for extra skills and courses qualified in MOOC/NPTEL***

III SEMESTER

Course	Course Title	Code	Hrs./ Week	Credits
Core - IX	Complex Analysis	22PMAC9	5	4
Core - X	Topology	22PMAC10	6	4
Core - XI	Number Theory	22PMAC11	5	4
Core - XII	Mathematical Statistics	22PMAC12	5	4
Elective III	Fluid dynamics/ Graph theory	22PMAEC3/ 22PMAESC3	5	3
Extra Disciplinary Course	Quantitative Aptitude for Competitive Examination	22PMAEDC	4	4
	Total		**30**	**23**
Extra Skills	• *Value Education* • *Physical Fitness* • *Life Skills Promotion* • *Productive Preparation for CSIR NET/SET/JRF - III(22PMASC3) (Self - Study - 1 Extra Credit)*			

- **Preparation for project - 5 Hours per week (Outside College Hours)**

IV SEMESTER

Course	Course Title	Code	Hrs./ Week	Credits
Core - XIII	Functional Analysis	22PMAC13	6	5
Core - XIV	Mathematical Modeling	22PMAC14	6	4
Elective IV	Optimization techniques/ Representation Theory	22PMAEC4/ 22PMAESC4	6	4
Core (Practical)	Core Practical - MATLAB	22PMAQC	6	3
Core - XV	Project and project viva - voce	22PMAPC	6	5
	Total		**30**	**21**
Extra Skills	• *Value Education - 1 Extra Credit* • *Physical Fitness Practice - 1 Extra Credit* • *Life Skills Promotion - 1 Extra Credit* • *Productive Preparation for CSIR NET/SET/JRF - IV (22PMASC4) (Self - Study - 1 Extra Credit)* • *Extension Activity - 1Extra Credit*			

- ***Extra credits are given for extra skills and courses qualified in MOOC/NPTEL***

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : ALGEBRA
Course Code : 22PMAC1 **Hours / Week: 6**
Semester : I **Credits: 5**

Course Objectives:

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

Syllabus

Unit - I(Hours : 18)

Another Counting Principle, Sylow's Theorem, Direct Products & Application of Sylow's theorem.

Chapter 2 - sec: 2.11, 2.12 & 2.13 (Page No: 82 - 108)

Web link:

https://www.youtube.com/watch?v=m3tm_5uFsEshttps://www.youtube.com/watch?v=CagTIfgASN 8https://www.youtube.com/watch?v=K8o4xc54GBw

Unit - II(Hours : 18)

Finite Abelian Groups. Fields - Extension Fields , Roots of Polynomials &Application of Finite fields in Cryptography.

Chapter 2 - Sec:2.14(Page No:109 - 115)

Chapter - 5 - sec:5.1& 5.3(Page No: 207 - 215,219 - 227)

Web link:

https://www.youtube.com/watch?v=psj6gKOv2Rg

Unit - III(Hours : 18)

More About Roots, The Elements of Galois Theory, Solvability by Radicals&Application of Galois theory.

Chapter 5 - Sec: 5.5, 5.6 & 5.7 (Page No: 232 - 256)

Web link:

https://www.matec - conferences.org/articles/matecconf/pdf/2018/69/matecconfcscc201803012.pdf

Unit - IV(Hours : 18)

Finite Fields, Wedderburn's Theorem on Finite Division Rings ,A Theorem ofFrobenius & Application of Finite fields.

Chapter - 7 - Sec: 7.1, 7.2 & 7.3(Page No: 355 - 370)

Web link: https://www.youtube.com/watch?v=0B0M0aocfJA

Unit - V(Hours : 18)

Definitions and examples, Submodules and direct sums, R - homomorphisms and Quotient modules, Completely reducible modules , Free modules & Application of Vector spaces.

Chapter - 14 - Sec: 1, 2, 3, 4 & 5 (Page No: 246 - 268)

Web link:

https://www.britannica.com/science/vector - space

Books for study:

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

edition), Cambridge University Press,1997.
(For Unit: V)

Books for Reference:

1. M.Artin, Algebra, Prentice Hall of India, 1991.
2. I.S. Luther and I.B.S.Passi , Algebra,Vol.I - Groups, Vol.II Rings, NarosaPublishing House, New Delhi,1999.
3. N.Jacobson , Basic Algebra Vol.I&II, 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_4fbAhXIOI8KHWXrAboQuwUILT AB#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 would be able to

CO Number	CO Statement	Knowledge Level
CO1	learn the concepts of groups ,fields and modules.	K - 1
CO2	prove Sylow's theorems on groups, Wedderburn's Theorem on finite division rings and theorems on Galois theory.	K - 5
CO3	understand in detail about extension fields and roots of polynomials, quotient ,free and completely reducible modules.	K - 2
CO4	apply the acquired knowledge on Sylow's theorems ,extension fields and roots of polynomials to prove the results and solve the problems.	K - 3
CO5	interrelate the solvability by radicals of a polynomial with the Galois group and analyse the importance of Direct products and Finite abelian groups.	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 / CO	PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO1	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : REAL ANALYSIS
Course Code : 22PMAC2 **Hours / Week:6**
Semester : I **Credits:5**

Course Objectives :

1. To understand the concepts of functions of bounded variation
2. To discuss the concepts of Riemann - Stieltjes integral, existence and propertiesof Riemann - Stieltjes integral
3. To acquire knowledge about the Inverse function theorem and Implicit functiontheorem

Syllabus

Unit - I(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 - 6.8)

Application of bounded variation :

Web link : https://youtu.be/kfhBMYJrPP0

Unit - II(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 - 7.14)

Application of Upper and lower integrals :

Web link : https://www.youtube.com/watch?v=hNOnzg - TcVs

Unit - III(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 criterion for the existence of Riemann integrals.

Chapter 7 (Sec 7.15 - 7.26)

Application of Riemann Stieltjes Integral :

Web link : https://www.youtube.com/watch?v=R1FfEIQ9Vr8

Unit - IV(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 - 12. 14)
Application of directional derivative :
Web link : https://youtu.be/Hc1KHP8Y590

Unit - V(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 several variables - Extremum problems with side conditions.
Chapter 13 (Sec 13.1 - 13.7)
Application of Extremum problems
Web link : https://youtu.be/tkAOuPSPGPM https://www.youtube.com/watch?v=tuLj - DVpOPg

Book for study:

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

Books for References

1. Walter Ruidin, Mathematical Analysis**,** Tata McGraw - Hill Publishing Company Ltd.,New Delhi (Third Edition)
2. Roydon H.L, Real Analysis, Macmillan Publishing Company, NewYork,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 would be able to

CO Number	CO Statement	Knowledge Level
1.	understand the concepts of functions of boundedvariation, Riemann - Stieltjes integral, multi variable derivatives, Implicit functions and extremum problems.	**K - 2**
2.	examine the properties of monotonic functions, Riemann - Stieltjes integral and the applications of fundamental theorems of integration .	**K - 4**
3.	assess the importance of functions of bounded variations, Mean value theorems for Riemann - Stieltjes ,implicit function and inverse function theorem .	**K - 5**
4.	recognise the concepts of directional derivative, total derivative, Jacobian matrix, functions with non - zero Jacobian determinant and discuss the related properties.	**K - 6**
5.	applying the derivatives in chain rule, Mean value theorem of differentiable functions and extrema of real valued functions of several variables	**K - 3**

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

Mapping of COs with POs :

PO / CO	PO								
	PO 1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO7**	**PO 8**	**PO 9**
CO1	S	S	S	M	M	S	S	S	S
CO2	S	S	S	M	M	S	S	S	S
CO3	S	S	S	M	M	S	S	S	S
CO4	S	S	S	M	M	S	S	S	S
CO5	S	S	S	M	M	S	S	S	S

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title	**: M.Sc. MATHEMATICS**	
Course Title	**: ORDINARY DIFFERENTIAL EQUATIONS**	
Course Code	**: 22PMAC3**	**Hours / Week: 6**
Semester	**: I**	**Credits: 5**

Course Objectives:

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

Syllabus

Unit - I (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 nonhomogeneousequation of order two.

Chapter 2 (Sections 2 to 6 only)

Newton's law of cooling using linear equations with constant coefficients

Book : Explorations of Mathematical Models in Biology with MATLAB - MazenShahin, Wiley Publishers

Chapter 2 (Sections 2.2.6, Pages 84 - 87 only)

Unit - II (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 methodfor solving the non - homogeneous equation.

Evaluation of hidden neurons in neural networks using linear equations with constantcoefficients

Web link : https://www.youtube.com/watch?v=LQ33 - GeD - 4Y

Chapter 2 (Sections 7 to 11 only)

Unit - III (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.

Applications of non - homogenous linear equations in traffic flow

Chapter 3 (Sections 2 to 8 only)

Web link : https://www.youtube.com/watch?v=gfQNuVDboCE

Unit - IV (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)
Various applications of Bessel equations
Web link : https://www.youtube.com/watch?v=1Mzg5kPRrH0

Unit - V(Hours : 18)

Existence and Uniqueness of Solutions to First Order Equations

Equations with Variables separated - Exact equations - The method of successiveapproximations - The Lipschitz condition - Convergence of the successive approximations - Non - local existence of solutions - Approximations to, and uniqueness of solutions
An application of Separable Differential Equation in mixing problem
Chapter 5 (Sections 2 to 8 only)
Web link : https://www.youtube.com/watch?v=A18pRe5AMis

Book for study:

1. E.A. Coddington, An Introduction to Ordinary Differential Equations**,** Prentice Hall of India Private Limited New Delhi - 2005.(Units I to V)

Books for Reference:

1. P. Hartman, Ordinary Differential Equations**,** John Wiley, 1964.
2. R.P. Agarwal and Ramesh C. Gupta, Essentials of Ordinary Differential Equations,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 would be able to

CO Number	CO Statement	Knowledge Level
CO 1	Learn the basic concepts and the genesis of ordinary differential equations such as determining roots and Wronskian	**K1**
CO 2	Discuss the nature of linear dependence and independence of the differential equations and interpret their possible solutions	**K2**
CO 3	Apply the techniques likeAnnhilator method, Euler equation and Bessel's equation available in Differential Equations for solving problems/society orientedproblems	**K3**
CO 4	Analyse linear second order equations with regular singular points at infinity and boundary value problems of first order equations using Lipschitz condition.	**K4**
CO 5	Justify the existence of a singular point for a Legendre equation, solution for a variable separable equation it's uniqueness and generate the basis and solutionfor a given differential equation	**K5& K - 6**

Mapping of COs with POs:

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	M	M	S	S	S	S
CO2	S	S	S	M	M	S	S	S	S
CO3	S	S	S	M	M	S	S	S	S
CO4	S	S	S	M	M	S	S	S	S
CO5	S	S	S	M	M	S	S	S	S

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS

Course Title : CLASSICAL DYNAMICS

Course Code : 22PMAC4 **Hours / Week: 6**

Semester : I **Credits: 5**

Course Objectives:

1. To 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. To gain knowledge about canonical transformations, Lagrange and Poisson brackets.
3. To develop flexibility and creativity of the students in applying mathematical ideas and techniques to unfamiliar problems arising in everyday life.

Syllabus

Unit - I(Hours:18)

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

Applications of Impulse - Momentum Change Theorem

Web link : https://www.physicsclassroom.com/class/momentum/Lesson - 1/Real - World - Application

Chapter 1 (Sections 1.1 to 1.5)

Unit - II(Hours:18)

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

Solve some real life problems using Lagrange's Method

Web link : https://scholar.harvard.edu/files/david - morin/files/cmchap6.pdf

Chapter 2 (Sections 2.1 to 2.3 only)

Unit - III(Hours:18)

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

Applications of Hamilton's Equations

Web link : http://ppc.inr.ac.ru/uploads/476_Hamill.pdf

Chapter 4 (Sections 4.1 to 4.3 only)

Section 4.1 Exclude Non holonomic systems and MultipliersSection 4.2 Derivation of Hamilton's equations only

Unit - IV(Hours:18)

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

Chapter 5 (Sections 5.1 to 5.3)

Applications of Hamilton - Jacobi theory

Weblink:

https://en.wikipedia.org/wiki/Hamilton%E2%80%93Jacobi_equation#HJE_in_a_gravitational_field

Unit - V(Hours:18)

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

Applications of Canonical Transformations

Weblink:

https://phys.libretexts.org/Bookshelves/Classical_Mechanics/Variational_Principles_in_Classical_Mechanics_(Cline)/15%3A_Advanced_Hamiltonian_Mechanics/15.03%3A_Canonical_Transformations_i n_Hamiltonian_Mechanics

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:

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

Books for Reference

1. H. Goldstein , Classical Machanics, Narosa Publishing House, New Delhi, 2001.
2. J.L. Synge and B.A. Griffth, Principles of Mechanics, McGraw Hill Book Co. NewYork, 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	Demonstrate the knowledge of core principles in classical Dynamics	K - 2
CO2	Analyze the Derivation of Lagrange's Equations from Hamilton'sPrinciple and Extension of Hamilton's Principle to Non - holonomic Systems.	K - 4
CO3	Apply the variation principle to solve the problems on real physical situations.	K - 3, K - 6
CO4	Identify the existing symmetries and the corresponding integrals of motion and analyze the qualitative nature of dynamics	K - 3, K - 4
CO5	Discuss the problem solving skills of classical dynamics in various contexts and Distinguish the concept of the Hamilton Equations of Motion and the Principle of Least Action.	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:

CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	L	L	S	S	S	S
CO2	S	S	S	L	L	S	S	S	S
CO3	S	S	S	L	L	S	S	S	S
CO4	S	S	S	L	L	S	S	S	S
CO5	S	S	S	L	L	S	S	S	S

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : NUMERICAL ANALYSIS
Course Code : 22PMAEC1 **Hours / Week: 6**
Semester : I **Credits: 4**

Course Objectives:

1. To acquire knowledge about the methods of obtaining numerical solutions to varioustypes of equations.
2. To develop problem solving skill applying different numerical methods.

Syllabus

Unit - I(Hours : 18)

Solution of algebraic and transcendental equations: Introduction, Newton - Raphson method, Generalized Newton's method, The Secant method, Muller's method, LIN - Bairstow's method. Numerical differentiation and integration: Numerical differentiation, Errors in Numerical differentiation, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Romberg integration (Errors in Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule are included).
Chapter 2 (2.1, 2.5, 2.7, 2.8, 2.10)
Chapter 5 (5.2, 5.2.1, 5.4, 5.4.1, 5.4.2, 5.4.3 and 5.4.6)

Unit - II(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)
Application of Gauss - Jordan method
Web link : https://youtu.be/Wa6kaCwyYRk

Unit - III(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.

Interpolation: Interpolating polynomial, Errors in polynomial interpolation, Divided differences and their properties, Newton's General interpolation formula, Interpolation by Iteration.
Chapter 7 (7.2, 7.4 (Omitting 7.4.1 only), 7.5, 7.6).
Chapter 3 (3.1, 3.2, 3.10, 3.10.1, 3.10.2)

Unit - IV(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)
Application of Eigen value problems
Web link : https://youtu.be/juXth3CYKn4

Unit - V(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)

Application of Finite difference approximation method

Web link : https://youtu.be/_6z_XYpzuG4

Book for study:

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

Books for Reference:

1. Devi Prasad, Introduction to Numerical Analysis, Second Edition**,** Narosa Publishing House.
2. Rama B.Bhat, S.Chakravarthy, Numerical Analysis in Engineering, 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 would be able to

CO Number	CO Statement	Knowledge Level
1.	understand and discuss efficient numerical methods for solving algebraic and transcendental equations, linear systems of equations, ordinary and partial differential equations, boundary and eigen value problems and for interpolating polynomials	**K - 2**
2.	analyse the methods of finding solutions using differentiation and integration methods, Taylor's series, Euler's methods, Runge kutta methods	**K - 4**
3.	apply Newton - Raphson method, Romberg integration method, differentiation and integration methods, direct and iterative methods to obtain solutions of linear systems, ordinary and partial differential equations	**K - 3**
4.	determine the solutions of initial and boundary value problems, laplace equations, parabolic equations and hyperbolic equations	**K - 5**
5.	derive various rules, formulae and interpret their applications	**K - 3, 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:

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO 9**
CO1	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S

S - Strong, M - Medium,L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS

Course Title : CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS

Course Code : 22PMAESC1 **Hours / Week: 6**

Semester : I **Credits: 4**

Course Objectives:

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

Syllabus

Unit - I(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(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(Hours : 18)

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

Unit - IV(Hours : 18)

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

Unit - V(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. A.S. Gupta - Calculus of Variations with Appication,Prentice Hall of India, New Delhi, 2005
2. Sudir. K Pundir and RimplePundir - Integral Equations and Boundary Value Problems, PragatiPrakasam, 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 would be able to

CO Number	CO Statement	Knowledge Level
1.	understand underlying notions behind types of boundary conditions and Sturm - Liouville problems	**K - 2**
2.	discuss Hamilton'sprinciple, Lagrange's equation and Rayleigh - Ritz method along with variational problems for deformable bodies	**K - 6**
3.	solve various problems on differential and integral equations with special reference to Fredholm equations	**K - 3**
4.	examine the utilisation of Hilbert - schmidt theory, Neumann series and Fredholm theory on various integral equations	**K - 4**
5.	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:

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	L	M	S	M	M	M	S	S	S
CO2	M	S	S	M	M	S	S	S	S
CO3	M	S	S	S	S	S	S	S	S
CO4	M	S	S	S	S	S	S	S	S
CO5	M	S	S	S	S	S	S	S	S

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS

Course Title : LINEAR ALGEBRA

Course Code : 22PMAC5 **Hours / Week:6**

Semester : II **Credits:5**

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 (Hours : 18)

Linear Transformations, The Algebra of Linear Transformations, Isomorphism & Representations of Transformations by Matrices. Application of linear transformations.

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

https://youtu.be/dv4cjQZrRp8

UNIT - II (Hours : 18)

Algebras, The Algebra of Polynomials, Lagrange Interpolation, Polynomial Ideals & The Prime Factorization of a Polynomial.Examples on Lagrange interpolations.

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

https://www.youtube.com/watch?v=AezNQM2JUt8

UNIT - III (Hours : 18)

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

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

https://www.researchgate.net/publication/304352656_Applications_of_Matrices_and_Determinant_Module_3

UNIT - IV (Hours : 18)

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

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

https://yutsumura.com/tag/linear - transformation/

UNIT - V (Hours : 18)

Trace and Transpose, Hermitian, Unitary, and Normal Transformations, Real Quadratic Forms. Problems on Linear transformations.

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

https://archive.nptel.ac.in/courses/111/106/111106135/

Book for Study:

1. Kenneth Hoffman and Ray Kunze, Linear Algebra(Second Edition), Prentice Hall of India Pvt. Ltd. (For units I - III)
2. I.N.Herstein, Topics in Algebra (Second edition), 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=4AF6D11E8924403809554271769AC7CE
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 Statement	Knowledge Level
1.	learnthe concepts and properties of vector spaces and linear transformations.	**K - 1**
2.	relate matrices and linear transformations and compute characteristic roots	**K - 3**
3.	prove the theorems on linear transformations,polynomials and determinants to solve the problems.	**K - 5**
4.	use the acquired knowledge to analyse and solve the problems onlinear transformations,polynomials and determinants.	**K - 3,K - 4**
5.	explain the theorems oncanonical forms,hermitian, unitary and normal transformations.	**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 :

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

S - Strong, M - Medium,L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS

Course Title : MEASURE AND INTEGRATION

Course Code : 22PMAC6 **Hours / Week:5**

Semester : II **Credits:3**

Course Objectives:

1. To acquire knowledge about the concepts of Measurable sets and Measurablefunctions.
2. To know about the Lebesgueintegral.
3. To understand the concept Outermeasure and Measurability

Syllabus

Unit - I(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)

Lebesgue measure:

https://youtu.be/z7 - OerO97Cs

Unit - II(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 - 4.4)

Lebesgue integral

https://youtu.be/rxQmgxg3o5Y

Unit - III(Hours : 15)

Differentiation and Integration

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

Chapter 5 (Sections 5.1, 5.3, 5.4)

Differentiation and Integration

https://youtu.be/knaVFUT2LsM

Unit - IV(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)

Measure and Integration

https://youtube.com/playlist?list=PLbMVogVj5nJTsl6c - UDL1luTVMT8v_RLQ

Unit - V(Hours :15) Measure and OuterMeasure

Outer measure and measurability - The Extension theorem Chapter 12 (Sections 12.1, 12.2)

Measure and OuterMeasure

https://youtu.be/IOsZEzkPxLk

Book for Study:

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

Books for Reference:

1. G. B. Folland, Real Analysis, Modern Techniques and Their Applications" Wiley lnterscience

Publications,1984.
2. W. Rudin, Real and Complex Analysis 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 would be ableto

CO Number	CO Statement	Knowledge Level
1.	understand the concepts of Lebesgue measure, Lebesgue integral ,Measure and outer measure.	**K - 2**
2.	prove the basic results of measure theory and integration theory.	**K - 3**
3.	analyse about the Little wood's theorem, integral of a non - negative function, Radon - Nikodym theorem and Caratheodary theorem.	**K - 4**
4.	explain the convergence theorem in measure theory, differentiation of an integral and absolute continuity.	**K - 5**
5.	apply the theorems of the course to solve the related problems at an appropriate level.	**K - 6**

K1:Recall; K - 2 :Understand; K - 3 :Apply; K - 4 :Analyze; K - 5 :Evaluate; K - 6:Create.

Mapping of COs with POs :

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

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : PARTIAL DIFFERENTIAL EQUATIONS
Course Code : 22PMAC7 **Hours / Week: 5**
Semester : II **Credits: 4**

Course Objectives:

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

Syllabus

Unit - I(Hours : 15)

Fundamental concepts

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

Chapter 1 (Sections 1.2 - 1.5)

Classification of Partial Differential Equations and Canonical Forms

Web link : https://www.iist.ac.in/sites/default/files/people/IN08026/Canonical_form.pdf

Unit - II(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 - 2.5)

Applications of Laplace & Poisson's Equation

Web link: https://www.youtube.com/watch?v=iUEPeOypba8

Unit - III(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 - 2.10), Chapter 3 (Section 3.1 - 3.4)

Solving Laplace equation with Dirichlet Boundary Conditions

Web link: https://www.youtube.com/watch?v=JR9S6ovU - _c

Unit - IV(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 - 4.6)

Numerical Solution of Hyperbolic Equation (One Dimensional Wave Equation)

Web link: https://www.youtube.com/watch?v=q8uKEQIEPQk

Unit - V(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)

Applications of Green's function

Web link: https://cns.gatech.edu/~predrag/courses/PHYS - 6124 - 11/StGoChap5.pdf

Book for study:

K. SankaraRao, Introduction to Partial Differential Equations, Prentice Hall of India private Limited, New Delhi (Ninth print - May 2008)

Books for Reference:

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

Web Resources :

1. http://www.cmap.polytechnique.fr/~jingrebeccali/frenchvietnammaster2_files/Lectures_JRL/Classification_PDEs_2.pdf.
2. http://home.iitk.ac.in/~tmk/courses/mth424/main.pdf.
3. 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 would be able to

CO Number	CO Statement	Knowledge Level
1.	understand the basic concepts of second order partial differential equations (PDE's) and different methods of solving PDE's	**K - 2**
2.	classify PDE's, apply analytic methods, Green's function and interpret the solution	**K - 3, K - 4**
3.	formulate and Analyse problems of Laplace, Poisson equations with initial and boundary conditions	**K - 4, K - 6**
4.	develop the knowledge of Direc - delta function, D' Alembert's solution, Vibrating string and solve the real world problems	**K - 3,K - 6**
5.	analyse the applications of the eigen function method and the method of images and discuss the properties of harmonic functions	**K - 4, 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:

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	L	L	S	S	S	S
CO2	S	S	S	L	L	S	S	S	S
CO3	S	S	S	L	L	S	S	S	S
CO4	S	S	S	L	L	S	S	S	S
CO5	S	S	S	L	L	S	S	S	S

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS

Course Title : DIFFERENTIAL GEOMETRY

Course Code : 22PMAC8 **Hours / Week: 6**

Semester : II **Credits: 5**

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 (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.

Application of Serret - Frenet Formula

Chapter 1: (Section 1.1 - 1.7 & 1.9)

https://faculty.ksu.edu.sa/sites/default/files/lec_10_5.pdf

https://www.youtube.com/watch?v=PvGHU6XbHBM

Unit - II (Hours : 18)

Elementary Theory of Surfaces:

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

Application of families of curves

Chapter 2: (Section 2.1 - 2.7)

https://bit.ly/3Gm7xF8

Unit - III (Hours : 18)

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

Geodesics in Real Life

Chapter 2: (Section 2.8 - 2.13)

https://infinityplusonemath.wordpress.com/2017/04/08/trippy - geodesics/

http://www.cmapx.polytechnique.fr/~boscain/SIBERIA/1 - introduction - to - geodesics - in - SRG.pdf

Unit - IV (Hours : 18)

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

Problems on the application of Gauss - Bonnet Theorem

Chapter 2: (Section 2.14 - 2.18)

https://www2.math.upenn.edu/~shiydong/Math501X - 7 - GaussBonnet.pdf

Unit - V (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.

Principal Curvature in Image Processing

Chapter 3: (Section 3.1 - 3.7)

https://www.semanticscholar.org/paper/Principal - Curvature - Based - Region - Detector - for - Deng - Zhang/12af8628e590b3da288d7f5ef0ac85676b8a7fa1

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
CO 1	Learn various propertiesabout tangents, normal, binormal, metric, geodesics, developables and minimal surfaces	**K - 1**
CO 2	Derive the equations for osculating plane, involutes, geodesics and conjugate direction	**K - 3**
CO 3	Defend the characteristics of curves and surfaces	**K - 5**
CO 4	Explain the polar representation for geodesic coordinates, geodesic parallels and the lines of curvature	**K - 5**
CO 5	Justify isometric correspondence between geodesic surfaces and develop the principal and lines of curvature for curves and surfaces	**K - 5& K - 6**

Mapping of COs with POs:

PO/ PSO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	L	-	S	S	S	-
CO2	S	S	S	M	-	S	S	S	-
CO3	S	S	S	M	-	S	S	S	-
CO4	S	S	S	M	-	S	S	S	-
CO5	S	S	S	M	-	S	S	S	-

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : FUZZY SETS AND THEIR APPLICATIONS
Course Code : 22PMAEC2 **Hours / Week: 6**
Semester : II **Credits: 5**

Course Objectives:

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

Syllabus

Unit - I(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 - 2.3)

Applications of fuzzy sets:

https://youtu.be/aVsPJYxyq04

Unit - II(Hours:18)

Types of operations - Fuzzy complements - Fuzzy intersections : t - Norms - Fuzzy unions : t - conomrs - Combinations of operations.

(Sections 3.1 - 3.5)

Applications of fuzzy operations:

https://youtu.be/1m4KSMsjdaM
https://youtu.be/jIfah0j6VwE

Unit - III(Hours:18)

Fuzzy numbers - Arithmetic operations on intervals - Arithmetic operations on Fuzzy numbers.

(Sections 4.1, 4.3, 4.4)

Real life applications of fuzzy systems:

https://youtu.be/Oetia7HJjQQ

More about arithmetic operations on fuzzy numbers:

https://youtu.be/nXKFN98K6Uc

Unit - IV(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, infωI compositions of fuzzy relations.

(Sections 5.2 - 5.10)

More about Morphisms and Fuzzy relations:

1. https://youtu.be/5DZFOC9A2us
2. https://youtu.be/n9eNXs76VVM

Unit - V(Hours:18)

Three valued logics - Infinite valued logics - Fuzzy logics - Fuzzy propositions and their interpretations interms of fuzzy sets - Fuzzy rules and their interpretations interms of fuzzy relation - Generalized modus ponens - Fuzzy inference mechanism (FIM) - Fuzzy modus tollens - Generalizations of fuzzy logics.

(Sections 8.2, 8.4 - 8.8, 8.9.1, 8.10)

Real Life Applications of Fuzzy Logic :

https://youtu.be/Nz9fpLxEtBE

Application of Fuzzy Logic in AI :

https://youtu.be/xD1c8jTFF78

Application of Fuzzy Logic in civil Engineering :

https://youtu.be/mH - FEfWQuI4

Books for Study

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

Book for Reference

Zimmermann, Hans - Jurgen, Fuzzy Set Theory and its Applications, 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 would be able to

CO Number	CO Statement	Knowledge Level
1.	recognize the basic types of fuzzy sets, types of operations on fuzzy sets, fuzzy arithmetic, fuzzy relations and fuzzy logic.	**K - 1**
2.	understand extention principle for fuzzy sets, combination of operations, fuzzy numbers, fuzzy morphisms and fuzzy rules	**K - 2**
3.	analyse the properties of α cuts, operations on sets, fuzzy numbers and fuzzy relations and examine the tautologies	**K - 4**
4.	solve problems using α cuts, operations on given fuzzy numbers and fuzzy compositions of fuzzy relations and identify Lattice and Boolean Lattice	**K - 3**
5.	formulate fuzzy model to 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:

PO CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	S	S	S	S	S	-
CO2	S	S	S	S	S	S	S	S	-
CO3	S	S	S	S	S	S	S	S	-
CO4	S	S	S	S	S	S	S	S	-
CO5	S	S	S	S	S	S	S	S	-

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : DIFFERENCE EQUATIONS
Course Code : 22PMAESC2 **Hours / Week: 6**
Semester : II **Credits: 5**

Course Objectives:

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

Syllabus

Unit - I(Hours : 18)

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

Chapter 2 (Sections : 2.1 - 2.3)

Unit - II(Hours : 18)

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

Chapter 3 (Sections : 3.1 - 3.4)

Unit - III(Hours : 18)

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

Chapter 3 (Sections : 3.5 - 3.7)

Unit - IV(Hours : 18)

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

Chapter 4 (Sections : 4.1 and 4.2)

Unit - V(Hours : 18)

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

Chapter 5 (Sections : 5.2 - 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 would be able to

CO Number	CO Statement	Knowledge Level
1.	recall the basic concepts in the theory of difference operators	**K - 1**
2.	interpret the notion of solving linear difference equations of first order	**K - 2**
3.	perceive the idea of converting nonlinear equations into linear equations and their applications on z - transform	**K - 5**
4	examine various initial value problems for linear systems	**K - 5**
5.	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:

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	L	M	S	M	M	M	S	S	M
CO2	M	S	S	M	M	S	S	S	M
CO3	M	S	S	S	S	S	S	S	M
CO4	M	S	S	S	S	S	S	S	M
CO5	M	S	S	S	S	S	S	S	M

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : COMPLEX ANALYSIS
Course Code : 22PMAC9 **Hours / Week: 5**
Semester : III **Credits: 4**

Course Objectives:

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

Syllabus

Unit - I(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 - 2.3 and 4.1 - 4.7)

UNIT - II(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 - 5.3 and 6.1 - 6.5), Chapter 6 (Sections 3.1 &3.2)

Unit - III(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 - 1.3, 2.1 - 2.4)

Unit - IV(Hours:15)

Entire Functions

Jensen's Formula, Hadamard's Theorem.

The Riemann Zeta Functions

The Product Development, Extension of ζ (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 - 4.4), Chapter 6 (Sections 1.1, 1.2)

Unit - V(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

Chapter 7 (Sections 1.1& 1.3, 2.1 - 2.4)

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

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

CO Number	CO Statement	Knowledge Level
1.	understand the fundamental concepts of Cauchy's integral formula, simple connectivity, homology, argument principle, partial fractions, Zeta functions and simply and doubly periodic functions	**K - 2**
2.	enhance the concepts of locally exact differentials, Multiply connected regions ,mean value property, Power Series expansion, Partial fractions and Factorizations,entire functions, Simply and doubly periodic functions	**K - 4**
3.	apply the acquired knowledge and evaluate definite integrals, Power Series expansion, Partial fractions and Factorizations	**K - 3, K - 4**
4.	analyze the properties of Cauchy's integral formula, harmonic functions, gamma functions, Riemann Zeta functions, General properties of Elliptic Functions	**K - 4**
5.	prove Cauchy's theorem, Schwarz' theorem, Jensen's formula, Harnack'principle, Weierstrass' theorem, Taylor's series,Laurent series, Hadamard's theorem, Riemann	**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:

PO / CO	PO								
	PO1	**PO 2**	**PO 3**	**PO 4**	**PO5**	**PO6**	**PO 7**	**PO8**	**PO9**
CO1	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS

Course Title : TOPOLOGY

Course Code : 22PMAC10 **Hours / Week: 6**

Semester : III **Credits: 4**

Course Objectives:

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

Syllabus

Unit - I(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 - 17)

Unit - II(Hours: 18)

Continuous Functions

Continuous functions, The product topology, The metric topology.

Chapter 2 (Sections 18 - 20)

Unit - III(Hours: 18)

Connectedness

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

Chapter 3 (Sections 23 - 25 only)

Unit - IV(Hours: 18)

Compactness

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

Chapter 3(Sections 26 - 29)

Unit - V(Hours:18)

Countability and Separation Axioms

The countability axioms, The separation axioms, Normal spaces, The UrysohnLemma, The UrysohnMetrization theorem.

Chapter 4 (Sections 30 - 34)

Book for Study:

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

Books for References:

1. J. Dugundji, Topology,Prentice Hall of India, New Delhi, 1975.
2. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Book Co, New York, 1963.
3. S.T. Hu, Holden Day - Elements of General Topology , 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 would be able to

CNumber	CO Statement	Knowledge Level
1.	learn the concepts of topological spaces, connected and compact spaces, continuous functions, countability and separation axioms	**K - 1**
2.	understand the attributes of continuous functions and inspect their applications in connected and compact spaces, countability and separation axioms	**K - 2, K - 4**
3.	apply the notions of different topological spaces and solve real world problems	**K - 3**
4.	interpret various forms of tological spaces and assess their attributes	**K - 2, K - 5**
5.	prove extreme value theorem, lebesgue number lemma, uniform continuity theorem, countability and separation axioms and inspect their applications	**K - 4, 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:

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : NUMBER THEORY
Course Code : 22PMAC11 **Hours / Week: 5**
Semester : III **Credits: 4**

Course Objectives:

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

Syllabus

Unit - I(Hours: 15)

Divisibility - Primes - Congruence's - Solutions of Congruences - Congruences of degree1.

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

Unit - II(Hours: 16)

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

Chapter 2 (Sec 2.4 - 2.9)

Unit - III(Hours: 16)

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

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

Unit - IV(Hours: 13)

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

Chapter 4 (Sec 4.2 - 4.4)

Unit - V(Hours: 15)

The Euclidean Algorithm - Uniqueness - Infinite continued fractions - Irrational numbers - Approximations to Irrational numbers - Best possible approximation.

Chapter 7 (Sec 7.1 - 7.6)

Book for study:

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.

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

CO Number	CO Statement	Knowledge Level
1.	understand the important properties of congruences, congruences of higher degree, Quadratic residue, greatest integer function, Arichmetic functions and continued fractions	**K - 2**
2.	solve congruences of first and higher degree and problems on simple continued fractions	**K - 3**
3.	prove Fermat's theorem, Lemma of Gauss, Gaussian reciprocity law, The Moebius inversion formula and Hurwitz theorem	**K - 5**
4.	analyse the applications of various theorems in number theory	**K - 4**
5.	discuss some important results in the number theory including Chinese reminder theorem, Wilson's theorem and their consequences	**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:

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	S	S	S	S	S	-
CO2	S	S	S	S	S	S	S	S	-
CO3	S	S	S	S	S	S	S	S	-
CO4	S	S	S	S	S	S	S	S	-
CO5	S	S	S	S	S	S	S	S	-

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : MATHEMATICAL STATISTICS
Course Code : 22PMAC12 **Hours / Week:5**
Semester : III **Credits:4**

Course Objectives:

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

Syllabus

Unit - I(Hours : 15)

Random Events - 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 - 1.7)

Unit - II(Hours : 15)

Random variables - 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 - 2.9, 3.1 - 3.8)

Unit - III(Hours : 15)

Characteristic Functions - 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 - 4.7)

Unit - IV(Hours : 15)

Some Probability Distributions - One - point and two - point 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 - 5.7)

Unit - V(Hours : 15)

Limit Theorems - 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 .

Stochastic Process - The notion of a stochastic process - Markov process and processes with independent increments - The poisson process.

Chapters 6 and 8 (Sections 6.1 - 6.9, 6.11, 6.12, 8.1 - 8.3)

Book for Study:

MarekFisz, Probability Theory and Mathematical statistics, Krieger Publishing Company.

Books for Reference:

1. V.K.Rohatgi - An introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd,Delhi.
2. Alexander M.Mood, FrauklinA.Gray Bill, Duano C. Boes - Third Edition, Introduction to theory of statistics, Tata McGraw Hillpublishers.

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=0ahUKEwj Whp - Nlp7AhVCLo8KHTo_A4sQ6AEITjAI#v=one page&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 would be able to

CO Number	CO Statement	Knowledge Level
1.	learn the concepts of Probability theory and Mathematical Statistics.	**K - 1**
2.	understand the notions and properties of Random variables, expectation, variance, moments, characteristic function, binomial distribution, poisson distribution, normal distribution and stochastic convergence.	**K - 2**
3.	apply the concepts obtained in the course to solve the related problems	**K - 3**
4.	evaluate mean, variance, moments for various distributions using Characteristic function, Probability Generating function, One point distribution and Two point distribution	**K - 5**
5.	prove variance theorems on probability, stochastic convergence and inspect their applications	**K - 4**

K1:Recall; K - 2 :Understand; K - 3 :Apply; K - 4 :Analyze; K - 5 :Evaluate; K - 6:Create.

Mapping of COs with POs :

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

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS

Course Title : FLUID DYNAMICS

Course Code : 22PMAEC3 **Hours / Week: 5**

Semester : III **Credits: 3**

Course Objectives:

1. To know the concepts of real fluids, velocity potential, equations of continuity, Euler's equation of motion and vortex motion with examples.
2. To gain knowledge about sources, sinks, doublets and axi - symmetric flows with examples.
3. To discuss the Milne - Thomson circle theorem, the Theorem of Blasius and the Navier - stokes's equation of motion of a viscous fluid.
4. To 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(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 - 2.10)

Unit - II(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 - Bernoulli's Equations - 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 - 3.8, 3.12)

Unit - III(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 - 4.5)

Unit - IV(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 applications of the circle theorem - The theorem of Blasius.

Chapter 5 (Sections 5.1 - 5.9)

Unit - V(Hours: 15)

Viscous Flows

Stress components in a real fluid - Relations between cartesian components of stress - Translational motion of fluid element - 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 - 8.9)

Book for Study:

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

Books for Reference:

1. L.M.Milne Thomson, Theoretical Hydrodynamics, The MACMILLAN Press Ltd.,
2. M.D. Raisinghania, Fluid Dynamics,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 would be able to

CO Number	CO Statement	Knowledge Level
1.	understand the fundamental knowledge of fluid and its properties	**K - 2**
2.	apply the equation of continuity, Bernoulli's equation, Weiss's sphere theorem, Milne - Thomson circle theorem and Theorem of Blasius to solve the related problems	**K - 3**
3.	derive different governing equations of the fluid motion including equations of continuity, Euler's equation of motion and Navier Stokes's equations of motion	**K - 3**
4.	examine vortex motion, some special forms of the stream function for Axi - symmetric irrotational motions, two dimensional image system and stress analysis in fluid motion	**K - 4**
5.	formulate a fluid dynamics model to 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:

CO \ PO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	S	S	S	S	S	-
CO2	S	S	S	S	S	S	S	S	-
CO3	S	S	S	S	S	S	S	S	-
CO4	S	S	S	S	S	S	S	S	-
CO5	S	S	S	S	S	S	S	S	-

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : GRAPH THEORY
Course Code : 22PMAESC3 **Hours / Week: 5**
Semester : III **Credits: 3**

Course Objectives :

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

Syllabus

Unit - I(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 - 1.8)

Unit - II(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 - 2.5 and Chapter - 3 : Sections 3.1 - 3.3)

Unit - III(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 - 4.4 and Chapter - 5 : Sections 5.1 - 5.5)

Unit - IV(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 - 6.3 and Chapter - 7 : Sections 7.1 - 7.3)

Unit - V(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 - 8.6)

Book for Study:

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

Books for Reference:

1. NarasingDeo, Graph Theory with Application to Engineering and Computer Science, Prentice Hall of India, New Delhi. 2003.

2. F. Harary, Graph Theory,Addison - Wesely Pub. Co. The Mass. 1969

3. L.R.Foulds, Graph Theory Application, Narosa Publ. House, Chennai, 1933.

Note: Questions to be taken only from the text book

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

CO Number	CO Statement	Knowledge Level
1.	recall the basic definitions and concepts of Graphs and Subgraphs	**K - 1**
2.	illustratethe concepts of Trees and connectivity with examples	**K - 2**
3.	apply the concepts of Euler Tours and Matchings to solve the related problems	**K - 3**
4.	analyse different coloring problems on Graphs and understand the notions of independent Sets	**K - 2, K - 4**
5.	understand and apply various concepts of graph theory to solve the real life problems	**K - 2,K - 3**

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

Mapping of COs with POs:

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

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.S/M.Sc

Course Title : QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS

Course Code : 22PMAEDC **Hours/week:4**

Semester : III **Credits: 4**

Course Objectives:

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

Syllabus

Unit - I(Hours :12)

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

Section 1 (1, 2, 3, 5)

Unit - II(Hours :12)

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

Section 1 (6 - 9)

Unit - III(Hours : 12)

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

Section 1 (11 - 14)

Unit - IV(Hours : 12)

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

Section 1 (17, 18, 19, 23)

Unit - V(Hours :12)

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

Section 1 (30, 31, 34, 35)

Book for Study:

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

Books for Reference:

AbhijitGuha, Quantitative Aptitude for All Competitive Examinations, 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 - onages.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 would be able to

CO Number	CO Statement	Knowledge Level
1.	recognise the basic notions on Numbers, Profit and Loss, Partnership, Permutation and combination, Probability, Height and Distances and Odd man out	**K - 1**
2.	understand and acquire knowledge on the concepts required to improve their quantitative aptitude	**K - 3**
3.	apply the concepts obtained in the course to solve the problems/society connect problems	**K - 3**
4.	relate ideas and concepts of H.C.F and L.C.M of numbers, Square roots and Cube roots, Ratio and Proportion, Chain rule, Logarithms and Probability	**K - 4**
5.	determine the speed of objects including train and boats and evaluate the height of a building tower etc by using trigonometric formulas	**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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : FUNCTIONAL ANALYSIS
Course Code : 22PMAC13 **Hours / Week: 6**
Semester : IV **Credits: 5**

Course Objectives:

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

Syllabus

Unit - I(Hours:18)

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

Unit - II(Hours:18)

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

Unit - III(Hours:18)

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

Unit - IV(Hours:18)

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

Unit - V(Hours:18)

Finite Dimensional Spectral Theory - The Spectral Theorem, 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 11 & 12 (Section 62, 64 - 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. Balmohan V. Limaye Professor of Mathematics, Functional Analysis, Indian Institute of Technology, Bombay Second edition New Age International Ltd Publishers.

4. Dr. D. Somasundaram,Functional Analysis , 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

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

CO Number	CO Statement	Knowledge Level
1.	learn the central concepts of Banach Space, Hilbert spaces and spectral theory	**K - 1**
2.	understand the notions of continuous linear transformations, Natural imbedding ,orthogonal complements, various operators, Banach algebra	**K - 2,K - 4**
3.	recognize and analyze conjugate of an operator, axiomatic knowledge of the properties of a Hilbert space, including orthogonal complements, orthonormal sets and topological divisors of zero	**K - 2, K - 4**
4.	apply the properties of various operators to the resolution of integral equations and Evaluate spectrum of anradius.	**K - 3, K - 5**
5.	prove Hahn Banach Theorm, open mapping theorem, properties of Hilbert spaces, the spectral theorem.	**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:

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS

Course Title : MATHEMATICAL MODELING

Course Code : 22PMAC14 **Hours / Week: 6**

Semester : IV **Credits: 4**

Course Objectives:

1. To comprehend mathematical modeling ideas
2. To acquire the knowledge of mathematical modeling through ordinary differential equations of first and second order.
3. To build up the capacity of tackling this present reality issues through mathematical modeling.

Syllabus

Unit - I(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 - 1.4), Chapter 2 (Sec 2.1 - 2.4)

Unit - II(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 - 3.4)

Unit - III (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 (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 CircularTubes - Basic Equations for Fluid Flow - Flow of Power - law Fluid in Circular Tube - Flow ofHerschel - 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 MildStenosis.

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

Unit - V(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 SolidWaste Disposal - Noise Pollution Control Model

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

Books for study

1. J. N. Kapur, Mathematical modeling, New Age International (P) Limited, Publishers, New Delhi, First Edition (Unit I - Unit III)

2. J. N. Kapur , Mathematical Models in Biology & Medicine, Affiliated East - WestPress Private Limited, New Delhi (Unit IV and Unit V)

Books for References

1. D.N. Burghes , Modeling through Differential Equation, Ellis Horwood and JohnWiley.

2. C. Dyson and E. Levery, Principle of Mathematical Modeling, Academic Press NewYork.

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 DifferentialEquation Approach using Maple and Matlab, 2nd Ed., Taylor and Francis group,London and New York, 2009.

Web Resources:

1. https://www.mat.univie.ac.at/~neum/model.html
2. https://nptel.ac.in/courses/111/107/111107113/
3. https://www.frontiersin.org/articles/10.3389/fgene.2015.00354/full

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

CO Number	CO Statement	Knowledge Level
1.	Learn the importance of differential equations in solving mathematical models.	**K - 1**
2.	Understand the Occurrence, classification and characteristics of Mathematical Models.	**K - 2**
3.	Apply problem solving techniques in Mathematical Modeling to bring solutions to various real life situations.	**K - 3**
4.	Examine the principles governing the motion of satellites through notions of Mathematical Modeling and interpret the techniques in Mathematical Models to analyse the motion of fluids.	**K - 4& K - 5**
5.	Construct suitable models for population dynamics, medicine and reducing various forms of Pollution.	**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:

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	M	M	S	S	S	L
CO2	S	S	S	M	M	S	S	S	L
CO3	S	S	S	M	M	S	S	S	L
CO4	S	S	S	M	M	S	S	S	L
CO5	S	S	S	M	M	S	S	S	L

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : OPTIMIZATION TECHNIQUES
Course Code : 22PMAEC4 **Hours / Week: 6**
Semester : IV **Credits: 4**

Course Objectives:

1. To learn the methods of solving the real - world mathematical programming problems applying minimal spanning tree, shortest route and maximal flow algorithms.
2. To gain knowledge about the applications of deterministic dynamic programming.
3. To analyse the formulation and solution of different inventory models and queuing systems.
4. Interpret the three categories of decision making process.
5. To familiarize the implementation of the course content in day - to - day life.

Syllabus

UNIT - I(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 - 6.3 (6.3.1, 6.3.2), 6.4 (6.4.1, 6.4.2).

UNIT - II(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 - 10.3(10.3.1 - 10.3.3)

UNIT - III(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 - 11.2.3)
Chapter 16 (Sections: 16.1(16.1.1, 16.1.2), 16.2(16.2.1, 16.2.2).

UNIT - IV(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(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 - 17.4(17.4.1, 17.4.2), 17.6(17.6.1 - 17.6.3(excluding self service model), 17.7)

Book for study:

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

Books for Reference :

1. Frederick S. Hillier, Gerald J. Lieberman, Bodhibrata Nag, PreetamBasu, Introduction to Operations Research, Nineth Edition, Tata - McGraw Hill Publications Company, New Delhi.
2. Kantiswarup, P.K.Gupta, Man Mohan,Operations Research, 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 would be able to

CO Number	CO Statement	Knowledge Level
1.	learn the notions of network models, deterministic dynamic programming, inventory models, decision analysis and queuing models	**K - 1**
2.	understand minimal spanning tree, maximal flow, shortest - route algorithms, forward and backward recursive approaches and solve real world problems	**K - 2, K - 3**
3.	analyse the criterions for different decision making environments, pure birth and death models, specialized poisson queues, single and multiple - server models and solve related problems	**K - 3, K - 4**
4.	determine the minimal spanning tree, most economical cable network, replacement policy, maximal flow, optimal inventory policy, solutions of cargo - loading and LP problems using dynamic programming	**K - 5**
5.	discuss Dijkstra's algorithm, Floyd's algorithm, Knapsack model, the procedure of determining optimum inventory policy in various EOQ models	**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 :

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	S	S	S	S	S	M
CO2	S	S	S	S	S	S	S	S	-
CO3	S	S	S	S	S	S	S	S	L
CO4	S	S	S	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	M

S - Strong, M - Medium, L - Low

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

For candidates admitted in 2022 - 2023 onwards (Under CBCS)

Programme Title : M.Sc. MATHEMATICS
Course Title : REPRESENTATION THEORY
Course Code : 22PMAESC4 **Hours / Week: 6**
Semester : IV **Credits: 4**

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

Syllabus

Unit - I(Hours : 18)

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

Unit - II(Hours : 18)

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

Unit - III(Hours : 18)

More on the group algebra, Conjugacy classes, Characters.

Unit - IV(Hours : 18)

Inner product of characters, The number of irreducible characters.

Unit - V(Hours : 18)

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

Book for Study:

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

Book for Reference :

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

Web Resource :

1. https://people.math.ethz.ch/~wilthoma/docs/grep.pdf
2. http://www.m67aths.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 would be able to

CO Number	CO Statement	Knowledge Level
1.	recall the basic properties of groups and learn about group representations, FG modules and reducibility and group algebras	**K - 1**
2.	understand the concepts of FG - homomorphisms, Maschike's theorem, Schur's lemma and irreducible modules	**K - 2**
3.	recognize inner product of characters and the number of irreducible characters	**K - 1**
4.	analyse the dimensions and characters of representations of symmetric groups, dihedral groups and conjugacy classes	**K - 4**
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:

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	L	L	S	S	S	-
CO2	S	S	S	L	L	S	S	S	-
CO3	S	S	S	L	L	S	S	S	-
CO4	S	S	S	L	L	S	S	S	-
CO5	S	S	S	L	L	S	S	S	-

S - Strong, M - Medium, L - Low

Programme Title : M.Sc. MATHEMATICS
Course Title : MATLAB PRACTICALS
Course Code : 22PMAQC **Hours / Week: 6**
Semester : IV **Credits: 3**

Course Objectives:

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

Syllabus

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 would be able to

CO Number	CO Statement	Knowledge Level
1.	getting acquainted with fundamental operations in Matlab, solving linear systems and Gauss elimination	**K - 1**
2.	familiar with performing statistical data analysis, data interpolation, polynomial curve fitting and least square curve fitting by Matlab	**K - 3**
3.	apply Matlab to solve ordinary differential equations and non - linear system of equations	**K - 3**
4.	apply Matlab to solve Partial differential equations and non - linear system of equations	**K - 3**
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:

PO / CO	PO								
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	S	S	S	S	S	-
CO2	S	S	S	S	S	S	S	S	-
CO3	S	S	S	S	S	S	S	S	-
CO4	S	S	S	S	S	S	S	S	-
CO5	S	S	S	S	S	S	S	S	-

S - Strong, M - Medium, L - Low

Programme Title : M.Sc. MATHEMATICS
Course Title : PROJECT REPORT AND VIVA
Course Code : 22PMAPC **Hours / Week: 6**
Semester : IV **Credits: 5**

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