Programme Code:	M.Sc	Programme Title:	Mathematics	
Course Code:	17PMS102	Title	Batch :	2017-2019
		REAL ANALYSIS	Semester	I
Hrs/Week	6		Credits :	4

Course Objective

This course will help students to understand the basics of real analysis and to reading and writing mathematical proofs. It will lay the foundation for the subsequent study of complex analysis and functional analysis.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

K1	CO1	attain a broad understanding of analysis techniques that are the basic stepping stones to contemporary research.
K2	CO2	classify sequences of functions which are pointwise convergent and uniform convergent.
K3	CO3	state some of the classical theorems in advanced real analysis.
K4	CO4	understand the concept of Lebesgue measure which is later used in developing the theory of Lebesgue integration that gives stronger results as compared to the theory of Riemann integration.

Unit -1

Riemann-Stieltjes Integral: Definition and Existence of the Integral – Properties of the Integral – Integration and Differentiation – Integration of Vector-valued Functions – *Rectifiable Curves (Self study).*

Text Book 1, Chapter 6. [15 hours]

Unit -2

Sequences and Series of Functions: Uniform convergence –Uniform convergence and Continuity-Uniform convergence and Integration-Uniform convergence and Differentiation- Equicontinuous Families of Functions-The Stone-Weierstrass Theorem.

Text Book 1, Chapter 7. [16 hours]

Unit -3

Functions of Several Variables: Linear Transformations - The Contraction Principle -The Inverse Function Theorem - The Implicit Function Theorem - Determinants - *Derivatives of Higher Order (Self study).*

Text Book 1, Chapter 9 (Except Differentiation, The Rank Theorem & Differentiation on Integrals).

[16 hours]

Unit -4

Lebesgue Measure: Lebesgue Outer Measure - The σ-Algebra of Lebesgue Measurable sets - Lebesgue Measurable Functions.

Text Book 2, Sections: 2.1, 2.2, 2.3, 3.1, 3.2. [15 hours]

Unit -5

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

Text Book 2, Sections: 4.1, 4.2, 4.3, 4.4. [16 hours]

Seminar, Assignment

Books for Study:

1. Walter Rudin, (2013), *Principles of Mathematical Analysis*, McGraw Hill, New York.
2. Royden H. L. and Fitzpatrick P. M., (2010), *Real Analysis*, Fourth Edition, Pearson Education, Inc., Publishing as Prentice Hall.

Books for Reference:

1. Edition, Pearson Education, Inc., Publishing as Prentice Hall.
2. W. Ruddin,(1986), *Real and Complex Analysis*, 3rd Edition, McGraw-Hill, New York.

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	H	M	S	S
CO3	M	H	S	S	S
CO4	H	S	H	S	M

S - Strong; H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name Signature (R. SEETHA)	Name Dr.M. SHEIK JOHN Signature	Name Dr.M. DURAIRAJU Signature	Name Dr. R. MUTHUKUMARAN Signature

Dr. M. DURAIRAJU, M.Sc., M.Phil., B.Ed., PGDGC. Ph.D.
Associate Professor / Co-ordinator.
Curriculum Development Cell (CDC)
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Pollachi - 642 001.

Dr. R.MUTHUKUMARAN
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Programme Code:	M.Sc	Programme Title:	Mathematics	
Course Code:	17PMS311	Title	Batch :	2017-2019
		TOPOLOGY	Semester	III
Hrs/Week	6		Credits :	4

Course Objective

This course deals with the essentials of topological spaces and their properties in terms of continuity, connectedness, compactness etc.

Course Outcomes (CO)

Upon successful completion of this course, students will be able to

K1	CO1	develop their abstract thinking skills.
K2	CO2	provide precise definitions and appropriate examples and counter examples of fundamental concepts in general topology.
K3	CO3	acquire knowledge about various types of topological spaces and their properties.
K4	CO4	appreciate the beauty of the mathematical results like Uryzohn's Lemma and understand the dynamics of the proof techniques.

Unit -1

`Topological spaces - Basis for a topology - The order topology - *The Product topology on X×Y (Self study)* - The Subspace topology - Closed sets and Limit points. [16 hours]

Chapter 2 Sections : 12 to 17.

Unit -2

Continuous functions - The metric topology - The metric topology (Continued) .

Chapter 2 Sections : 18, 20, 21. [15 hours]

Unit -3

Connected spaces - Connected subspaces of the real line - Components and Local Connectedness - Compact spaces.

Chapter 3 Sections : 23 to 26. [15 hours]

Unit -4

The Separation axioms - Normal spaces - The Urysohn lemma - The Urysohn Metrization Theorem - The Tietz Extension theorem.

Chapter 4 Sections : 31 to 35. [16 hours]

[17PMS311]

Unit -5

The Tychonoff theorem - The Stone-Cech Compactification - The Nagata-Smirnov Metrization theorem - The Smirnov Metrization Theorem.

Chapter 5 Sections :37, 38, Chapter 6 Sections :40, 42. [16 hours]

Seminar, Assignment.

Books for Study :

Munkres J. R, *Topology*, Second Edition, Pearson Education, Inc, 2000.

Books for Reference :

1. Simmons G. F, *Introduction to topology and modern analysis,* Tata McGraw Hill book company, Inc, 1963.
2. Dugundji J, *Topology,* Prentice Hall of India, 1975.
3. John Kelly L, *General Topology*, Van Nostrand Reinhold Company,1968.
4. Stephen Willard, *General Topology*, Addision Wesley, 1970.
5. Benjamin Sims T, *Fundamentals of Topology*, Macmillan Publishing Company, 1976.

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	H	S	S	S	S
CO3	H	S	S	M	S
CO4	M	S	H	M	S

S - Strong; H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name Dr. V. Inthumathi Signature	Name Dr.M. SHEIK JOHN Signature	Name Dr.M. DURAIRAJU Signature	Name Dr. R. MUTHUKUMARAN Signature

Dr. M. DURAIRAJU, M.Sc., M.Phil., B.Ed., PGDCA., Ph.D.
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Programme Code:	M.Sc	Programme Title:	Mathematics	
Course Code:	17PMS313	Title	Batch :	2017-2019
		COMBINATORICS	Semester	III
Hrs/Week	6		Credits :	4

Course Objective

Combinatorial mathematics is concerned with counting the number of ways of arranging given objects in a particular way. Generating functions are used to solve a variety of Combinatorial problems.

Course Outcomes (CO)

On successful completion of the course student will be able to

K1	CO1	gain a working knowledge of the basic ideas and techniques of the subject
K2	CO2	handle various aspects of assignment problems, beginning with the famous result of Philip Hall, and its various applications.
K3	CO3	understand the Steiner system S(5, 8, 24) and the construction of Leech Lattice in 24 dimensions..
K4	CO4	have a sound knowledge of block designs and its applications to error correcting codes

Unit -1

Introduction to basic ideas - Selections and Binomial coefficients - Permutations - Ordered selections - Unordered selections - Further remarks on the binomial theorem - Miscellaneous.

Chapter 1 and 2. [16 hours]

Unit -2

Pairings problems: Pairings within a set - Pairings between sets - An optimal assignment problem and Gale's optimal assignment problem.

Chapter 3. [15 hours]

Unit -3

Concurrence: Some miscellaneous problems - Fibonacci type relations - Using Generating Functions - Miscellaneous methods and Counting simple electrical networks.

Chapter 4. [16 hours]

[17PMS313]

Unit -4

The Inclusion-Exclusion Principle: The Principle - *The Rook Polynomials (Self study)* - Steiner Systems and Sphere Packings - Introductory remarks - Steiner Systems S(5,8,24) - Leech's Lattice. [16 hours]

Chapter 5 and 7.

Unit -5

Block Designs and Error correcting codes: *Block designs (Self study)* - Square block designs - Hadamard configurations - Error correcting codes. [15 hours]

Chapter 6.

Seminar, Assignment.

Books for Study:

Ian Anderson, *A first course in Combinatorial Mathematics,* Oxford University press, 1974.

Books for Reference:

1. Krishnamurthy V, *Combinatorics*, Affiliated East West Press Pvt Ltd, New Delhi, 1986.
2. Balakrishnan V. K and Balakrishnan V, *Schaum's outline of Combinatorics,* McGraw Hill Publishers, 1984.

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	M	H	S
CO2	H	S	H	S	S
CO3	S	H	M	H	H
CO4	H	S	M	M	S

S - Strong; H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name M. AMBAVENI Signature	Name Dr.M. SHEIK JOHN Signature	Name Dr.M. DURAIRAJU Signature	Name Dr. R. MUTHUKUMARAN Signature

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Programme Code:	M.Sc	Programme Title:	Mathematics	
Course Code:	17PMS314	Title	Batch :	2017-2019
		GRAPH THEORY	Semester	III
Hrs/Week	6		Credits :	4

Course Objective

Graph theory is major area of combinatorics. In this course we introduce basic concept of graph theory and analyze some important concepts and make them to crack CSIR / NET examination graph theory which comes in discrete mathematics.

Course Outcomes (CO)

On successful completion of the course student will be able to

K1	CO1	keep in mind the preliminaries of both undirected graphs and directed graphs.
K2	CO2	get an idea and understand the concept of planar graph and connectivity.
K3	CO3	apply the concept of Eulerian graph and Hamiltonian graph.
K4	CO4	analyze both vertex colouring and edge colouring as well as matchings in graphs.

Unit -1

Graphs and Subgraphs: Graphs and simple graphs - Graph Isomorphism - The Incidence and Adjacency matrices - Subgraphs - Vertex degrees - Path and Connection and Cycles.Trees: Trees - Cut edges and bonds - Cut vertices and Cayley's formula.

Chapter 1 Sections : 1.1 - 1.7, Chapter 2 Sections : 2.1 - 2.4. [16 hours]

Unit -2

Connectivity: Connectivity and Blocks. Euler Tours and Hamilton cycles: Euler tours and Hamilton cycles.

Chapter 3 Sections : 3.1, 3.2, Chapter 4 Sections : 4.1, 4.2. [16 hours]

Unit -3

Matchings: Matchings - Matchings and coverings in bipartite graphs and perfect matchings.Independent sets and Cliques: Independent sets.

Chapter 5 Sections : 5.1 - 5.3, Chapter 7 Sections : 7.1. [16 hours]

[17PMS314]

Unit -4

Edge Colorings: Edge chromatic number and Vizing's theorem.Vertex Colorings: Chromatic number, Brooks' theorem, Hajo's Conjecture - Dirac's Theorem, Chromatic polynomials, Girth and chromatic number.
Chapter 6 Sections : 6.1,6.2, Chapter 8 Sections : 8.1 - 8.5. [15 hours]

Unit -5

Planar Graphs: Plane and planar graphs, Dual graphs - Euler's formula and Kuratowski's theorem.Directed Graphs: Directed graphs - Directed paths and Directed cycles.
Chapter 9 Sections : 9.1 - 9.3, 9.5, Chapter 10 Sections : 10.1 - 10.3. [15 hours].

Seminar, Assignment.

Books for Study :

Bondy J. A and Murty U. S. R, *Graph Theory with Applications*, Macmillan Company, 1976.

Books for Reference :

1. Balakrishnan R and Ranganathan K, *A Text Book on Graph Theory*, Springer Verlog, New York, 2000.
2. Gould R, *Graph Theory*, The Benjamin/Cummings Publishing Company, Inc, California, 1988.
3. Hartsfield N and Ringel G, *Pearls in Graph Theory*, Academic Press, 1990.

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	M	M	M	M	M
CO3	H	H	H	M	S
CO4	H	H	H	M	H

S - Strong; H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE
Name S.SIVABALAN	Name Dr.M. SHEIK JOHN	Name Dr.M. DURAIRAJU	Name Dr. R. MUTHUKUMARAN
Signature	Signature	Signature	Signature

Dr. M. DURAIRAJU, M.Sc., M.Phil., B.Ed., PGDCA, Ph.D.
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Programme Code:	M. Sc	**Programme Title:**	Mathematics	
Course Code:	18PMS314	**Title**	**Batch :**	2018-2020
		GRAPH THEORY	**Semester**	III
Hrs/Week	6		**Credits :**	4

Course Objective

Graph theory is major area of Combinatorics. In this course we introduce basic concept of graph theory and analyze some important concepts and make them to crack CSIR / NET examination graph theory which comes in discrete mathematics.

Course Outcomes (CO)

On successful completion of the course student will be able to

K1	CO1	Understand the preliminaries of both undirected graphs and directed graphs.
K2	CO2	visualize the concept of planar graph and connectivity.
K3	CO3	Apply the concept of Eulerian graph and Hamiltonian graph.
K4	CO4	analyze both vertex colouring and edge colouring as well as matchings in graphs.

Unit -1

Graphs and Subgraphs: Graphs and simple graphs - Graph Isomorphism - The Incidence and Adjacency matrices - Subgraphs - Vertex degrees - Path and Connection and Cycles.

Trees: Trees - Cut edges and bonds - Cut vertices and Cayley's formula.

Chapter 1 Sections : 1.1 - 1.7, Chapter 2 Sections : 2.1 - 2.4. . [16 Hours]

Unit -2

Connectivity: Connectivity and Blocks.

Euler Tours and Hamilton cycles: Euler tours and Hamilton cycles.

Chapter 3 Sections: 3.1, 3.2, Chapter 4 Sections : 4.1, 4.2. . [16 Hours]

Unit -3

Matchings: Matchings - Matchings and coverings in bipartite graphs and perfect matchings.

Independent sets and Cliques: Independent sets.

Chapter 5 Sections : 5.1 - 5.3, Chapter 7 Sections : 7.1. [16 Hours]

Unit -4

Edge Colorings: Edge chromatic number and Vizing's theorem.
Vertex Colorings: Chromatic number - Brooks' theorem - Dirac's Theorem, Chromatic polynomials- Girth and chromatic number.
Chapter 6 Sections : 6.1,6.2, Chapter 8 Sections : 8.1,8.2,8.4,8.5 [15 Hours]

Unit -5

Planar Graphs: Plane and planar graphs, Dual graphs - Euler's formula and Kuratowski's theorem.
Directed Graphs: Directed graphs - Directed paths - Directed cycles.
Chapter 9 Sections : 9.1 -9.3, 9.5 Chapter 10 Sections : 10.1 - 10.3. [15 Hours]

Seminar, Assignment.

Books for Study :

Bondy J. A and Murty U. S. R, *Graph Theory with Applications*, Macmillan Company, 1976.

Books for Reference :

1. Balakrishnan R and Ranganathan K (2000), *A Text Book on Graph Theory*, Springer Verlog, New York.
2. Gould R (1988), *Graph Theory*, The Benjamin/Cummings Publishing Company, Inc, California.
3. Hartsfield N and Ringel G (1990), *Pearls in Graph Theory*, Academic Press.

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	M	M	M	M	M
CO3	H	H	H	M	S
CO4	H	H	H	M	H

S - Strong; H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE
	Head of The Department Of Mathematics N.G.M. College, POLLACHI - 642 001.	Dr. M. DURAIRAJU, M.Sc.,M.Phil.,B.Ed.,PGDGC.,Ph.D. Associate Professor / Co-ordinator, Curriculum Development Cell (CDC) NGM College (Autonomous) Pollachi - 642 001.	Dr. R.MUTHUKUMARAN Controller of Examinations NGM College (Autonomous) POLLACHI - 642 001.

Programme Code:	M. Sc	**Programme Title :**	Mathematics	
Course Code:	18PMS311	**Title**	**Batch :**	2018-2020
		TOPOLOGY	**Semester**	III
Hrs/Week	6		**Credits :**	4

Course Objective

This course deals with the essentials of topological spaces and their properties in terms of continuity, connectedness, compactness etc.

Course Outcomes (CO)

Upon successful completion of this course, students will be able to

K1	CO1	develop their abstract thinking skills.
K2	CO2	provide precise definitions and appropriate examples and counter examples of fundamental concepts in general topology.
K3	CO3	acquire knowledge about various types of topological spaces and their properties.
K4	CO4	appreciate the beauty of the mathematical results like Uryzohn's Lemma and understand the dynamics of the proof techniques.

Unit -1

`Topological spaces - Basis for a topology - The order topology - *The Product topology on X×Y (Self study)* - The Subspace topology - Closed sets and Limit points.

Chapter 2 Sections : 12 to 17.

[16 Hours]

Unit -2

Continuous functions - The metric topology - The metric topology (Continued) .

Chapter 2 Sections : 18, 20, 21.

[15 Hours]

Unit -3

Connected spaces - Connected subspaces of the real line - Components and Local Connectedness - Compact spaces.

Chapter 3 Sections : 23 to 26.

[15 Hours]

Unit -4

The Separation axioms - Normal spaces - The Urysohn lemma - The Urysohn Metrization Theorem - The Tietz Extension theorem.

Chapter 4 Sections : 31 to 35. [16 Hours]

Unit -5

The Tychonoff theorem - The Stone-Cech Compactification - The Nagata-Smirnov Metrization theorem - The Smirnov Metrization Theorem.

Chapter 5 Sections :37, 38, Chapter 6 Sections :40, 42. [15 Hours]

Seminar, Assignment.

Books for Study :

Munkres J. R, *Topology*, Second Edition, Pearson Education, Inc, 2000.

Books for Reference :

1. Benjamin Sims T, *Fundamentals of Topology*, Macmillan Publishing Company, 1976.
2. Dugundji J, *Topology*, Prentice Hall of India, 1975.
3. John Kelly L, *General Topology*, Van Nostrand Reinhold Company,1968.
4. Simmons G. F, *Introduction to topology and modern analysis*, Tata McGraw Hill book company, Inc, 1963.
5. Stephen Willard, *General Topology*, Addision Wesley, 1970.
6. Sundaram P., A Text Book of Topology, Kedar Nath Ram Nath Publishers, 2017.

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	H	S	S	S	S
CO3	H	S	S	M	S
CO4	M	S	H	M	S

S - Strong; H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE
	Head of The Department Of Mathematics N.G.M. College, POLLACHI - 642 001.	Dr. M. DURAIRAJU, M.Sc.,M.Phil.,B.Ed.,PGDCA.,Ph.D., Associate Professor / Co-ordinator, Curriculum Development Cell (CDC) NGM College (Autonomous) Pollachi - 642 001.	Dr. R.MUTHUKUMARAN Controller of Examinations NGM College (Autonomous) POLLACHI - 642 001.

Programme Code:	M. Sc	**Programme Title :**	Mathematics	
Course Code:	19PMS311	**Title**	**Batch :**	2019-2021
		TOPOLOGY	**Semester**	III
Hrs/Week	6		**Credits :**	4

Course Objective

This course deals with the essentials of topological spaces and their properties in terms of continuity, connectedness, compactness etc.

Course Outcomes (CO)

Upon successful completion of this course, students will be able to

K1	CO1	develop their abstract thinking skills.
K2	CO2	provide precise definitions and appropriate examples and counter examples of fundamental concepts in general topology.
K3	CO3	acquire knowledge about various types of topological spaces and their properties.
K4	CO4	appreciate the beauty of the mathematical results like Uryzohn's Lemma and understand the dynamics of the proof techniques.

Unit -1

Topological Spaces and Continuous Functions: Topological Spaces- Basis for a topology - The order topology - *The Product topology on X×Y (Self study)* - The Subspace topology - Closed sets and Limit points.

Chapter 2: Sections : 12 - 17. [16 Hours]

Unit -2

Topological Spaces and Continuous Functions: Continuous functions - The metric topology - The metric topology (Continued) .

Chapter 2 : Sections : 18, 20, 21. [15 Hours]

Unit -3

Connectedness and Compactness: Connected spaces - Connected subspaces of the real line - Components and Local Connectedness - Compact spaces.

Chapter 3 : Sections : 23 - 26. [15 Hours]

Unit -4

Countability and Separation Axioms: The Separation axioms - Normal spaces - The Urysohn lemma - The Urysohn Metrization Theorem - The Tietze Extension theorem.

Chapter 4 : Sections : 31 - 35. [16 Hours]

Unit -5

The Tychonoff Theorem: The Tychonoff theorem - The Stone-Cech Compactification.

Metrization Theorems and Paracompactness: The Nagata-Smirnov Metrization theorem - The Smirnov Metrization Theorem.

Chapter 5:Sections: 37, 38,

Chapter 6 : Sections: 40, 42. [15 Hours]

Seminar, Assignment.

Text Book :

Munkres J. R, *Topology*, Second Edition, Pearson Education, Inc, 2000.

Books for Reference :

1. Dugundji J, *Topology*, Prentice Hall of India, 1975.
2. John Kelly L, *General Topology*, Dover Publications, Inc., New York, 2017.
3. Simmons G. F, *Introduction to topology and modern analysis,* Tata McGraw Hill book company, Inc, Ninth reprint, 2004.
4. Sundaram P., A Text Book of Topology, Kedar Nath Ram Nath Publishers, 2017.

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	H	S	S	S	S
CO3	H	S	S	M	S
CO4	M	S	H	M	S

S - Strong; H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE
	For,		

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

Dr. M. DURAIRAJU, M.Sc.,M.Phil.,B.Ed.,PGDGC.,Ph.D.,
Associate Professor / Co-ordinator,
Curriculum Development Cell (CDC)
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POLLACHI - 642 001.

Programme Code:	M. Sc	**Programme Title:**	Mathematics	
Course Code:	19PMS207	**Title**	**Batch :**	2019-2021
		PARTIAL DIFFERENTIAL EQUATIONS	**Semester**	II
Hrs/Week	5		**Credits :**	4

Course Objective

This course helps the students to understand linear and non linear partial equations and solving them using Charpit's and Jacobi's methods, methods of separation of variables and by method integral transforms. This course includes the study of Laplace equation, wave equation and diffusion equation and their classifications.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

K1	CO1	recollect the first order and second order partial differential equations and their solution.
K2	CO2	understand the linear partial differential equations with constant and variable coefficients, Boundary value problems and application of calculus of variations.
K3	CO3	gain good knowledge in applying Charpit's and Jacobi's methods, method of separation of variables and the method of integral transforms obtain solutions of partial differential equations.
K4	CO4	demonstrate on the canonical forms of second order PDEs and bounded value problems by Dirichlet and Neumann.

Unit -1

Partial Differential Equations of the First Order: Partial Differential Equations - *Origins of First-order Partial Differential Equations (Self study)* - Nonlinear Partial Differential Equations of the First Order - Compatible Systems of First-order Equations - Charpit's Method - Special Types of First-order Equations - Jacobi's Method.

Chapter 2: Sections: 1, 2, 7, 9, 10, 11 and 13. [15 Hours]

Unit -2

Partial Differential Equations of the Second Order: The Origin of Second-order Equations - Linear Partial Differential Equations with Constant Coefficients - Equations with Variable Coefficients.

Chapter 3: Sections: 1, 4 and 5. [16 Hours]

Unit -3

Partial Differential Equations of the Second Order: Separation of variables - The Method of Integral Transforms - Nonlinear Equations of Second Order.

Chapter 3: Sections: 9, 10 and 11. [15 Hours]

Unit -4

Laplace's Equation: Elementary Solutions of Laplace's Equations - Families of Equipotential Surfaces - *Boundary Value Problems(Self study)* - Separation of Variables - Problems with Axial Symmetry.

Chapter 4 : Sections: 2 - 6.

[16 Hours]

Unit -5

The Wave Equation: Elementary Solutions of the One-dimensional Wave Equation - Vibrating Membranes: Application of the Calculus of Variations.

The Diffusion Equation: Elementary Solutions of Diffusion Equation - Separation of Variables.

Chapter 5: Sections: 2 and 4

Chapter 6: Sections: 3 and 4. [16 Hours]

Seminar, Assignment.

Text Book:

Ian N. Sneddon, (2006), *Elements of Partial Differential Equation, Dover Publication,* New York.

Books for Reference:

1. Michael Renardy and Robert C. Rogers. (2004), *An Introduction to Partial Differential Equations.* Second Edition. Springer.
2. Robert C. Mc Owen. (2004), *Partial Differential Equations, Methods and Applications,* Second Edition. Pearson Education, Inc.
3. Sankara Rao . K (2009), Introduction *to Partial Differential Equations, Second Edition,* PHI Learning Pvt.Ltd, New Delhi

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	H	H	M	H	M
CO2	S	H	H	H	H
CO3	H	M	M	S	H
CO4	M	H	M	H	H

S - Strong; H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE
HOD	For,		

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

Dr. M. DURAIRAJU, M.Sc.,M.Phil.,B.Ed.,PGDGC.,Ph.D.,
Associate Professor / Co-ordinator,
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Dr. R.MUTHUKUMARAN
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Programme Code:	M. Sc	**Programme Title:**	Mathematics	
Course Code:	19PMS104	**Title**	**Batch :**	2019-2021
		ORDINARY DIFFERENTIAL EQUATIONS	**Semester**	I
Hrs/Week	6		**Credits :**	4

Course Objective

This course introduces the formulation, classification of differential equations and existence and uniqueness of solutions. It also provides skill in solving initial value and boundary value problems and developing the skill in solving first and second order linear homogeneous and non- homogeneous differential equations using power series methods.

Course Outcomes (CO)

On successful completion of this course, students will be able to

K1	CO1	understand the concept of Linear differential equation, Wronskian and properties
K2	CO2	solve differential equations using power series method
K3	CO3	understand linear System ,fundamental matrix and its properties
K4	CO4	analyse existence, uniqueness, other properties of a solution of differential equations and concepts of boundary value problems

Unit -1

Linear differential equations of higher order: Introduction-Linear dependence and Wronskian - Basic theory for linear equations - Method of variation of parameters - Two useful formulae - Homogeneous linear equations with constant co-efficients.

Chapter 2: Sections : 2.1 - 2.6. [16 Hours]

Unit -2

Solutions in power series: Second order linear equations with ordinary points - Legendre equation and Legendre polynomials - Second order equations with regular singular points - Bessel equation.

Chapter 3: Sections : 3.2 - 3.5 [15 Hours]

Unit -3

Systems of Linear Differential Equations: Systems of first order equations - Existence and uniqueness theorem - Fundamental matrix - Non-homogeneous linear systems - Linear systems with constant co-efficients - *Linear systems with periodic co-efficients (Self study).*

Chapter 4: Sections : 4.2 - 4.7 [15 Hours]

Unit -4

Existence and uniqueness of solutions and Oscillations of second order equations: Introduction - Preliminaries - Successive approximations- Picard's theorem - Fundamental results - Strum's comparison theorem - Elementary linear oscillations - Comparison theorem of Hille-Wintner - Oscillations of x'' + a(t)x=0 .

Chapter 5 and 6 : Sections : 5.1 - 5.4 and 6.1- 6.5 [16 Hours]

Unit -5

Boundary Value problems: Introduction - Strum-Liouville problem - Green's functions - Picard's theorem.

Chapter 7: Sections : 7.1 - 7.3, 7.5 [16 Hours]

Seminar, Assignment

Text Book:

Deo S. G. and Raghavendran V, (1990), *Ordinary Differential Equations and Stability Theory*, Tata McGraw Hill Publishing company Limited.

Books for Reference :

1. Coddington E. A and Levinson N.,(1955), *Theory of Ordinary Differential Equations*, McGraw Hill, New York.
2. Martin H.(1985), *Ordinary Differential Equations*, Tata McGraw Hill Publishing company Limited.

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	H	S	S
CO2	S	M	S	S	H
CO3	H	S	H	S	M
CO4	S	S	S	S	S

S - Strong; H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE
	For,		

Dr. V. Inthumathi, Ph.D.,
Associate Professor & Head
Department of Mathematics
N.G.M College, Pollachi - 642 001.

Dr. M. DURAIRAJU, M.Sc.,M.Phil.,B.Ed.,PGDGC.,Ph.D.,
Associate Professor / Co-ordinator,
Curriculum Development Cell (CDC)
NGM College (Autonomous)
Pollachi - 642 001.

Dr. R.MUTHUKUMARAN
Controller of Examinations
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POLLACHI - 642 001.

Programme Code:	M. Sc	**Programme Title:**	Mathematics	
Course Code:	19PMS314	**Title**	**Batch :**	2019-2021
		GRAPH THEORY	**Semester**	III
Hrs/Week	6		**Credits :**	4

Course Objective

Graph theory is major area of Combinatorics. In this course we introduce basic concept of graph theory and analyze some important concepts and make them to crack CSIR / NET examination graph theory which comes in discrete mathematics.

Course Outcomes (CO)

On successful completion of the course student will be able to

K1	CO1	Understand the preliminaries of both undirected graphs and directed graphs.
K2	CO2	visualize the concept of planar graph and connectivity.
K3	CO3	Apply the concept of Eulerian graph and Hamiltonian graph.
K4	CO4	analyze both vertex colouring and edge colouring as well as matchings in graphs.

Unit -1

Graphs and Subgraphs: Graphs and simple graphs - Graph Isomorphism - The Incidence and Adjacency matrices - Subgraphs - Vertex degrees - Path and Connection and Cycles.

Trees: Trees - Cut edges and bonds - Cut vertices and Cayley's formula.

Chapter 1: Sections : 1.1 - 1.7

Chapter 2: Sections : 2.1 - 2.4. [16 Hours]

Unit -2

Connectivity: Connectivity and Blocks.

Euler Tours and Hamilton cycles: Euler tours and Hamilton cycles.

Chapter 3: Sections: 3.1, 3.2

Chapter 4: Sections : 4.1, 4.2. [16 Hours]

Unit -3

Matchings: Matchings - Matchings and coverings in bipartite graphs and perfect matchings.

Independent sets and Cliques: Independent sets.

Chapter 5: Sections : 5.1 - 5.3

Chapter 7: Sections : 7.1. [16 Hours]

Unit -4

Edge Colorings: Edge chromatic number and Vizing's theorem.

Vertex Colorings: Chromatic number - Brooks' theorem - Dirac's Theorem, Chromatic polynomials- Girth and chromatic number.

Chapter 6: Sections : 6.1, 6.2

Chapter 8: Sections : 8.1, 8.2, 8.4, 8.5 [15 Hours]

Unit -5

Planar Graphs: Plane and planar graphs, Dual graphs - Euler's formula and Kuratowski's theorem.

Directed Graphs: Directed graphs - Directed paths - Directed cycles.

Chapter 9: Sections : 9.1 - 9.3, 9.5

Chapter 10: Sections : 10.1 - 10.3. [15 Hours]

Seminar, Assignment.

Text Book:

Bondy J. A and Murty U. S. R, *Graph Theory with Applications*, Macmillan Company, 1976.

Books for Reference :

1. Balakrishnan R and Ranganathan K (2000), *A Text Book on Graph Theory*, Springer Verlog, New York.
2. Gould R (1988), *Graph Theory*, The Benjamin/Cummings Publishing Company, Inc, California.
3. Hartsfield N and Ringel G (1990), *Pearls in Graph Theory*, Academic Press.

4. Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	M	M	M	M	M
CO3	H	H	H	M	S
CO4	H	H	H	M	H

S - Strong; H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE
	For,		

Dr. V. Inthumathi, Ph.D.,
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Dr. R.MUTHUKUMARAN
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POLLACHI - 642 001.

Programme Code:	M.Sc	**Programme Title:**	Mathematics	
Course Code:	20PMS311	**Title**	**Batch :**	2020-2022
		TOPOLOGY	**Semester**	III
Hrs/Week	6		**Credits :**	4

Course Objective

This course deals with the essentials of topological spaces and their properties in terms of continuity, connectedness, compactnessetc.

Course Outcomes (CO)

Upon successful completion of this course, students will be able to

K1	CO1	develop their abstract thinking skills.
K2	CO2	provide precise definitions and appropriate examples and counter examples of fundamental concepts in general topology.
K3	CO3	acquire knowledge about various types of topological spaces and their properties.
K4	CO4	appreciate the beauty of the mathematical results like Uryzohn's Lemma and understand the dynamics of the proof techniques.

Unit -1

Topological Spaces and Continuous Functions: Topological Spaces-Basis for a topology - The order topology - *The Product topology on X×Y (Self study)* - The Subspace topology - Closed sets and Limit points.

Chapter 2:Sections : 12 - 17. [16 Hours]

Unit -2

Topological Spaces and Continuous Functions: Continuous functions - The metric topology - The metric topology (Continued) .

Chapter 2 : Sections : 18, 20, 21. [15 Hours]

Unit -3

Connectedness and Compactness: Connected spaces - Connected subspaces of the real line - Components and Local Connectedness - Compact spaces.

Chapter 3 : Sections : 23 - 26. [15 Hours]

Unit -4

Countability and Separation Axioms: The Separation axioms - Normal spaces - The Urysohn lemma - The UrysohnMetrization Theorem - The Tietze Extension theorem.

Chapter 4 : Sections : 31 - 35. [16 Hours]

Unit -5

The TychonoffTheorem: The Tychonoff theorem - The Stone-CechCompactification.

Metrization Theorems and Paracompactness: The Nagata-Smirnov Metrization theorem - The Smirnov Metrization Theorem.

Chapter 5:Sections:37, 38,

Chapter 6 : Sections:40, 42. [15 Hours]

Seminar, Assignment.

Text Book :

Munkres J. R, *Topology*, Second Edition, Pearson Education, Inc, 2000.

Books for Reference :

1. Dugundji J, *Topology*, Prentice Hall of India, 1975.
2. John Kelly L, *General Topology*, Dover Publications, Inc., New York, 2017.
3. Simmons G. F, *Introduction to topology and modern analysis*, Tata McGraw Hill book company, Inc, Ninth reprint, 2004.
4. Sundaram P., A Text Book of Topology, KedarNath RamNath Publishers, 2017.

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	H	H	H	M	H
CO2	M	H	H	H	L
CO3	M	H	H	M	L
CO4	M	H	M	M	H

H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE

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Programme Code:	M.Sc	**Programme Title:**	Mathematics	
Course Code:	20PMS314	**Title**	**Batch :**	2020-2022
		GRAPH THEORY	**Semester**	III
Hrs/Week	6		**Credits :**	4

Course Objective

Graph theory is major area of Combinatorics. In this course we introduce basic concept of graph theory and analyze some important concepts and make themto crack CSIR / NET examination graph theory which comes in discrete mathematics.

Course Outcomes (CO)

On successful completion of the course student will be able to

K1	CO1	Understand the preliminaries of bothundirected graphs and directed graphs.
K2	CO2	visualizethe concept of planar graph and connectivity.
K3	CO3	Apply the concept of Eulerian graph and Hamiltonian graph.
K4	CO4	analyze both vertexcolouring and edge colouring as well as matchings in graphs.

Unit -1

Graphs and Subgraphs: Graphs and simple graphs - Graph Isomorphism - The Incidence and Adjacency matrices - Subgraphs - Vertex degrees - Path and Connection and Cycles.

Trees: Trees - Cut edges and bonds - Cut vertices and Cayley's formula.

Chapter 1:Sections : 1.1 - 1.7

Chapter 2:Sections : 2.1 - 2.4. [16 Hours]

Unit -2

Connectivity: Connectivity and Blocks.

Euler Tours and Hamilton cycles: Euler tours and Hamilton cycles.

Chapter 3: Sections: 3.1, 3.2

Chapter 4:Sections : 4.1, 4.2. [16 Hours]

Unit -3

Matchings: Matchings - Matchings and coverings in bipartite graphs and perfect matchings.

Independent sets and Cliques: Independent sets.

Chapter 5:Sections : 5.1 - 5.3

Chapter 7:Sections : 7.1. [16 Hours]

Unit -4

Edge Colorings: Edge chromatic number and Vizing's theorem.

Vertex Colorings: Chromatic number - Brooks' theorem - Dirac's Theorem, Chromatic polynomials- Girth and chromatic number.

Chapter 6: Sections : 6.1, 6.2

Chapter 8:Sections : 8.1,8.2,8.4,8.5 [15 Hours]

Unit -5

Planar Graphs: Plane and planar graphs, Dual graphs - Euler's formula and Kuratowski's theorem.

Directed Graphs: Directed graphs - Directed paths - Directed cycles.

Chapter 9:Sections : 9.1 -9.3, 9.5

Chapter 10:Sections : 10.1 - 10.3. [15 Hours]

Seminar, Assignment.

Text Book:

Bondy J. A and Murty U. S. R, *Graph Theory with Applications*, Macmillan Company, 1976.

Books for Reference :

1. Balakrishnan R and Ranganathan K (2000), *A Text Book on Graph Theory*, Springer Verlog, New York.
2. Gould R (1988), *Graph Theory*, The Benjamin/Cummings Publishing Company, Inc, California.
3. Hartsfield N and Ringel G (1990), *Pearls in Graph Theory*, Academic Press.

Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5
CO1	H	M	M	M	M
CO2	M	M	H	M	L
CO3	M	H	M	H	H
CO4	H	M	H	M	L

H- High; M- Medium; L- Low

Course Designed by	Verified by HOD	Checked by CDC	Approved by COE

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Programme Code:	M.Sc.	**Programme Title:**	M.Sc. Mathematics	
Course Code:	21PMS311	**Title**	**Batch:**	2021 - 2023
		TOPOLOGY	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	4

Course Objective

This course deals with the essentials of topological spaces and their properties in terms of continuity, connectedness, compactness etc.

Course Outcomes (CO)

After successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	understand the concepts of topological spaces, continuity, homeomorphism, connectedness and compactness.	K2
CO2	generate different topologies (product topology, metric topology, usual topology) and analyze the properties and inter relationships between them.	K2,K4
CO3	generalize the concepts like continuity, reconstruct homeomorphisms between topological spaces and solved related problems.	K4
CO4	analyze separation axioms and the impact of metrization theorems in topology.	K4
CO5	pursue research in different areas of topological spaces and find applications in the field of Engineering, Medicine, Agriculture and social studies.	K5

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	H	H	M	H	M
CO2	H	H	H	H	M	H	M	H	M
CO3	H	H	H	H	H	H	M	H	M
CO4	M	H	H	H	M	M	H	H	M
CO5	M	M	H	H	H	H	H	M	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Topological Spaces and Continuous Functions:** Topological Spaces-Basis for a topology - The order topology - *The Product topology on X×Y (Self study)* - The Subspace topology - Closed sets and Limit points. **Chapter 2: Sections: 12 – 17.**	16
Unit II	**Topological Spaces and Continuous Functions:** Continuous functions - The metric topology - The metric topology (Continued) . **Chapter 2: Sections: 18, 20, 21.**	15
Unit III	**Connectedness and Compactness:** Connected spaces - Connected subspaces of the real line - Components and Local Connectedness - Compact spaces. **Chapter 3: Sections: 23 - 26.**	15
Unit IV	**Countability and Separation Axioms:** The Separation axioms - Normal spaces - The Urysohn lemma - The UrysohnMetrization Theorem - The Tietze Extension theorem. **Chapter 4 : Sections : 31 - 35.**	16
Unit V	**The Tychonoff Theorem:** The Tychonoff theorem - The Stone-CechCompactification. **Metrization Theorems and Paracompactness:** The Nagata-Smirnov Metrization theorem - The Smirnov Metrization Theorem. **Chapter 5:Sections:37, 38,** **Chapter 6: Sections:40, 42.**	16
	Total Contact Hrs.	**78**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Munkres J. R., Topology, Pearson Education, Inc/Second Edition, 2000.

Books for Reference :

1. Dugundji J, *Topology*, Prentice Hall of India, 1975.
2. John Kelly L, *General Topology*, Dover Publications, Inc., New York, 2017.
3. Simmons G. F, *Introduction to topology and modern analysis*, Tata McGraw Hill book company, Inc, Ninth reprint, 2004.

4. Sundaram P., A Text Book of Topology, KedarNath Ram Nath Publishers, 2017.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. **https://nptel.ac.in/content/storage2/courses/111106054/Topology%20complete%20course.pdf**
2. **https://www.youtube.com/playlist?list=PLbMVogVj5nJRR7zYZifYopb52zjoScx1d**
3. **http://www.math.iitb.ac.in/~ronnie/Fall2019/Lecture-Notes.pdf**
4. **https://www.uio.no/studier/emner/matnat/math/MAT4500/h18/dokumenter/topology.pdf**

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name:Dr. V. INTHUMATHI Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

Dr. V. Inthumathi, Ph.D.,
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K. SRINIVASAN, M.C.A.,
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Dr. R.MANICKA CHEZIAN, M.Sc.,M.S.,Ph.D.,
Controller of Examinations
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Programme Code:	M.Sc.	**Programme Title:**	M.Sc. Mathematics	
Course Code:	21PMS104	**Title**	**Batch:**	2021 - 2023
		ORDINARY DIFFERENTIAL EQUATIONS	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	4

Course Objective

This course introduces the formulation, classification of differential equations and existence and uniqueness of solutions. It also provides skill in solving initial value and boundary value problems and developing the skill in solving first and second order linear homogeneous and non-homogeneous differential equations using power series method.

Course Outcomes (CO)

On successful completion of this course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	recollect the preliminaries of analysis and calculus and understand the concept of Linear differential equations.	K2
CO2	solve differential equations using power series method and applying the ideas of differential equations in a coherent and meaningful manner for solving real world problems.	K3
CO3	formulate and solve linear systems using fundamental matrix and its properties and apply in the field of industrial organization engineering and research.	K5
CO4	analyze existence, uniqueness, other properties of a solution of differential equations and concepts of boundary value problems.	K4
CO5	determine the real life problems beyond the classroom.	K5

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	H	H	M	H	M
CO2	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Linear differential equations of higher order**: Introduction-Linear dependence and Wronskian - Basic theory for linear equations - Method of variation of parameters - Two useful formulae - Homogeneous linear equations with constant co-efficients. **Chapter 2: Sections: 2.1 - 2.6.**	16
Unit II	**Solutions in power series**: Second order linear equations with ordinary points - Legendre equation and Legendre polynomials - Second order equations with regular singular points - Bessel equation. **Chapter 3: Sections : 3.2 - 3.5**	15
Unit III	**Systems of Linear Differential Equations**: Systems of first order equations - Existence and uniqueness theorem - Fundamental matrix - Non-homogeneous linear systems - Linear systems with constant co-efficients-*Linear systems with periodic co-efficients (Self study).* **Chapter 4: Sections : 4.2 - 4.7**	15
Unit IV	**Existence and uniqueness of solutions and Oscillations of second order equations**: Introduction - Preliminaries - Successive approximations- Picard's theorem - Fundamental results - Strum's comparison theorem-Elementary linear oscillations - Comparison theorem of Hille-Wintner - Oscillations of x'' + a(t)x=0 . **Chapter 5 and 6 : Sections : 5.1-5.4 and 6.1- 6.5**	16
Unit V	**Boundary Value problems**: Introduction - Strum-Liouville problem - Green's functions - Picard's theorem. **Chapter 7: Sections : 7.1 - 7.3, 7.5**	16
	Total Contact Hrs.	**78**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Deo S. G. and Raghavendran V, *Ordinary Differential Equations and Stability Theory*, Tata McGraw Hill Publishing company Limited, 1990.

Books for Reference:

1. Coddington E. A and Levinson N., *Theory of Ordinary Differential Equations*, McGraw Hill, New York, 1955.
2. Martin H., *Ordinary Differential Equations*, Tata McGraw Hill Publishing company Limited, 1985.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/111/107/111107111/
2. https://ocw.mit.edu/courses/mathematics/18-03-differential-equations-spring-2010/videolectures/
3. https://nptel.ac.in/courses/122/107/122107037/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
Name:Dr. S. KALEESWARI Signature	Name: Dr. V. INTHUMATHI Signature	Name: Signature	Name: Signature

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Dr. R.MANICKA CHEZIAN, M.Sc.,M.S.,Ph.D.,
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Programme Code:	M.Sc.	**Programme Title:**	M.Sc. Mathematics	
Course Code:	21PMS207	**Title**	**Batch:**	2021 - 2023
		PARTIAL DIFFERENTIAL EQUATIONS	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

This course helps the students to understand linear and nonlinear partial differential equations and solving those using Charpit's and Jacobi's methods, methods of separation of variables and by method integral transforms. This course includes the study of Laplace equation, wave equation and diffusion equation and their classifications.

Course Outcomes (CO)

On successful completion of this course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	understand and classify partial differential equations to transform into canonical form.	K2
CO2	gain good knowledge in applying Charpit's and Jacobi's methods, method of separation of variables and the method of integral transforms to obtain solutions of partial differential equations.	K3
CO3	determine the canonical forms of second order PDEs and boundary value problems by Dirichlet and Neumann and apply the techniques to predict the behavior of certain phenomena.	K5
CO4	evaluate the elementary solutions of Laplace equations and explain the problems with axial symmetry and demonstrate the ability to think critically by developing appropriate mathematical models of physical systems .	K5
CO5	analyze linear partial differential equations with constant and variable coefficients, boundary value problems and apply specific methodologies to conduct research and produce innovative results.	K4

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	H	H	H	M	H	M
CO2	H	H	H	H	H	H	M	H	H
CO3	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Partial Differential Equations of the First Order:**Partial Differential Equations - *Origins of First-order Partial Differential Equations (Self study)* - Nonlinear Partial Differential Equations of the First Order - Compatible Systems of First-order Equations - Charpit's Method - Special Types of First-order Equations - Jacobi's Method. **Chapter 2:Sections:1, 2, 7, 9, 10, 11 and 13.**	14
Unit II	**Partial Differential Equations of the Second Order:**The Origin of Second-order Equations - Linear Partial Differential Equations with Constant Coefficients - Equations with Variable Coefficients. **Chapter 3:Sections:1,4 and 5.**	13
Unit III	**Partial Differential Equations of the Second Order:**Separation of variables - The Method of Integral Transforms- Nonlinear Equations of Second Order. **Chapter 3:Sections: 9, 10 and 11.**	13
Unit IV	**Laplace's Equation:** Elementary Solutions of Laplace's Equations - Families of Equipotential Surfaces - *Boundary Value Problems(Self study)* - Separation of Variables - Problems with Axial Symmetry. **Chapter 4 :Sections: 2 - 6.**	12
Unit V	**The Wave Equation:**Elementary Solutions of the One-dimensional Wave Equation - Vibrating Membranes: Application of the Calculus of Variations. **The Diffusion Equation:**Elementary Solutions of Diffusion Equation - Separation of Variables. **Chapter 5: Sections: 2 and 4** **Chapter 6: Sections: 3 and 4.**	13
	Total Contact Hrs.	**65**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Ian N. Sneddon, *Elements of Partial Differential Equation, Dover Publication*, New York, 2006.

Books for Reference:

1. Michael Renardy and Robert C. Rogers, *An Introduction to Partial Differential Equations.* Second Edition. Springer, 2004.
2. Robert C. Mc Owen, *Partial Differential Equations, Methods and Applications,* Second Edition. Pearson Education, Inc., 2004.
3. SankaraRaoK., Introduction *to Partial Differential Equations, Second Edition,* PHI Learning Pvt.Ltd, New Delhi, 2009.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/111/107/111107111/
2. https://nptel.ac.in/courses/122/107/122107037/
3. https://ocw.mit.edu/courses/mathematics/18-152-introduction-to-partial-differential-equationsfall-2011/lecture-notes/

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name with Signature	CDC	COE
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POLLACHI - 642 001.

Programme Code:	M.Sc.	**Programme Title:**	M.Sc. Mathematics	
Course Code:	21PMS314	**Title**	**Batch:**	2021 - 2023
		GRAPH THEORY	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	4

Course Objective

Graph theory is major area of Combinatorics. In this course we introduce basic concept of graph theory and analyze some important concepts and make themto crack CSIR / NET examination graph theory which comes in discrete mathematics.

Course Outcomes (CO)

On successful completion of the course student will be able to

CO Number	CO Statement	Knowledge Level
CO1	understand the preliminaries of both undirected graphs and directed graphs.	K2
CO2	visualize the concept of planar graph and connectivity and applying it.	K3
CO3	apply the concept of Eulerian graph and Hamiltonian graph.	K3
CO4	analyze both vertex colouring and edge-colouring as well as matchings in graphs.	K4
CO5	enrich knowledge of problem solving and pursue further research.	K5

Mapping

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	H	H	H	M	H	H	M	H	M
CO2	H	H	H	H	H	H	M	H	M
CO3	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	H	H

H - HIGH; M - MEDIUM; L - LOW.

Units	Content	Hrs.
Unit I	**Graphs and Subgraphs**: Graphs and simple graphs - Graph Isomorphism - The Incidence and Adjacency matrices - Subgraphs - Vertex degrees - Path and Connection and Cycles. Trees: Trees - Cut edges and bonds - Cut vertices and Cayley's formula. **Chapter 1: Sections : 1.1 - 1.7** **Chapter 2: Sections : 2.1 - 2.4.**	16
Unit II	**Connectivity:** Connectivity and Blocks. **Euler Tours and Hamilton cycles**: Euler tours and Hamilton cycles. **Chapter 3: Sections: 3.1, 3.2** **Chapter 4: Sections : 4.1, 4.2.**	16
Unit III	**Matchings**: Matchings - Matchings and coverings in bipartite graphs and perfect matchings. **Independent sets and Cliques**: Independent sets. **Chapter 5: Sections : 5.1 - 5.3** **Chapter 7: Sections : 7.1.**	16
Unit IV	**Edge Colorings**: Edge chromatic number and Vizing's theorem. **Vertex Colorings**: Chromatic number - Brooks' theorem - Dirac's Theorem, Chromatic polynomials- Girth and chromatic number. **Chapter 6: Sections : 6.1, 6.2** **Chapter 8:Sections : 8.1,8.2,8.4,8.5**.	15
Unit V	**Planar Graphs**: Plane and planar graphs, Dual graphs - Euler's formula and Kuratowski's theorem. **Directed Graphs**: Directed graphs - Directed paths - Directed cycles. **Chapter 9: Sections : 9.1 -9.3, 9.5** **Chapter 10: Sections : 10.1 - 10.3.**	15
	Total Contact Hrs.	**78**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Bondy J. A and Murty U. S. R, *Graph Theory with Applications*, Macmillan Company, 1976.

Books for Reference:

1. Balakrishnan R and Ranganathan K , *A Text Book on Graph Theory*, Springer Verlog, New York, 2000.

2. Gould R, *Graph Theory*, The Benjamin/Cummings Publishing Company, Inc, California,1988.
3. Hartsfield N and RingelG ,*Pearls in Graph Theory*, Academic Press,1990.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

https://nptel.ac.in/courses/111/106/111106102/

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