SRI RAMAKRISHNA
COLLEGE OF ARTS AND SCIENCE
(An Autonomous Institution)
Nava India, Avinashi Road, Coimbatore

Scheme of Examination

*(For the students admitted during the **academic year 2020 - 2021** and onwards)*

Under
Choice Based Credit System (CBCS)
&Learning Outcomes-Based Curriculum Framework (LOCF)

POSTGRADUATE PROGRAMMES

Programme: **M.Sc.** Branch:**Mathematics**

Course Code	Study Components and Course Title	CIA	Comprehensive Exam		Comprehensive Exam Total	Total	Credit
			Online	Descriptive Theory			
	SEMESTER I						
20MMA101	CORE I – **ALGEBRA**	40	10	50	60	100	4
20MMA102	CORE II – **REAL ANALYSIS**	40	10	50	60	100	4
20MMA103	CORE III – **ORDINARY DIFFERENTIAL EQUATIONS**	40	10	50	60	100	4
20MMA104	CORE IV – **MATHEMATICAL STATISTICS**	40	10	50	60	100	4
20MMA105	CORE V –**MATLAB& LATEX** (Theory & Practical)	50	-	50	50	100	5
20MMAE01	**DS Elective I**	40	10	50	60	100	4
						600	**25**

	SEMESTER II						
20MMA201	CORE – VI – **COMPLEX ANALYSIS**	40	10	50	60	100	4
20MMA202	CORE – VII – **PARTIAL DIFFERENTIAL EQUATIONS**	40	10	50	60	100	4
20MMA203	CORE – VIII - **MECHANICS**	40	10	50	60	100	4
20MMA204	CORE – IX – **ADVANCED EXCEL & SPSS**(Theory &Practical)	50	-	50	50	100	5
20MMAM01	**DS Elective – II**	40	10	50	60	100	4
20MEA01	Mandatory Non-CGPA **AEC / MACE @**				100	100 @	2$
20MMA205	Mandatory Non-CGPA (Summer Project-1 /Internship/Teaching Assignment)	100				100	1$
20VEA01	Mandatory Non-CGPA Co/Extra CC/VE	100				100	1$
						500	**21**
	SEMESTERIII						
20MMA301	CORE – X - **TOPOLOGY**	40	10	50	60	100	4
20MMA302	CORE – XI – **FLUID DYNAMICS**	40	10	50	60	100	4
20MMA303	CORE – XII – **NUMERICAL METHODS**	40	10	50	60	100	4
	IDC PAPER					100	4
20MMAE06	**DS Elective –III**	40	10	50	60	100	4
20MEA02	Mandatory Non-CGPA **SEC** / MACE @				100	100 @	2$
						500	**20**

	SEMESTERIV						
20MMA401	CORE – XII – **FUNCTIONAL ANALYSIS**	40	10	50	60	100	4
20MMA402	CORE – XIV - **MATHEMATICAL METHODS**	40	10	50	60	100	4
20MMA403	CORE – XV – **NUMBER THEORY**	40	10	50	60	100	4
20MMAS01	DS Elective – IV (Self-Study-Research)**Research Methodology**	50		50	50	100	4
20MMA404	CORE – XVI **Internship / Capstone Project**	120			80	200	8
						600	**24**

$ Extra credit courses

@ Comprehensive Examinations only.

**** Not included in Total Marks and CGPA Calculation.**

@@ MOOC Course-Minimum of 30 Hours from recognizedMOOC portal like SWAYAM, Coursera, etc. Assessment with Score/Credit and Certificate is mandatory.

Abstract of

Scheme of Examination

(For the students admitted during the academic year 2020 - 2021 and onwards)

Subject	Papers	Credit	Total credits	marks	Total marks
Core (including Project work & Viva voce)	15/1	4/5/8	52 +10+8 = **70**	100/200	**1700**
DS Elective	4	4	16	100	**400**
IDC / Generic Elective	1	4	4	100	**100**
Mandatory Non-CGPA **AEC** / MACE	1	2	2$	100	100**
Mandatory Non-CGPA **SEC** / MACE	1	2	2$	100	100**
Mandatory Non-CGPA **(Summer Project-1)**	1	1	1$	100	100**
Mandatory Non-CGPA **(Co/Extra Curricular/VE)**	1	1	1$	100	100**
Total			**90** + (6 Extra Credits)		**2200** + (400**)

Note:

- **Minimum 20 and Maximum 25Credit/Semester**

List of Elective Papers/ DSE (Can choose any one of the paper as electives)		
ElectivesTrack -1 (SLET/NET)- / **DSE-I**	Course Code	Title
	20MMAE01	**INTEGRAL EQUATIONS**
	20MMAE02	APPLIED LINEAR ALGEBRA
	20MMAE03	INTRODUCTION TO ALGEBRAIC TOPOLOGY
Electives Track -2 (Research)/ **DSE-II**	**20MMAM01**	**GRAPH THOERY (MOOC COURSE)**
	20MMAE04	FUZZY LOGIC AND FUZZY SETS
	20MMAE05	NEURAL NETWORKS
Electives Track -3 (Entrepreneurship & Innovation) / **DSE-III**	**20MMAE06**	**OPERATIONS RESEARCH**
	20MMAE07	LINEAR SYSTEMS THEORY
	20MMAE08	CONTROL THEORY

SIVACHANDRAN Y L
(Syllabus Coordinator)

Dr UMA N
(BOS Chairperson)

Dr HARIPRASAD D
(Academic Council-Member Secretary)

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MMA101	ALGEBRA	DSC	60	-	-	4	A (THEORY)

PREAMBLE / COURSE OBJECTIVE

- Understand the fundamental concepts of Group Theory which include group actions and sylow theorems
- Define the concepts of Ring Theory
- Develop the ability to form and evaluate Field Theory

DEPARTMENT OFFERING

PG and Research Department of Mathematics

PREREQUISTIE

BSc Mathematics / Mathematics CA - Groups, Subgroups, Rings

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Apply the characteristics of Dihedral groups, Symmetric groups, Matrix groups, Quotient groups and Alternating groups.	Apply
CO2	Derive the Class equations using Group Actions and Analyze the Sylow theorems	Analyze
CO3	Summarize the concepts of Ring Theory	Evaluate
CO4	Explain the concepts of Field Theory	Analyze
CO5	Analyze roots of polynomials using Galoi's theory	Analyze

SR-CAS

SYLLABUS

UNIT I

GROUP THEORY **12 HOURS**

Groups - Subgroups - Dihedral groups - Symmetric groups - Matrix groups – Homomorphisms and Isomorphisms – Centralizers and Normalizer, Stabilizers and Kernels.- Cyclic groups and Cyclic Subgroups, Quotient Groups - Transpositions and the Alternating groups

UNIT II

GROUP ACTIONS & SYLOW THEOREMS **14 HOURS**

Group Actions and Permutation Representations - Groups acting on themselves by left multiplication - Cayley's theorem - Groups acting on themselves by conjugation - The class equation - Automorphisms - The Sylow theorems

UNIT III

RING THEORY **10 HOURS**

Definitions and Examples- Ring Homomorphism and Quotient rings- Properties of Ideals-Rings of Fractions- The Chinese Remainder theorem

UNIT IV

FIELD THEORY **12 HOURS**

Definition – Examples – Polynomials over Rational Fields – Extension Fields – Roots of Polynomials – Splitting Fields.

UNIT V **12 HOURS**

FIELD THEORY

Simple extension – Fixed Fields – Normal extension - Galoi's Group - Fundamental theorem of Galoi's theory.

TEXT BOOKS

A. **David S. Dummit** and **Richard M. Foote** , "*Abstract Algebra*" (Third Edition), Wiley Student Edition (1999)

Unit I : Chapter 1: (Sections 1.2, 1.3. 1.4, 1.6)
Chapter 2: (Sections 2.1, 2.2, 2.3)
Chapter 3: (Sections 3.1, 3.2, 3.5)
Unit II : Chapter 4: (Sections 4.1, 4.2, 4.3, 4.4, 4.5)
Unit III : Chapter 7: (Sections 7.1 to 7.6)

B. **I.N. Herstein**, "Topics in Algebra", 2nd Edition, John Wiley and Sons, New York, 1975.

Unit IV : Chapter 5 (Section 5.5, 5.6)
Unit V : Chapter 5 (Section 5.7) ,
Chapter 7 : Section 7.1

REFERENCE BOOKS

A. **N. Jacobson, D.** *"Lectures in Abstract Algebra"* Vol. I, Van Nostrand Co., New York, 1976.

B. **N. Jacobson** , "Basic Algebra", Volume I & II, W.H. Freeman, 1980.

C. **S. Lang**, "Algebra", 3rd edition, Addison – Wesley, 1993.

D. **John B. Fraleigh,** *"A First Course in Abstract Algebra"* Addison Wesley, Mass, 1982.

E. **M. Artin**, *"Algebra"* , Prentice-Hall of India, New Delhi, 1991.

WEB RESOURCES

A. http://abstract.ups.edu/download/aata-20150812.pdf

B. http://www2.math.umd.edu/~jcohen/402/Pinter%20Algebra.pdf

C. https://math.dartmouth.edu/archive/m31x13/public_html/Notes%20on%20Abstract%20Algebra%202013.pdf

D. https://ict.iitk.ac.in/wp-content/uploads/CS203-Mathematics-for-Computer-Science-III-Lecture-Notes.pdf

E. https://math.berkeley.edu/~apaulin/AbstractAlgebra.pdf

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	L	L	_	-	-	S	-	M
CO2	S	M	L	_	-	-	S	-	M
CO3	S	L	L	_	-	-	S	-	M
CO4	S	L	M	_	-	-	S	-	M
CO5	S	L	L	_	-	-	S	-	M

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Dr UMA N
(Course Coordinator)

Dr JAYASHEELA D
(Academic Council-Member Secretary)

Dr UMA N
(BOS Chairperson)

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MMA102	REAL ANALYSIS	DSC	60	-	-	4	A (Theory)

This course aims at facilitating the students to train the students on This course will focus on the proofs of basic theorems of analysis. The way to establish the proofs, many new concepts will be introduced. Understanding the basic concepts and their properties are important for the development of the present and further courses

DEPARTMENT OFFERINGPREAMBLE / COURSE OBJECTIVE

PG & Research Department of Mathematics

PREREQUISITE

BSc Mathematics / Mathematics CA – Metric Space, Uniform convergence

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Determine the Riemann integrability and Riemann – Stieltjes integrability of a bounded function and proved a selection of theorems concerning integration.	Remember
CO2	Recognize the difference between pointwise and uniform convergence of a sequence of functions.	Understand
CO3	Determine the continuity, differentiability and integrability of functions defined on subsets of the real line. Illustrate the derivatives of higher order and differentiation of integral.	Apply
CO4	Analyze the Lebesgue measure and Lebesgue integral with related problems.	Apply

SYLLABUS

UNIT I

12 HOURS

Definition and Existence of the Integral – properties of the integral – integration and differentiation – Integration of vector valued function – rectifiable curves.

UNIT II

12 HOURS

Uniform convergence and continuity –uniform convergence and integration - uniform convergence and differentiation – equicontinuous families of functions – The Stone Weirstrass theorem.

UNIT III

13 HOURS

Functions of several variables :Linear transformations –Differentiation - The contraction principle – The inverse function theorem – The implicit function theorem – Determinants – Derivatives of higher order – Differentiation of integrals.

UNIT IV

12 HOURS

Outer measure – Measurable sets and Lebesgue measure – Non measurable set-Measurable functions – Littlewood's three principles.

UNIT V

11 HOURS

The Lebesgue integral of a bounded function over a set of finite measure – The integral of a nonnegative function – The general Lebesgue integral – Convergence in measure.

TEXT BOOKS

A. Principles of Mathematical Analysis by W. Rudin, McGraw Hill, New York, third edition - 2017.

REFERENCE BOOKS

A. R.G.Bartle, Elements of Real Analysis, 2nd Edition, John Wily and Sons, New York, 1975.

B. W.Rudin, Real and Complex Analysis, 3rd Edition, McGraw-Hill, New York, 2017.

WEB RESOURCES

A. https://b-ok.asia/book/1049095/b56660

B. https://www.pdfdrive.com/a-course-in-mathematical-analysis-vol-1-foundations-and-elementary-real-analysis-d166198740.html

C. https://www.pdfdrive.com/problems-in-mathematical-analysis1-d33607722.html

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	-	-	-	-	-	M	S	-
CO2	S	S	S	S	-	-	-	-	-	M	S	-
CO3	S	S	S	S	-	-	-	-	-	M	S	-
CO4	S	S	S	S	-	-	-	-	-	M	S	-
CO5	S	S	S	S	-	-	-	-	-	M	S	-

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

PROF E VIVEK
(Course Coordinator)

Dr JAYASHEELA D
(Academic Council-Member Secretary)

Dr UMA N
(BOS Chairperson)

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MMA103	ORDINARY DIFFERENTIAL EQUATIONS	DSC	60	-	-	4	A (THEORY)

PREAMBLE / COURSE OBJECTIVE

- The main purpose of the course is to introduce students to the theory and methods of ordinary differential equations.
- Students should be able to implement the methods taught in the course to work associated problems, including proving results of suitable accessibility.
- This course is designed to prepare students to solve problems arising from many applications such as mathematical models of physical or engineering processes.

DEPARTMENT OFFERING

PG & Research Department of Mathematics

PREREQUISTE

BSc Mathematics / Mathematics CA – Differential Equations

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Identify the difference between Legendre's equation and Bessel's equation	Understand
CO2	Explain the system of first order equations	Apply
CO3	Acquire the knowledge about Non homogeneous linear systems	Apply
CO4	Evaluate Successive Approximation problems	Analyze
CO5	Analyze the problems in Sturn's comparision theorem	Analyze

SYLLABUS

UNIT I

12 HOURS

Second order linear equations with ordinary points – Legendre equation and Legendre polynomials – Second order equations with regular singular points – Bessel equation.

UNIT II

11 HOURS

Systems of first order equations – existence and uniqueness theorem – Fundamental matrix.

UNIT III

11 HOURS

Non-homogeneous linear systems – linear systems with constant coefficients – linear systems with periodic co-efficients.

UNIT IV

13 HOURS

Successive approximation – Picard's theorem - Non-uniqueness of solution – Continuation and dependence on initial conditions, Existence of solutions in the large – Existence and uniqueness of solutions of systems.

UNIT V

13 HOURS

Fundamental results – Sturm's comparison theorem – Elementary linear oscillations. Comparison theorem of Hille-Winter – oscillations of x a(t)x 0 - Elementary non-linear oscillation.

TEXT BOOK

A. S. G. Deo and V. Raghavendra: "Ordinary Differential Equations and Stability Theory", Third Edition, Mc Graw Hill, Copyright 2015.

REFERENCE BOOKS

A. E. A. Coddington and N. Levinson, "Theory of Ordinary Differential Equations", McGraw Hill, New York, 1955.

B. D. A. Sanchez, "Ordinary Differential Equations and Stability Theory", W. H. Freeman & Co., San Francisco, 1968.

WEB RESOURCES

A. https://ltcconline.net/greenl/courses/204/PowerLaplace/seriesSolutions1.htm

B. http://www.sosmath.com/diffeq/first/existence/existence.html

C. https://advancesindifferenceequations.springeropen.com/articles/10.1155/2009/496135

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	L	L	L	-	-	L	-	M
CO2	S	M	S	M	-	-	L	-	M
CO3	S	L	M	L	-	-	L	-	M
CO4	S	L	S	M	-	-	L	-	M
CO5	S	S	M	M	-	-	L	-	M

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prof VASANTH KUMAR BONIFACE	Dr JAYASHEELA D	Dr UMA N
(Course Coordinator)	(Academic Council-Member Secretary)	(BOS Chairperson)

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MMA104	MATHEMATICAL STATISTICS	DSC		-	-		A (THEORY)

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to gain knowledge about the concept of random variable, Expectations and special probability distribution. The course helps the students to learn the concept of hypothesis testing in real world.

DEPARTMENT OFFERING

PG & Research Department of Mathematics

PREREQUISTE

BSc Mathematics / Mathematics CA – Probability, Statistics

EXPECTED SKILL

Domain Knowledge / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Explain the fundamental concepts of random variable and distribution function.	Understand
CO2	Apply the concept of probability distribution	Apply
CO3	Solve problems on MLE & Moments	Apply
CO4	Acquire knowledge about testing of hypothesis	Understand
CO5	Analysis the data by using Non-Parametric test	Analysis

SYLLABUS

UNIT I **11 HOURS**

Random variables and distribution functions- probability mass function and probability density function-discrete and continuous distribution function- mathematical expectations-moment generating function-cumulants-characteristic function-Chebychevs inequality.

UNIT II

13 HOURS

Probability Distributions –Uniform, Bernoulli and Binomial distribution- Negative Binomial and Poisson distribution-Rectangular and exponential distribution-Normal distribution(No derivations)-Properties-Applications-Simple problems.

UNIT III

13 HOURS

Parametric point estimation-Characteristics of good estimator-Consistency-Unbiased-Cramer Rao Inequality-Efficiency-Sufficiency-Rao Blackwell Theorem-Methods of estimation-Method of moments-Method of MLE-Method of minimum Chi-Square .

UNIT IV

12 HOURS

Fundamental concepts of hypothesis testing : Hypothesis-Null and Alternative, simple and composite, problem of testing of hypothesis, critical region, two kinds of errors, level of significance-most powerful test and uniformly most powerful test-Neyman Pearson Lemma- Likelihood Ratio test.

UNIT V

11 HOURS

Non-Parametric test-Wald Wolfowitz Run Test-Test for Randomness-Median test-Sign test- Mann-Whitney-Wilcoxon U-test-Sequential Probability Ratio Test-Average Sample Number.

TEXT BOOK

A. S.C. Gupta & V.K. Kapoor "Fundamentals of Mathematical Statistics" Sultan Chand & Sons Educational Publishers, 11th Revised Edition, Reprint 2016.

REFERENCE BOOKS

A. S. P. Gupta: "Statistical Methods"1st Edition1969, Reprint 2017.
B. P. R. Vittal: "Mathematical Statistics"1st Edition2002, Reprint 2016.

WEB RESOURCES

A. https://www.coconino.edu/resources/files/pdfs/academics/sabbatical-reports/kate-kozak/chapter_5.pdf

B. http://biostat.mc.vanderbilt.edu/wiki/pub/Main/AnesShortCourse/NonParametrics.pdf

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	L	-	-	-	-	-	-	-
CO2	S	S	-	M	-	-	-	M	L
CO3	S	L	-	-	-	-	-	-	-
CO4	S	S	-	M	-	-	-	-	-
CO5	S	M	-	L	-	-	-	-	-

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

PROF SINTHIYA J	Dr JAYASHEELA D	Dr UMA N
(Course Coordinator)	(Academic Council-Member Secretary)	(BOS Chairperson)

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MMA105	MATLAB & LATEX (Theory & Practical)	DSC	75	-	-	5	A (Theory & Practical)

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students to gain knowledge about the concept of random variable, Expectations and special probability distribution. The course helps the students to learn the concept of hypothesis testing in real world.

DEPARTMENT OFFERING

PG & Research Department of Mathematics

PREREQUISITE

BSc Mathematics / Mathematics CA – C, C++ (or) Basic Knowledge of Computer Programming.

EXPECTED SKILL

Domain Knowledge / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Apply the basic concepts of MATLAB and its commands	Apply
CO2	Analyse script files and function files in MATLAB	Analyze
CO3	Apply subplot and graphical commands to plot 2D and 3D graphs	Apply
CO4	Understand the various special formatting commands, including those for mathematics, text formatting, and tables.	Understand
CO5	Understand the various commands, environments, declarations and special characters in Latex.	Apply

SYLLABUS

UNIT I **9 HOURS**

Introduction: Basic of MATLAB, Input – Output - File types – Platform dependence– General commands-Interactive Computation: Matrices and vectors – Matrix and Array Operations –Creating and Using Inline functions – Using Built-in Functions and On-line Help –Saving and loading data – Plotting simple graphs.

UNIT II **10 HOURS**

Programming in MATLAB: Scripts and Functions – Script files – Function files – Language specific features – Advanced data objects.

UNIT III **10 HOURS**

Applications: Linear Algebra – Curve fitting and Interpolation – Data analysis and Statistics – Numerical Integration – Ordinary differential equations – Nonlinear Algebraic Equations- Graphics: Basic 2-D plots – Using subplot to layout multiple graphs – 3-D Plots – Handle Graphics – Saving and Printing Graphs – Errors.

UNIT IV **8 HOURS**

Latex-Commands & Environments- Special Characters – Document Layout and Organization-Page Style, Table of Contents – Changing font, Centering and Identing, Lists, Generalized lists.

UNIT V **8 HOURS**

Tables, Footnotes and Marginal Notes – Drawing Picture – Mathematical formulas – Mathematical environments – Mathematical Symbols, Additional Elements, Fine – tunning Mathematics

Total Periods : 45 Hrs

PRACTICALS : 30 HOURS

1. Multiply, divide and exponentiation vectors
2. Matrices and vectors
3. Solution of a system of linear equations
4. Ordinary Differential Equation
5. Curve fitting and interpolation
6. 2-D plots and 3-D Plots
7. Type a letter for applying a job
8. Type your own Bio-data.
9. Construct a Table Structure in Latex
10. Type a given article.

TEXT BOOKS

A. 1. Getting started with MATLAB – A Quick Introduction for Scientists and Engineers by Rudra Pratap, Oxford University Press, 2003.
Chapter I: Section 1.6
Chapter III: Sections 3.1 – 3.6.
Chapter IV: Sections 4.1 – 4.4
Chapter V: Sections 5.1 – 5.6.
Chapter VI & VII: Sections 6.1 – 6.5.

B. . A guide to LATEX by H.Kopka and P.W. DDaly, 3rd Edition, Addison – Wesley, London, 1999

WEB RESOURCES

A. http://mayankagr.in/images/matlab_tutorial.pdf

B. http://www.docs.is.ed.ac.uk/skills/documents/3722/3722-2014.pdf

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	-	M	S	S	-	-	-	-	M	-
CO2	S	M	-	M	S	S	-	-	-	-	M	-
CO3	S	M	-	S	S	S	-	-	-	-	M	-
CO4	S	M	-	M	-	-	-	M	-	-	S	-
CO5	S	M	-	M	-	-	-	M	-	-	S	-

S- Strong; M- Medium; L- Low

ASSESSMENT PATTERN (if deviation from common pattern)

CIA (Practical) – 50 Marks, CE (Theory) – 50 Marks
[Each programme carries 5 marks, in the specified list of 10 practical programmes]

PROF SANTHAKUMARI R
(Course Coordinator)

Dr JAYASHEELA D
(Academic Council-Member Secretary)

Dr UMA N
(BOS Chairperson)

SEMESTER I

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MMAE01	INTEGRAL EQUATIONS	DSE - I	60	-	-	4	A (Theory)

PREAMBLE / COURSE OBJECTIVE

This course aims to impart knowledge on solution of integral equations using approximations, transforms and Greens functions

DEPARTMENT OFFERING

PG and Research Department of Mathematics

PREREQUISITE

BSc Mathematics / Mathematics CA - Differential and Integral Calculus

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Classify the types of linear integral equations	Understand
CO2	Solve boundary value problems by converting them to integral equations	Apply
CO3	Apply Laplace transforms for solving integral equations	Apply
CO4	Analyze the properties of Greens function	Analyze
CO5	Determine the solution of singular integral equations	Apply

SYLLABUS

12 HOURS

UNIT I

Linear integral equations –Classification--Basic identities -Types of Kernels- Initial value problems reduced to Volterra integral equations-Solution of Volterra integral equations using resolvent kernel, successive approximations and Neumann series method

UNIT II

13 HOURS

Boundary value problems reduced to Fredholm integral equations- Solution of Fredholm integral equations using separable kernel, resolvent kernel, successive approximation and successive substitution-Solution of Homogeneous Fredholm integral equations using Eigen values and Eigen vectors

UNIT III

12 HOURS

Properties of Laplace transforms-Solution of convolution type kernel Volterra integral equations using Laplace transforms-Solution of integrodifferential equations using Laplace transforms

UNIT IV

11 HOURS

Properties of Greens function- Construction of Greens function-Solution of Boundary value problems using Greens function- Reduction of Boundary value problems to an integral equation using Greens function

UNIT V

12 HOURS

Abel integral equation-Solution of Abel integral equation using Laplace transforms-Cauchy principal value-Cauchy type integrals-Solution of Hilbert kernels- Solution of Hilbert type singular integral equation

TEXT BOOKS

A. **Warwaz A.M**, "*A First Course in Integral Equations*", World Scientific Publishing Co Inc,1997
B. **Jerri A**, "*Introduction to Integral Equations with Applications*", John Wiley & Sons,1999

REFERENCE BOOKS

A. **Kanwal R.P**, "*Linear Integral Equation. Theory and Techniques*", Academic Press,2014
B. **Raisinghania M.D**, "*Integral Equation and Boundary value problem*", S Chand Publishing,2007

WEB RESOURCES

https://www.et.byu.edu/~vps/ET502WWW/NOTES

https://www.mcs.st-and.ac.uk/~rac/MT5802/Integral%2520equations.pdf

https://staff.www.ltu.se/~larserik/applmath/chapter8e.pdf

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	L	L	L	-	-	L	-	M
CO2	S	L	S	M	-	-	L	-	M
CO3	S	L	S	M	-	-	L	-	M
CO4	S	M	L	L	-	-	L	-	M
CO5	S	L	S	L	-	-	L	-	M

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

PROF SIVACHANDRAN YL
(Course Coordinator)

Dr JAYASHEELA D
(Academic Council-Member Secretary)

Dr UMA N
(BOS Chairperson)

SEMESTER II

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MMA201	COMPLEX ANALYSIS	CORE	60	-	-	4	A

PREAMBLE / COURSE OBJECTIVE

This course aims at facilitating the students in the fundamental concepts and applications of complex analysis

DEPARTMENT OFFERING

PG & RESEARCH DEPARTMENT OF MATHEMATICS

PREREQUISTE

BSc Mathematics level complex analysis

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Compute definite integrals using residue calculus.	Apply
CO2	Explain the basic algebraic manipulation of complex numbers using power series.	Understand
CO3	Apply partial fractions and factorization on complex functions.	Apply
CO4	Analyze analytical functions using conformal mappings.	Analyze
CO5	Analyze complex periodic functions	Analyze

SYLLABUS

UNIT I **11 HOURS**

Complex Integration: Cauchy's integral formula– local properties of analytic functions – the calculus of residues.

UNIT II **12 HOURS**

Harmonic Functions: Series and product development: power series expansions.

UNIT III **12 HOURS**

Partial Fractions and Factorizations – Entire functions-The Riemann Zeta Function.

UNIT IV **13 HOURS**

Conformal Mapping, Dirichlet Problem: Conformal mapping of polygons, A closer look at harmonic functions, The Dirichlet problem

UNIT V **12 HOURS**

Elliptic Functions: Simply periodic functions, Doubly periodic functions

TEXT BOOKS

Complex Analysis by Lars. V. Ahlfors, McGraw Hill, International Edition (Third Edition) 1979

REFERENCE BOOKS

Complex Variables and Applications by J.W.Brown and R.V.Churchill Mcgraw-Hill Higher Education(Eighth Edition)

WEB RESOURCES

A. https://www.studocu.com/in/document/birla-institute-of-technology-and-science-pilani/maths/other/complex-variables-and-applications-brown-j-churchill-r-student-solutions-manual-8th-edition-solution-manual/4457841/view

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	S	-	S	-	-	S	-	-
CO2	S	S	-	S	-	-	S	-	-
CO3	S	S	-	M	-	-	S	-	-
CO4	S	M	-	M	-	-	S	-	-
CO5	S	L	-	M	-	-	S	-	-

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (If deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations

Prof MOHAMED RAJIK M
(Course Coordinator)

Dr JAYASHEELA D
(Academic Council -Member Secretary)

Dr UMA N
(BOS Chairperson)

SEMESTER - II

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MMA202	PARTIAL DIFFERENTIAL EQUATIONS	CORE	60	-	-	4	A (Theory)

PREAMBLE / COURSE OBJECTIVE

This course aims to enable the students to understand the elementary concepts and basic ideas involved in partial differential equations and to solve problems arising from many applications such as mathematical models of physical or engineering process.

DEPARTMENT OFFERING

PG & RESEARCH DEPARTMENT OF MATHEMATICS

PREREQUISTE

Basic Differentiation and Integration

UG DEGREE OF MATHEMATICS

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

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

S.NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Solve first order partial differential equations by Cauchy's method and Jacobi method	Apply
CO2	Solve second order linear partial differential equations with constant and variable coefficients.	Apply
CO3	Solve linear hyperbolic and non-linear partial differential equations of second order by the method of separation of variable and integral transform.	Apply
CO4	Analyze the solution of Boundary value problems and Laplace equations	Analyze
CO5	Analyze the solution of wave equation and diffusion equation	Analyze

SYLLABUS

UNIT - I : NON LINEAR PARTIAL DIFFERENTIAL EQUATION OF THE FIRST ORDER (12)

Cauchy's method of characteristics – Compatible systems of first order equations – Charpit's method – Special types of first order equations – Jacobi's method

Chapter 2: Sections: 8, 9, 10, 11, 13

UNIT - II: PARTIAL DIFFERENTIAL EQUATIONS OF SECOND ORDER (12)

The origin of second order equations – Linear partial differential equations with constant coefficients – Equations with variable coefficients - Characteristics curves of second order equations - Characteristics of equations in three variables.

Chapter 3: Sections: 1, 4, 5, 6, 7

UNIT - III: : PARTIAL DIFFERENTIAL EQUATIONS OF SECOND ORDER (12)

The solution of linear hyperbolic equations - Separation of variables – The method of Integral transforms – Non linear equations of the second order.

Chapter 3: Sections: 8, 9, 10, 11

UNIT - IV: LAPLACE EQUATION (12)

The occurrence of Laplace equations in physics – Elementary solution of Laplace equation – Families of equi-potential surfaces – Boundary value problems – Separation of variables

Chapter 4: Sections: 1, 2, 3, 4, 5

UNIT V: THE WAVE EQUATION AND DIFFUSION EQUATION (12)

Elementary solution of one dimension wave equation – Vibrating Membranes – Application of the calculus of variations – Three Dimensional problems - The Diffusion equation – Elementary solution of the Diffusion equations - Separation of variables.

Chapter 5: Sections: 2, 4, 5
Chapter 5: Sections: 3, 4

TEXT BOOKS

1. Ian Sneddon, "Elements of Partial Differential Equations", McGraw Hill International Book Company, New Delhi, 2006 **(Unit - I, II, III, IV, V)**

REFERENCE BOOKS

1. K. Sankara Rao, "Introduction to Partial Differential Equations", Second edition – Prentice – Hall of India, New Delhi 2011.
2. M.D. Raisinghania "Advanced Differential Equations" S. Chand and Company Ltd., 9th Edition New Delhi, 2005.

3. J.N. Sharma & K. Singh "Partial Differential Equations for Engineers & Scientists", Narosa Publishing House, 2006
4. Vairamanikam. K and Etal "Transforms and Partial Differential Equations", Scitech Publication India Pvt Ltd, 2nd Edition 2009.
5. Veerarajan.T "Transforms and Partial Differential Equations" , Tata McGraw Hill Publication New Delhi 2011

WEB RESOURCES

A. https://www.slideshare.net/aman1894/partial-differential-equations-42054204

B. https://www.youtube.com/watch?v=W3HXK1Xe4nc&list=PLbPn3CUduj5TPQtrwfI70F1SW4LvPf90d

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	M,	S	-	-	-	-	M	S
CO2	S	L	M	-	-	-	-	M	L
CO3	S	M	S	-	-	-	-	L	L
CO4	S	S	S	-	-	-	-	M	S
CO5	S	S	S	-	-	-	-	M	S

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prof GOWRISANKAR S
(Course Coordinator)

Dr JAYASHEELA D
(Academic Council -Member Secretary)

Dr UMA N
(BOS Chairperson)

SEMESTER II

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MMA203	MECHANICS	CORE	60	-	-	4	A

PREAMBLE/COURSE OBJECTIVE

This course aims to impart knowledge on the principles of a mechanical system using the classical theories of Lagrange and Hamilton.

DEPARTMENT OFFERING

PG & RESEARCH DEPARTMENT OF MATHEMATICS

PREREQUISTE

BSc Mathematics-Statics and Dynamics

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Explain a mechanical system using generalized coordinates	Understand
CO2	Derive the Lagrange's equations of a dynamical system	Apply
CO3	Analyze a mechanical system using Hamilton's principle	Analyze
CO4	Derive the Hamilton-Jacobi equation for a dynamical system	Apply
CO5	Analyze canonical transformations using Lagrange and Poisson brackets	Analyze

SYLLABUS

UNIT I **13 HOURS**

INDRODUCTORY CONCEPTS: Mechanical system – Generalized Coordinates – Constraints – Virtual Work – Energy and Momentum.

UNIT II **11 HOURS**

LAGRANGE'S EQUATIONS: Derivation of Lagrange's Equations – Examples – Integrals of Motion.

UNIT III **11 HOURS**

HAMITON'S EQUATIONS: Hamilton's Principle –Derivation of Hamilton's Equations.

UNIT IV **12 HOURS**

HAMILTON – JACOBI THEORY: Hamilton's Principle function – Hamilton – Jacobi Equation – Separability.

UNIT V **13 HOURS**

CANONICAL TRANSFORMATIONS: Differential forms and Generating Functions – Lagrange and Poisson Brackets

TEXT BOOKS

A. Donald. T. Greenwood, Classical Dynamics, 3rd Edition, Dover Publication, New York, 1997

REFERENCE BOOKS

A. F. Gantmacher, Lectures in Analytic Mechanics, MIR Publishers, Moscow, 1975

B. I.M. Gelfand and S.V. Fomin, Calculus of Variations, Prentice Hall., 2017

C. S.L. Loney, An Elementary Treatise on Statics, Kalyani Publishers, New Delhi, 1979.

WEB RESOURCES

A. http://www.macs.hw.ac.uk/~simonm/mechanics.pdf

B. https://www.cmi.ac.in/~govind/teaching/ujire-cm-rc14/cm-lec-note-ujire-gk.pdf

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	M	S	M	-	-	L	-	L
CO2	S	M	S	M	-	-	L	-	L
CO3	S	M	S	M	-	-	L	-	L
CO4	S	M	S	M	-	-	L	-	L
CO5	S	M	S	M	-	-	L	-	L

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prof SIVACHANDRAN Y L
(Course Coordinator)

Dr JAYASHEELA D
(Academic Council -Member Secretary)

Dr UMA N
(BOS Chairperson)

SEMESTER II

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MMA204	ADVANCED EXCEL &SPSS	CORE	45	-	30	5	A

PREAMBLE / COURSE OBJECTIVE

- To enable the students to gain knowledge about Advanced Excel and SPSS.
- To facilitate the students to undergo hands on training in Excel and SPSS software

DEPARTMENT OFFERING

PG & Research Department of Mathematics

PREREQUISTE

UG Level: Basic Excel and Statistics Skills

EXPECTED SKILL

Domain Knowledge, Employability and Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Explain the procedure to navigation within workbooks and worksheets	Understand
CO2	Apply the features of ranges in a worksheet	Apply
CO3	Create and work with formulas and functions	Analyze
CO4	Explain the basic concepts of SPSS	Understand
CO5	Analyze data using Diagrammatic Representation and ANOVA	Analyze

SYLLABUS

UNIT I **8 HOURS**

Getting Started with Excel: Introducing Excel-Exploring Data Types-Entering text and values into worksheets-Modifying cell contents-Applying number formatting

UNIT II **8 HOURS**

Introducing Table: What is Table? – Creating table-changing the look of a table-working with table-Sorting and Filtering a table-Converting a table back into range.

UNIT III **8 HOURS**

Working with Formulas and Functions: Introducing Formulas and Functions-Understanding Formula Basics-Entering Formulas into your worksheets-Working with Formulas.

UNIT IV **10 HOURS**

An overview of SPSS-SPSS windows Processes-Creating and Editing a Data File-Name & Type-Labels & Values-Missing and Columns-Entering and Editing Data.
Introduction to Managing Data-Listing Cases-Replacing Missing Values-Computing New Variables-Recoding Variables-Selecting Cases-Sorting Cases and Merging Files.

UNIT V **12 HOURS**

Graphs and Charts: Creating and Editing –Bar Charts- Line Charts-Pie Chart- Box Plots – Histogram – Scatter Plots-Bivariate Correlation-Significance-Direction of Causality-t-Test-One way ANOVA and Two way ANOVA

PRACTICALS (30 HOURS)

1. Create a student table and Create student mark table with 5 subjects and calculate Total, Average and Result using simple if function
3. Built a worksheet to perform correlation and regression coefficient using formula
4. Worksheet preparation for Electricity Bill Calculation
5. Worksheet preparation for Employee salary calculation
6. Calculation of EMI
7. Draw Bar Diagram and Line Diagram using SPSS
8. Draw Pie Chart Using SPSS
9. Calculate t-test Using SPSS
10. Calculate ANOVA using SPSS

Program No. 1 to 6 : Excel and 7 to 10 SPSS

[Each programme carries 5 marks, in the specified list of 10 practical programmes]

TEXT BOOKS

A. John Walkenbach "Microsoft Excel 2016 BIBLE", 'The Comprehensive Tutorial Resource', John Willey & Sons.
B. Darren George, Paul Mallery, "SPSS for Windows Step by Step", Eleventh Edition ,Published by Dorling Kindersley Pvt.Ltd.

REFERENCE BOOKS

A. Scott Proctor, "Building Financial Models with Microsoft Excel", second Edition, Willey Finance.
B. Greg Harvey "Excel 2016 for Dummies", Jhon Willey & Sons.
C. Sabine Landau and Brain S. Everitt, "A Handbook of Statistical Analysis using SPSS", Chapman & Hall/CRC Press LLC.2004.

WEB RESOURCES

A. https://opentextbc.ca/introductorybusinessstatistics/chapter/descriptive-statistics-and-frequency-distributions-2/
B. https://www.montclair.edu/media/montclairedu/oit/documentation/office2016/Introduction-to-Excel-2016.pdf
C. https://www.dit.ie/media/ittraining/msoffice/MOAC_Excel_2016_Core.pdf
D. https://opentextbc.ca/introductorybusinessstatistics/chapter/descriptive-statistics-and-frequency-distributions-2/
E. https://courses.lumenlearning.com/suny-natural-resources-biometrics/chapter/chapter-1-descriptive-statistics-and-the-normal-distribution/
F. https://basketsoftgo.tistory.com/m/16?category=0

MAPPING WITH PROGRAM OUTCOMES

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	M	-	S	S		-	M	M	L
CO2	M	-	S	S	-	-	M	M	L
CO3	M	-	S	S	-	-	L	M	L
CO4	M	-	S	M	-	-	M	M	L
CO5	S	-	S	S	-	-	M	M	M

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Practical Examination CIA - 50 Marks

[Each programme carries 5 marks, in the specified list of 10 practical programmes]

Semester Theory Examination – 50 Marks

Prof MANI N
(Course Coordinator

Dr JAYASHEELA D
(Academic Council -Member Secretary)

Dr UMA N
(BOS Chairperson)

SEMESTER II

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT CODE
20MMAM01 (MOOC COURSE)	GRAPH THEORY	DSE-2	55	-	-	4	A (Theory)

PREAMBLE / COURSE OBJECTIVE

This Course introduces in an elementary way of some basic knowledge and the primary methods in Graph Theory.

DEPARTMENT OFFERING

PG & Research Department of Mathematics

PREREQUISTE

Under Graduate - Discrete Mathematics

EXPECTED SKILL

Domain Knowledge / Skill Development

COURSE OUTCOMES

On successful completion of the course, students will be

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Implement the graph theory concept in real life problems	Apply
CO2	Explain the concepts of sub graphs, operations of graphs.	Understand
CO3	Determine the best solution for travelling salesman problem.	Apply
CO4	Solve the time tabling problem collectively using edge colourings	Apply
CO5	Analyze the characterization of planar graph and its dual, vertex colouring and its application.	Analyze

SYLLABUS

Week 1 : Paths, Cycles, Trails, Eulerian Graphs, Hamiltonian Graphs.
Week 2 : Bipartite graphs, Trees, Minimum Spanning Tree Algorithms
Week 3 : Matching and covers
Week 4 : Maximum matching in Bipartite Graphs.
Week 5 : Cuts and Connectivity
Week 6 : 2-Connected graphs.
Week 7 : Network flow problems, Ford-Fulkerson algorithm.
Week 8: Planar graph, Coloring of graphs.

TEXT BOOK

1. Introduction to Graph Theory: D.B. West (2001) Prentice Hall.
2. Graph Theory: F.Harary (1969) Addison-Wesley.
3. Graph Theory: R.Diestel (2006) Springer and network information science.

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	M	S	M	M	-	-	-	-	-
CO2	S	M	M	-	-	-	-	-	-
CO3	S	S	S	S	M	-	-	-	M
CO4	S	S	S	-	-	-	-	-	M
CO5	S	M	M	S	-	-	-	-	-

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

The Assessment of the NPTEL (SWAYAM Portal) will be inforporated as per our Regulations.

Prof SANTHAKUMARI R
(Course Coordinator)

Dr JAYASHEELA D
(Academic Council-Member
Secretary)

Dr UMA N
(BOS Chairperson)

SEMESTER III

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT PATTERN
20MMA301	TOPOLOGY	DSC	60	-	-	4	A(THEORY) CIA-40; CE-60 TOTAL-100

PREAMBLE / COURSE OBJECTIVE

To enable the students to comprehend the fundamental concepts of Topology such as compactness, connectedness and countability axioms.

DEPARTMENT OFFERING

PG and Research Department of Mathematics

PREREQUISITE

BSc Mathematics / Mathematics CA –Real and Complex Analysis, Algebra

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Find the Basis for a given Topological space	Apply
CO2	Analyze the effects of continuity on Topological spaces.	Analyze
CO3	Illustrate the properties of Connectedness	Apply
CO4	Compare the concepts of limit point compactness and local compactness.	Analyze
CO5	Analyze Urysohn lemma and Urysohn Metrization theorem using Separation axioms.	Analyze

SYLLABUS

UNIT I-Topological Spaces **13 HOURS**

Topological Spaces – Basis for a topology – The order topology – The product topology on $X \times Y$– Closed sets and Limit Points.

UNIT II-Continuity **11 HOURS**

Continuous functions - The product topology – The metric topology.

UNIT III-Connectedness **11 HOURS**

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

UNIT IV-Compactness **12 HOURS**

Compact Spaces – Compact subspaces of the real line - Limit Point Compactness- Local compactness.

UNIT V-Separation Axioms **13 HOURS**

The countability axioms – The separation axioms –The Urysohn Lemma – Urysohn Metrization Theorem.

Total: 60 HOURS

TEXT BOOKS

A. James R Munkers, *Topology*, Prentice Hall of India Pvt Ltd, 2nd edition, Reprint 2006.

REFERENCE BOOKS

A. J Dugundji, Allyn and Bacon, *Topology*, Prentice Hall of India Pvt. Ltd, New Delhi 1966.

B. GeorgeFSimmons, *Introduction to Topology and Modern Analysis*, McGraw Hill Book Company, 1963.

C. Sze-Tsen Hu, *Elements of General Topology*, Holden – Day, Inc. 1965.

WEB RESOURCES

A. https://home.iitk.ac.in/~chavan/topology_mth304.pdf

B. https://ece.iisc.ac.in/~parimal/2015/proofs/lecture-18.pdf

C. https://www.cmi.ac.in/~vipul/mathjourneys/contytopologysep.pdf

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	L	L	M	-	-	L	-	M
CO2	S	L	L	M	-	-	L	-	M
CO3	S	L	L	M	-	-	L	-	M
CO4	S	L	L	M	-	-	L	-	M
CO5	S	L	L	M	-	-	L	-	M

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by

MALARVIZHI M
(Course Coordinator)

Verified by

SIVACHANDRAN Y L
(Syllabus Coordinator)

Approved by

Dr UMA N
(BOS Chairperson)

Dr HARIPRASAD D
(Academic Council-Member Secretary)

SEMESTER III

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT PATTERN
20MMA302	FLUID DYNAMICS	DSC	60	-	-	4	A (THEORY) CIA-40; CE-60 TOTAL-100

PREAMBLE / COURSE OBJECTIVE

To impart knowledge on the dynamics of inviscid and viscous fluid flow across specific surfaces using the fundamental concepts of conservation laws and Navier-Stokes equations

DEPARTMENT OFFERING

PG and Research Department of Mathematics

PREREQUISITE

BSc Mathematics / Mathematics CA - Differential and Integral Calculus, Vector Calculus

EXPECTED SKILL

Domain knowledge

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Apply the basic notions of fluid dynamics such as velocity, density, pressure, linear momentum and continuity equations.	Apply
CO2	Derive the energy equation of an inviscid fluid flow	Apply
CO3	Compare fluid flow across two dimensional surfaces with that of cylindrical surfaces	Analyze
CO4	Apply Navier- Stokes equations for the flow of viscous fluids	Apply
CO5	Analyze flow of incompressible fluids using boundary layer concept	Analyze

SYLLABUS

UNIT I-Introductory Notion **13 HOURS**

Introductory Notions – Velocity – Stream Lines and Path Lines – Stream Tubes and Filaments – Fluid Body – Density – Pressure - Differentiation following the Fluid – Equation of continuity – Boundary conditions – Kinematical and physical – Rate of change of linear momentum – Equation of motion of an inviscid fluid.

UNIT II-Steady Inviscid Flow **11 HOURS**

Euler's momentum Theorem – Conservative forces – Bernoulli's theorem in steady motion – energy equation for inviscid fluid – circulation – Kelvin's theorem – vortex motion– Helmholtz equation.

UNIT III-Two Dimensional motion **12 HOURS**

Two Dimensional Motion – Two Dimensional Functions – Complex Potential – basic singularities – source – sink – Vortex – doublet – Circle theorem - Flow past a circular cylinder with circulation – Blasius Theorem – Lift force(Magnus effect).

UNIT IV-Viscous Flow **11 HOURS**

Viscous flows – Navier-Stokes equations – Vorticity and circulation in a viscous fluid – Steady flow through an arbitrary cylinder under pressure – Steady Couette flow between cylinders in relative motion – Steady flow between parallel planes.

UNIT V-Boundary Layer concept **13 HOURS**

Laminar Boundary Layer in incompressible flow - Boundary Layer concept – Boundary Layer equations – Displacement thickness - Momentum thickness – Kinetic energy thickness – integral equation of boundary layer – flow parallel to semi infinite flat plate –Blasius equation and its solution in series.

Total: 60 HOURS

TEXT BOOKS

A. L.M. Milne Thomson,*Theoretical Hydro Dynamics*, Macmillan Company, 5th Edition (1968)

B. N. Curlea and H.J. Davies,*Modern Fluid Dynamics (Volume I)* ,D Van Nostrand Company Limited., London (1968).

REFERENCE BOOKS

A. F.Chorlton, *Textbook of Fluid Dynamics*, CBS Publishers, New Delhi, 2004.

B. A.J.Chorin and A.Marsden, *A Mathematical Introduction to Fluid Dynamics*, Springer

WEB RESOURCES

A. https://nptel.ac.in/content/storage2/courses/101103004/pdf/mod5.pdf

B. https://nptel.ac.in/content/storage2/courses/103104043/Lecture_pdf/Lecture16.pdf

C. https://nptel.ac.in/content/storage2/courses/103105052/Lecture_1_Eqn%20of%20Continuity_UPDATED.pdf

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	L	L	M	-	-	L	-	M
CO2	S	L	L	M	-	-	L	-	M
CO3	S	L	L	M	-	-	L	-	M
CO4	S	L	M	M	-	-	L	-	M
CO5	S	L	M	M	-	-	L	-	M

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by

SIVACHANDRAN YL
(Course Coordinator)

Verified by

SIVACHANDRAN Y L
(Syllabus Coordinator)

Approved by

Dr UMA N
(BOS Chairperson)

Dr HARIPRASAD D
(Academic Council-Member Secretary)

SEMESTER III

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT PATTERN
20MMA303	NUMERICAL METHODS	DSC	60	-	-	4	A (THEORY) CIA-40; CE-60 TOTAL-100

PREAMBLE / COURSE OBJECTIVE

- To impart knowledge on the numerical techniques for finding derivatives, integrals and characteristic values.
- To impart knowledge on solving algebraic and differential equations using numerical methods.

DEPARTMENT OFFERING

PG and Research Department of Mathematics

PREREQUISITE

BSc Mathematics / Mathematics CA - Algebra, Calculus

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Apply numerical techniques for solving nonlinear equations, finding derivatives and integrals	Apply
CO2	Solve a system of linear and nonlinear equations using direct and iterative methods	Apply
CO3	Analyze solution of ordinarily differential equations using single step and multi-step method	Analyze
CO4	Find the solution of boundary value problems by numerical methods	Apply
CO5	Analyze finite differences to solve partial differential equations.	Analyze

SYLLABUS

UNIT I - Solution of Nonlinear Equations **13 HOURS**

Newton's method – Convergence of Newton's method – Bairstow's Method for quadratic factors- Derivatives from Difference tables – Higher order derivatives –Divided Differences- CentralDifference formulas– Composite formula of Trapezoidal rule – Romberg integration – Simpson's rules.

UNIT II-Solution of System of Equations **12 HOURS**

The Elimination method – Gauss and Gauss Jordan methods – LU Decomposition method – Matrix inversion by GaussJordan method – Methods of Iteration – Jacobi and Gauss Seidel Iteration – Relaxation method – Systems of Nonlinear equations.

UNIT III-Solution of Ordinary Differential Equations **11 HOURS**

Taylor series method – Euler and Modified Euler methods – Runge Kutta methods – Multistep methods –Milne's method – Adams Moulton method.

UNIT IV-Boundary Value problems and Characteristic values **13 HOURS**

The shooting method – solution through a set of equations – Derivative boundary conditions – Characteristic value problems – Eigen values of a matrix by Iteration –The power method.

UNIT V-Solution of Partial Differential Equations **11 HOURS**

Representation as a difference equation – Laplace's equation on a rectangular region – Iterative methods for Laplace equation – The Poisson equation

Total: 60 HOURS

TEXT BOOKS

A. C.F.Gerald and P.O.Wheatley ,*Applied Numerical Analysis*, Addison Wesley, 5th Edition (1998)

REFERENCE BOOKS

A. S.C. Chapra and P.C. Raymond,*Numerical Methods for Engineers*, Tata McGraw Hill, New Delhi, (2000)

B. S.S. Sastry, *Introductory methods of Numerical Analysis*, Prentice Hall of India, New Delhi, (1998).

C. P.Kandasamy et al., *Numerical Methods*, S.Chand&Co.Ltd., New Delhi(2003)

WEB RESOURCES

A. https://nptel.ac.in/content/storage2/courses/101108057/downloads/Lecture 3.pdf

B. https://www.ece.mcmaster.ca/~xwu/part6.pdf

C. https://www.lkouniv.ac.in/site/writereaddata/siteContent/20200403225057206 8siddharth bhatt engg Numerical Solution of Ordinary Differential Equations.pdf

MAPPING WITH PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	S	L	M	M	-	-	L	-	M
CO2	S	L	M	M	-	-	L	-	M
CO3	S	L	M	M	-	-	L	-	M
CO4	S	L	M	M	-	-	L	-	M
CO5	S	L	M	M	-	-	L	-	M

S- Strong; M-Medium; L-Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Prepared by	Verified by	Approved by
INFANT GABRIEL G (Course Coordinator)	SIVACHANDRAN Y L (Syllabus Coordinator)	Dr UMA N (BOS Chairperson)

Dr HARI PRASAD D
(Academic Council-Member Secretary)

SEMESTER III

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT	ASSESSMENT PATTERN
20MMAE06	OPERATIONS RESEARCH	DSE	60	-	-	4	A (THEORY) CIA-40; CE-60 TOTAL-100

PREAMBLE / COURSE OBJECTIVE

To impart knowledge on the concepts of

- Linear & Advanced Linear Programming and classification of optimization problem.
- Network & Simulation models.

DEPARTMENT OFFERING

PG and Research Department of Mathematics

PREREQUISITE

BSc Mathematics / Mathematics CA - Linear Programming Problems

EXPECTED SKILL

Domain Knowledge

COURSE OUTCOMES

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

S. NO.	COURSE OUTCOME	BLOOMS LEVEL
CO1	Solve Linear programming problems using Simplex Method	Apply
CO2	Analyze Transportation and Assignment Models	Analyze
CO3	Construct networks for projects and find the optimum completion time	Apply
CO4	Apply Revised Simplex algorithm for advanced linear programming problems	Apply
CO5	Simulate and derive conclusions using various simulation techniques	Analyze

SYLLABUS

UNIT I-Simplex Method **13 HOURS**

What is operation research? – Modeling with Linear Programming – Simplex method – Artificial starting solution – Special cases in the Simplex method.

UNIT II-Duality **13 HOURS**

Duality – Definition – Primal –Dual relationship – Dual simplex method – Transportation model – Assignment model.

UNIT III-Network Models **12 HOURS**

Network models – Minimal spanning tree algorithm – Shortest route algorithm (Dijkstra's algorithm only) – CPM pert.

UNIT IV-Revised Simplex Method **12 HOURS**

Advanced linear programming – Simplex method – Fundamentals – Revised Simplex method.

UNIT V-Simulation **10 HOURS**

Simulation modeling – Monte Carlo simulation – Types of simulation – Elements of Discrete event simulation – Generation of random numbers.

Total: 60 HOURS

TEXT BOOKS

A. H.A. Taha, *Operations Research: An Introduction*, Prentice Hall of India Private Limited, New Delhi, 8th Edition (2006)

REFERENCE BOOKS

A. G.Dantzig, *Linear Programming and Extension*, Princeton University Press, Princeton , 1963.

B. S.Ross, *A Course in Simulation*, Macmillion, New York, 1990.

WEB RESOURCES

A. https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_3/M3L5_LN.pdf

B. https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_4/M4L3_LN.pd

C. http://www.iitg.ac.in/nwast2015/slides/sbs.pdf

MAPPING WITH PROGRAM OUTCOMES

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