Department of Mathematics

ADIKAVI NANNAYA UNIVERSITY

Rajamahendravaram (A.P.) – 533296

M.Sc. Applied Mathematics

Syllabus [w.e.f 2016 Admitted Batch]

COURSE STRUCTURE

Sl.No.	Subject code	Name of the Subject	Number of Periods per Week	Credits
		I-SEMESTER		
1	AM 101(2016)	Real Analysis	6	4
2	AM 102(2016)	Ordinary Differential Equations	6	4
3	AM 103(2016)	Probability & Statistics	6	4
4	AM 104(2016)	Algebra	6	4
5	AM 105(2016)	C- Programming	6	4
6	AM 106-LAB(2016)	C- programming Lab	6	4
		Total:	36	24
		II-SEMESTER		
7	AM 201(2016)	Complex Analysis	6	4
8	AM 202(2016)	Numerical Methods	6	4
9	AM 203(2016)	Mathematical Methods	6	4
10	AM 204(2016)	Fluid Dynamics	6	4
11	AM 205(2016)	Partial Differential Equations	6	4
12	AM 206-LAB(2016)	Numerical Methods Lab	6	4
		Total:	36	24
		III-SEMESTER		
13	AM301(2016)	Advanced Complex Analysis	6	4
14	AM302(2016)	Linear Programming	6	4
15	AM303(2016)	Topology	6	4
16	AM304(2016)	Discrete Mathematical Structures	6	4
17	AM305(2016)	Elective-I	6	4
18	AM 306-LAB(2016)	FORTRAN LAB	6	4
		Total:	36	24

IV- SEMESTER				
19	AM 401(2016)	Functional Analysis	6	4
20	AM402(2016)	Operations Research	6	4
21	AM403(2016)	Methods of Applied Mathematics	6	4
22	AM404(2016)	Integral Transforms	6	4
23	AM405(2016)	Elective-II	6	4
24	AM406-LAB(2016)	MAT Lab	6	4
25	AM407(2016)	Project	---	4
		Total:	36	28

Elective-I	Elective-II
1. Numerical Solutions to PDE	1. Finite Element Methods
2. Lebesgue Theory	2. Bio Mechanics
3. Theoretical Computer Science	3. Graph Theory
4. Cryptography	4. Fuzzy Sets & Fuzzy Logic
5. Any Subject Approved by BOS	5. Any Subject Approved by BOS

Instructions for evaluation

1. Each theory subject is evaluated for 100 Marks out of which 75 Marks through end examination and internal assessment would be for 25 Marks. The minimum marks for qualifying in theory subject shall be 40% subject to securing minimum of 40% in the end examination.
2. End Examination Question Paper Pattern is as follows:

Sl. No.	Questions	Units of the Syllabus	Marks
1	Question1 and Question2	Form UNIT-I	15
2	Question3 and Question4	Form UNIT-II	15
3	Question5 and Question6	From UNIT-III	15
4	Question7 and Question8	From UNIT-IV	15
5	Question 9 Short answers from (a) to (e) (Three out of Five should be answered, each question is of 5 Marks)	Covers All Four Units of the Syllabus	3X5=15
		Total:	75

3. Internal assessment for 25 Marks is as follows:
   - i) Mid Examinations : 15 Marks
     (Two mid examinations shall be conducted and average of two should be considered as mid examinations marks).
   - ii) Assignments / Seminar : 5 Marks
   - iii) Attendance : 5 Marks
     (% of attendance < 80 : 4 Marks
     % of attendance ≥ 80 : 5 Marks)

4. Each Lab is for 100 Marks out of which 75 Marks for end examination and internal assessment would be for 25 Marks. The minimum marks for qualifying in Lab shall be 50% subject to securing minimum of 50% in the end examination.
5. External assessment for Lab (End examination) is as follows:
   [External Examiner should be invited]
   i. For Computer Program / algorithm : 45 Marks
   ii. Lab Record : 15 Marks
   iii. Viva-Voce : 15 Marks
6. Internal assessment for Lab is as follows:
   [Can be conducted in any of Lab session]
   i) Lab internal exam : 20 Marks
   ii) Continuous evaluation : 5 Marks
7. Student will be assigned with project work after the completion of II-Semester and should be carried out under the supervision of a guide, faculty with applied mathematics specialization in the department. The progress of the work would be continuously monitored by the members of departmental committee.
8. For the adjudication of project a committee will be constituted with the members of the departmental committee, project guide and external examiner. The adjudication is for 100 Marks and marks division is as follows:
   i. Report adjudication : 50 Marks
   ii. Oral presentation : 25 Marks
   iii. Viva Voce : 25 Marks

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AM 101(2016):

REAL ANALYSIS

UNIT-I:

The Reimann - Stieltjes Integral: Definition and Existence of Integral-Properties of the integral-Integration and Differentiation –Integration of vector-valued function - Rectifiable Curves.
[Chapter-6 of TextBook-1]

UNIT-II:

Sequences and series of functions: Discussion of main problem - Uniform convergence – Uniform convergence and continuity – Uniform Convergence and Integration – Uniform Convergence and Differentiation – Equicontinuous Families of functions – The Stone - Weierstrass Theorem.
[7.1 to 7.26 of Text Book 1]

UNIT-III:

Improper Integrals: Introduction – Integration of unbounded Functions with Finite limits of Integrations – Comparison Tests for Convergence at ' a' of $\int_a^b f\,dx$, Infinite Range of Integration – Integrand as a Product of Functions.
[Chapter-11 of Text Book-2]

UNIT-IV:

Functions of several variables: Explicit and Implicit Functions – Continuity – Partial Derivatives – Differentiability – Partial Derivatives of Higher Order - Functions of Functions – Change of variables – Taylor's Theorem – Extreme Values - Maxima and Minima – Functions of Several Variables.
[Chapter-15 of Text Book-2]

Text Books:

1. **Principles of Mathematical Analysis,** Walter Rudin, McGraw-Hill International Student Edition 1976.
2. **Mathematical Analysis** by S.C. Malik and Savita Aurora, New Age International Publishers, Fourth edition.

Reference Book:

Mathematical Analysis by Tom. M. Apostol (second Edition) Addison Weslay Publishing company.

AM 102(2016):

ORDINARY DIFFERENTIAL EQUATIONS

UNIT-I:
Linear Differential Equations of Higher Order: Preliminaries – Higher Order Linear Differential Equations – a modelling problem – linear independence – equations with constant coefficients – equations with variable coefficients – Wronskian – variation of parameters – some standard methods.
[Chapter 2.1 to 2.9 of Text Book]

UNIT-II:
Solutions of Differential Equations in Power series: Preliminaries – Second order Linear Equations with Ordinary points – Legendre equations with Legendre Polynomials – Second Order equations with regular singular points – Properties of Bessel functions.
[Chapter 3 of Text Book]

UNIT-III:
Systems of Linear Differential Equations: Preliminaries – Systems of first order equations – Model of arms competitions between two nations – Existence and uniqueness theorem – Fundamental Matrix – Non homogeneous linear systems – Linear systems with constant coefficients – Linear systems with periodic coefficients.
[Chapter 4 of Text Book]

UNIT-IV:
Existence and Uniqueness of solutions: Preliminaries – Successive approximations – Picard's theorem – Fixed point method.
[Chapter 5.1 to 5.4 and 5.9 0f Text Book]

Text Book:
S.G. Deo, V. Lakshmi kantham and V. Raghavendra: Text Book of Ordinary Differential Equations, second edition, Tata Mc Graw – Hill Publishing company Limited, New Delhi, 1997.

Reference Books :

1. An introduction to Ordinary Differential Equations by E.A. Coddington
2. Differential Equations with applications and Historical notes by George F.Simmons.
3. Theory of Ordinary Differential Equations by Samsundaram – Narosa Publications.

AM 103(2016):

PROBABILITY & STATISTICS

UNIT-I:

Distribution functions: Discrete random variable - Continuous random variable - Two-Dimensional Random variables - Mathematical expectation - Moments of a distribution function - Moment generating functions - Characteristic functions and their properties – Chebychev inequality - Probability generating functions.
[5.2 to 5.5(up to 5.5.5.) of Chapter-5, Chapter 6 except 6.7 and 7.1, 7.2, 7.3, 7.5 and 7.9 of Chapter 7]

UNIT-II:
Distributions: Discrete Distributions Binomial - Poisson distributions and their properties - Continuous distributions - Normal and Rectangular distributions and their properties.
[8.1 to 8.5 of Chapter 8 and 9.1 to 9.3 of Chapter 9]

UNIT-III:
Correlation and Regression: Correlation - Karl pearson's coefficient of correlation - Calculation of correlation coefficient for bivariant frequency distribution - Spearman's rank correlation coefficient - Linear regression- Regression coefficients and their properties - Angle between regression lines.
[10.1 to 10.5 and 10.7.1 of Chapter 10 and Chapter 11 (upto 11.2.3)]

UNIT-IV:
Sampling distribution: Sampling and Large sample tests, Exact sampling distributions - χ^2, t and F-distributions.
[Chapter-14, Chapter 15 up to 15.6.4 and Chapter 16 up to 16.6 except 16.4]

Text Book:
Fundamentals of Mathematical Statistics by S.C.Gupta and V.K.Kapoor , 11th Edition, Sultan Chand & Sons, New Delhi.

Reference Book:
Probability and Statistics for Engineers and Scientists, 9th edition, Walpole Myers, Keying Ye Pearson Publications.

AM 104(2016):

ALGEBRA

UNIT-I:

Normal sub groups: Automorphisms – Conjugacy and G-sets – Normal series solvable groups – Nilpotent groups.
[5.3 and 5.4, 6.1 to 6.3 of Text Book]

UNIT-II:

Structure theorem of groups: Direct product – Finitely generated abelian groups – Invariants of a finite abelian group – sylow's theorems.
[8.1 to 8.4 of Text Book]

UNIT-III:

Ideals and homomorphisms: Ideals – homomorphisms - Sum and direct sum of ideals - Maximal and prime ideals – Nilpotent and Nil ideals – Zorn's lemma.
[10.1 to 10.6 of Text Book]

UNIT-IV:

Unique factorization domains and Euclidean domains: Unique factorization domains - Principle of ideal domains – Euclidean domains – Polynomial rings over UFD – Rings of fractions. [11.1 to 11.4 and 12.1of Text Book]

Text Book:
Basic Abstract Algebra by P.B. Bhattacharya, S.K. Jain and S.R. Nagpal.

Reference Book:
Topics in Algebra by I.N.Herstein.

AM 105(2016):

C- PROGRAMMING

UNIT-I:

Over view of C – constants – variables – Data types – operators and expressions. [Chapters 2,3,4 of the Text Book]

UNIT-II:

Managing Input and output operations – Decision making – branching – decision making and looping.

[Chapters 5,6,7 of the Text Book]

UNIT-III:

Arrays – Handling of character strings – user defined functions.

[Chapters 8, 9, 10 of the Text Book]

UNIT-IV:

Pointers – Structures and Unions.

[Chapter 11 and 12 of the Text Book]

Text Book:

C-Programming and Data Structures – E. Balagurusamy, Second Edition Tata McGraw – Hill Publishing company (We should verify 4^{th} edition)

Reference Books:

1. Programming in C by D. Ravichandran, New Age International, 1998.
2. C and Data Structures by Ashok N. Karthane, Pearson Education.

AM 106-LAB(2016):

C- PROGRAMMING LAB

LIST OF C – PROGRAMES :

1. Factorial of a number
2. Reverse of a number
3. GCD of two numbers using EUCLIDIAN algorithm
4. Fibonacci numbers up to "N"
5. Perfect numbers up to "N"
6. Prime numbers up to "N"
7. Sum of digits of a number
8. Number palindrome
9. Find the squares of first ten natural numbers using function
10. Find biggest of three numbers using function
11. Find biggest element in an array
12. Find Transpose of a Matrix
13. Sum of the matrices
14. Product of the matrices
15. To find String length using user defined function

AM 201(2016):

COMPLEX ANALAYSIS

UNIT-I:

Regions in the complex plane – Functions of a complex variable – Mappings by exponential functions – Limits – Continuity – Derivatives – Cauchy-Riemann equations – Sufficient conditions for differentiation – Polar coordinates.
[10 of Chapter-1 and chapter-2 of Text Book]

UNIT-II:

Analytic functions – Harmonic functions - Uniquely determined analytic functions - Reflection principle – The exponential function – The logarithmic function – Complex exponents – Trigonometric functions – Hyperbolic functions – Inverse trigonometric – Hyperbolic functions.
[Chapter-3 of Text Book]

UNIT-III:

Derivatives of functions w(t) – Definite integrals of functions w(t) – Contours – Contour integrals – Upper bounds for moduli of contour integrals – Anti derivatives.
[36 to 42 of Chapter-4 of Text Book]

UNIT-IV:

Cauchy-Goursat theorem and its proof – Simply and multiply connected domains – Cauchy's integral formula – Derivatives of analytic functions – Liouville's theorem and fundamental theorem of algebra – Maximum modulus principle.
[43 to 50 of Chapter-4 of Text Book]

Text Book:
Complex Variables and Applications by James Ward Brown, Ruel V.Churchill, McGraw-Hill International Edition.

Reference Books:

1. Complex analysis for Mathematics and Engineering by John H.Mathews and Russel.W, Howell, Narosa Pulishing house.
2. Complex Variables by H.S.Kasana, Prentice Hall of India.

AM 202(2016):

NUMERICAL METHODS

UNIT-I:

Transcendental and Polynomial Equations: Introduction - Bisection method - Iteration methods based on first degree equation - Secant method - Regula falsi method - Newton Raphson method - Iteration method based on second degree equation - Rate of convergence of secant method - Newton Raphson method.
[Above topics are from Chapter-2 of the Text Book]

UNIT-II:

System Of Linear Algebraic Equation And Eigen Value Problems: Direct methods - Introduction - Gauss Elimination Method- Gauss – Jordan Method - Triangularisation method - Iteration Methods- Jacobi iteration Method - Gauss-Seidel Iteration Method - Eigen values and Eigen vectors.
[Above topics are from Chapter-3 of the Text Book]

UNIT-III:

Interpolation And Approximation: Introduction - Lagrange Interpolation - Newton Divided Differences - Finite Difference Operators - Interpolating Polynomials using finite differences- Gregory- Newton forward difference interpolation- Backward difference interpolation - Stirling and Bessel interpolation - Hermite interpolation - Spline interpolation - Approximation: Least Square approximation.
[Above topics are from Chapter-4 of the Text Book]

UNIT-IV:

Numerical Differentiation and Integration: Introduction – Numerical differentiation: Methods based on finite differences- Numerical integration: Composite integration methods- Trapezoidal rule- Simpsons rules – numerical solution of ODEs by picard – Euler - Modified Euler – Runge Kutta methods.
[Above topics are from Chapter-5 and 6 of the Text Book]

Text Book:
Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, R. K. Jain, New Age International (p) Limited, Publishers, 5 th Edition.

Reference Book:
An Introduction to Numerical Analysis by Kendall E. Atkinson.

AM 203(2016):

MATHEMATICAL METHODS

UNIT-I:

Fourier Series: Fourier coefficients- Even and Odd functions- Cosine and Sine series- Fourier Series on arbitrary intervals.
[5.1,5.3 and 5.4 of Text Book-1]

UNIT-II:

The Calculus of variations: Euler's Equation – functions of the form $\int_{x_0}^{x_1} f(x, y_1, y_2, \dots y_n, y_1', y_2', \dots y_n',)dx$ - functional dependence on higher order derivatives- Variational problems in parametric form and applications.
[Chapter VI of Text Book-2]

UNIT-III:

Difference Equations: Introduction, Definition, Formation of difference equations, Linear difference equations, Rules for finding complementary function, Rules for finding the Particular Integral.
[From Text Book 3]

UNIT-IV:

Tensor Analysis: N- dimensional space – Covariant and Contravariant vectors – Contraction – Second and higher order tensors – Quotient law –Fundamental tensor – Associate temsor – Angle between the vectors – Principal directions – Christoffel symbols – Covariant and intrinsic derivatives – Geodesics.
[Chapter 1 to 4 Text Book 4]

Text Books:

1. Differential Equations Theory, Technique and Practice by George F.Simmons and Steven G.Krantz, Tata McGraw-Hill Edition.
2. Differential Equations by L.Elsgolts, Mir Publishers, Moscow.
3. Higher Engineering Mathematics by B.S.Grewal, Khanna Publishers.
4. Tensor Calculus by Barry Spain.

AM204(2016):

FLUID DYNAMICS

UNIT-I:

Vectors and Scalars - Addition and Subtraction of Vectors - Use of coordinates - Scalars product of Two Vectors - Vector product of Two Vectors - Triple Product - Vector Moment about a point and Scalar Moment about an Axis - Vector and Scalar Couples - Different ion of Vectors w.r.t Scalars - Notation of Scalars and Vector Fields - The Vector Gradient and Direction Differentiator - Normal Flux of a Vector over a Surface - Divergence of a Vector-Line integrals - Curl of a vector function - Some Vector Identities - Conservative Vector Fields - Conservative Field of Force.

UNIT-II:

Real Fluids and Ideal Fluids - Velocity of a Fluid at a Point - Streamlines and Pathlines - Steady and Unsteady Flows - The Velocity Potential - The Vorticity Vector - Local and Particle Rates of Change - The Equation of Continuity - Acceleration of a Fluid - Conditions at Rigid Boundary.

UNIT-III:

Euler's Equations of Motion - Bernoulli's Equation - Some Special Two-Dimensional Flows - Some Three Dimensional Flows - Introduction - Sources - Sinks and Doublets.

UNIT-IV:

Viscous flow: Stress Components in a Real Fluid - Relation between Cartesian Components of Stress - Translational Motion of Fluid Element - The Rate of Strain Quadric and Principal Stresses - Stress Analysis in Fluid Motion - Relations between Stress and Rate of Strain - The Coefficient of Viscosity and Laminar Flow - The Navier-Stokes Equations of Motion of a Viscous Fluid - Some Solvable Problems in Viscous Flow - Steady Motion between Parallel Planes.

Text Book:

Text Book of Fluid Dynamics by F.Chorlton, CBS Publishers & Distributors (Reprint 2004)

AM205(2016):

PARTIAL DIFFERENTIAL EQUATIONS

UNIT-I:

First Order PDE's: Introduction – Methods of solution of $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ - orthogonal trajectories of a system of curves on a surface- Pfaffian Differential forms and equations – Solutions of Pfaffian Differential Equations in three variables – Cauchy's problem for first order PDE.
[Sections 3 to 6 of Chapter 1, Sections 1 to 3 of Chapter 2]

UNIT-II:

Linear Equations of the first order – Integral Surfaces – Orthogonal Surfaces – Non-Linear PDE of the first order – Cauchy's method of characteristics – compatible systems of first order equations – Charpit's method – special types of first order equations – Jacobi's method
[Sections 4 to 13 of Chapter 2]

UNIT-III:

Partial differential equations of the second order , their origin, linear partial differential equations with constant and variable coefficients – solutions of linear Hyperbolic equations – Method of separation of variables – Monger's method.
[Sections 1to 5 and sections 8, 9, 11 of Chapter 3)

UNIT-IV:

Laplace Equation – elementary solutions0 families of equipotential surfaces, boundary value problems, method of separation of a variables of solving Laplace equation, problems with axial symmetry, Kelvin's inversion theorem, The wave equation, elementary solution in one dimensional form, Riemann – Volterra solution of one dimensional wave equation.
[Section 1 to 7 of Chapter 4 and Sections 1 to 3 of Chapter 5)

[**Problematic approach is Preferred**]

Text Book:

Elements of partial differential equations by I.N. Sneddon. Mc – Graw Hill, international edition, Mathematics series**.**

Reference book:

T. Amarnath, An Elementary Course in Partial differential equations, Second Edition, Narosa |Publishig House.

AM 206-LAB(2016):

NUMERICAL METHODS LAB

LIST OF PROGRAMS:

1. Bisection method
2. False position method
3. Newton Raphson method
4. Secant method
5. Gauss elimination method
6. Gauss seidal method
7. Difference table method
8. Trapezoidal method
9. Simpson 1/3 rule
10. Simpson 2/3 rule2
11. Euler's method
12. Thomas method
13. Lagranges method
14. Taylor's method
15. Runge-kutta method
16. Modified Euler's method

AM301(2016):

ADVANCED COMPLEX ANALYSIS

UNIT-I:
Series: Convergence of sequences and series – Taylor's series – Laurent's series – Absolute and uniform convergence of power series – Continuity of sums of power series – Uniqueness of series representation.
[51 to 58 and 60 of Chapter-5 of the Text Book]

UNIT-II:
Residues and Poles: Residues - Cauchy's residue theorem – Using a single residue – the three types of isolated singular points - Residues at poles – Zeroes of analytic function – Zeroes and Poles – Behaviour of f near isolated singular points.
[62 to 70 of Chapter-6 of the Text Book]

UNIT-III:
Applications of Residues: Evaluation of improper integrals - Jordan's lemma – Indented paths – Definite integrals involving sines and cosines – Argument principle – Rouche's theorem.
[71, 74, 75, 78 to 80 of Chapter-7 of the Text Book]

UNIT-IV:
Linear Transformations: The transformation w=1/z - mappings by w=1/z - Linear fractional transformations –An implicit form – Mapping of the upper half plane – The transformation w=sinz – Mapping by Z^2 – Conformal mapping – Preservation of angles.
[83 to 90 and 94 of the Text Book]

Text Book:
Complex Variables and Applications by James Ward Brown, Ruel V.Churchill, McGraw-Hill International Editions

Reference Books:
1. Complex analysis for Mathematics and Engineering by John H.Mathews and Russel.W, Howell, Narosa Pulishing house.
2. Complex Variables by H.S.Kasana, Prentice Hall of India.

AM302(2016):

LINEAR PROGRAMMING

UNIT-I:

Overview of operations research: OR models - OR Techniques- Linear Programming- Introduction - Graphical solution - The standard form of linear programming problems- Basic feasible solutions- Unrestricted variables - Simplex Method.

UNIT-II:

Concept of Duality: Artificial variables - Big M and Two phase method- Degeneracy - Alternative optima- Unbounded solutions - infeasible solutions - Dual problems - Relation between primal and dual Problems - Dual simplex method.

UNIT-III:

Game theory: Two person Zero sum games- Principle of dominance – Matrix method for mxn games without saddle points - Mixed strategy games.

UNIT-IV:

Transportation and Assignment Problems: Transportation model - Basic feasible solutions- North West corner Rule- Lowest cost method- Vogel approximation method- transportation algorithm (MODI -method) - Assignments problem - Hungarian method.

Text Book: Operations Research, Theory and Applications by J.K.SHARMA

Reference Books:

1. Operations Research, An Introduction- Hamdy A.Taha, Seventh Edition.
2. Introduction to Operations Research- Hillier Lieberman, Tata Mc Graw Hill.

AM303(2016):

TOPOLOGY

UNIT-I:
Metric Spaces and Topological Spaces: The definition and some examples – Open sets – Closed sets – Convergence, Completeness and Baire's Theorem – Topological Spaces - the definition and some examples – Elementary concepts – Open bases and Open subbases.
[Section 12 of Chapter-2, Sections 16,17 and 18 of Chapter-3 of Text Book]

UNIT-II:
Compactness: Compact spaces – Product spaces – Tychonoff's theorem and locally compact spaces – Compactness for Metric spaces – Ascoli's Theorem.
[Sections 21-24 and 25 of Chapter-4 of Text Book]

UNIT-III:
Separation: T_1-Spaces and Hausdorff spaces – Completely regular spaces and normal spaces – Urysohn's lemma and the Tietze extension theorem – The Urysohn imbedding theorem.
[Sections 26-29 of Chapter-5 of Text Book]

UNIT-IV:
Connectedness: connected spaces – The components of a space – Totally disconnected spaces – Locally connected spaces.
[Chapter-6 of Text Book]

Text Book:
Introduction to Topology and Modern Analysis by G.F.Simmons, Tata McGraw-Hill Edition 2004.

Reference Book:

Topology by James R.Munkres, Second Edition, Pearson Education Asia

AM304(2016):

DISCRETE MATHEMATICSL STRUCTURES

UNIT –I:
Relations and ordering: Relations- properties of binary relations in a set- partially ordereing-Partially ordered sets - representation and associated terminology.
[2-3.1,2-3.2,2-3.8,2-3.9 of Chapter 2 of the Text Book]

UNIT- II:
Lattices: Lattices as partially ordered sets - some properties of Lattices - Lattices as algebraic systems - sub-Lattices - direct product and homomorphism some special Lattices.
[4-1.1 to 4-1.5 of Chapter 4 of the Text Book]

UNIT- III:
Boolean Algebra: Sub algebra - direct product and Homorphism - Boolean forms and free Boolean Algebras - values of Boolean expressions and Boolean function.
[4-2.1,4-2.2,4-3.1, 4-3.2 of Chapter 4 of the Text Book]

UNIT- IV:
Representations and minimization of Boolean Function: Representation of Boolean functions – minimization of Boolean functions- Finite State Machines - Introductory Sequential Circuits - Equivalence of Finite-State Machines.
[4-4.1,4-4.2,4-6.1, 4-6.2 of Chapter 4 of the Text Book]

Text Book:

Discrete Mathematical structures with applications to Computer Science by J.P.Trembly and R. Manohar, Tata McGraw-Hill Edition.

Reference Book:

Discrete Mathematics for Computer Scientists and Mathematicians by J.L.Mott, A.Kandel and T.P. Baker, Prentice-Hall India.

AM305(2016): **Elective-I**

NUMERICAL SOLUTIONS TO PDE

UNIT-I:
Partial differential equations: Introduction – Difference methods – Routh Hurwitz criterion – Domain of dependence of hyperbolic equations.
[1.1 to 1.4 of Text Book]

UNIT-II:
Parabolic equations: Difference methods for parabolic differential equations – introduction – One space dimension – Two space dimension.
[2.1, 2.2, 2.3 of Text Book]

UNIT-III:
Hyperbolic equations: Difference methods for hyperbolic partial differential equations – introduction- One dimension – Two dimension – First order equations.
[3.1 -3.4 of Text Book]

UNIT-IV:
Elliptic equations: Numerical methods for elliptic partial differential equations – introduction- Difference methods for linear boundary value problems – General second order linear equation.
[4.1 -4.3 of Text Book]

Text book:
Computational Methods for Partial Differential Equations by M.K. Jain, S.R.K. Iyengar and R.K. Jain, Wiley Eastern Limited, New Age International Limited, New Delhi.

Reference Book:
Numerical Solution of Differential Equations by M.K. Jain, Wiley Eastern, New Delhi..

AM305(2016): **Elective-I**

LEBESGUE THEORY

UNIT-I:

Algebra of sets, Lebesgue measure ,Outer measure, Measurable set and Lebesgue measure, a nonmeasurable set measurable function, littlewood's Three principles(statements only).

[From Chapter- 3 of Text book]

UNIT-II:

The Riemann integral, the lesbesgue integral of a bounded function over a set of finite measures, the integral of a non-negative function, the general lebesgue integral convergence in measure.

[From Chapter- 4 of Text book]

UNIT-III:

Differentiation of monotonic functions, functions of bounded variation, differentiation of an integral, absolute continuity.

[From Chapter- 5 of Text book]

UNIT-IV:

L^p-Spaces, the Holder's and Minkowski inequalities, convergence and completeness.

[From Chapter- 6 of Text book]

Text Book:

Real Analysis by H.L.Royden, Prentice Hall of India, Third Edition.

AM305(2016): **Elective-I**

THEORETICAL COMPUTER SCIENCE

UNIT-I:
The Theory of Automata: Definition of an automat - Description of a Finite Automation - Transition System - Properties of Transition Functions - Acceptability of a string by a finite Automation - Non Deterministic finite State Machines - The Equivalence of DFA and NDFA - Mealy and Moore models - Minimization of Finite Automaton.

UNIT-II:
Formal Languages: Basic definitions and example - Chomsky classification of Languages - Languages and their relation- Recursive and recursively enumerable sets- operations of languages - Languages and Automaton.

UNIT-III:
Regular sets and Regular Grammars: regular expressions - Finite Automata and regular expressions - Pumping lemma for Regular sets, Application of Pumping lemma - Closure properties of regular sets - Regular sets and Regular grammars - Context free languages- derivation trees – Ambiguity in context -Free Grammars - Simplification of Context-free Grammars - Normal forms for Context-free Grammars.

UNIT-IV:
Turing Machines: Turing Machine model - Representation of Turing Machines - Languages Acceptability by Turing Machines - Design of Turing Machines - Universal Turing Machines and other modifications.

Text book:
Theory of Computer Science (Automata, Languages and Computation) Chapters: 2,3,4,5.1 to 5.4 and 7.1 to7.5 By K.L.P. Mishra, N. Chandrasekharan, PHI, Second edition

AM 306-LAB(2016):

FORTRAN LAB

1. Program to solve Quadratic Equaitons
2. Program to reverse a given integer and check it for palindrom
3. Program to generate Prime numbers
4. Program to generate Fibonacci Sequence
5. Sorting of numbers
6. Program to compute Trigonometric functions
7. Program to transpose a matrix
8. Multiplication of two matrices
9. Finding roots of a transcendental equation using N – R
10. Eigen value of a 3 X 3 real symmetric matrix
11. Sorting of numbers using functions in a 2 – D array row wise
12. Program to linear curve fitting
13. Program to declare student result using logical variables.
14. Program to find inverse of a matrix
15. Bisection method
16. False position method
17. Newton Raphson method
18. Secant method
19. Gauss elimination method
20. Gauss seidal method
21. Difference table method
22. Trapezoidal method
23. Simpson 1/3 rule
24. Simpson 2/3 rule2
25. Euler's method
26. Thomas method
27. Lagranges method
28. Taylor's method
29. Runge-kutta method
30. Modified Euler's method

AM 401(2016):

FUNCTIONAL ANALYSIS

UNIT-I:
Banach Spaces: Normed space – Banach space – properties of normed spaces – Finite dimensional normed spaces and subspaces – Compactness and finite dimension – Linear operators – Bounded and continuous linear operators – Linear functionals - Linear operators and functional on finite dimensional spaces – Normed spaces of operators – Dual space.
[2.2 – 2.10 of Text Book]

UNIT-II:
Hilbert Space: Inner product space – Hilbert space – Properties of inner product spaces – Orthogonal complements and direct sums – Orthonormal sets and Sequences - Series related to orthonormal sequences and sets.
[3.1-3.5 of Text Book]

UNIT-III:
Proper ties of Hilbert Space: Total orthonormal sets and sequences – Representation of functional on Hilbert spaces – Hilbert-Adjoint operator – Self adjoint, unitary and normal operators.
[3.6 and 3.8-3.10 of Text Book]

UNIT-IV:
Fundamental Theorems: Hahn Banach theorem for complex vector spaces and normed spaces – Adjoint operator – Reflexive space – Uniform boundedness theorem – Open mapping theorem – Closed graph theorem.
[4.3, 4.5-4.7, 4.12 and 4.13 of Text Book]

Text Book:
Introductory Functional Analysis with Applications by Erwin Kreyszig, John Wiley & Sons, 1989.

Reference Book:
1. Introduction to Topology and Modern Analysis by G.F.Simmons, McGraw-Hill Edition.
2. E.Taylor, Introduction to Functional analysis, Wiley International Edition.
3. C.Goffman and G.Pedrick, First Course in Functional analysis, Prentice Hall of India Private Limited, 1991.

AM402(2016):

ORERATIONS RESEARCH

UNIT-I:

Network Models: Definitions - Net work diagrams – Time estimates - CPM and PERT techniques - Algorithms.

UNIT-II:

Deterministic Inventory Models: Static EOQ Models – Cost involved in inventory control - Single items inventory control models without shortages - Model-I: EOQ Model with instant supply - Model-2: Economic production quantity model when Supply (Replenishment) is gradual - Single item inventory control models with shortages - Model-3: EOQ Model with constant rate of demand and variable order cycle time - Model-4: EOQ Model with gradual supply and shortages allowed.

UNIT-III:

Queuing Theory: Introduction - Essential features of a queuing system - Performance measures of a queuing system - probability distributions in queuing systems - Classification of queuing single-server queuing models: Model I: {(M/M/1) : (∞ /FCFS)} Exponential service-Unlimited queue - Model II: {(M/M/1) : (∞ /SIRO)} - Model III: {(M/M/1) : (N/FCFS)} Exponential service-finite.

UNIT-IV:

Dynamic Programming: Recursive nature of dynamic programming - Forward and Backward recursion.
Sequencing Problem: Introduction -Terminology and Assumptions-Processing n jobs Through Two Machines - Processing n jobs Through Three Machines.

Text Book: Operations Research, Theory & Applications- J.K.Sharma

Reference Books:

[1] Operations Research, An Introduction by Hamdy A.Taha , Seventh Edition.

[2] Introduction to Operations Research by Hillier Lieberman, Tata Mc Graw Hill

AM403(2016):

METHODS OF APPLIED MATHEMATICS

UNIT-I:

Linear vector spaces-Linear equations and vector space-characteristic value problems-Orthogonalization of vector sets- Quadratic forms- A numerical example –Equivalent matrices and transformations- Hermitian matrices-Multiple characteristic numbers of symmetric matrices-Definite forms.

(Sections 1.10 to 1.19 of chapter 1 in text book-1)

UNIT-II:

Integral equation- Solution of non-homogeneous Volterra's integral equation of second kind by the method of successive substitution-Solution of non-homogeneous Volterra's integral equation of second kind by the method of successive approximation-Determination of some resolvent kernels-Volterra Integral equations of first kind- Solutions of the Fredholm integral equation by the method of successive substitutions-Iterated kernels-Solution of the Fredholm integral equation by the method of successive approximation.

(Section- 1.1 of chapter 1 and Sections 2.1 to2.7 of chapter 2 of text book-2)

UNIT-III:

Fredholm First Theorem-Unique solution of the non-homogeneous Fredholm integral equation-Order of the pole of Fredholm function-Conjugate complex eigen value of the kernel-Hadamard lemma-Hadamard'sTheorem-Convergence proof-Fredholm second theorem-Fredholm Associated equation-Orthogonality of Characteristic solutions-Fredholm's Third theorem.

(Sections 3.1 to 3.10 of chapter 3 of text book-2)

UNIT-IV:

Solution of Homogeneous Integral equation when $D(\lambda)=0$, $D'(\lambda)=0$-Continuous solutions of the homogeneous integral equations-Fundamental functions-Degenerate (or seperable) kernel-Greens Functions-Construction of Green's functions-Particular case: Green's functions.

(Sections 3.11 to 3.14 of chapter 3 and Section 5.6 to5.8 of chapter 5 of text book 2)

Text books:

1) Methods of Applied Mathematics by Francis B.Hildebrand, Prentice-Hall, Inc. Englewood clifs, New Jersey.
2) Integral Equations by Santhi Swarup, Krishna prakashan media(p) Ltd.,Merrrut 2003.

Reference Books:

1) Linear integral equations theory and techniques by R.P.Kanwal, Academic Press.
2) Mathematical methods in physics and Engineering by John.W.Deltman, McGraw-Hill Book company.

AM404(2016):

INTEGRAL TRANSFORMS

UNIT- I:
Laplace Transforms: Laplace Transform of basic function, Laplace Transform of derivatives-integral –inverse Laplace Transforms of partial fractions- convolution theorem –Solution of Ordinary differential Equations.
[of the Text Book]

UNIT- II:
Fourier Integral formula - Fourier Transform - Inversion Theorem for Complex Fourier transform - Fourier sine transform - Inversion formula for Fourier sine transform - Fourier cosine transform - Inversion formula for Fourier cosine transform - Linearity property of Fourier transform - Change of Scale property - Shifting Property - Modulation theorem – Theorem - Multiple Fourier Transforms – Convolution - The Convolution Theorem - Parseval's identity.
[6.3 to 6.19 of chapter VI of the Text Book]

UNIT- III:
Finite Fourier sine transforms - inversion formula for sine transform - Finite Fourier cosine transform - inversion formula for cosine transform - Multiple finite Fourier transforms - Operational properties of finite Fourier sine transforms - Operational properties of finite Fourier cosine transforms - Combined properties of finite Fourier sine and cosine transforms - convolution.
[7.1 to 7.9 of chapter VII of the Text Book]

UNIT- IV:
Hankel Transforms - Inversion formula for the Hankel transform - Some important Results for Bessel Functions - Linearity Property - Hankel transform of the Derivatives of a function - Hankel transform of $\frac{d^2f}{dx^2}+\frac{1}{x}\frac{df}{dx}-\frac{n^2}{x^2}f$ - Parseval's Theorem.
[9.1 to 9.7 of chapter IX of the Text Book]

Text Book:
Integral Transforms by A.R.Vasihatha and R.K.Gupta, KRISHNA Prakashan Media (P) Ltd.

Reference Books:
1. Hildenbrand, Methods of Applied Mathemetics, PHI. New Jercy, 1960.
2. E.O. Brigham, The Fast Fourier Transforms, Prentice Hall, New Jersy, 1988.
3. E.I.Jury, Theory and Applications of Z Transforms Method, Johm Wiley, 1964.p

AM405(2016): **Elective-II**

FINITE ELMENT METHODS

UNIT-I:
Weighted residual methods: Least square method – Partition method – Galerkin method – Moment Method – Collocation method – Variational methods – Ritz method. (Only One-dimensional)
[8.1 to 8.3 of the Text Book]

UNIT-II:
Finite Elements: Line segment elements – Triangular element – Rectangular elements with examples.
[From 8.4 of the Text Book]

UNIT-III:
Finite Element Methods: Ritz finite element method – Least square finite element method – Galerkin finite element method – Boundary value problem in ordinary differential equations – Assembly of element equations.
[From 8.5 and 8.6 of the Text Book]

UNIT-IV:
Boundary value problem in PDE- Linear triangular element – Mixed boundary conditions – Boundary points – Examples.
[From 8.7 of the Text Book]

Text Book:

Numerical Solutions of Differential Equations by M.K.Jain, New Age International (P)Limited, New Delhi.

Reference Book:

Finite Element Methods by J.N.Reddy, McGraw-Hill International Edition.

AM405(2016): **Elective-II**

BIO-MECHANCS

UNIT-I:
Mathematical models in pharmacokinetics.
Basic Equations and their Solutions for special cases.

UNIT-II:
Models for blood flows I: Some basic concepts of fluid dynamics - Basic concepts about blood- Cardiovascular system and blood flow.

UNIT- III:
Models for blood flow 2: Steady Non- Newtonian fluid flows in circular tubes - Newtonian Pulsatile flow in Rigid and Elastic tubes - Blood flow through Artery with mild Stenosis.

UNIT- IV:
Models of flows for other Bio fluids: Peristaltic flow in tube and channel - Two Dimensional flow in Renal tubule - Lubrication of Human joints.
[Section 10.1,10.2 of Chapter 10, section 11.1,11.2,11.3 and 11.5 of Chapter 11 Sections 12.1,12.3,12.4 of Chapter 12 of Text Book]

Text Book:
Mathematical Models In Biology And Medicine by J.N.Kapur, Affiliated East – West press Pvt. Ltd., New Delhi.

Reference Book:
1. Y.C. Fung, Bio-Mechanics, Springer – Verlag, New York Inc. 1990.

AM405(2016): **Elective-II**

GRAPH THEORY

UNIT-I:
Basic concepts: Isomorphism - Euclidian and Hamilton Graphs – Trees - Properties of Trees - Spanning Trees - Connectivity and Separability.
[Chapters 1,2,3 and Sections 4.1 to 4.5 of Chapter 4 of the Text Book]

UNIT-II:
Planar graphs: Planar graphs - Kuratowski's two graphs - Different representations of planar graphs- Detection of Planarity - Geometric Dual of a graph- Combinatorial Dual.
[Sections 5.1 to 5.7 Chapter 5 of the Text Book]

UNIT-III:
Matrix representation of graphs: Incidence and circuit matrices of a graph - Fundamental Circuit Matrix - Cut set and Path Matrices - Adjacency matrices - Directed Graphs - Incidence and adjacency matrix of a digraph.
[Chapter 7 and Sections 9.1, 9.2, 9.8 and 9.9 of Chapter 9 of Text Book]

UNIT-IV:
Coloring - Covering and Partitioning - Chromatic number- Chromatic Partitioning – Chromatic Polynomial – Matchings –Coverings -The four color problem - Applications of graph theory in Operations Research.
[Chapters 8 and Sections 14.1 to 14.3 of chapter 14 of Text Book]

Text Book:
Graph Theory with applications to Engineering and Computer Science by Narasingh Deo, Prentice – Hall of India.

Reference Books:
1. Discrete Mathematics for Computer Scientists and Mathematicians by J.L.Mott, A.Kandel and T.P. Baker, Prentice-Hall India.
2. Graph Theory with applications by Bond JA and Murthy USR, North Holland, New York.

AM405(2016): **Elective-II**

FUZZY SETS & FUZZY LOGIC

UNIT I:
Fuzzy sets: Introduction - crisp sets – overview - Fuzzy Sets Basic types - Fuzzy Sets Basic concepts - Characteristics & Significance of the paradigm shift - Additional properties of α-cuts - Representation of Fuzzy sets - Extension principle for Fuzzy sets.
[Chapters 1 & 2 of Text Book]

UNIT II:
Operations: Types of Operations - Fuzzy compliments - Fuzzy Intersections - Fuzzy Unions - Combinations of Operations - Aggregation Operations.
[Chapter 3 of Text Book]

UNIT III:
Fuzzy numbers: Linguistic variables - Arithmetic operations on intervals - Arithmetic operations on Fuzzy numbers - Lattice of Fuzzy numbers - Fuzzy equations.
[Chapter 4 of Text Book]

UNIT IV:
Classic logic: Overview - Multivalued Logics - Fuzzy propositions - Fuzzy quantifiers - Linguistic Hedges - Inference from Conditional Fuzzy-Propositions - Inference from Conditional and Qualified Propositions - Inference from Quantified Propositions.
[Chapter 8 of Text Book]

Text Book:

Fuzzy Sets and Fuzzy Logic (Theory and Applications) by George J.Klir/Bo Yuan, Prentice Hall, New Jersey.

AM406-LAB(2016):

MAT LAB

(A):

1. Solving a first order differential equation analytically
2. Solving a second order differential equation analytically
3. Solving a first order IVP using Euler method
4. Solving a first order IVP using modified Euler method
5. Solving a first order IVP using 4^{th} order RK method
6. Modelling of LR,RC circuits and solving through MATLAB and graphical representations
7. Modelling of free oscillations ,forced oscillations without damping
8. Modelling of free oscillations ,forced oscillations with damping
9. Fourier series expressions of given function, graphical comparison
10. Solving linear system of equations modelling
11. Finding eigen values of a matrix
12. Modelling of electrical circuits formation of linear systems and solving through MATLAB and graphical representation

(OR)

(B):

Develop a User friendly Package for Numerical methods

(OR)

(C):

Develop a User friendly Package for Linear Programming/ Operations Research Problems

(OR)

(D):

Write Programs for Linear Programming/ Operations Research Problems