KAKATIYA UNIVERSITY
M.A/M.Sc (APPLIED MATHEMATICS)
Scheme of Instruction and Examination
(With effect from 2012-14)

SEMESTER-I

Paper	Code of The paper	Title of The paper	No. of Periods (1 hr duration) per week	Internal Assess-ment Marks	Semester End Exam Marks		
					Theory	Practical	Total
I	AM1CP1	Algebra	6	20	80	-	100
II	AM1CP2	Real Analysis-I	6	20	80	-	100
III	AM1CP3	Ordinary differential equations	6	20	80	-	100
IV	AM1CP4	Discrete Mathematics	6	20	80	-	100
V	AM1CP5	Fundamentals of Statistics	6	20	80	-	100

SEMESTER-II

Paper	Code of The paper	Title of The paper	No. of Periods (1 hr duration) per week	Internal Assess-ment Marks	Semester End Exam Marks		
					Theory	Practical	Total
I	AM2CP1	Partial differential equations	6	20	80	-	100
II	AM2CP2	Analysis-II	6	20	80	-	100
III	AM2CP3	Fourier Series and special functions	6	20	80	-	100
IV	AM2CP4	Operations research	6	20	80	-	100
V	AM2CP5	Integral equations and transforms	6	20	80	-	100

Semester-III

Paper	Code of The paper	Title of The paper	No. of Periods (1 hr duration) per week	Internal Assess-ment Marks	Semester End Exam Marks		
					Theory	Practical	Total
I	AM3CP1	Topology	6	20	80	-	100
II	AM3CP2	Complex Analysis-I	6	20	80	-	100
III	AM3CP3	Classical Mechanics	6	20	80	-	100
IV	AM3OP4(1)	Measure and integration	Th 6	20	80	-	100
	AM3OP4(2)	Optimization Techniques	6	20	80	-	100
	AM3OP4(3)	Automata and langagues	6	20	80	-	100
V	AM3OP5(1)	Computer fundamentals and Programming in C	Th .4+Pr.3	20	60	20	100
	AM3OP5(2)	Applied Stochastic process with matlab	Th .4+Pr.3	20	60	20	100
	AM3OP5(3)	Numerical analysis through C	Th .4+Pr.3	20	60	20	100

Semester-IV

Paper	Code of The paper	Title of The paper	No. of Periods (1 hr duration) per week	Internal Assess-ment Marks	Semester End Exam Marks		
					Theory	Practical	Total
I	AM4CP1	Functional Analysis	Th 6	20	80	-	100
II	AM4CP2	Complex analysis- II	Th 6	20	80	-	100
III	AM4CP3	Mechanics of solids	6	20	80	-	100
IV	AM4OP4(1)	Automata and Machines	Th 6	20	80	-	100
	AM4OP4(2)	Bio-Mechanics	Th 6	20	80	-	100
	AM4OP4(3)	Fluid mechanics	Th 6	20	80	-	100
	AM4OP4(4)	Fuzzy sets and Fuzzy logic	Th 6	20	80	-	100
	AM4OP4(5)	Theory of Reliability	Th 6	20	80	-	100
V	AM4OP5(1)	Numerical solution of differential equations	Th .6	20	80	-	100
	AM4OP5(2)	Advanced Linear Algebra	Th .6	20	80	-	100
	AM4OP5(3)	Finite element method	Th .6	20	80	-	100
	AM4OP5(4)	Graph theory	Th .6	20	80	-	100
	AM4OP5(5)	Programming in c++	Th.4+Pr.3	20	60	20	100

The Scheme of 1st Internal Assessment of each paper of Semester-I to IV is as follows:

KAKATIYA UNIVERSITY
M.A./M.Sc (Applied Mathematics) (w.e.f 2012-14)
1st Internal Assessment Examination
Semester-I/II/III/IV
Papers I/ II/ III/ IV/ V

Time: 1 ½ Hours Max Marks: 20.

Answer all the questions.
All questions carry equal marks.

1. A question from unit-I
2. A question from unit-I
3. A question from unit-I
4. A question from unit-I
5. A question from unit-I
6. A question from unit-II
7. A question from unit-II
8. A question from unit-II
9. A question from unit-II
10. A question from unit-II

The Scheme of 2nd Internal Assessment of each paper of Semester-I to IV is as follows:

KAKATIYA UNIVERSITY
M.A./M.Sc (Applied Mathematics) (w.e.f 2012-14)
2nd Internal Assessment Examination
Semester-I/II/III/IV
Papers I/ II/ III/ IV/ V

Time: 1 ½ Hours Max Marks: 20.

Answer all the questions..
All questions carry equal marks.

1. A question from unit-III
2. A question from unit-III
3. A question from unit-III
4. A question from unit-III
5. A question from unit-III
6. A question from unit-IV
7. A question from unit-IV
8. A question from unit-IV
9. A question from unit-IV
10. A question from unit-IV

The scheme of the examination of each paper of Semester I to IV is as follows.

KAKATIYA UNIVERSITY
M.A./M.Sc (Applied Mathematics)
(w.e.f 2012-14)
Semester-I/II/III/IV
Papers I/ II/ III/ IV/ V

Time: 3 Hours Max Marks: 80/60*
(*if paper has practical examination)

Answer all Questions.
All Questions carry equal Marks.

1. a) A short question From Unit-I.
   b) A short question From Unit-II.
   c) A short question From Unit-III.
   d) A short question From Unit-IV.

2. Answer any two of the following.
   a) From Unit-I.
   b) From Unit-I.
   c) From Unit-I.
   d) From Unit-I.

3. Answer any two of the following.
   a) From Unit-II.
   b) From Unit-II.
   c) From Unit-II.
   d) From Unit-II.

4. Answer any two of the following.
   a) From Unit-III.
   b) From Unit-III.
   c) From Unit-III.
   d) From Unit-III.

4. Answer any two of the following.
   a)From Unit-IV.
   b) From Unit-IV.
   c) From Unit-IV.
   d) From Unit-IV.

KAKATIYA UNIVERSITY
M.A/M.SC. (APPLIED MATHEMATICS) Syllabus(w.e.f. 2012-14)
I – Semester
Paper – I
(Paper Code : AM1CP1)
ALGEBRA

UNIT – I

Isomorphism theorems on Groups, Normal Series Solvable groups, Nilpotent groups
(Chapter 5 : **Section 2** and Chapter 6 of Text Book 1)

UNIT – II

Group Action on A set :

The notion of a group action on a set. Isotropy subgroups, Orbits, Application of G-sets to counting.

Sylow Theorems:

P-groups, Cauchy theorem, the Sylow theorems. Application of the Sylow theorems: application to P-groups and the class equation. Further applications.

(Sections :16,17,36,37 of Text Book 2)

UNIT – III

· The field of quotients of an integral domain: The construction, Uniqueness. Rings of Polynomials: Polynomials in an indeterminate – A review – The evaluation homomorphism. Factorization of polynomials over a field. The Division algorithm in F[x], irreducible Polynomials, Eisenstein criterion, Uniqueness of factorization in F[x], Prime fields. Application to unique factorization in F[x].

(Sections 21,22,23,27.17 to 27.27 of Text Book 2)

UNIT – IV

Factorization:

Unique factorization domains. Every PID is a UFD. If D is a UFD then D[x] is a UFD.
Euclidean Domains: Euclidean domains and Arithmetic in Euclidean domains.
Gaussian Integers and Multiplicative norms.
(Sections 45,46,47 of Text Book 2)

Text-Book:

(1) : Basic Abstract Algebra by P.B. Bhattacharya, S.K.Jain, and S.R.Nagpaul, Second Edition , Cambridge University press.

(2): A first Course in Abstract Algebra by John B.Fraleigh, Seventh Edition, Pearson eduction.

Reference Books:

1. Abstract Algebra by David S.Dummit, Richard M.Foote, Second edition, Wiley Student edition
2. Topics in Algebra by I.N Herstein
3. University algebra by N.Gopala Krishna.
4. Abstract Algebra by S.Lang.

KAKATIYA UNIVERSITY
M.A/M.SC. (APPLIED MATHEMATICS) Syllabus(w.e.f 2012-14)
I – Semester
Paper – II
(Paper Code: AM1CP2)
Real Analysis – I

UNIT – I

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Extreme values – Necessary condition for extreme values – Investigation of the points of maximum and minimum values – Indeterminate forms – Power series – Exponential functions – Logarithmic functions – Trigonometric functions – Functional equations – Functions of bounded Variation – Vector Valued functions.
(Chapter 7 and 8 of Text-book)

UNIT-II

The Riemann-Stieltjes integral – Definition and existence of the integral – A condition of Integrability – Some theorems on R-S integration – Definition integral as a limit of sum – Some important theorems.
(Chapter 10 of Text-book)

UNIT-III

Improper Integrals – Integration of unbounded function with finite limits of integration – Comparision test for convergence at a of $\int_a^b f(x)dx$ - Infinite range of integration – Integrand as a product of functions.
(Chapter 11 of Text-book)

UNIT-IV

Uniform Convergence : Pointwise convergence – Uniform convergence – Tests of uniform Convergence – Properties of uniformly convergence sequences and series – The Weierstrass approximation theorem – power series – introduction – properties of Functions expressible as power series – Abel's theorem
Chapter 12 and 13 of Text-book)

Text-book: Mathematical Analysis by S.C.Mallik and Savita Arora ,S.Chand and Co., 4th edition.
Reference books :
1.Principles of Mathematical Analysis by Walter Rudin, Mg-Graw Hill.
2. Mathematial Analysis by T.Apostle, Narosa.

KAKATIYA UNIVERSITY
M.A/M.Sc. (APPLIED MATHEMATICS) Syllabus(w.e.f.2012-14)
I – Semester
Paper – III
(Paper Code: AM1CP3)
Ordinary Differential Equations

UNIT – I

Linear equations with variable coefficients – Introduction – Initial value problem for homogeneous equation – The Wronskian and linear dependence – reduction of the order of homogeneous equation – The new homogeneous equation
(Section 3.1to 3.6 of text-book 1)

UNIT-II

Existence and uniqueness of solution of first order equation – The method of successive approximation – The Liptsctitz condition – Convergence of successive approximation – Uniqueness of solution.
(Section 5.4-5.6 and 5.8 of text-book 1)

UNIT-III

Integration in series : Ordinary and singular points – power series solution at ordinary point – Frobenius method – Problems on type I , type II , type III and type IV – series solution aboutregular singular point at infinity – series solution in descending powers of independent variable.
(Chapter 8 of Text book 2)

UNIT-IV
Variational problems with fixed boundaries – Euler's equation for functional containing first order derivative and one independent variable – Extremals – functional dependent on higher order derivatives – Functions dependent on more than one independent variable – variational problem in parametric form – invariance of Euler's equation under coordinate transformation
(Chapter 1 of part V of text book -2)
Text book

1. **An introduction to ordinary differential equations by E.A.Coddington Prientice-Hall of India Pvt. Lted.**
2. **Advanced differential equations, M.D. Raisingania,S.Chand Company Ltd.**

Referene books :

1. Differential equations with applications and Historical notes by George F. Simmons
2. Theory of ordinary differential equations by Somasundaram – Narosa.

KAKATIYA UNIVERSITY
M.A/M.Sc.(APPLIED MATHEMATICS) Syllabus(w.e.f. 2012-14)
I – Semester
Paper – IV
(Paper code: AM1CP4)
DISCRETE MATHEMATICS

UNIT – I

Fundamentals of Logic : Fundamentals of logic-Logical inferences - Methods of proof of an implication – First order logic and other methods of proof - Rules of inference for propositions .

UNIT – II

Elementary Combinatorics: Rules of inference for quantified propositions - Enumerating combinations and permutations with repetitions- Enumerating permeations with constrained repetitions- The principle of inclusion and exclusion.

UNIT – III

Recurrence relations: Generating function of sequences – Calculating coefficients of generating functions- Recurrence relations-Solving recurrence relations by substitution and generating functions-the method of characteristic roots – solutions of inhomogeneous recurrence relations.

UNIT – IV

Boolean Algebras: Boolean algebras – Boolean functions – Switching mechanisms – Minimization of Boolean functions – Karnaugh's graph Method-Logical Circuits.

Text-Book:

Discrete Mathematics for computer scientists and Mathematician by J.L.Mott, A.Kandel, and T.P. Bakel.

Reference Books:

1. Discrete Mathematical structures by Roden.
2. Discrete Mathematics by Kolman.
3. A Text book of Discrete Mathematics by tremblay and Manohar.
4. Elements of Discrete Mathematics by C.L.Liu. McGraw Hill company

AM1CP5

KAKATIYA UNIVERSITY
M.A/M.Sc. (APPLIED MATHEMATICS) Syllabus(w.e.f.2012-14)
I – Semester
Paper – V
(Paper Code. : AM1CP5)
FUNDAMENTALS OF STATISTICS

UNIT – I

Moments–Pearson's β and γ coefficients -Skewness and Kurtosis
Probability Definitions–Addition Theorem-conditional probability-Multiplication Law of probability-Bays Theorem. Random Variables-Probability mass function – Probability density function.
Chapter 2, 3, 4.2, 5.1 to 5.5

UNIT – II

Mathematical Expectation – Expectation of a function of a random variable – Addition and Multiplication theorem of expectation - Expectation of linear Combination of random variables – Covariance – Variance of linear combination on of random variables – Moment generating function – Chebychev's inequality – Correlation –Karl Pearson's coefficient of Correlation- Linear regression.Angle between two regression lines.
Chapter 6.1 to 6.6, 7.1 and 7.5, 10.1 to 10.4, 11

UNIT – III

Discrete Distributions - Bernoulli distribution – Moments of Bernoulli distribution – Binomial distribution – Moments - Moment generating function of Binomial distribution – Additive property of Binomial distribution - Poisson distribution – Moments of Poisson distribution – Geometric distribution –Lack of memory property.
Chapter 8.

UNIT – IV

Continuous Distributions -Normal Distribution – Characteristics of Normal Distribution and normal probability curve - Moments of Normal Distribution – Area property- Gamma Distribution - Moment generating function of Gamma Distribution – Exponential distribution- Moment generating function of Exponential distribution- Lack of memory property.
Chapter 9.

Text-Book:

Fundamentals of Mathematical Statistics by S.C. Gupta & V.K.Kapoor (11^{th} Edition)

K KAKATIYA UNIVERSITY
M.A/M.Sc. MATHEMATICS Syllabus(w.e.f.2012-14)
II – Semester
Paper – I
(Paper Code. : AM2CP1)
PARTIAL DIFFERENTIAL EQUATIONS

U N I T – I

Formation of First Order Partial Differential Equations – Solution of Linear First Order Partial Differential Equations (Langrange's Method)- Integral Surfaces Passing Through a Given Curve - Surfaces Orthogonal to a Given System of Surfaces-Compatibility of First Order Partial Differential Equations – Classification of the Solutions of First Order Partial Differential Equations - Solutions of Non-Linear Partial Differential Equations of First Order – Charpit's Method - Jacobi's Method - Special Types of First Order Equations – Cauchy's Method of Characteristics.

U N I T –I I

Second order Partial Differential Equations – Origin – Linear Partial Differential Equations with Constant Coefficients - Methods of Solving Linear Partial Differential Equations – Classification of Second Order Partial Differential Equations - Classification of Second Order Partial Differential Equations - Adjoint Operators- Riemann's Method..

U N I T – III

Derivation of Laplace equation and Possion's equation – Boundary Value Problems – Separation of Variable method - Laplaces equation in Cylindrical and Spherical coordinates - Interior and exterior Dirichlet problem for a circle – Interior Dirichlet problem for a Sphere- Interior Neumann problem for a Circle - Miscellaneous examples.

U N I T – IV

Solution of Diffusion by Separation of Variables Method - Diffusion Equation in Cylindrical and Spherical coordinates – D'Alembert solution of one dimensional Wave Equation – Separation of Variable Method - Two Dimensional Wave Equation – Separation of Variable Method- Two Dimensional Wave Equation - Green's Function Method of solving Laplace Equation, Wave Equation and Diffusion Equation.

TEXT BOOK :

Partial Differential Equations for Engineers and Scientists - by J.N. Sarma and Kehar Singh Published by Narosa Publishing House.

REFERENCE BOOKS:

1. Elements of partial Differential Equations – By I.N. Sneddon
2. Partial Equations - By L.C Evans.
3. Partial Differential Equations – By Prasad & Ravindran.

KAKATIYA UNIVERSITY
M.A/M.Sc. APPLIED MATHEMATICS Syllabus(w.e.f.2012-14)
II – Semester
Paper – II
(Paper Code. : M2CP2)

(REAL ANALYSIS-II)

UNIT-I

Explicit and Implicit functions – continuity – Partial derivatives – differentiability – partial derivatives of higher order – differentials 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 1)

UNIT-II

Definition – Jacobinas – Stationary values under subsidiary conditions – Surface integrals – Surface integrals of the first type – Reducing a surface integral of first type to double integral – Oriented surface,positive and negative sides – surface integral of second type - -flux across the surface – Reducing a suface integral of second type to a double integral-Relating between the two types of surface integrals - Stokes's theorem – Volume integrals – Gauss's Theorem.

(Chapter 16 and 18.4,18..5,18.7,18.8)

UNIT-III

Metric spaces :- Definition and examples – Open sets - Closed sets – Convergence - Completeness

(Sections 1,2,3 of Chapter 19 of text book)

UNIT-IV

Continuity and uniform continuity – Compactness and connectedness

(Sections 4,5,6 of Chapter 19 of text book)
Text book : Mathematical Analysis by S.C.Malik, Savita Arora

Reference books :
1.Principles of Mathematical Analysis by Walter Rudin, Mg-Graw Hill.
2. Mathematical Analysis by T.Apostle, Narosa.

KAKATIYA UNIVERSITY
M.A/M.Sc. MATHEMATICS Syllabus(w.e.f.2012-14)
II – Semester
Paper –III
(Paper Code. : AM2CP3)
FOURIER SERIES AND SPECIAL FUNCTIONS

UNIT – I

Trigonometrical Series – Fourier Series – Periodic function – Some definitions – The main theorem – Fourier series for even and odd function – Half range series – Interval other than $[-\pi,\pi]$.

(Chapter 14 of Text-book 1)

UNIT-II
Legendre's equation and its solution – Legendre's function of the first kind – Generating function for Legendre polynomials – Orthogonal properties of Legendre's polynomials – Recurrence relations – Beltrani's result – Rodrigues's formula – Legendre's series for a polynomial Expansion of function f(x) in a series of Legendre's polynomial – Even and odd function
(Chapter 9 of Text book 2)

UNIT-III

Bessel's equation and its solution – Bessel's function of the first kind of order n – List of important results of Gamma function and beta function – Bessels's function of the second kind of order n – Recurrence relations – Generating function for Bessels's function $J_n(x)$ – Orthogonality of Bessels's function – Bessel-sereis or Fourier Bessel expansion of f(x).
(Chapter 11 of Text book 2)
UNIT-IV
Hermite equation and its solution – Hermite polynomial of order n – Generating function for ermite polynomials – Alternative expressions for the Hermite polynomials – Hermite polynomials Hn(x) for some special values of n – Evaluation of values of h2n(0) and H(2n+1)(0) – Orthogonality properties – recurrence relations

(Chapter 12 of Text book 2)

Text book:
1. **Mathematical Analysis by S.C.Malik, Savita Arora**
2. Advanced Differential Equations- M.D. Raisinghania

KAKATIYA UNIVERSITY
M.A/M.Sc. APPLIED MATHEMATICS Syllabus(w.e.f.2012-14)
II – Semester - Paper – IV
\Paper Code. : AM2CP4
OPERATIONS RESEARCH

UNIT – I

Solution of linear equations – Hyper planes – Hyper spheres – Convex sets – Separating and supporting Hyper planes – Convex functions- Definition of Global and Local minima/maxima - Mathematical formulation of a LPP-Graphical solution method- Canonical and Standard form of a LPP.

Solutions Basic – Degenerate – Basic feasible-optimum basic feasible solutions – fundamental properties of solutions-reduction of a feasible solution to a basic feasible solution – improved basic feasible solution. Existence of unbounded solutions – conditions for optimality.

UNIT – II

The simplex algorithm Charne's Big M-Method-Two phase simplex method- Degeneracy and cycling – inverse of a matrix by simplex method. Duality – Properties and fundamental theorems on Duality – Solution of a LPP by using Duality-Dual simplex method.

UNIT – III

Transportation problem- Matrix form of T.P. – special case of LPP Transportation table- Initial Basic Feasible Solution – North West Corner Rule Matrix - Minima Method, Vogel approximation method of finding initial basic feasible solution – loops in a T.P. – Transportation Algorithm of finding optimal solution - Degeneracy in T.P. – Unbalanced T.P.

UNIT – IV

Assignment and Routing problems – Hungarian method of finding optimal assignment problems – Sequencing problems – Johnson's method - problems with n jobs and two and more than two machines.
Integer programming – all & mixed integer programming problems- Gomory's All IPP method- Gemory's mixed integer programming – branch and bound method – Zero - One programming .

Text-Book:

Operations Research by Kanti Swarup. P.K.Gupta and Manmohan.

Reference Books:

1. Operations Research by Handy A.Taha. Printice Hall of India.
2. Linear programming methods.H.A.Taha

KAKATIYA UNIVERSITY
M.A/M.Sc. APPLIED MATHEMATICS Syllabus(w.e.f.2012-14)
II – Semester
Paper – V
(Paper Code. : AM2CP5)

INTEGRAL EQUATIONS AND TRANSFORMS

U N I T – I

Integral Equation – Differentiation of a Function under an Integral Sign – Relation Between Differential and integral Equations – Solution of Non-homogeneous Volterra's Integral Equations by the method of Successive Substitution and Successive Approximation of some Resolvent Kernels – Volterra Integral Equation of First Kind.

U N I T –I I

Solution of the Fredholm Integral Equation by the Method of Successive Substitution and successive approximation – Reciprocal Functions - Volterra's Solution of Fredholm's Equation – Fredholm first Theorem- Unique Solution of the Non-homogeneous Fredohlm Integral Equation – Symmetric Kernel – Orthogonality – Orthogonality of Fundamental Functions – Eigen value of a Symmetric kernel Real Characteristic Constants – Expansion of a Symmetric Kernel in Eigen Functions – Greens Functions – Construction of Green's Functions.

U N I T – III

Laplace Transforms – Existence of Laplace Transform – Properties of Laplace Transform- The inverse Laplace transform and properties – Convolution Theorem- Solution of ordinary differential Equation by Laplace Transforms- Solution of partial Differential Equation by Laplace Transforms- Solution of partial Differential Equations by Laplace Transforms. Application of Laplace Transforms to Integral Equations

U N I T – IV

Fourier Transforms – Fourier Integral Formula – Inversion Theorem for Complex Fourier Transform -Fourier Sine and Cosine Transform - Inversion of Formulae – Convolution Theorem-Parseval's identity -Finite Fourier Sine and Cosine Transforms - Inversion Formulae -Operational Properties – Convolution – Application of Fourier Transforms to Inversion and Boundary value problems.

TEXT BOOK :

1. Integral Equations – BY shanty Swarup
2. Integral Transforms – By A. R Vasistha and R.K. Gupta

REFERENCE BOOKS :

1. Advance Calculus for Applications – By Francis B. Hilder Brand Prentic Hall of India

KAKATIYA UNIVERSITY
M.A/M.Sc. APPLIED MATHEMATICS Syllabus (w.e.f. 2012-14)
III– Semester
Paper – I (Paper Code : AM3CP1)

TOPOLOGY

UNIT – I

Topological spaces:

The definition and examples, Elementary concepts, Open bases and Open-sub bases, Weak topologies. If f and g are real or complex continuous functions defined on a topological space then f+g, f.g and αg (α, scalar) are continuous. Any uniform limit of continuous functions is continuous.
(Chapter 3 : Sections 16-20 of the text book)

UNIT – II

Compactness:
Compact spaces, Products of spaces, Tychnoff's theorem, Generalized Heine-Borel theorem, Compactness for metric spaces.
(Chapter 4 : Sections 21-24 of the text book)

UNIT – III

Separation:
T_1-Spaces and Hausdorff spaces, Completely regular spaces and normal spaces, Statements of Uryshon's lemma and Tietz-extension theorem.

(Chapter 5 : Sections 26-28 of the text book)

UNIT – IV

Connectedness:

Connected spaces, The Components of a space, Totally disconnected spaces.
(Chapter 6 : Sections 31-33)

Text-Book:

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

Reference Books:

1. Topology by James R. Munkres, 2ed, Pearson Education, Asia(2001).
2. Introduction to General Topology by K.D.Joshi, Wiley eastem.
. Topology by J.L.Kelly, Van Nostrad, Princeton.
4. Elements of General Topology by S.T. HU, Holden day Inc.;

KAKATIYA UNIVERSITY
M.Sc (APPLIED MATHEMATICS) Syllabus (w.e.f 2012-14)
Semester-III
Paper-II
(Paper Code : AM3CP2)
COMPLEX ANALYSIS-I

UNIT-I:

Sums and products, basic algebraic properties, further properties, vectors and moduli, complex conjugates, exponential form, products and powers in exponential form, arguments of products and quotients - Roots of complex numbers- examples - Regions in the complex plane.
Functions of complex variable, mappings, mappings by exponential function, limits, Theorems on limits – limits involving the point at infinity - continuity, derivatives, Differentiation formulas - Cauchy-Riemann equations, sufficient conditions for differentiability, polar co-ordinates.
(Sections 1 to 23 of text book)

UNIT-II :

,Analytic functions, Harmonic functions.Uniquely determined functions –Reflection principle -The exponential function, the logarithmic functions, branches and derivatives of logarithms, Some identities involving logarithms – Complex exponents – Triginometric functions and their derivatives – Hyperbolic functions and their derivatives – Inverse trigonometric functions and hyperbolic function. Derivatives of functions $w(t)$, definite integrals of functions $w(t)$, contours, contour integrals, Some examples – Examples with branch cuts - upper bounds for moduli of contour integrals, anti-derivatives, Proof of the theorem (45)-Cauchy-Goursat theorem, simply and multiply connected domains
(Sections: 24-49of text book)

UNIT-III :

Cauchy integral formula, An extension of the Cauchy integral formula – Some consequences of the extension - Liouvelli's theorem and fundamental theorem of Algebra, maximum modulus principle.Convergence of sequences, convergence of series, Taylor series, Laurent series, absolute and uniform convergence of power series, continuity of sums of power series, integration and differentiation of power series, uniqueness of series representations, multiplication and division of power series.
(**Sections: 50—67 of text book)**

UNIT-IV ::
Isolated singular points - Residues, Cauchy residue theorem, Residue at infinity -The three types of isolated singular points – Residue at poles – Examples.Zeros of analytic functions, zeros and poles, behavior of a function near isolated singular points.Evaluation of improper

integrals, Example – Improper integrals from Fourier analysis -Jordan Lemma - definite integrals involving Sines and Cosines
(Sections 68 to 81 and 85 of text book)

Text Book:

Complex Variables and Applications , James Ward Brown, Ruel V. Churchill, Mc raw Hill, Eighth Edition, 2009.

Reference Books:

1. Complex Variables, H. Silvermen
2. Complex Variables by H.S.Kasana,Prentice Hall of India
3. Complex Variables by Murrey Rspiegel, Scheam's Outline series

KAKATIYA UNIVERSITY
M.Sc (APPLIED MATHEMATICS) Syllabus (w.e.f 2012-14)
Semester-III
Paper-III
(Paper Code : AM3CP3)

Classical Mechanics

UNIT-I
Some Definitions – Lagrange's equations for a Holonomic system – Lagrange's equations of motion for conservative and non-holonomic system
(Sections 1.1-1.3 of Textbook 1)

UNIT-II

Hamilton's principle – Derivation of Hamilton's principle from Lagrange's equation – Derivations of Lagrange's equation from Hamilton's principle – Extension of Hamilton's principle – Cyclic coordinates – Conservations theorem

(Sections 2.1,2.3 to 2.8 of text book 1)

UNIT-III

Independent coordinates of a rigid body – Generalized coordinates of a rigid body – Eulerian angles – Components of angular velocity along the body set of axes – Rate of change of vector – Coriolis force – Euler's equations of motion of rigid body

(Sections 3.1 to 3.7)

UNIT-IV

Derivation of Hamilton's equations of motion – Routh's procedure – Derivation of Hamilton's equations from Hamilton principle – principle of least action

(Sections 4.1 to 4.4 of text book 1)

Text book:

1. **Classical Mechanics : C.R. Mondal ,Prentice –Hall of India pvt. Ltd.**

KAKATIYA UNIVERSITY
M.Sc (Applied Mathematics) Syllabus(w.e.f 2012-14)
Semester-III
Paper-IV(Elective)
Paper Code : AM3OP4(1)

MEASURE AND INTEGRATION

UNIT-I

Measurable Sets: Outer Measure- Properties of Outer Measure. Measurable Sets and Lebesgue Measure. Properties of Measurable Sets. Sequences of Measurable sets. A Nonmeasurable Set.
(Chapter-3, Sec.1-4 of the Text Book)

UNIT-II

Measurable Functions: Properties of Measurable Functions. Sequences of Measurable Functions. Almost everywhere concept. Measurability of a Characteristic Function, Simple and Step Functions. Egoroff's Theorem.
Lebesgue Integral: The Riemann Integral. The Lebesgue Integral of a Bounded Measurable Function over a Set of Finite Measure. The necessary and sufficient condition for measurability of bounded function. Properties of integral of bounded measurable functions. Bounded convergence Theorem.
(Chapter-3, Sec.5-6 and Chapter-4, Sec 1-2 of the Text Book)

UNIT-III

The Lebesgue in Integral of a Nonnegative Function: Properties of Integral of Nonnegative functions. Fatou's Lemma. Monotone Convergence Theorem. Some propositions related to Integrals. The General Lebesgue Integral. Properties of Lebesgue Integrals. Lebesgue Dominated Convergence Theorem.
(Chapter-4, Sec.3-4 of the Text Book)

UNIT-IV

Differentiation and Integration: Statement of Vitali Covering lemma. The four Dini's derivatives of a function. A theorem on integral of a differentiable function. Differentiation of an Integral. Absolute Continuity.
(Chapter-5, Sec.1-4 of the Text Book)

TEXT BOOK: Real Analysis by H.L.Royden, PHI

Reference Books: 1. Measure Theory by P.R.Halmos, Vaan Nostrand, Princeton.
2. An Introduction to Measure and Integration by Inder K. Rana, Narosa Publications.

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Semester-III
Paper-IV(Elective)
Paper Code: AM3OP4(2)

OPTIMIZATION TECHNIQUES

UNIT-I

Non-Linear Programming: Survey of quadratic Forms and Classical Methods. Convex Functions and Kuhn-Tucker Theory.
Quadratic Programming: Wolfe's Method and Beale's method for QP.
(Chapter 4, Sections 4.1, 4.2, 4.3 and 4.4 of the Text Book)

UNIT-II

Search Techniques: Search Methods in One Dimension. Multi-Dimensional Search Methods. Univariate Search Method. Conjugate Directions and Conjugate Gradient Method. Fletcher Reeves Method.
Constrained Multi-Dimensional Search: A Rosen's Gradient Projection Method. Penalty Function Approach.
(Chapter 6, Sections 6.1, (a, b ,c ,d) 6.2(a,b,c,d), 6.3 of the Text Book)

UNIT-III

Sequencing and Scheduling: Sequencing Problem Finite Jobs and Finite Machines. Scheduling. Critical Path Determination by CPM and PERT. Optimum Scheduling by CPM. Linear Programming Model for CPM and PERT.
Game Theory: A Two-Person Zero Sum Game. Min-Max and Max-Min Criterion. Problems with Mixed Strategies. Dominance Property. Graphical Method. Linear Programming in Game Theory.
(Chapter 7, 9 Sections 7.1, 7.2, 7.3 and 9.5 of the Text Book)

UNIT-IV

Queueing Systems: Introduction. Markov Process, Birth-Death Process and Steady State Solution. Poisson Queues. The Classical Queue System. The Queue Systems with Finite Population, Finite Storage and s-Server Case. Self Service System. Non-Poisson Markovian Queues.
(Chapter 11 of the Text Book)

TEXT BOOK: Introduction to Optimization & Operations Research by J.C.Panth, Jain Brothers. (Seventh revised Edition)

Reference Books: 1.Operations Research by Kanthi Swaroop, Man Mohan…, Sultan Chand Publications (2008).
2. Operations Research by Hamdy A,Taha, Pearson Education.
3. Operations Research by F.S.Hillar& G.J.Libberman, TMG.

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AUTOMATA AND LANGUAGES

6ppw

UNIT-I

Mathematical Preliminaries: Sets, relations and functions. Graphs, Trees, Strings and their properties. Principle of induction.
The theory of Automata: Definition of automation. Description of a finite automation. Transition systems.
(Chapter 1, Sec 1.1-1.4 and Chapter 2, Sec 2.1-2.2)

UNIT-II

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 automata.
(Chapter 2, Sec 2.4-2.9)

UNIT-III

Formal Languages: Basic definitions and examples. Chomsky classification of languages and their relations. Recursive and recursively enumerable sets. Operations on languages and automata.
(Chapter 3, Sec 3.1-3.6)

UNIT-IV

Regular Sets and Regular Grammars: Regular expressions. Finite automata and Regular expressions. Pumping Lemma for regular sets. Applications of Puming Lemma. Closure properties of regular sets. Regular sets and regular grammar.
(Chapter 4, Sec 4.1-4.6)

TEXT BOOK: Theory Computer Science (Automata, Languages and Computation) by K.L.P. Mishra and N. Chandrasekhar, PHI

Reference: 1.Introductory theory of computer science by E.V.Krishna Murthy, East-West Press.

2. Theory of Finite Automates with an introduction to formal languages by Carrel J and Lang D,PHI

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M.A. /M.Sc. APPLIED MATHEMATICS Syllabus (w.e.f 2012-14)
SEMESTER –III
PAPER – V (Elective)
Paper Code :AM3OP5(1)

COMPUTER FUNDAMENTALS AND PROGRAMMING IN C

UNIT – I

Major Components of a Digital Computer, Computer Classification, User Interface, Hardware Software and Firmware, LAN and WAN.

Number System (Binary, Decimal, Octal and Hexadecimal), Conversion of one Number System to another, Floating-Point Representation.

(Chapters 1,2 of Textbook 1)

UNIT – II

Constants – Variables – data types – Operators – Expressions – Managing input and output operations

(Chapter 2, 3, 4 of Textbook – 2)

UNIT – III

Decision making and branching – decision making and looping – arrays .-user defined function

(Chapters 5, 6,7, 9 of Textbook 2)

UNIT – IV

Structures and unions – pointers - File management in C.

(Chapters 10 11 and 12 of Textbook 2)

TEXTBOOK

1. Computer Fundamentals, Architecture and Organization, Third Edition – by B.Ram. New Age International(P) Limited.
2. Programming in ANSI C, Fourth Edition – by E.Balagursamy Tata McGraw-Hill Education Pvt. Ltd.

Computer Lab Work

1. Program to print Biggest of 3 given numbers.
2. Program to print the roots of a quadratic equation
3. Program to print sum of N given numbers.
4. Program to print N prime numbers.
5. Program to check whether the given number is palindrome or not.
6. Implement functions to find whether a given number is prime or not.
7. Program to find the n^{th} Fibonacci number using recursion.
8. Program to multiply two matrices
9. Program to check whether the given string is palindrome or not.
10. Program to sort a given string.
11. Create a file of student records .
12. Program to swap two numbers using pointers.
13. Program to compute sum of elements stored in an array using pointers.
14. Program to read student records (name, roll, m1, m2, m3) as structure and sort according to name.
15. Program to read student records (name, roll, m1, m2, m3) as structure and print the result.

16. . Programs i)to create a file ii) to read the created file and display it contents..

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SEMESTER –III
PAPER – V (Elective)
Paper Code : M3OP5(2)

APPLIED STOCHASTIC PROCESS WITH MAT LAB

UNIT-1

Stochastic Process:

Some Notations, Introduction, Specifications of Stochastic Process, Stationary process.

(Section 2.1,2.2 &2.3 of Text Book.1)

Markov chains:

Definition and Examples Transition Matrix, order of Markov chains, Markov chain as graphs - Higher transition probabilities - Classification of States and chains, irreducible chain, periodic chain , transient and recurrence states, first passage time distributions - stability of Markov system, stationary distribution ,ergodicity.

(Section 3.1, 3.2, 3.4, 3.6 of text book.1)

UNIT-II

Markov Process with Discrete State Space

Poison process - Poisson process and related distributions, Continuous Time Markov Chain (CTMC).

(Section 4.1, 4.2 & 4.5 of Text Book.1)

UNIT-III

Finite Markov Chains and its Applications:

Finite Markov chains with recurrent & transient States, irreducible finite Markov Chains with Ergodic states , statistical inference.

(Section 5.1,5.2 & 5.3 of Text Book.2)

UNIT-IV

Stationary Process and Time Series :

Introduction - models of time series - time and frequency domain: Power spectrum

Statistical Analysis of Time Series :

some definitions

(Section 8.1, 8.2, 8.3 & 8.4 of Text Book.1)

TEXT BOOKS

1. Stochastic Process - J.Medhi,- Second Edition, Wiley Eastern Limited
2. Elements of Applied Stochastic Process - U.N.Bhatt, JohnWiley & Sons

REFERENCE BOOK

1. Stochastic Process, N.U. Prabhu, Macmillan, NewYork

PRACTICALS (20 Marks)

i) Lab Work (MATLAB)

(10 Marks)

1. Basic Matrix operations
2. Computation of Eigen values & Eigen vectors.
3. Computation of steady state probability distribution using
    a. Power method
    b. Jacobi method
    c. Gauss-Seidel method

REFERENCE BOOKS:

a) Getting Started with MATLAB, Rudra Pratap, Oxford University Press.

b) Introduction to Numerical Solutions of Markov Chains, William J.

Stewart, Princeton University Press.

ii. Case Studies (10 Marks)

Applications of finite Markov Chains in Finance and Banking, Health Care, Retail Business, Internet Traffic Modeling and other research and development areas.

Note: For the case studies, students will be divided into batches. Each batch consists of two or three students.

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SEMESTER –III
PAPER – V (Elective)
Paper Code : M3OP5(3)
NUMERICAL ANALYSIS Through C

UNIT – I
TRANSCENDENTAL AND POLYNOMIAL EQUATIONS

Introduction, Bisection Method, Secant Method, Regula-Falsi Method, Newton-Raphson Method, Mullar Method, Chebyshev Method, Multipoint Iterative Methods, Rate of convergence
(Chapters 2.1, 2.2, 2.3, 2.4 and 2.5 of the Text Book)

UNIT – II
SYSTEM OF LINEAR ALGEBRAIC EQUATIONS AND EIGEN VALUE PROBLEMS

Introduction, Direct Methods: Gauss-Elimination Method, Gauss-Jordan Method, Triangularisation Method, Cholesky Method, Partition Method, error analysis for direct methods, Iteration Methods: Jacobi Iteration Method, Gauss-Seidel Iteration Method, Eigen Values and Eigen Vectors, Power Method, Inverse Power Method.
(Chapters 3.1, 3.2, 3.3, 3.4, 3.5, 3.11 and 3.12 of the Text Book)

UNIT – III
INTERPOLATION AND APPROXIMATION

Introduction, Lagrange Interpolation, Newton Divided Differences, Quadratic Interpolation, Higher Order Interpolation, Iterated Interpolation, Finite Differences 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.
(Chapters 4.1, 4.2, 4.3, 4.4, 4.5, 4.6 and 4.9 of the Text Book)

UNIT – IV
NUMERICAL DIFFERENTIATION AND INTEGRATION

Introduction, Numerical Differentiation: Linear interpolation, Quadratic interpolation, Methods based on finite differences, Methods Based on Undetermined Coefficients, Numerical Integration, Methods Based on Interpolation: Newton-Cotes Methods, Open type integration Rules, Composite Integration Methods: Romberg Integration, Double Integration.
(Chapters 5.1, 5.2, 5.6, 5.7, 5.9, 5.10 and 5.11 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, 5th Edition.

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

Numerical Analysis Laboratory

The following programs are to be executed in C/Fortran language.

1. Solution of system of NXN linear equations AX=B using Gauss Elimination method.
2. Finding solution of NXN linear equations AX=B using LU decomposition method.
3. Finding solution of NXN linear equations AX=B using Gauss-Seidel iteration method.
4. Finding the largest Eigen value in magnitude and the corresponding Eigen vector of an NXN matrix A by Power method.
5. Lagrange interpolation.
6. Newton-Gregory forward interpolation.
7. Newton-Gregory backward interpolation.
8. Evaluation of the integral of f(x) between the limits 'a' and 'b' using Trapezoidal rule with 'n' subintervals.
9. Evaluation of the integral of f(x) between the limits 'a' and 'b' using Simpson's $1/3^{rd}$ rule with '2n' subintervals.
10. Evaluation of the integral of f(x) between the limits 'a' and 'b' using Simpson's $3/8^{th}$ rule with '3n' subintervals.
11. Solution of equation by Bisection method.
12. Solution of equation by Regula-Falsi method.
13. Solution of equation by Newton-Raphson method.
14. Solution of equation by Mullar method.

Text/Reference Books:

1. Numerical methods for scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar and R. K. Jain.
2. Numerical methods by E. Balagurusamy.
3. Computer oriented Numerical methods by V. Raja Raman.

A**M4CP1**

KAKATIYA UNIVERSITY
M.A. /M.Sc. APPLIIED MATHEMATICS (Syllabus (w.e.f 2012-14)
SEMESTER –IV
PAPER – I
Paper Code : A**M4CP1**
FUNCTIONAL ANALYSIS

UNIT-I

Normed spaces-Banach spaces: Definition and examples of Normed spaces and Banach spaces. Continuous linear transformations. The Hahn-Banach Theorem .The natural imbedding of N in N^{**}.
(Chapter 9 of Text Book 1: Sections 46-49)

UNIT- II

The Open mapping Theorem. The Conjugate of an Operator.
Hilbert Spaces: Definition and examples of inner product spaces and Hilbert Spaces. Simple Properties of Hilbert Spaces. Orthogonal Complements.
(Chapter10 of Text Book 1: Sections 50-53)

UNIT-III

Orthogonal sets. Bessel's inequality. Fourier series in Hilbert Spaces. Gram-Schmidt orthogonalization process. The Conjugate Space H^*.
Operators on Hilbert Spaces: The Adjoint of an Operator. Self –Adjoint Operators. The Normal Operator and the Unitary Operator.
(Chapter 10 of Text Book 1: Sections 54-58)

UNIT-IV

Further Applications: Banach fixed point theorem and its applications to linear equations. Approximation in Normed spaces. Uniform approximations.
(Chapter 5, Sec 5.1-5.4; Chapter 6, Sec 6.1-6.3)

TEXT BOOKS: 1. Introduction to Topology and Modern Analysis by G.F. Simmons McGraw-Hill.
2. Introductory Functional Analysis with Applications by E.Kreyszig, McGraw-Hill.

Reference Books: 1.Function analysis with applications by B.Chaudary and Sudarshan Nanda, New Age International (pvt) Ltd.
2.Functional Analysis by B.V.Limaye, Wiley Eastern Ltd

KAKATIYA UNIVERSITY
M.A. /M.Sc. APPLIED MATHEMATICS Syllabus (w.e.f 2012-14)
SEMESTER –IV
PAPER – II
Paper Code : AM4CP2
COMPLEX ANALYSIS - II

UNIT-I :

Indented paths – an indentation around a branch point – integration along a branch cut – –argument principle, Rouche's Theorem – Inverse Laplace transforms – Examples

Mapping by elementary functions:
Linear Transformation – The transformation of w=1/z; - Mappings by 1/z; - Linear Fractional transformation – an implicit form – Mappings of the Upper half plane – The transformation 2=sin z

(Sections 82 to 84, 86 to 96 of text book 1)
UNIT II:
Conformal Mapping: Preservation of angles – scale factors – local inverses – Harmonic conjugates – Transformations of Harmonic functions – Transformations of Boundary conditions

Definition of Harmonic functions,- Harmonic functions and alalytic functions, - Maximum principle – Minimum principle – Harmonic functions on disk – Poission'a Integral formula - Constructions of harmonic functions on a disk

(sections 101to 106 of text book 1,Sections 9.1 to 9.4 of text book 2)
UNIT III
Some Physical Applications of Conformal mapping
Metric on on C(G,Ω), spaces of analytical functions, Weirstrass factorization theorem, Mittag-Leffler theorem
(Sections 10.5, 11.1-11.3 of text book 2)

UNIT IV

Applications of Complex analysis

Two dimensional fluid flow - The stream function - Flows around a corner and around a cylinder
(Sections 113 to 115)

Text Books :
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1. **Complex variables and Applications by James Ward Brown, Ruel V. Churchill, Mc.Graw Hill, Eighth Edition , 2009**
2. **The elements of complex analysis: B.Choudhary, New age Inernational PVt Ltd.**

KAKATIYA UNIVERSITY
M.Sc (APPLIED MATHEMATICS) Syllabus (w.e.f 2012-14)
Semester-IV
Paper-III
Paper Code: AM4CP3
MECHANICS OF SOLIDS

UNIT-I

a) Introduction to Tensors:

Coordinate transformations, Summation Convention, Contravariant, Covariant and mixed tensors, Symmetric and skew symmetric tensor, Fundamental operations with the tensors, The line element and metric tensor, Tensor form of gradient, divergence and curl.

(Scope as in Text book 1)

b) Analysis of Strain:

Deformation, Affine transformations, Infinitesimal affine transformations, Geometrical interpretation of the components of strain, Strain quadric of Cauchy, Principal strain and strain invariants, Examples of strain, Equations of compatibility (a simple derivation).

(Chapter-1 of the Text book 2)

UNIT-II

Analysis of Stress

Body and surface forces, Stress tensor, Equations of equilibrium, Transformation of coordinates, Stress quadric of Cauchy, Maximum normal and shear stress, Mohr's diagram, Examples of stress.

(Chapter-2 of the Text book 2)

UNIT-III

Equations of Elasticity

Generalized Hooke's law, Homogeneous isotropic media, Elastic moduli for isotropic media, Simple tension, Pure shear and hydrostatic pressure, Equilibrium equations for an isotropic elastic solid, Dynamical equations for an isotropic elastic solid, The strain energy function and it's connection with Hooke's law, Uniqueness of solutions.

(Chapter-3 of the Text book 2)

UNIT-IV

Basic Problems of Elasticity

Statement of problem, Extension of beams by longitudinal forces, Beam stretched by its own weight, Bending of beams by terminal couples, Torsion of circular shaft, Torsion of cylindrical beams, Stress function.

(Chapter-4 of the Text book 2: Section 29-35)

TEXT BOOKS:

1. Vector Analysis (For Unit-I, a) Introduction to Tensors) – Murray R Spiegel, Schaum's Series.
2. Mathematical Theory of Elasticity – I.S.Sokolnikoff, TMG- New Delhi.

References:

1. Theory of Elasticity – S.P.Timoshenco, J.N.Goodier.
2. Theory of Elasticity – PDS. Verma, Vikas Publications.

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SEMESTER –IV
PAPER – IV (Elective)
Paper Code: AM4OP4(1)
AUTOMATA & MACHINES

U N I T – I

CONTEXT - FREE LANGUAGES :
Context – Free languages – Derivation Tress- Ambiguity in Context – Free Grammers – Simplification of Context – Free Grammers – Comosky Normal Form of Context - Free Grammars – Pumping Lesmma for context – Free Languages- Decision Algorithms for Context – Free Languages.

U N I T –I I

PUSHDOWN AUTOMATA :
Basic Definitions – Acceptance by Pda – Pushdown Automata and Context Free Languages- Parsing and Push Down Automata.

U N I T – III

TURNING MACHINES AND LINEAR BOUNDED AUTOMATA:
Turning Machine Model – Representation of Turning Machines – Language Acceptability by Turing Machines – Design of Turing Machines – Universal Turing Machines and their Modifications. The Model of Linear Bounded Automation – Turing Machines and Type O Grammers.

U N I T – IV

Linear Bounded Automata and languages – Halting Problem of Turning Machines – NP – Completeness – LR (K) Grammers – Properties of LR(K) Grammars – Closure Properties of Languages.

TEXT BOOK :

Theory of Computer Science (Automata, languages and Computation) By KLP Mishra and N.Chandrasekhar, Printice Hall of India.

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SEMESTER –IV
PAPER – IV (Elective)
Paper Code: AM4OP4(2)
AUTOMATA & MACHINES

BI0MECHANICS

UNIT-I

A brief on cell biology, the extra cellular matrix and mechanotransduction in cells.
Bio Solid Mechanics: Concept of stress and stress transformation. Principal stresses and maximum shear stress. Concept of strain and the constitutive behavior of materials. Mechanical properties of bone. General equilibrium equations. Navier space equations and axially loaded rods.
(Chapter1, Sec1.4-1.6, Chapter 2, Chapter3, Sec 3.1-3.3)

UNIT-II

Pressurization and Extension of a thin walled tube. Pressurization of a thin spherical structure and thick walled cylindrical tube.
Extension and Torsion: Deformation due to extension. Shear stress due to torsion. Principal stresses and principal strains in torsion. Angle of twist due to torque and experimental design. Bone properties and papillary muscles. Inflation, extension and twist.
(Chapter3, Sec 3.4-3.6, Chapter 4)

UNIT-III

Beam bending and Column buckling: Shear forces and bending moments. Stresses in beams. Deformation in beams and transducer design. The AFM and the principle of superposion. Column buckling.
Bio Fluid Mechanics: Stress and Pressure. Kinematics. Study of Motion. Constitutive Behavior. Blood characteristics. Cone and plate viscometry.
(Chapter 5, Chapter 7, Sec 7.1-7.6)

UNIT-IV

Fundamental Balance Relations: Balance of mass and linear momentum. Navier- Stokes equations, The Euler equation and the Bernoulli equation. Measurement of Pressure and Flow. Some Exact Solutions: Flow between parallel plates. Steady flow in circular tubes. Circumferential flow between concentric cylinders.
(Chapter 8, Sec 8.1-8.6 and Chapter 9, Sec 9.1-9.3)

TEXT BOOK: An Introduction to Biomechanics, Solids and Fluids and Design by J.D. Humphrey and Sherry L.Delange, Springer (2005).

Reference Books: 1.Bio-Mechanics, Flow, Stress and Growth by Y.C.Fung Springer.
2. Fundamentals of biomechanics, equilibrium and deformation by Ozakaya N.M. Nordin, Springer (1999).

KAKATIYA UNIVERSITY
M.Sc (Applied Mathematics) Syllabus (w.e.f 2012-14)
Semester-IV
Paper-IV
Paper code:AM4OP4(3)
FLUID DYNAMICS

UNIT-I

Kinematics of Fluids in Motion: Real Fluids and Ideal Fluids. Velocity of a Fluid at a Point. Stream Lines and Path Lines. 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 a Rigid Body.
Equations of Motion of Fluid: Euler's equation of Motion. Bernoulli's equation.
(Chapter-2, Sec.2.1-2.10 and Chpter3, Sec 3.4-3.6 of the Text Book)

UNIT-II

Some Three- dimensional flows: Introduction. Sources, Sinks and Doublets.
Some Two- dimensional flows: Meaning of Two-Dimensional flow. The Stream Function. The Complex Potential for two-dimensional irrotational and incompressible flow. Complex Velocity Potentials for standard two-dimensional flows. Uniform stream. Line Sources, Line Sinks and Line Doublets. Line Vortices.
(Chapter-4, Sec.4.1-4.2 and Chapter-5, Sec 5.1-5.6 of the Text Book)

UNIT-III

The Milne-Thompson Circle Theorem. Some Applications of the Circle theorem. Extension of the Circle theorem. The theorem of Blasius.
Viscous Flows: Stress analysis in Fluid motion. Relation between stress and rate of strain. The Coefficient of Viscosity and Laminar Flow.
(Chapter-8, Sec.8.6-8.10 of the Text Book)

UNIT-IV

The Navier-Stoke's equation of motion of Viscous Fluids. Some solvable Problems. Steady motion between parallel planes through tube of uniform cross section and flow between concentric rotating cylinders.
Steady Viscous Flow in a tube of uniform cross section: A Uniqueness Theorem. Tube having uniform elliptic cross section and equilateral cross section. Diffusion of Vorticity. Energy dissipation due viscosity.
(Chapter-8, Sec.8.11, 8.14 and 8.15 of the Text Book)

TEXT BOOK: Fluid Dynamics by Frank Charlton- CBS Publications.

Reference Books: 1.Theoretical Hydrodynamics by L.M.Milne-Thompson, Macmillan.
2. Modern Fluid Dynamics by N.Curle and H.J.Davies, VanNostrand.

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Semester-IV
Paper-IV (Elective)
Paper code:AM4OP4(4)
FLUID DYNAMICS

FUZZY SETS AND FUZZY LOGIC

UNIT-I

Classical Sets to Fuggy sets: Introduction. Crisp Sets and Fuzzy Sets. Basic Concepts. Fuzzy Sets V_S Crisp Sets: Properties of α-cuts. Representation of Fuzzy sets. Extension Principle.

Operations on Fuzzy Sets: Fuzzy Compliments. Fuzzy intersections (t-norms) and Fuzzy Unions (t-conorms). Combination Operations.

UNIT-II

Fuzzy Arithmetic: Fuzzy Numbers. Arithmetic Operations on Fuzzy numbers. Lattice of Fuzzy numbers and Fuzzy Equations.

Fuzzy Relations: Crisp Fuzzy relations. Binary Fuzzy relations. Fuzzy equivalence relations. Fuzzy ordering relations. Fuzzy morphisms. sup-i composition and inf-ω_1 compositions of Fuzzy relations.

UNIT-III

Fuzzy Relation Equations: Problem partitioning. Solution method. Fuzzy relation equations based on sup-i and inf-ω_1 compositions and approximate solutions.

Possibility Theory: Fuzzy measure. Evidence theory. Possibility theory. Possibility V_S Probability.

UNIT-IV

Fuzzy Logic: Classical logic and multivalued logic. Fuzzy Propositions. Fuzzy quantifiers. Logical inferences from conditional propositions. Qualified propositions and Quantified propositions.

Uncertainty based information: Non specification of Crisp sets and Fuzzy sets. Fuzziness of Fuzzy sets. The Shannon entropy. Total uncertainty. The principle of minimum uncertainty and maximum uncertainty.

TEXT BOOK: Fuzzy Sets and Fuzzy Logic by G.J.Klir & Boyuon, PHI
(Chap1to Chap-9)

Reference Books:1. Fuzzy Logic- John Yen &R.Langari,Pearson.
2.Fyzzy logic with applications, Timothy Ross, McGraw Hill.

KAKATIYA UNIVERSITY
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Semester-IV
Paper-IV (Elective)
Paper code:AM4OP4(5)

THEORY OF RELIABILITY

UNIT-I

Fundamental concepts in Reliability Engineering – Introductin – General reliability function – General concepts – Hazard rate – reliability function – Bath tub Hazard rae curve – Mean time failure

UNIT-II

System Reliability – Series configuaration – Parallel configuration – Mixed configuration – diagrams – Maker models – Marker graphs

UNIT-III

Failure Data Analysis – Failure data – Mean failure rate – Mean time to failure – Mean time between failures – Graphical plots – MTTF in terms of failure density – Reliability in terms of Hazard rate and failure

UNIT-IV

Hazard Models: Constant Hazard, Linearly increasing Hazard – The Weibull model – Distribution functions and reliability analysis – density functions – Expected value – some important distributions – Standard deviation and variation

Text Book:

1. **L.S. Srinath "Reliability Engineering"**

Reference book:

1.E.Balagurusamy, " Reliability Engineering"

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Semester-IV
Paper-V(Elective)
Paper code:AM4OP5(1)

NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS

Solution of Ordinary Differential Equations: Initial value problems. Single step methods. Taylor's, Euler's and Runge-Kutta methods. Convergence of these methods.
System of differential equations: Taylor's method and Runge-Kutta methods.
Higher order differential equations: Runge-Kutta Method.
Multi step methods: Adam-Bashforth method. Nystrom's method. Adams-Moultan method. Milne-Simpson's method.
(Sections 6.4 and 6.6 of Text Book-1)

UNIT-II
Finite Difference Methods: Finite difference approximations for derivatives. Linear second order differential equations with explicit and implicit derivative boundary conditions. Fourth order method when y' is absent.
Non- Linear second order differential equations of the form y''= f(x, y). Convergence of difference schemes.
(Section 7.3 of Text Book-1)

UNIT-III
Solutions of Partial Differential Equations: Classification of Partial differential equations. Finite difference approximations for partial derivatives.
Finite Difference schemes for Parabolic partial differential equations: One space dimensions. Two level explicit Schmidt method and Laosoner method. Two level implicit difference schemes. Crank-Nicholson's formulae.
Finite Difference of Hyperbolic partial differential equations: One space dimensions. Explicit and implicit difference schemes. Difference schemes for equations in two space variables with constant coefficients with ADI methods.
(Sectionsc1.2, 1.2, 2.2, 3.2 and 3.3 of Text Book -2)

UNIT_IV
Elliptic Equations: Laplace equation and Poisson equation. Iterative schemes. Dirichlet problem for Laplacian. Neumann problem. Mixed boundary value problems.
(Sections 4.2 of the Text Book-2)

TEXT BOOKS: 1.Numerical methods for Scientific and Engineering Computations by M.K.Jain, S.R.K.Iyengar and R.K.Jain, New Age International.
2. Computational methods for Partial differential equations by M.K.Jain, S.R.K.Iyengar and R.K.Jain, New Age International.

References: 1.Introductory methods of Numerical Analysis by S.S.Sastry, PHI.
2. Numerical Solutions of Differential Equations by M.K.Jain, Wiley.

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M.Sc (Applied Mathematics) Syllabus (w.e.f 2012-14)
Semester-IV
Paper-V(Elective)
Paper code:AM4OP5(2)

ADVANCED LINEAR ALGEBRA

Review of Vector Spaces, Subspaces Bases and Dimension.

UNIT – I:

Linear Transformations: The algebra of Linear Transformations, Isomorphism, Representation of Transformations by Matrices. Linear Functional. The double Dual, The Transpose of Linear Transformation.
(Chapter 3 Sec 3.13.7 of the text book)

UNIT-II:

Elementary Canonical forms: Characteristic Values. Annihilating Polynomials. Invariant Subspaces. Direct-sum Decompositions. Invariant Direct sums. The primary Decomposition theorem
(Chapter 6 Sec 6.1-6.4 and 6.6-6.8 of the text book)

UNIT-III:

The Rational and Jordon Forms: Cyclic Subspaces and Annihilators. Cyclic Decompositions and rational form. Cyclic Decomposition Theorem (with out proof). The Jordon Form, computation of Invariant factors.
(Chapter 7 Sec 7.1-7.4 of the text book)

UNIT-IV:

Bilinear forms: Bilinear forms, Symmetric Bilinear Forms, Skew Symmetric Bilinear Forms Groups preserving Bilinear Forms
(Chapter 10 Sec 10.1-10.4 of the text book)

TEXT BOOK:
Linear Algebra by Kenneth Hoffman and Ray Kunze, Pearson (2003).

Reference Books:

1. Finite Dimensional Vector Spaces by p.Halmos,D Vanostrand,Princeton.
2. Linear Algebra by H.Friedberg etal, PHI(2007)
3. Linear Algebra by Lipschitz, Schaum Series.

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FINITE ELEMENT METHOD

6ppw

UNIT-I

Calculus of Variations: Euler's Equation. Other forms of Euler's Equation. Brachistochrone Problem. Isoperimetric Problem. Problem of Geodesics.
Integral Formulation: Integral identities. Linear and Bilinear Functionals.Weighted integral and weak formulations. Linear and bilinear forms and quadratic functionals.
Examples.
(Chap 12 of Text Book 1, Sec 6.5-6.7 & Chap 2 of Text Book 2, Sec2.2.3,2.2.4&2.4)

UNIT-II

Variational Methods: Introduction. The Ritz Method. Examples. The method of Weighted Residuals. The Petrov –Galrekin method. The Least Squares method. The Collocation method. Applications to the Boundary Value Problems.
(Chap 2 of Text Book 2, Sec 2.5)

UNIT-III

Second- Order Differential Equations in One Dimension: Back ground. Basic steps of the finite element analysis. Model Boundary value problem. Discretization of the domain. Derivation of element equations. Connectivity of elements. Imposition of boundary conditions. Solution of equations. Post processing of the solution. Applications to the problems in solid and structural mechanics.
(Chap 3 of Text Book 2, Sec3.1, 3.2..1-3.2.7,3.3; Chp4, Sec 4.5)

UNIT-IV

Single-Variable Problems in Two-Dimensions: Introduction. Boundary Value Problems. The Model equations. The finite element discretization. Weak form of finite element model. Interpolation functions. Evaluation of element matrices and vectors. Assembly of element equations and post processing of the solutions. Applications to Solid Mechanics.
(Chap 8 of Text Book 2, Sec 8.1, 8.2.1-8.2.8 and 8.5.3)

TEXT BOOK: 1. Differential Equations with applications and historical notes by George.F.Simmons. TMH.(2nd edition)
2. An Introduction to Finite Element Method by J.N.Reddy,MGH

Reference Book: Boundary and Finite Elements Theory and Problems by J.Ramachandran. Narosa(2000)

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GRAPH TEHORY

UNIT-I
Relations and Digraphs: Relations and directed graphs. Equivalence relations. Ordering relations. Lattices and enumerations. Paths and closures. Directed graphs and adjacency matrices. Warshall's algorithm.
(Chapter 4, Sec 4.1-4.7)

UNIT-II
Graphs: Basic concepts. Isomorphism and Sub graphs. Trees and their properties. Spanning. Directed trees. Binary trees. Planar Graphs.
(Chapter 5, Sec 5.1-5.7)

UNIT-III
Multi Graphs: Euler's formula. Koenig's Berg Seven Bridges Problem. Euler circuits. Hamiltonian graphs. Chromatic numbers. The Four color problem.
(Chapter 5, Sec 5.8-5.12)

UNIT-IV
Network Flows: Graphs as models of Flow of commodities. Flows. Maximal flows and minimal cuts. The Max flow- Min cut Theorem. Applications. Matching and Hall's marriage theorem.
(Chapter 7, Sec 7.1-7.5)

TEXT BOOK: 1.Discrete Mathematics for computer scientists and mathematicians by J.L.Mott, A. Kandel and P. Baker,PHI.

References: 1.Graph Theory by Narsing Deo, PHI.
2. A First look at Graph Theory by John Clark & D.A.Hotton,Allied Pub.

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Semester-IV
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Paper code:AM4OP5(5)
PROGRAMMING IN C++

U N I T – I

Input and Output in C++-C++ Declarative control Structures .
(Chap 2, 3 and 4 of Textbook)

U N I T –I I

Functions in C++ - Classes and Objects.
(Chap 5 and 6 of Textbook)

U N I T – III

Constructors and Destructors – Operator Overloading and Type conversion – Inheritance
(Chap 7, 8 and 9 of Textbook)

U N I T – IV

Pointers and Array – C++ and Memory – Binding , Polymorphism and Virtual Functions
(Chap. 10, 11 and 12 of Textbook)

TEXT BOOK:
Object-Oriented Programming with ANSI & Turbo C++ - By Ahok. N. Kamthane.

LAB WORK:
Simple programs in C ++ on the above topics.

PATTERN OF LAB TRAINING :
The total number of students are made into batches. The number of students in each batch should not be more than 10 students and each batch should be handled by two teachers.