KAKATIYA UNIVERSITY
M.A/M.Sc (MATHEMATICS)
Semester I/II/III/IV
Scheme of Instruction and Examination
(With effect from 2012-2014 batch)

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	M1CP1	Algebra-I	6	20	80	-	100
II	M1CP2	Real Analysis-I	6	20	80	-	100
III	M1CP3	Ordinary differential equations	6	20	80	-	100
IV	M1CP4	Discrete Mathematics	6	20	80	-	100
V	M1CP5	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	M2CP1	Algebra-II	6	20	80	-	100
II	M2CP2	Real Analysis-II	6	20	80	-	100
III	M2CP3	Fourier series and Special functions	6	20	80	-	100
IV	M2CP4	Complex Analysis	6	20	80	-	100
V	M2CP5	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	M3CP1	Topology	6	20	80	-	100
II	M3CP2	Measure and Integration	6	20	80	-	100
III	M3CP3	Partial Differential Equations	6	20	80	-	100
IV	M3OP4(1)	Commutative Rings and Modules	6	20	80	-	100
	M3OP4(2)	Operations Research -I	6	20	80	-	100
	M3OP4(3)	Numerical analysis	6	20	80	-	100
	M3OP4(4)	Automata and Languages	6	20	80	-	100
	M3OP4(5)	Mechanics of solids	6	20	80	-	100
	M3OP4(6)	Classical Mechanics	6	20	80	-	100
V	M3OP5(1)	Computer Fundamentals and Operating systems	Th .4+Pr.3	20	60	20	100
	M3OP5(2)	Computer fundamentals and Programming in C	Th .4+Pr.3	20	60	20	100
	M3OP5(3)	Office automation and C-Language	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	M4CP1	Functional Analysis	6	20	80	-	100
II	M4CP2	Advanced Linear Algebra	6	20	80	-	100
III	M4CP3	Graph Theory	6	20	80	-	100
IV	M4OP4(1)	Automata and Machines	6	20	80	-	100
	M4OP4(2)	Mathematical theory of waves	6	20	80	-	100
	M4OP4(3)	Theory of Ordinary Differential Equations	6	20	80	-	100
	M4OP4(4)	Operations Research-II	6	20	80	-	100
	M4OP4(5)	Fluid Dynamics	6	20	80	-	100
	M4OP4(6)	Near Rings	6	20	80	-	100
	M4OP4(7)	Theory of Reliability	6	20	80	-	100
	M4OP4(8)	Advanced Analysis	6	20	80	-	100
V	M4OP5(1)	Programming Methodology	Th .4+Pr.3	20	60	20	100
	M4OP5(2)	Programming in C++	Th .4+Pr.3	20	60	20	100
	M4OP5(3)	Data Structures using C	Th .4+Pr.3	20	60	20	100
	M4OP5(4)	Applied Stocastic process with Matlab	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 (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 in serial order.
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 (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 in serial order.
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 (Mathematics)
(w.e.f 2012-2014)
Semester-I/II/III/IV
Papers I/ II/ III/ IV/ V

Time: 3 Hours Max Marks: 80/60*

*for papers having 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. MATHEMATICS Syllabus(w.e.f. 2012-2014)
I – Semester
Paper – I
(Paper Code. : M1CP1)
ALGEBRA – I

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. MATHEMATICS Syllabus(w.e.f 2012-14)
I – Semester
Paper – II
(Paper Code: M1CP2)
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 theoem
(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. MATHEMATICS Syllabus(w.e.f.2012-14)
I – Semester
Paper – III
(Paper Code: M1CP3)
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
(Chapeter I 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.**

Reference 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. MATHEMATICS Syllabus(w.e.f. 2012-14)
I – Semester
Paper – IV
(Paper code: M1CP4)
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

KAKATIYA UNIVERSITY
M.A/M.Sc. MATHEMATICS Syllabus(w.e.f.2012-14)
I – Semester
Paper – V
(Paper Code. : M1CP5)
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.
(Some topics of 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.
(Some topics of 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. : M2CP1)

ALGEBRA - II

UNIT – I

Algebraic Extensions of Fields:

Adjunction of roots, Algebraic extensions, Algebraically closed fields.
(Sections 2,3,4 of Chapter 15 of the Text Book)

UNIT – II

Normal and Separable extensions:

Splitting fields, Normal extensions, Multiple roots, Finite fields, Separable extensions.
(Chapter 16 of the Text Book)

UNIT – III

Galois Theory :

Automorphism groups and fixed fields, Fundamental theorem of Galois theory Fundamental theorem of algebra.
(Chapter 17 of the Text Book)

UNIT – IV

Applications of Galois theory to classical problems:

Roots of unity and Cyclotomic polynomials, Cyclic extensions, Polynomials solvable by radicals.
(Sections 1,2,3 of Chapter 18 of the Text Book)

Text-Book:

Basic abstract algebra by P.B. Bhattacharya, S.K.Jain and S.R. Nagpaul.
Second edition, Cambridge University press

Reference Books:

1. A first course in abstract algebra by J.B. Fraleigh.
2. Algebra by S. Lang
3. Topics in algebra by T.N. Herstein
4. University algebra by Gopala Krishna.
5. Abstract Algebra by David S.Dummit, Richard M.Foote,Second edition, Wiley Student edition

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M.A/M.Sc. 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)

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.

(Chaper 16 and 18.4,18..5,18.7,18.8 of text book)

UNIT-III

Metric spaces :- Definition and examples – Open sets - Closed sets – Converegence - 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. Mathematial Analysis by T.Apostle, Narosa.

KAKATIYA UNIVERSITY
M.A/M.Sc. MATHEMATICS Syllabus(w.e.f.2012-14)
II – Semester
Paper –III
(Paper Code. : M2CP3)
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 by M.D. Raisinghania

KAKATIYA UNIVERSITY
M.A/M.Sc. MATHEMATICS Syllabus(w.e.f.2012-14)
II – Semester
Paper – IV
(Paper Code. : M2CP4)

Complex Analysis

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 Graw 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.A/M.Sc. MATHEMATICS Syllabus(w.e.f.2012-14)
II – Semester
Paper – V
(Paper Code. : M2CP5)

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. MATHEMATICS syllabus(w.e.f. 2012-14)
III– Semester
Paper – I
(Paper Code : M3CP1)

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.A. / M.Sc. MATHEMATICS Syllabus(w.e.f. 2012-14)
SEMESTER –III
PAPER –II
Paper Code M3CP2

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.

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus(w.e.f.2012-14)
SEMESTER –III
PAPER –III (Paper Code M3CP3)
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. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –III
PAPER –IV (Elective)
Paper Code : M3OP4(1)
COMMUTATIVE RINGS & MODULES

U N I T – I

Modules – Homomorphisms - Exact Sequences- Free modules – Vector spaces
(Chap - 4 articles 1 & 2 of Textbook)

U N I T –I I

Projective Modules – Injective Modules – Hom & Duality
(Chap-4 articles 3 & 4 of Textbook)

U N I T – III

Chain Conditions – Prime and Primary Ideals
(Chap-8 articles 1 & 2 of Textbook)

U N I T – IV

Primary Decomposition - Noetherian Rings and Modules – Krull Intersection Theorem – Nakayamma lemma- Hilbert Basis Theorem.
(Chap-8 articles 3 & 4 of Textbook)

TEXT BOOK : Algebra , by Thomas Hungerford.

KAKATIYA UNIVERSITY
M.A/M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
III – Semester
Paper – IV (Elective)
(Paper Code : M3OP4(2))
OPERATIONS RESEARCH - I

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 and applications by Gass. S.I

KAKATIYA UNIVERSITY
M.A. /M.SC. MATHEMATICS Syllabus(w.e.f. 2012-14)
SEMESTER –III
PAPER –IV(Elective)
Paper Code: M3OP4(3)
NUMERICAL ANALYSIS

U N I T – I

Computer Representation of numbers, Definition and sources of Error, Definition of stable problem – Iterative methods –Newton's method-Newton Fourier method- the secant method– Muller's method -A General theory for one point iteration methods – Roots of Polynomials (Horner's method) – Systems of nonlinear Equations – Newton's method for nonlinear systems .
(Chapter 1 & 2 of the Text Book)

U N I T –I I

Polynomial interpolation theory – Newton divided differences – Finite differences and Table Oriented Interpolation formulas– Hermite interpolation . The minimax approximation problem – The least square approximation problem- orthogonal polynomials –The Least squares approximation problem (continued) -Minimax approximations
(Chapter 3 & 4 of the Text Book)

U N I T – III

The trapezoidal rule and Simpson's rule – Newton Cotes Integration formulas – Gaussian quadrature. Euler's method- Multistep methods -The midpoint method – The trapezoidal method -single step and Runge-Kutta methods.
Chapter 5 & 6 of the Text Book)

U N I T – IV

Gaussian eleimination – The residual correction method – Iteration methods. Eigen value location (Gerschgorin theorem)– The power method – The eigen values of a symmetric Tridiagonal matrix – The QR method – The calculation of eigen vectors and inverse iteration
Chapter 8 & 9 of the Text Book)

TEXT BOOK :

An Introduction to Numerical Analysis -By Kendall E. Atkinson

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –III
PAPER –IV (Elective)
Paper Code : M3OP4(4)
AUTOMATA AND LANGUAGES

U N I T – I

MATHEMATICAL PRELIMINARIES:
Sets, Relations – Function Graphs – Trees – Strings and their Properties - Principle of Induction.
THE THEORY OF AUTOMATA.
Definition of an Automaton – Description of a Finite Automaton – Transition Systems.

U N I T –I I

PROPERTIES OF TRANSITION FUCNTIONS :
Acceptability of a String by a Finite Automaton – Non-Deterministic Finite State Machines – The Equivalence of DFA and NDFA – Mealy and Moore Modals – Minimization of Finite Automata

U N I T – III

FORMAL LANGUAGES :
Basic Definitions and examples - Chomsky Classification of Languages - Languages and their Relations – Recursive and Recursively Enumerable Sets – Operations on Languages and Automata

U N I T – IV

REGULAR SETS AND REGULAR GRAMMERS:
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 Grammers.

TEXT BOOK:
Theory of Computer Science (Automata, Languages and Computation) - by K.L.P. Mishra and N. Chandra Sekhar, Prentice Hall of India.

KAKATIYA UNIVERSITY
K.A./M.Sc MATHEMATICS Syllabus (w.e.f.2012-14)
Semester-III
Paper-IV (Elective)
Paper Code : M3OP4(5)
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 : introduction to tensors – Murray R. Spiegel – Schaum's series
2. Mathematical theory of elasticity : I. S.Sokolnikoff –TMG – New Delhi

References:

1. Theorey of elasticity : S.P. Timosheneo , J.N. Goodier
2. Theory of Elasticity: PDS Verma , Vikas Publications

KAKATIYA UNIVERSITY
M.Sc MATHEMATICS Syllabus(w.e.f 2012-14)
Semester-III
Paper-IV(Elective)
Paper Code : M3OP4(6)

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 anglar 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.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –III
PAPER – V (Elective)
Paper Code :M3OP5(1)
COMPUTER FUNDEMANTALS AND OPERATING SYSTEMS

UNIT-1
DISK OPERATING SYSTEM:
DOS Internal commands- DOS External commands-File and Directory structure- Batch command-Indirection –Pipes
WINDOWS:
WINDOWS 95 Visual Tool- Navigating Windows 95-Work on Desktop-Running Programs and Working with Documents-Tips and Ticks for Mastering Windows 95- Tips for copying, Moving and Deleting files.

UNIT-II
Introduction- Number system-Digital Devices.
(Chapter 1,2 and 3 of text book 1)
UNIT-III
Logic Design-Central Processing Unit.
(Chapter 4 and 5 of text book 1)
UNIT- IV
Memory-Input/Output devices
(Chapter 6 and 7of text book 1)

TEXT BOOK:

1. Computers Fundamentals,Archtecture and Organization-By B.Ram
2. Windows Made Easy-By Tom Sheldon
3. Peter Norton's guide- By Peter Norton

LAB WORK:
1. MS DOS
2. MS WINDOWS
3. MS WORD
4. MS EXCEL
5. MSACCESS

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

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –III
PAPER – V (Elective)
Paper Code : M3OP5(2)
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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M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –III
PAPER – V (Elective)
Paper Code : M3OP5(3)
OFFICE AUTOMATION AND C – LANGUAGE

UNIT – I

MS-Office, MS-Word – Basics – Header – Footer – Tables – Graphics – Templates – Macros.

MS-Excel – Worksheet – Formatting – Functions – Charts – Graphs – Worksheets and Data Strings.

(Textbook 1)

UNIT – II

Overview of C, Constants, Variables and Data types, Operators and Expressions, Managing Input and Output operations.

(Chapters 1,2,3 and 4 of Textbook 2)

UNIT – III

Decision making and Branching, Decision Making and Looping, Arrays, Handling Character Strings, User Defined Functions.

(Chapters 5,6,7 8 and 9 of textbook 2)

UNIT – IV

Structures and Unions, Pointers, File Management in C.

(Chapters 10 11 and 12 of textbook 2)

TEXTBOOK:

1.Working in MS-Office – By Ron Mansfeild, Tata McGrawHill.

2. Programming in ANSI C, Third Edition– by E.Balagurusamy, Tata McGraw-Hill

REFERENCE : MS-OFFICE For everyone – Sanjay Saxena – Vikas Publication.

Computer Lab Work

1. Prepare Curriculum Vitea of a student.
2. Mail Merge.
3. Create graphs(Line, Pie and Bar) in Excel
4. Simple macros in Excel.
5. Program to print Biggest of 3 given numbers.
6. Program to print sum of N given numbers.
7. Program to check whether the given number is palindrome or not.
8. Implement functions to find whether a given number is prime or not.
9. Program to find the n^{th} Fibonacci number using recursion.
10. Program to multiply two matrices
11. Program to check whether the given string is palindrome or not.
12. Program to sort a given string.
13. Create a file of student records .
14. Program to swap two numbers using pointers.
15. Program to read student records (name, roll, m1,m2,m3) as structure and sort according to name.
16. Program to copy contents of one file to another file.

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

U N I T – I

BANACH SPACES
The definition and some Examples, Continuous Linear Transformations, The Hahn-Banach Theorem, The Natural imbedding of N in N**

U N I T –I I

The Open Mapping Theorem, The Conjugate of an Operator.
Hilbert Spaces: The Definition and some Examples, Orthogonal Complements.

U N I T – III

Orthonormal Sets, The Conjugate Space H*. The Adjoint of an Operator, The Self-Adjoint Operators.

U N I T – IV

Normal and Unitary Operators, Projections, The Spectral Theorem.

TEXT BOOK :
Introduction to Topology and Modern Analysis- By G.F. Simmons.

REFERENCE BOOK:
1. Functional Analysis-By G. Backmenn and Narici
2. Functional Analysis- By P.K. Jain IP, Ahuja and Khalil Ahmed.
3. Introductory Functional Analysis with Applications – By E. Kreyszig.
4. Functional Analysis – By B.V. Limaye.
5. A First Course in Functional Analysis- By G. Goffman and G. Pedick Prentice Hall of India.

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –IV
PAPER – II
Course No.: M4CP2
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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M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –IV
PAPER – III
Course No. : M4CP3
GRAPH THEORY

U N I T – I

Relations and Digraphs

Relations and Digraphs – Special Properties of Binary Relations – Equivalence Relations – Ordering Relations – Lattices and Enumerations – Paths and Closures – Directed Graphs and Adjacency Matrices

U N I T –I I

Graphs

Basic Concepts – Isomorphism and Subgraphs – Trees and their properties – Spanning Trees – Directed Trees – Binary Trees – Planar Graphs.

U N I T – III

Multigraphs

Euler's Formula – Konigsberg Seven Bridges problems – Multigraphs – Euler Circuits – Hamiltonian Graphs – Chromatic Numbers – The Four–Colour Problem.

U N I T – IV

Net works flows

Graphs as Models of Flow of Commodities – Flows – Maximal Flows and Minimal cuts- The Maxflow Min- Cut Theorem – Applications – Matching and Hall's Marriage Theorem.

TEXT BOOK :

Discrete Mathematics for Computer Scientists and Mathematicians By J.L. Mott. A. Kandle, P.Bakes.

REFERENCE BOOKS :

1. A First Book at Graph Theory – By John Clark and Derek Allan Hotton.
2. Discrete Mathematical Structures & Graph Theory – By Rao
3. A Text Book of Graph Theory and its applications – By B. Suryanarayana and G.K. Ranganath.

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –IV
PAPER – IV (Elective)
Paper Code: M4OP4(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.

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –IV
PAPER – IV (Elective)
Paper Code : M4OP4(2)
MATHEMATICAL THEORY OF WAVES

UNIT – I

Wave Phenomena, Examples of waves, Traveling waves, Wave fronts and pulses, wave trains and dispersion, D'Alembert 's solution of the wave equation, A semi-infinite string with fixed end. A semi-infinite string with free end. Domain of dependence and range of influence, Characteristics and solutions of the wave equation, Solutions of the semi-infinite problem. Conservative Laws: Conservation law, Constitutive equations, Diffusion, Trafic flow. (Chapter 1,4,8-10,15-16 of Text Book 1)

UNIT – II

The method of Characteristics: Advection equation, Non-homogeneous advection equation, General linear conservation laws, Nonlinear conservative laws, Gradient Catastrophe, Breaking time. Shock Waves: Piecewise smooth solutions of a conservation law. Shock wave solutions of a conservation law. Traffic at a Red Light: An initial value problem, Shock wave solution. (Chapter 17 – 20 of Textbook 1)

UNIT – III

Shock waves and the viscosity Method: Another model of Traffic flow, Traveling wave solutions of the new model. Viscosity. Rarefaction waves: An example of a rarefaction wave, Stopped traffic at a green light. An example with Rarefaction and shock waves:
Non-unique solutions and the entropy condition. Non-uniqueness of piecewise smooth solutions, The entropy condition. Weak solutions of conservation laws: Classical solutions. The weak form of a conservative law. (Chapter 21-25 of Text Book 1)

UNIT – IV

Continuous solutions, kinematics waves, shock waves, shock structure, weak shock waves, breaking condition, note on conservation laws and weak solutions, shock fitting:quadrature single hump, N wave, periodic wave confluence of shocks. shock fitting :general. Note on linearized theory. The signaling problem. Damped waves. waves produced by a moving source (Chapter 2 of Text Book 2)

Text-Books: 1. An Introduction to the Mathematical theory of Waves by - Roger Knobel, American Mathematical Society.
2. Linear and Nonlinear Waves - By G.B.Whitham, Wiley - Interscience

Reference Books: 1.Shocks Waves and Reaction-Diffusion equations (page 239-367) by Joel Smoller, Springer-Verlag.
2.Partial Differential equations (page 136-166) by L.C.Evans, Americal Mathematical Society

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –IV
PAPER – IV(Elective)
Paper Code : M4OP4(3)
THEORY OF ORDINARY DIFFERENTIAL EQUATIONS

U N I T – I

System of Linear Differential Equations: Introduction system of First order Equations, Existence and Uniqueness theorem, Fundamental Matrix, Non Homogenous Linear System - Systems with Constant Coefficients – Linear Systems with Periodic Co-efficient

(Sec. 4.1 to 4.7 of Text book)

U N I T –I I

Existence and Uniqueness of Solutions : Introduction, Preliminaries, Successive Approximations, Picard's Theorem, Non Uniqueness of Solutions , Continuation and Dependence on initial conditions - Existence of Solutions in the large - Existence and Uniqueness of Solutions of Systems.

(Sec. 5.1. to 5.8 of Text book)

U N I T – III

Behavior of Solutions of linear Differential Equations : Introduction, n^{th} order, Elementary Critical Points, Critical Points of Non-Linear system, Linear Systems with Constant-coefficient, Linear Systems with variable Co-efficient, Second Order Linear Differential Equations .

(Chap-5 & 6 of Text book)

U N I T – IV

Stability Non-Linear systems : Introduction, Stability of Quasi- Linear Systems, Stability of Autonomous Systems, Stability of Non- Autonomous Systems - A special Lyapanov Function

(Sec. 9.1 to 9.5 of Text book)

TEXT BOOK :
Ordinary Diff. Equations and Stability Theory – By S.G. Deo. & V. Ragvendra & V. Laxmi Kantham.

KAKATIYA UNIVERSITY
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SEMESTER –IV
PAPER –IV (Elective)
Paper Code No. : M4OP4(4)
OPERATIONS RESEARCH-II

Unit- I
Theorey of Games
Chapter 11 of Text book 1

Unit II
Replacement and Maintenance models
Chapter 16 of text boo 1

Unit III
Dynamic Programming
Chapter 21 of text book 1)

Unit- Iv
Non linear programming methods
Chapter 23 of text book 1

Text book 1:
Operations Research theory and applications : J.K.Sharma, Macmillan,

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SEMESTER –IV
PAPER –IV (Elective)
Paper Code No. : M4OP4(5)
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.

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –IV
PAPER –V (Elective)
Paper Code :M4OP4(6)

NEAR -RINGS

U N I T – I

THE STRUCTURE OF NEAR –RINGS

Near-ring, the Near-Ring of all mappings on a group G , the Near-Ring of all zero respective mappings on G , Sub-Near-Ring, Abelian Near-Ring, Commutative Near-Ring, Zero Near-Ring, Zero Symmetric Near-Ring, Constant Near-Ring, Trivial Zero Symmetric Near-Ring, and Trivial Constant Near-Ring. Near-ring homomorphism and isomorphism. Ideal (left,right) of a Near-Ring. Quotient Near-Ring, Natural homomorphism associated with an Ideal, Kernel of homomorphism. R-sub group (left,right) of a Near-Ring R. Simple Near-Ring.

(Articles 1.1 to 1.40 of chapter 1 of the text book)

U N I T – II

NEAR-RING MODULES

R-module, Faithful representation, Centralizer Near-Ring, The right regular representation of a Near-Ring. R-sub module. Unital R-module, R-module homomorphism and isomorphism, Quotient R-module. Annihilator of a subset.

(Articles 2.1 to 2.37 of the text book)

U N I T –III

PRIMITIVE NEAR-RINGS

Momogenic Near-Ring ,R-module of type 0 , R-module of type 1, R-module of type 2. V-primitive Near-Ring. the Stabilizer.

(Articles 3.1 to 3.37 of the text book)

U N I T – IV

MORE ON 2-PRIMITIVE NEAR-RINGS

Rank, Projection, Minimal condition, Maximal condition. DCCS,DCCR.DCCI,ACCR, ACCI.

(Articles 4.1 to 4.28 of the text book)

TEXT BOOK :

NEAR-RINGS AND THEIR LINKES WITH GROUPS –BY J.D.P.MELDRUM.

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –IV
PAPER –V (Elective)
Paper Code :M4OP4(7)
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"

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –IV
PAPER –V (Elective)
Paper Code :M4OP4(8)
ADVANCED ANALYSIS

1. General Measure and Integration.

UNIT – I:

Measure spaces, measurable functions, integration; General convergence theorems
(Sec 11.1-11.4 of text book 1)

UNIT-II:

Signed measures, The Radon-Nikodym theorem, The Lp-spaces .Outer measure and measurability.
(Sec 11.5-11.7 ,12.1 of text book 1)

2. Advanced Complex Analysis.

UNIT-III:

Conformal mapping:
Definition, linear fractional transformations, cross ratio, symmetry.
The Transformations $W = \sin z$ and $W = \cos z$.
Harmonic Functions:
Definition of harmonic functions, harmonic functions and analytic functions, harmonic functions on a disk. Construction of harmonic function on a disk.
(Sec 9.1-9.4, 10.1-10.4 of text book 2)

UNIT-IV:

Some Physical Applications of Conformal mapping.
Metric on $C(G,\Omega)$, spaces of analytical functions, Weirstrass factorization theorem, Mittag-Leffler theorem
(Sec 10.5, 11.1-11.3 of text book 2)

Text Books:

1. Real Analysis, H.L Royden.
   Prentice- Hall of India, Pvt Ltd , EEE.
2. The Elements of Complex Analysis. B.Choudhary, New Age International Pvt Ltd.

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –IV
PAPER – V (Elective)
Paper Code : M4OP5(1)
PROGRAMMING METHODOLOGY

U N I T – I

Algorithms – Data-Data types and primitive operations – Variables and Expressions - From Algorithms to Programs Decisions Structures – Looping – Use of Compound conditions – Case Statement Applications

U N I T – II

Sub Algorithms – Argument – Parameter Correspondence – Recursive Subalgorithms – Applications composite Date Structures One- Dimensional Arrys – Sorting and Searching with Vectors – Application of Vectors.

U N I T –III

Higher – Dimensional Arrays – Application of Arrays – Files – Linear Data Structures – Linear Lists- Storage Structure Concepts – Sequential Storage Structure for Arrys – Application of Stacks – Queues.

U N I T – IV

Non-Linear Data Structures – Trees – General Trees – Application of Trees- Graphs.

TEXT BOOK :
Introduction to Computer Science – By Trembay and Bunt.

LAB WORK :
Simple programs in C on the above Structures
PATTERN OF LAB TRAINING.
The total number of students are made into batches. The number of students in each batch should not more than students and each batch should be handled by two teachers

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –IV
PAPER – V (Elective)
Paper Code : M4OP5(2)

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.

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –IV
PAPER – V (Elective)
Paper Code : M4OP5(3)

DATASTRUCTURES USING C

UNIT-I
Stack- Definition and Examples- Representing Stacks in C- Infix Postfix conversions
Queues- Queue and its sequential representation.
(Chapter 2.1, 2.2, 2.3, 4.1 of the text book)

UNIT-II

Lists in C –Linked Lists- Doubly Liked lists-Stacks and Queues as circular Lists.
Chapter 4.2, 4.3, 4.5 of the text book)

UNIT-III

Trees-Binary Tree representation –Representing lists as Binary Trees-trees and their Applications.
Sorting-Bubble Sort, Insertion Sort (Simple), Merge Sort.
Chapter 5.1, 5.2, 5.4, 5.5, 6.3, 6.4, 6.5 of the text book)

UNIT-IV
Searching-Linear Search (sequential), Binary Search.
Graphs and their Applications- Linked representation of graphs –Graph Traversal and Spanning Forest-Methods DFS, BFS
(Chapter 7.1, 8.1, 8.3, 8.4 of the text book)

TEXT BOOK:
Data structures Using C and C++, Yedidyah Langsam, Moshe J . Augestine and Aaron M. Tenenbaum-Prentice Hall of India Pvt Ltd.

Reference Books:

Introduction to Computer Science-By Trembay and Bunt

List of Practical:

1. Implementing push and pop Operations.
2. Converting an Expression from Infix to Postfix
3. Implementation of Queue (Insertion).
4. Implementation of Queue (Deletion).
5. Insert and Delete an element from a list
6. Linked List creation
7. Circular List creation
8. Doubly List creation
9. Creation of Binary Tree
10. Finding K^{th} element and deleting it
11. tree traversal(Pre order, post order in order)
12. Sorting (Bubble Sort Insertion Sort , Merge Sort) any one
13. Searching an element –Linear Search
14. Searching an element –Binary Search
15. Breadth First Search
16. Depth First Search

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2012-14)
SEMESTER –III
PAPER –V (Elective)
Paper Code : M4OP5(4)
APPLIED STOCHASTIC PROCESS WITH MAT LAB

THEORY (60 Marks)

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

2. Stochastic Process - J.Medhi,- Second Edition, Wiley Eastern Limited
3. 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.