The Principals of University and Affiliated Colleges offering M.Sc. Mathematics & Applied Mathematics courses
KAKATIYA UNIVERSITY


Ref:- Lr. No. 63/M/UC/KU/2016, dated 25th July, 2016 of the Chairperson, Board of Studies in Mathematics, KU.

Sir,

I am to inform you that in pursuance of the decision taken by the Standing Committee of the Academic Senate at its 2nd meeting held on 3rd August, 2016, the Vice-Chancellor has accorded approval to implement the revised syllabus of M.Sc. Mathematics & Applied Mathematics for I, II, III and IV semesters under Choice Based Credit System during the academic year 2016-2017 onwards.

A copy of the syllabus is available at the University Website www.kakatiya.ac.in. The same may be brought to the notice of the students and the staff concerned.

Yours faithfully,

[Signature]

REGISTRAR

Encl.: As stated.

Copy to:
1. The Dean, Faculty of Science, KU
2. The Chairperson, Board of Studies in Mathematics, KU
3. The Controller/Addl. Controller of Examinations (PG/ConfIdl.), KU
4. The Director, Campus Network/Website, KU with a request to place the revised syllabi on the website.
5. The Secretary to the Vice-Chancellor, KU
6. The P.A. to Registrar, KU
7. The SF.
# KAKATIYA UNIVERSITY
M.A/M.Sc (MATHEMATICS)
Semester I/II/III/IV
Scheme of Instruction and Examination
(With effect from 2016-2018 batch)

## SEMESTER-I

<table>
<thead>
<tr>
<th>Paper</th>
<th>Code of The paper</th>
<th>Title of The paper</th>
<th>No. of Periods (1 hr duration) per week</th>
<th>Internal Assessment Marks</th>
<th>Semester End Exam Marks</th>
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## SEMESTER-II

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<td>Applied Stochastic process with MATLAB</td>
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<td>20</td>
<td>60 20 100</td>
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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 2016-18)
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 2016-18)
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 2016-2018)
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.
UNIT I

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

UNIT II

Group Action on A set : The notation 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.
(Sec 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].
(Sec 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.
(Sect 45,46,47 of Text Book 2)

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

Reference Books:
   Student edition
2. Topics in Algebra by I.N Herstein
UNIT I
Metric Spaces: Limit points – Closed sets – Open sets – Perfect Sets – Bounded Sets – Closure of a set - Compact sets – Connected sets.
Numerical sequences in metric spaces: Subsequences – Cauchy sequence – Diameter of a set – Definition of complete metric space.
Continuous functions in metric spaces: Characterization of continuity in terms of open sets and closed sets, Continuity and Compactness.
(Sec 2.15, 2.16, 2.18 - 2.38, 2.44 – 2.47, 3.1, 3.2, 3.5, 3.6(a), 3.7 – 3.11(a), (b), 3.12, 4.5 – 4.8, 4.13, 4.14, 4.18, 4.19, 4.22 of Text Book)

UNIT II
The Riemann-Stieltjes Integral: Definitions of partition – Refinement of partition and RS-Integral, Necessary and Sufficient condition for integrability, Integral as a limit of a sum.
Integrability of continuous, Monotonic, discontinuous and composite functions.
(Sec 6.1 – 6.17, 6.19 of Text Book)

UNIT III
Sequences and Series of Functions: Pointwise and Uniform Convergence - Cauchy criterion for uniform convergence – Weirstrass \( M_n \) – test – Uniform convergence and Continuity – Uniform convergence and Integrability – Uniform convergence and differentiability - Equi continuous families of functions
(Sec 7.1 – 7.14, 7.16 – 7.25 of Text-book)

UNIT IV
Weirstrass approximation theorem – Definition of uniformly closed algebra – Stone’s generalization of the Weirstrass theorem.
(Sec 3.38 – 3.40, 7.26 – 7.32, 8.1 – 8.5 of Text-book )

Text Book:
Principles of Mathematical Analysis by Walter Rudin, McGraw – Hill, 3rd Edition

Reference books:
1. Mathematical Analysis by S.C.Malik and Savita Arora, S.Chand, 4th Edition
UNIT I

(Sec 3.1 to 3.6 of Text Book 1)

UNIT II

(Sec 5.4 to 5.5 of Text Book 1 and Sec 15.10 to 15.12 of Text Book 2)

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
(Chapter 8: Sec 8.1 to 8.14 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
   Prentice-Hall of India Pvt. Ltd.
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
UNIT I


(See 1.5, 1.6, 1.7, 1.8 up to De Morgan Laws, 1.9 of Text Book 1)

UNIT II

Enumerating combinations and permutations with repetitions - Enumerating permutations with constrained repetitions - The principle of inclusion and exclusion.

(See 2.1 to 2.5, 2.8 of Text Book 1)

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.

(See 3.1 to 3.6 of Text Book 1)

UNIT IV

Boolean Algebras: Boolean algebras - Boolean polynomials - Disjunctive and Conjunctive normal forms - Black Box method - Switching circuits and applications

(See 8.1 to 8.4 of Text Book 2)

Text Book:


Reference Books:

1. Discrete Mathematical structures by Roden.
2. Discrete Mathematics by Kolman.
5. Mathematical Foundation of Computer Science by Bhavanari Satyanarayana, Pradeep Kumar TV, Mohiddin Shaw, B S Publications
UNIT I
Moments–Pearson’s $\beta$ and $\gamma$ coefficients -Skewness and Kurtosis
(Chapter 2, 3, 4.2, 5.1 to 5.5.5 of Text Book)

UNIT II
(Chapter 6.1 to 6.6.1, 7.1, 7.1.2, 7.5,10.1 to 10.4.2, 11.1 to 11.2.3 of Text Book)

UNIT III
(Chapter 8.1 to 8.4.1, 8.4.4 to 8.4.7, 8.5, 8.5.2, 8.5.3, 8.5.5, 8.5.8, 8.7 to 8.7.3 of Text Book)

UNIT IV
(Chapter 9.1, 9.2, 9.2.2 to 9.2.5, 9.2.7 to 9.2.11, 9.5, 9.5.1, 9.5.3, 9.8, 9.8.1 of Text Book)

Text Book:
UNIT I

Algebraic Extensions of Fields: Adjunction of roots - Algebraic extensions - Algebraically closed fields.
(Chapter 15: Sect 2, 3, 4 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.
(Chapter 18: Sec 1, 2, 3 of the Text Book )

Text-Book


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.
UNIT I

Fourier Series: Definition of Fourier Series and orthogonal systems of functions – Minimum property of partial sums – Bessel’s inequality – Dirichlet kernel – A theorem on point wise convergence of Fourier Series – Perseval’s theorem – Fezer theorem and Point wise version of Fezer theorem(In Exercise 12-16 Problems)
(Chapter 8: Sec 8.9 to 8.14, 8.16 of Text Book 1)
Improper Integrals – I: Convergence at the left and right end – Convergence at both the end point – General case – Convergence at $\infty$ and $-\infty$ - General case – The necessary and sufficient condition for the convergence of the improper integral $\int_{a}^{\infty} f(x)dx$ - Comparison test – A useful comparison integral – Convergence of Beta function – General test for convergence – Absolute convergence
(Chapter 9: Sec 9.1 to 9.5 of Text Book 2)

UNIT II

Improper Integrals – II: Convergence of $\int_{a}^{\infty} f(x)dx$ - A useful comparison integral – Convergence of Gamma function – General test for convergence – Absolute convergence – Abel’s and Dirichlet’s theorems
(Chapter 9: Sec 9.6 to 9.9.2 of Text Book 2)

UNIT III

Functions of Several Variables – I: Definition of Limit and Continuity of real valued functions – Intermediate value theorem – Convex sets – Partial derivatives – Existence of directional derivatives – Mean value theorem
Differentiability: Necessary and sufficient condition for differentiability – Partial derivatives of higher order
(Chapter 12, Chapter 13: Sec 13.1 to 13.6 of Text Book 2)

UNIT IV

Functions of Several Variables – II: Schwarz’s and Young’s theorem - Taylor’s theorem – Extreme values
Invertible and Implicit Functions: Definition of locally invertible transformations – Jacobian of transformation – Linear transformations – Statement of inverse function theorem – Implicit function theorem for the case of two variables and its applications for the existence of unique solutions of equations
(Chapter 13: Sec 13.6.1, 13.7 to 13.9, Chapter 14 of Text Book 2)
Integrals as Functions of a Parameter: Definite integral as function of a parameter –
Theorems on continuity and inversion of differentiation and integration – Limits of
integration as functions of y – Inversion of the order of integration - Uniform convergence of
improper integrals – Test for uniform convergence – Inversion of the order of integration -
Interchange of differentiation and integration
The Gamma Function: Definition of Gamma function and its properties – Beta function and
its connection with Gamma function
(Chapter 15 of Text Book 2, Chapter 8: Sec 8.17 to 8.21 of Text Book 1)

Text Book:
1. Principles of Mathematical Analysis by Walter Rudin, MgGraw Hill.
2. A Course of Mathematical Analysis by Shantinarayan and Mittal, S.Chand
Publications

Reference Books:
1. Mathematical Analysis by Tom Apostle, TMH
2. Principles of Real Analysis by S.C.Malik and Savitha Arora, Newage International
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 : Sec 16 to 20 of the Text Book)

UNIT II

(Chapter 4 : Sec 21 to 24 of Text Book)

UNIT III

Separation: T₁-Spaces and Hausdorff spaces - Completely regular spaces and normal spaces - Statements of Uryshon’s lemma and Tietz-extension theorem.
(Chapter 5 : Sect 26 to 28 of Text Book)

UNIT IV

(Chapter 6 : Sec 31 to 33 of Text Book)

Text Book:

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

Reference Books:

4. Elements of General Topology by S.T. HU, Holden day Inc.;
UNIT I
Origin of complex numbers – Basic algebraic properties – Different types of representations
– Conjugates – Modulus – Roots of complex numbers – Regions in complex plane
(Sec 1 to 11 of Text Book)
(No question is to be set from this part)
Functions of complex variable – Limits – Continuity – Derivatives – Differentiation formulas
– Cauchy-Riemann equations – Sufficient condition for differentiability – Polar coordinates
(Sec 12, 15, 16, 18, 19, 20, 21, 22, 23 of Text Book)

UNIT II
Analytic functions – Harmonic functions – Derivatives of functions W(t) – Definite integrals
W(t) – Contours – Contour integrals – Upper bounds for moduli of contour integrals – ML
inequality – Anti derivatives – Cauchy-Goursat theorem – Simply and Multiply connected
domains
(Sec 24, 25, 26, 37, 38, 39, 40 to 49 of Text Book)

UNIT III
Cauchy integral formula – An extension of the Cauchy integral formula – Some
consequences of the extension – Liouville’s theorem – Fundamental theorem of algebra –
Maximum modulus principle – Convergence of sequences – Convergence of series – Taylor
series – Laurent series – Isolated singular points – Residues – Cauchy Residue theorem
(Sec 50 to 63, 68, 69, 70 of Text Book)

UNIT IV
The three types of isolated singular points – Residues of Poles – Examples – Zeros of analytic
functions(Theorem 1 only) – Zeros and Poles – Behaviour of functions – Near isolated
singular points – Evaluation of improper integrals - Argument principle – Roche’s theorem –
Examples
(Sec 72 to 79, 86 to 87 of Text Book)

Text Book:

Reference Books:
UNIT I

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 – Beltrami’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: Sec 9.1 to 9.3, 9.8 to 9.10, 9.13 to 9.19 of Text Book)

UNIT II

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 – Bessel’s function of the second kind of order \( n \) – Recurrence relations – Generating function for Bessel’s function \( J_n(x) \) – Orthogonality of Bessel’s function – Bessel’s series or Fourier Bessel expansion of \( f(x) \).

(Chapter 11: Sec 11.1 to 11.5, 11.6A, 11.7, 11.7A, 11.7B, 11.8, 11.10, 11.11A of Text Book)

UNIT III

Hermite’s equation and its solution – Hermite polynomial of order \( n \) – Generating function for Hermite polynomials – Alternative expressions for the Hermite polynomials – Hermite polynomials \( H_n(x) \) for some special values of \( n \) – Evaluation of values of \( H_{2n}(0) \) and \( H_{2n+1}(0) \) – Orthogonality properties – recurrence relations

(Chapter 12 of Text Book)

UNIT IV

Laguerre’s equation and its solution – Laguerre polynomial of order (or degree) \( n \) – Alternative definition of Laguerre polynomial of order (or degree) \( n \) – Generating function for Laguerre polynomials – Alternative expression for the Laguerre polynomials – First few Laguerre polynomials – Orthogonal properties of Laguerre polynomials – Expansion of a polynomial in a series of Laguerre polynomials – Relations between Laguerre polynomials and their derivatives.

(Chapter 13 of Text Book)

Text Book:

1. Advanced Differential Equations- M.D. Raisinghania
UNIT I

Algebra of sets – Borel sets
(See 1.4, 2.7, Chapter 3: Sec 1 to 4 of the Text Book)

UNIT II

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 to 6 and Chapter 4: Sec 1 to 2 of the Text Book)

UNIT III

(Chapter 4: Sec 3 to 4 of the Text Book)

UNIT IV

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

Text Book:
Real Analysis by H.L.Royden, PHI, 3rd Edition

Reference Books:
2. An Introduction to Measure and Integration by Inder K. Rana, Narosa Publications.

M3CP2

KAKATIYA UNIVERSITY
M.A. / M.Sc. MATHEMATICS Syllabus(w.e.f. 2016-18)
Semester –III
Paper –II
Paper Code: M3CP2
FUNCTIONAL ANALYSIS

UNIT I
Banach Spaces: The definition and some Examples - Continuous Linear Transformations - The Hahn-Banach Theorem - The Natural imbedding of N in N**

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

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

UNIT IV
Normal and Unitary Operators – Projections - The Spectral Theorem.

Text Book:
Introduction to Topology and Modern Analysis by G.F. Simmons.

Reference Books:
1. Functional Analysis by G. Backmenn and Narici
3. Introductory Functional Analysis with Applications by E. Kreyszig.
UNIT I

UNIT II

UNIT III

UNIT 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


Reference Books:
1. Elements of partial Differential Equations by I.N. Sneddon

M3OP4(1)

KAKATIYA UNIVERSITY
M.A./M.Sc. MATHEMATICS Syllabus (w.e.f.2016-18)
Semester –III
Paper –IV (Elective)
Paper Code: M3OP4(1)
OPERATIONS RESEARCH - I

UNIT I


UNIT II


UNIT III


UNIT IV


Text-Book:


Reference Books:

2. Linear programming methods and applications by Gass. S.I
UNIT I


UNIT II


UNIT III


UNIT IV


Text Book:

UNIT I
Mathematical Preliminaries: Sets, relations and functions – Graph – 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 to 1.4 and Chapter 2: Sec 2.1 to 2.2 of Text Book)

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 to 2.9 of Text Book)

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 to 3.6 of Text Book)

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 to 4.6 of Text Book)

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

Reference Books:
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
UNIT I:
Harmonic Functions: Harmonic functions – Borel-Carathodary theorem – Poisson’s integral formula – Positive harmonic functions – Harnack’s functions – Harnack’s inequality – Harnack’s principle
(Chapter 10: Sec 10.1 to 10.3 of Text Book)

UNIT II:
Conformal mappings and Bilinear transformations: Introduction – Conformality theorem – Bilinear transformations – Special bilinear transformations – Exponential and trigonometric transformations – Normal families – Montel’s theorem and Riemann mapping theorem(Statement only)
(Chapter 11 of Text Book)

UNIT III:
Univalent functions: Definition of univalent functions and elementary properties – Area theorem – Coefficient conjectures – Coefficient estimates – Growth and distortion theorems – Function with positive real part
(Chapter 12 of Text Book up to theorem 12.8)

UNIT IV:
(Chapter 12: Sec 12.2 , Chapter 13: Sec 13.1, 13.2 of Text Book)

Text Book:
Complex Variables by H.Silverman

Reference Books:
1. Complex Variables Theory and Applications by H.S.Kasana
2. Univalent Functions by P.C.Duren
3. Univalent Functions by A.W.Goodman(Vol I & II)
UNIT I

Modules – Homomorphisms - Exact Sequences- Free modules – Vector spaces
(Chapter 4: Sec 1 & 2 of Text Book)

UNIT II

Projective Modules – Injective Modules – Hom & Duality
(Chapter 4: Sec 3 & 4 of Text Book)

UNIT III

Chain Conditions – Prime and Primary Ideals
(Chapter 8: Sec 1 & 2 of Text Book)

UNIT IV

Primary Decomposition - Noetherian Rings and Modules – Krull Intersection Theorem – Nakayamma lemma- Hilbert Basis Theorem.
(Chapter 8: Sec 3 & 4 of Text Book)

Text Book:

Algebra by Thomas Hungerford.
UNIT I

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)
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

(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

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

Text Book:
1. Vector Analysis (For Unit-I, a) Introduction to Tensors) – Murray R Spiegel, Schaum’s Series.

Reference Books:
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 Text Book 1)

UNIT II
Constants – Variables – Data types – Operators – Expressions – Managing input and output operations
(Chapter 2, 3, 4 of Text Book 2)

UNIT III
Decision making and branching – Decision making and looping – Arrays - User defined function
(Chapters 5, 6, 7, 9 of Text Book 2)

UNIT IV
Structures and unions – Pointers - File management in C.
(Chapters 10, 11 and 12 of Text Book 2)

Text Book:
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 its contents.

Board of Studies in Mathematics, Kakatiya University
M3OP5(2)

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2016-18)
Semester –III
Paper – V (Elective)
Paper Code: M3OP5(2)
OFFICE AUTOMATION AND C – LANGUAGE

UNIT I
( Text Book 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 Text Book 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 Text Book 2)

UNIT IV
Structures and Unions – Pointers - File Management in C.
(Chapters 10, 11 and 12 of Text Book 2)

Text Book:

Reference Book:
MS-OFFICE For everyone by Sanjay Saxena, Vikas Publication.
Computer Lab Work

1. Prepare Curriculum Vitea of a student.
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\textsuperscript{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.
UNIT I

(Chapter 2: Sec 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
(Chapter 3: Sec 3.1, 3.2, 3.3, 3.4, 3.5, 3.11 and 3.12 of the Text Book)

UNIT III

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.
(Chapter 4: Sec 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.
(Chapter 5: Sec 5.1, 5.2, 5.6, 5.7, 5.9, 5.10 and 5.11 of the Text Book)

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

1. Solution of system of $n \times n$ linear equations $AX=B$ using Gauss Elimination method.
2. Finding solution of $n \times n$ linear equations $AX=B$ using LU decomposition method.
4. Finding the largest Eigen value in magnitude and the corresponding Eigen vector of an $n \times n$ matrix $A$ by Power method.
5. Lagrange 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.
14. Solution of equation by Mullar method.

Text/Reference Books:

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 3.1 to 3.7 of the Text Book)

UNIT II

Elementary Canonical forms: Characteristic Values - Annihilating Polynomials - Invariant Subspaces – Simultaneous Triangulation – Simultaneous Diagonalization
(Chapter 6: Sec 6.1 to 6.5 of the Text Book)

UNIT III

Direct-sum Decompositions - Invariant Direct sums - The primary Decomposition theorem
The Rational and Jordan Forms: Cyclic Subspaces and Annihilators - Cyclic Decompositions and rational form - Cyclic Decomposition Theorem (without proof) - The Jordan Form
(Chapter 6: Sec 6.6 to 6.8, Chapter 7: Sec 7.1 to 7.3 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 to 10.4 of the Text Book)

Text Book:


Reference Books:

2. Linear Algebra by H.Friedberg etal, PHI(2007)
3. Linear Algebra by Lipschitz, Schaum Series.
UNIT I

(Chapter 13: Sec 13.1 to 13.4 of Text Book)

UNIT II

Trees – Fundamental Circuits – Cut-Sets and Cut-Vertices
(Chapter 13: Sec 13.5 to 13.7 of Text Book)

UNIT III

Planarity, Colouring and Partitioning: Planar graphs and Dual graphs – Colouring and Partitioning
(Chapter 14: Sec 14.1 to 14.2 of Text Book)

UNIT IV

Some algebraic aspects of graphs: Vector space of a graph – Matrix representations of graphs
Directed graphs: Introduction – Representation of a binary relation as a graph – Directed hypercubes – Properties of a directed graph
(Chapter 15: Sec 15.1 to 15.2, Chapter 16: Sec 16.1 to 16.3 of Text Book)

Text Book:


Reference Books:

UNIT I

(See 1.1 to 2.4 of Text Book 1)

UNIT II

(See 2.5 to 2.9, 3.1, 3.2, 3.14, 4.1, 4.4, 5.6, 5.7, 5.8 of Text Book 1)

UNIT III

(Chapter 1, Chapter 2: Sec 2.1 to 2.15, Chapter 3: Sec 3.1 to 3.4, Chapter 4 of Text Book 2)

UNIT IV

(Chapter 6: Sec 6.1 to 6.15, 6.17, 6.18, 6.19, Chapter 7: Sec 7.1 to 7.4, 7.6, 7.7, 7.9, Chapter 8 of Text Book 2)

Text Book:
1. Integral Equations by Shanty Swarup
2. Integral Transforms by A. R Vasistha and R.K. Gupta
UNIT I


(Chapter 1: Sec 1.1 to 1.40 of the Text Book)

UNIT 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.

(Chapter 2: Sec 2.1 to 2.37 of the Text Book)

UNIT III


(Chapter 3: Sec 3.1 to 3.37 of the Text Book)

UNIT IV


(Chapter 4: Sec 4.1 to 4.28 of the Text Book)

Text Book:

Near-Rings and their links with groups by J.D.P.Meldrum.
KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2016-18)
Semester –IV
Paper – IV (Elective)
Paper Code: M4OP4(2)
THEORY OF ORDINARY DIFFERENTIAL EQUATIONS

UNIT I
(Chapter 4: Sec 4.1 to 4.7 of Text Book)

UNIT II
(Chapter 5: Sec. 5.1. to 5.8 of Text Book)

UNIT III
Behavior of Solutions of linear Differential Equations : Introduction - n\text{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,
(Chapter 5 & 6 of Text Book)

UNIT IV
(Chapter 9: Sec 9.1 to 9.5 of Text Book)

Text Book:
Ordinary Diff. Equations and Stability Theory by S.G. Deo, V. Ragvendra and V.Laxmi Kantham.
UNIT I:

Sequencing and Scheduling: Sequencing Problem – The Problem of n Jobs and Two Machines – Problem with n Jobs and m Machines – General Problem of n Jobs and m Machines - Scheduling – Critical Path Determination by CPM – Critical Path Determination by PERT – Optimum Scheduling by CPM. (Chapter 7 of Text Book)

UNIT II


UNIT III

Dynamic Programming – Bellmen’s Optimality Principle – Recursive Relations – Solution of LPP by Dynamic Programming – Dimensionality in Dynamic Programming. (Chapter 5: Sec 5.1 to 5.3 of Text Book)

UNIT IV


Text Book:

UNIT I

(Chapter 1: Sec 1.1 to 1.4 of Text Book)

UNIT II

(Chapter 2: Sec 2.1 to 2.3, 2.5 of Text Book)

UNIT III

(Chapter 3: Sec 3.1 to 3.4 of Text Book)

UNIT IV

(Chapter 4: Sec 4.1 to 4.4 of Text Book)

Text Book:

KAKATIYA UNIVERSITY
M.A./M.Sc. MATHEMATICS Syllabus (w.e.f.2016-18)
Semester –IV
Paper –IV (Elective)
Paper Code: M4OP4(5)
AUTOMATA & MACHINES

UNIT I

UNIT II

UNIT III

UNIT IV

Text Book:
Theory of Computer Science (Automata, languages and Computation) by KLP Mishra and N.Chandrasekhar, Printice Hall of India.
UNIT I
Fundamental concepts in Reliability Engineering – Introduction – General reliability function – General concepts – Hazard rate – reliability function – Bath tub Hazard rate curve – Mean time failure

UNIT II
System Reliability – Series configuration – 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:
Reliability Engineering by L.S. Srinath

Reference Books:
Reliability Engineering by E.Balagurusamy
UNIT 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

UNIT II

Sub Algorithms – Argument – Parameter Correspondence – Recursive Sub algorithms – Applications composite Date Structures One-dimensional Arrays – Sorting and Searching with Vectors – Application of Vectors.

UNIT III


UNIT IV


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.
UNIT I
Input and Output in C++ - C++ Declarative control Structures.
(Chapters 2, 3 and 4 of Text Book)

UNIT II
Functions in C++ - Classes and Objects.
(Chapters 5 and 6 of Text Book)

UNIT III
Constructors and Destructors – Operator Overloading and Type conversion – Inheritance
(Chapters 7, 8 and 9 of Text Book)

UNIT IV
Pointers and Array – C++ and Memory – Binding, Polymorphism and Virtual Functions
(Chapters 10, 11 and 12 of Text Book)

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.
M4OP5(3)

KAKATIYA UNIVERSITY
M.A. /M.Sc. MATHEMATICS Syllabus (w.e.f.2016-18)
Semester –IV
Paper – V (Elective)
Paper Code: M4OP5(3)

APPLIED STOCHASTIC PROCESS WITH MAT LAB

UNIT I
(Sec 2.1, 2.2 & 2.3 of Text Book 1)
(Sec 3.1, 3.2, 3.4, 3.6 of Text Book 1)

UNIT II
(Sec 4.1, 4.2 & 4.5 of Text Book 1)

UNIT III
(Sec 5.1, 5.2 & 5.3 of Text Book 2)

UNIT IV
(Sec 8.1, 8.2, 8.3 & 8.4 of Text Book 1)

Text Book:

Reference Books:
PRACTICALS 

i) Lab Work (MATLAB) 

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: 

1. Getting Started with MATLAB by Rudra Pratap, Oxford University Press. 

ii) Case Studies 

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.