With effect from 2018-2019 Under CBCS

YOGI VEMANA UNIVERSITY COLLEGE :: KADAPA
DEPARTMENT OF APPLIED MATHEMATICS

Name of the Course : Mathematics

(With effect from 2018-2019 Under CBCS)

PAPER CODE	TITLE OF THE PAPER
SEMESTER - I	
15051	MA 101 : Algebra
15052	MA 102 : Real Analysis
15053	MA 103 : Ordinary Differential Equations
15054	MA 104 : Complex Analysis
15055	MA 105 : Numerical Methods
SEMESTER - II	
25051	MA 201 : Topology
25052	MA 202 : Galois Theory
25053	MA 203 : Partial Differential Equations
25054	MA 204 : Advanced Complex Analysis
25055	MA 205 : Fluid Dynamics
25056 Non-Core	**Business Mathematics**
SEMESTER - III	
35051	MA 301 : Functional Analysis
35052	MA 302 : Discrete Mathematics
35053	MA 303 : SemiGroups
Elective I 35054-A 35054-B	MA 304 (A) : Operations Research MA 304 (B) : Coding Theory
Elective II 35055-A 35055-B	MA 305 (A) : 'C' & Data Structures MA 305 (B) : Biomechanics
35056 Non Core	**Mathematics and Applications**
The student has to choose one from each of the Elective I and Elective II	
SEMESTER - IV	
45051	MA 401 : Lebesgue Measure Integration
45052	MA 402 : Graph Theory
45053	MA 403 : Number Theory
Elective III 45054-A 45054-B	MA 404 (A) : Mathematical Statistics MA 404 (B) : Theoretical computer science
Elective IV 45055-A 45055-B	MA 405(A) : Mathematical Modelling MA 405(B) : Fuzzy sets and Fuzzy logic
The student has to choose one from each of the Elective III and Elective IV	

YOGI VEMANA UNIVERSITY COLLEGE :: KADAPA

DEPARTMENT OF APPLIED MATHEMATICS

M.Sc., MATHEMATICS

SYLLABUS

SEMESTER-I

MA 101 :ALGEBRA

UNIT I: Structure Theorems of groups : Conjugacy and G-Sets, Normal series, solvable groups and sylow theorems.

UNIT II: Permutation Groups: Cyclic Decomposition – Alternating group A_n-Simplicity of A_n.

UNIT III :Unique Factorization domains and Euclidean Domains: Unique factorization domains – Principal ideal domains – Euclidean domains polynomial rings over UFD.

UNIT IV Modules: Definition and examples, sub modules and direct sums, R- homomorphisms and quotient modules, completely reducible modules,free modules

Scope and standard as in **"Basic Abstract Algebra"** by P.B. Bhattacharya , S.K.Jain and S. R. Nagpaul, Cambridge University press.

Chapter 5: Section 4 , Chapter 6 : Sections 1 and 2 , Chapter 8 : Section 4, Chapter 7, Chapter 11, Chapter 14: Sections 1 to 5

REFERENCE BOOKS :

1. Topics in Algebra, by I.N. Hierstein .
2. Commutative algebra, by Zariski and Samuel Affiliated East – West Press.

MA102 : REAL ANALYSIS

UNIT I : The Remiann - Steiltjes Integral: Definition and Existence of Integral- Properties of the Integral - Integration and Differentiation-Integration of Vector – valued Function**.**

UNIT II Sequences and Series of Functions: Discussion of Main Problem-Uniform Convergence - Uniform Convergence and Continuity - Uniform Convergence and Integration - Uniform Convergence and Differentiation, Equicontinuous Families of Functions- The Stone - Weierstrass Theorem.

UNIT III Improper Integrals: Introduction - Integration of Unbounded Functions with Finite Limits of Integrations - Comparison Tests for Convergence at a of $\int_a^b f$ dx, Infinite Range of Integration - Integrand as a Product of Functions.

UNIT IV Functions of Several Variables : 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.

1. Scope and Standard as in "**Principle of Mathematical Analysis**" by Walter Rudin's (Third Edition 1976) Mc Graw Hill International Student Edition 1976.
   Chapter 6: Sections 6.01 to 6.25 , Chapter :7 Sections :7.1 to 7.26
2. Scope and Standard as in **"Mathematical Analysis"** By S.C.Malik 1994 of Wiley Eastern limited
   Chapter 11:Sections 1 to 5, Chapter15: Sections 1 to 10.

REFERENCE BOOK:-

1. **"Mathematical Analysis"** By Tom .M .Apostol (Second Edition) Addison Weslay publishing company.

MA 103 : ORDINARY DIFFERENTIAL EQUATIONS

UNIT –I : **Oscillation Theory and boundary value problems**: Qualitative properties of solutions –The Sturm comparison theorem-Eigen values, Eigen functions and the vibrating string.

UNIT – II: **Power series solutions**: Series solutions of first order equations –Second order linear equations-Ordinary points-Regular singular points- Gauss's hyper geometric equation.

UNIT – III: Some special functions of Mathematical Physics : Legender polynomials – properties of Legender polynomials –Bessel functions –The gamma function- Properties of Bessel functions.

UNIT-IV: **The existence and uniqueness of solutions** : The method of successive approximations-Picard's theorem-systems - The second order linear equations.

Scope and standard as in " **Differential Equations with Applications and Historical notes"** by George F. Simmons . (1992) Tata Mc Graw Hill Publications
Chapter 4 :Sections 22 to 24, (excluding Appendices A), Chapter 5: Sections 26 to 30, Chapter 6: Sections 32 to 35, (excluding Appendices), Chapter 11: Sections 55 to 57.

REFERENCES :
1. Advanced Differential Equations, M.D. Raisinghania , S. Chand Publications
2. " Differential Equations" Ross, Shepley L Wieley India Pvt LTD.

MA 104 : COMPLEX ANALYSIS

UNIT I : Differentiation : Analytic Functions : Derivative rules for differentiating complex functions – The Cauchy – Riemann equations – analytic functions – Geometric interpretation of arg $f'(z)$ and $|f'(z)|$- conformal mapping – The mapping $w = \frac{az+b}{cz+d}$- Conformal. Mapping of the extended plane.

UNIT II : Mobius Transformations : The Group property of Mobius transformations – The circle preserving property of Mobius transformations – Fixed points of a Mobius transformation – Invariance of cross ratio- Mapping of a circle onto a circle – symmetry transformations.

UNIT III : Complex Integrals : Cauchy integral theorem : Rectifiable curves – complex integrals – The case of smooth curves – Cauchy's integral theorem – The Key lemma-Proof of Cauchy's integral theorem – Application to the Evaluation definite integrals – Cauchy's integral theorem for a system of Contours.

Cauchy's Integral formula and its Implications: Indefinite integrals – Cauchy's integral formula – Morera's theorem – Cauchy's Inequalities.

UNIT IV : Power series: The Cauchy – Handamard theorem – Taylors series – The Uniqueness theorem for power seies – Expansion of an Analytic function in a power series – Liouville's theorem – The uniqueness theorem for analytic functions- A points and zeros- Weierstrass Double series theorem – Substitution of one power series into another – Division of power series.

Scope and standard as in **"Introductory Complex Analysis"** by Richard A. Silverman Dover Publications, Inc. (1972), New York. Chapters 3,5,7,8 and 10.

REFERENCE BOOKS :-

1. A Text book of "Functions of a Complex variable" by J. N. Sharma.
2. A Text book of "Complex variables theory and applications " by H. S. Kasana, Second Edition.

MA 105 : NUMERICAL METHODS

UNIT 1 : **Least Squares ,B - Splines and Fourier Transforms Introduction** ; **Least-Squares Curve Fitting Procedures**: Fitting a Straight line – Nonlinear Curve Fitting- Curve Fitting by a Sum Of Exponentials. **Weighted Least Squares Approximation**; Linear Weighted least Squares Approximation- Nonlinear weighted Least Squares Approximation. **Cubic B-Splines**: Least-Squares Solution – Representation of BSplines-Computation of B-Splines. **Fourier Approximation** : The Fourier Transform – The Fast Fourier Transform- Approximation Of Functions : Chebyshev Polynomials- Economization of Power Series.

UNIT 2 : **Numerical Solution Of Ordinary Differential Equations:** Predictor-Corrector Methods Adams – Moultan Method- Milne's Method. The Cubic Spline Method .**Boundary-Value Problems:** Finite-Difference Method- the Shooting Method- the Cubic Spline Method.

UNIT 3: Numerical Solution of Partial Differential Equations: Introduction- Finite-Difference Approximations to Derivatives.Laplace's Equation Jacobi's Method – Gauss-Seidel Method- SOR Method- The ADI Method- Parabolic Equations – Iterative Methods for the Solution Of Equations- Hyperbolic Equations.

UNIT 4: **The Finite Element Method** Introduction**:** Functional – Base Functions. Methods Of Approximation: The RayleighRitz Method – The Galerkin Method-Application to Two-Dimensional Problems. The Finite Element Method: Finite Element Method for One-dimensional problems- Application to Two Dimensional Problems.

Scope and Standard as in **"Introductory Methods Of Numerical Analysis"** by (Thirty-Third Printing (Fourth Edition February,2005) , Published by Prentice-Hall Of India Pvt.Ltd.,Delhi. S.S.Sastry

Chapter 4 : Sections 4.1,4.2,4.3,4.5,4.6.1,4.6.2,4.7, Chapter 7 : Sections 7.6,7.7,7.10 ,
Chapter 8 : Sections 8.1 to 8.6, Chapter 10: Sections 10.1,10.2,10.3,10.4

YOGI VEMANA UNIVERSITY COLLEGE :: KADAPA

DEPARTMENT OF APPLIED MATHEMATICS

M.Sc., MATHEMATICS

SYLLABUS

SEMESTER-II

MA 201 : TOPOLOGY

UNIT –I : **Metric spaces**-open sets-closed sets- convergence-completeness and Baire's theorem-Continuous mappings spaces of continuous functions-Euclidean and Unitary Spaces

UNIT – II: **Topological Spaces**, definition & examples-open bases and open sub bases weak topologies.

UNIT – III: **Compact spaces**- product spaces-Trychonoff's theorem and loally compact spacescompactness in Metric spaces- Acoli's Theorem.

UNIT-IV: **Separation** –T_1 Spaces and Hausdorff spaces –completely regular spaces and Normal spaces –Urysohn's lemma- Urysohn's imbedding theorem –Stone –Cech compactification - Connected spaces-Components of a space.

Scope and Standard as in "**Introduction to Topology and Modern Analysis**" by G.M. Simmons, MC Graw Hill Book company, inc. International student edition.

Chapter II, Chapter III : articles 16-19, Chapter IV: articles 21-25 , Chapter V: articles 26-30, and Chapter VI: articles 31 and 32

REFERENCE :

1. 'Topology' by K.Chandra Sekhara Rao, Narosa Publications
2. "Topology" by J.P. Chauhan, J.N. Sharma, Krishna Publications
3. "General Topology" by M.G. Murdeshwar, new age International publications

MA 202 : GALOIS THEORY

UNIT I: **Algebraic Extension of Fields:** Irreducible polynomials and Eisenstein Criterion - Adjunction of roots - Algebraic extensions - Algebraically closed fields.

UNIT II: **Normal and Separable Extensions:** Splitting fields - Normal extensions - Multiple roots - Finite fields - Separable extensions.

UNIT III: Galois Theory: Automorphism Groups and Fixed Fields - Fundamental theorem of Galois Theory - Fundamental theorem of Algebra.

UNIT IV: Applications of Galois Theory to Classical Problems: Roots of unity and Cyclotomic Polynomials - Polynomials solvable by radicals - Ruler and Compass constructions .

Scope and Standard as in **Basic Algebra by P.B. Bhattacharya**, by S K.Jain and S.R. Nagpaul, Cambridge University press.

Chapter 15: Sections 15.1, 15.2, 15.3 and 15.4, Chapter 16: Sections 16.1, 16.2, 16.3, 16.4 and 16.5, Chapter 17: Sections 17.1,17.2 and 17.3, Chapter 18: Sections 18.1, 18.3 and 18.5

REFERENCE BOOK

Topic in Algebra by I.N.Herstein.

MA 203 : PARTIAL DIFFERENTIAL EQUATIONS

UNIT I : Ordinary Differential Equations in more than two variables: Methods of solutions of dx/P = dy/Q = dz/R – Orthogonal trajectories of a system of curves on a surface Pfaffian differential forms and equations – Solution of Pfaffian Differential equations in three variables.

UNIT II : Partial Differential Equations of the First order : Partial differential equations – Origins of first order partial differential equations – Linear equations of first order – Integral surfaces passing through a given curve – Surfaces orthogonal to a given system of surfaces – Charpit's method – Jocobi's method.

UNIT III : Partial Differential Equations of the Second Order : The origin of second order equations – Linear Partial differential equations with constant coefficients – Equations with variable coefficients.

UNIT IV :Laplace's Equation : Elementary solutions of Laplce's equation – Families of equipotential surfaces –Boundary value problems –Separation of variable.

Scope and Standard as in "**Elements Of Partial Differential Equations**" by IAN Sneddon Macgraw Hill Company.

Chapter1: Sections 3,4,5,6, Chapter2: Sections 1, 2, 3, 4,5,6,10 ,13, Chapter 3: Sections 1,4,5. Chapter 4: Sections 2,3,4,5.

REFERENCE BOOK:-

1."Ordinary And Partial Differential Equations" By M.D.Raisinghania, Published

By S.Chand & Co, New Delhi.

MA 204 : ADVANCED COMPLEX ANALYSIS

UNIT I : Laurent series - Singular Points - Laurent series – Laurent's theorem- poles and Essential singular points – Behavior at an essential Singular point – Picards theorem – Behavior at infinity.

UNIT II : The Residue theorem and its Application:-The Residue theorem – Residues at infinity – Jorden's lemma – Evaluation of definite integrals – The Argument principle – The Theorems of Rouche and Hurwitz- Local behavior of analytic mappings – The Maximum Modulus principle – Schwarz's lemma.

UNIT III : Harmonic Functions *:* Laplace's Equation – Conjugate harmonic functions- Poisson's integral – Schwarz's Formula – The Dirichlet Problem.

Conformal mapping*:* General principles of Conformal mapping – Mapping of the upper half – plane onto a rectangle – The Schwarz's Christoffel transformation.

UNIT IV: Infinite product and partial fraction Expansions: Preliminary results – Infinite Products – Weierstrass theorem – Mittage – Leffler's theorem – The Gamma Function – Cauchy's theorem on partial fraction Expansions.

Scope and standard as in **"Introductory complex Analysis"** by Richard A. Silverman, Dover Publications, Inc. New York (1972), Chapters 11 to 15.

REFERENCE BOOKS :-

1.A Text book of "Functions of a Complex Variable" by J. N. Sharma.

2. A Text book of "Complex Variable Theory and Applications" by H. S. Kasana, Second edition.

MA 205 : FLUID DYNAMICS

UNIT I - Kinematics of Fluid in Motion: Real Fluids and Ideal Fluids - Velocity of a Fluid at a Point – Streamlines and Path lines - Steady and Unsteady Flows - The Velocity Potential- The Vorticity Vector - Local and Particle Rates of change - The Equation of Continuity – Worked Example - Accelerations of a Fluid- Condition at a Rigid Boundary – General Analysis of Fluid Motion.

UNIT II - Equations of Motion of a Fluid:-Pressure at a point in Fluid at Rest- Pressure at a point in a moving Fluid- Conditions at a Boundary of Two Inviscid Immiscible Fluids- Euler's Equations of Motion - Bernoulli's Equation - Worked Examples - Discussion of the case of Steady Motion under Conservative Body Forces.

UNIT III - Some Three Dimensional Flows:- Introduction – Sources - Sinks and Doublets- Images in Rigid Infinite Plane – Images in Solid Spheres – Axi - Symmetric Flows : Stokes's Stream function – Some special Forms of the stream Function for Axi-Symmetric Irrotational Motions.

UNIT IV - Some Two Dimensional Flows :- Meaning of Two – Dimensional Flow – Use of Cylindrical polar Co-ordinates – The Stream Function – The Complex Potential for Two-Dimensional – Irrotational – Incompressible Flow- Complex velocity Potentials for Standard Two – Dimensional Flows –The Milne – Thomson circle Theorem - The Theorem of Blasius Theorem

Scope and Standard as in "**Text Book of Fluid Dynamics**" by F.Chorlton, C.B.S. Publishers and Distributors, Delhi , 1985, Chapter 2, Chapter 3:Sections 3.1 to 3.7, Chapter 4 , and Chapter 5: Sections 5.1 to 5.5, 5.8 and 5.9

REFERENCE BOOKS:-

1. "**Classical Mechanics**" By Herbert Goldstain, Narosa Publishing House, Second Edition

2. "**Foundations Of Fluid Mechanics**" By S.W Yuvan Printice Hall of India Pvt.Ltd

YOGI VEMANA UNIVERSITY COLLEGE:: KADAPA
DEPARTMENT OF APPLIED MATHEMATICS
M.Sc., Mathematics
Semester - II

NON-CORE PAPER

BUISINESS MATHEMATICS

UNIT - I

Number - H.C.F. and L. C.M. of Numbers - Decimal Fractions.

UNIT - II

Surds and Indices – Percentage - Profit and loss.

UNIT - III

Linear Equations in Two Variables – Ratio and Proportion- Variation.

UNIT -IV

NUMBER SYSTEM:

Types of Number Systems – Conversion of Decimal Number to Binary Number and Vice versa -Conversion of Decimal numbers to Octal numbers and Vice versa - Converation of Hexadecimal number into Decimal number and Vice versa - Binary Airthmetic.

Scope and Standard as in **"OBJECTIVE ARITHMETIC" ,** by **R.S.Aggarwal ,** S.Chand and Company. Chapters 1,2,3,9,10,11,31,12,

Scope and Standard as in "**BUSINESS MATHEMATICS**", by P.R.Vittal , Margham Publications, Chapter 1

YOGI VEMANA UNIVERSITY COLLEGE :: KADAPA

DEPARTMENT OF APPLIED MATHEMATICS

M.Sc., MATHEMATICS

SYLLABUS

SEMESTER-III

MA 301 : FUNCTIONAL ANALYSIS

UNIT- I: Banach Spaces: The Definition and some Examples – Continuous Linear Transformations - The Hahn – Banach Theorem.

UNIT –II: The natural imbedding of N in N ** - The open mapping theorem - The conjugate of an Operator.

UNIT- III:Hilbert Spaces:The definition and some simple properties - Orthogonal complements - Orthonormal sets - The Conjugate space H *

UNIT – IV : The adjoint of Operator - Self - adjoint operators - Normal and Unitary Operators Projections.

Finite Dimensional Spectral Theory: Determinants and the Spectrum of an operator - The Spectral Theorem.

Scope and Standard as in "**Introduction To Topology And Modern Analysis"** by G.F.Simmons, Mc Graw – Hill book Company , Inc., International Student Edition.

Chapters: 9,10, Chapter 11 :Sections 2 and 3

REFERENCE BOOKS :-

1. "Functional Analysis" By G.Backmenn and Narici.
2. "Functional Analysis" By P.K.Jain IP.Ahuja and Khalil Ahmed.
3. "Introduction Functional Analysis with Application" By E.Krayszing.
4. "Functional Analysis" By B.V,Limage.
5. "A First course in Functional Analysis" By C.Goffman and G.Pederick Prentice Hall of India.

MA 302 : DISCRETE MATHEMATICS

UNIT I - Mathematical Logic : Normal forms- Disjunctive, Conjugative Principle- Disjunctive Principle – Conjunctive normal forms- Ordering and uniqueness of normal forms- Statements – Connectives -Tautologies –The Theory of inference for Statement calculus - Rules of inference - Predicate Calculus - Inference theory for predicate Calculus.

UNIT II - Relations : Properties - Equivalence Relations - Partial order relations and partially ordered sets - Semi groups and monoids - Sub semi - groups and Submonoids - Homomorphism of Monoids and Semi groups.

UNIT III - Lattices : Lattices as Partially order sets – Complete - Complemented and Distributive Lattices – Sub Lattices – Direct Product and Homeomorphisms.

UNIT IV - Boolean Algebra : Boolean algebras as lattices - Examples - Join irreducible elements - Mini terms - Boolean forms and their Equivalence - Sum of products - Canonical forms - Minimization of Boolean functions - Karnaugh maps - Application to switching algebras.

Scope and Standard as in "**Discrete Mathematical Structures With Application To Computer Science**" by J.P Trembley and P.Manohar , Mc Graw-Hill book Co.1997.

Chapter 1: Articles 1.2, to 1.6, Chapter 2: Article 2.3, Chapter 3: Article 3.2

Chapter 4: Articles 4.1, 4.2, 4.3 and 4.4 .

REFERENCE BOOK :-

1. C.L Liu, "**Elements of Discrete Mathematics"** Tata Mc Graw Hill Publishing Company Ltd. New Delhi.(Second Edition)

MA 303 : SEMIGROUPS

UNIT-I :-Introductory Ideas: Basic Definitions - Monogenic Semigroups - Ordered sets, Semi lattices and Lattices - Binary Relations, Equivalences.

UNIT-II :-Congruences-Free Semi groups - Ideals and Rees Congruences - Lattices of equivalences and congruences.

UNIT-III :-Green's Equivalences: Introduction –The equivalences $\mathcal{L}, \mathcal{R}, \mathcal{H}, \mathcal{J}$, and $\mathfrak{D}$ -The structure of $\mathfrak{D}$- Classes – Regular $\mathfrak{D}$- Classes-Regular Semigruops

UNIT-IV:- 0 - Simple Semigroups: Introduction - Simple and 0-Simple Semigroups; Principle Factors-Rees's Theorem - Primitive idempotents - Congruences on completely 0-Simple semi groups.

Scope and Standard as in **AN INTRODUCTION TO SEMIGROUP THEORY** by J.M. Howie (1976), Academic Press, (Contents of the Syllabus : **Chapters- I, II and III**).

Chapter1: Sections 1.1,1.2,1.3,1.4,1.5,1.6 & 1.7, Prepositions 8.1 ,8.2,8.3,8.4,8.5,8.6 & 8.7 of Section 1.8; Chapter 2: Sections 2.1 ,2.2 & 2.3, Prepositions 4.1 ,4.2,4.3,4.4,4.5 & 4.6 of Section 2.4 ; Chapter 3: Section 3.1, Lemmas 2.3 ,2.4,2.5,2.6 & 2.7 of Section 3.2, Theorem 3.12 to Lemma 3.3 of Section 3.3, Lemma 4.6 to 4.17 of Section 3.4.

MA 304 : OPERATIONS RESEARCH

UNIT I: Linear Programming Problem:
Mathematical Formulation: Introduction - Mathematical Formulation of the Problem
Linear Programming problem : Graphical solution Introduction- Graphical Solution Method – Some Exceptional Cases

Linear Programming : Simplex Method :- The Computational Procedure – Use of Artificial Variables**.**

UNIT II : **Transportation Problem:** Introduction – General Transportation Problem – The Transportation Table – Duality in Transportation Problem –Loops in Transportation Tables- LP Formulation of the Transportation Problem – Solution of a Transportation Problem – Finding an Intial Basic Feasible Solution – Test for Optimality – Degeneracy in transportation Problem – Transportation Algorithm (MODI Method) – Stepping Stone solution Method- Some Exceptional Cases

UNIT III : **Assignment Problem:** Introduction – Mathematical Formulation of the problem – The Assignment Method – Special cases in Assignment problems – A Typical Assignment problems – The Travelling Salesman Problem.

UNIT IV: Games and Strategies : Introduction – Two-Person Zero-Sum Games – Some Basic Terms- The Maximin – Minimax Principle – Games Without Saddle Points—Mixed Strategies – Graphic Solution of 2 x n and m x 2 Games – Dominance Property- Arithmetic Method for n x n Games – General Solution of m x n Rectangular Games**.**

Scope and Standard as in "**Operations Research**" by Kanti Swarup , P.k.Gupta and ManMohan , Sultan Chand & Sons , New Delhi.

Chapter 2: Sections 2.1 and 2.2 ;Chapter 3: Sections 3.1 to 3.3; Chapter 4: Sections 4.3 and 4.4; Chapter 10: Sections 10.1 to 10.13; Chapter 11: Sections 11.1 to 11.16, Chapter 17: Sections 17.1 to 17.9

REFERENCE BOOKS:
1. S.D. Sharma, "Operations Research"
2. H.A Taha, "Operations Research – An Introduction".
3. "Operation Research " By Pannerselvam R, Published by Prentice Hall of India New Delhi , 2002 Edition

Elective-I
35054 - B

MA 304 : CODING THEORY

UNIT I : Introduction to Coding Theory : Introduction – Basic Assumptions- Correcting and Detecting Error Patterns – Information Rate – The Effects of Error Corrections and Detection – Finding the Most Likely Codeword Transmitted – Some Basic Algebra – Weight and Distance – Maximum Likelihood Decoding – Reliability of MLD – Error – Detecting Codes – Error – Correcting Codes.

UNIT II : Linear Codes : Two Important Subspaces – Independence, Basis, Dimension – Matrices – Bases for C = < S > and $C^{"¥"}$ - Generating Matrices and Encoding – Parity – Check Matrices – Equivalent Codes – Distance of Linear Code – Cosets – MLD for Linear Codes – Reliability of IMLD for Linear Codes.

UNIT III : Perfect and Related Codes : Some Bounds for Codes – Perfect Codes – Hamming Codes – Extended Codes- The Extended Golay Code – Decoding the Extended Golay Code- The Golay Code – Reed – Mullar Codes – Fast Decoding for RM (1,m).

UNIT IV : Cyclic Linear Codes : Polynomials and Words – Introduction to Cyclic Codes – Polynomial Encoding and Decoding – Finding Cyclic Codes – Dual Cyclic Codes.

Burst Error – Correcting Codes : Introduction – Interleaving – application to Compact Disc.

Scope and Standard as in **"Coding Theory The Essentials"** by D.G.Hoffman, D.A. Leonard, C.C. Linder, K.T.Phelps, C.A.Rodger, J.R.Wall, Monographs and text books in Pure and Applied Mathematics.

Chapter 1: Sections 1.1 to 1.12, Chapter 2: Sections 2.1 to 2.12, Chapter 3: Sections 3.1 to 3.9, Chapter 4 :Sections 4.1 to 4.5 , Chapter 7: Sections 7.1 to 7.3 .

Elective -II
35055-A

MA 305 : C AND DATA STRUCTURES

(A) 'C' PROGRAMMING:

UNIT 1: Overview of C- Constants, variables and Data Types – Operators and Expressions – Managing Input and Output operations-Decision Making and Branching – Decision Making and looping –Arrays.

UNIT II :- Character Arrays and Strings - User- defined Functions - Structures and Unions – Pointers – File mangement in C.

TEXT BOOK ; Scope and Standard as in chapters 1 to 12 of 'C' programming by E.BALAGURU SWAMY, published by Tata Mc Graw Hill Book co .

(B) DATA STRUCTURE :

UNIT III : (a) **Introduction and overview:-**
concept of Data Structures- Implementations of Data Structures.
(b) **Arrays:-**
Definition- Terminolgy - One Dimensional Array - Memory allocation for an Array – Operations on Arrays – Application of Arrays.
(c) **Linked Lists:-**
Definitions - Single linked lists - Represenation of Linked list in Memory – Operation on a linked list in Memory.
(d) **Stacks And Queues:-**
Introduction – Definition- Representation- Deletion- Insertion Operation.

UNIT IV :- **Trees:-**
Basic Concepts – Binary Trees - Properties of binary Trees - Linear, Linked Representation of binary Trees - Insertion, Deletion, Traversal opertions of Binary Trees - Binary Search Trees - Help Trees.

Scope and Standard as in **"Classic Data Structures"** by SAMANTA. D Published by Prentice Hall of India. New Delhi.

Chapter 1, Chapter 2: Sections 2.1,2.2,2.3.1 and 2.3.2,
Chapter 3: Sections3.1 and 3.2; Chapter 4: Sections 4.1,4.2 and 4.3.1,
Chapter 7 :Sections 7.1,7.2.1,7.2.2,7.3.1,7.3.3,7.4.1,7.4.2,7.4.4,7.5.1,7.5.2 and 7.5.3

Elective-II
35055-B

MA 305 : BIOMECHANICS

UNIT I : Mathematical models in pharmacokinetics.

Basic Equations and their Solution ; Solution for Special Cases.

UNIT II : Models for blood flows 1

Some basic concepts of fluid dynamics ; Basic Concepts about blood, Cardiovascular system and blood Flow

UNIT III : Models for blood flow 2

Steady Non – Newtonian fluid flows in circular tubes; Newtonian Pulsatile flow in Rigid and Elastic tubes ; Blood flow through Artery with mild Stenosis

UNIT IV : Models of flows for other Biofluids

Peristaltic flow in tube and channel; Two Dimensional flow in Renal tubule; Lubrication of Human joints.

Scope and Standard as in "**Mathematical Models in Biology and Medicine"** by J.N.Kapur Affiliated East – West press Pvt.Ltd., New Delhi.

Chapter 10: Sections 10.1,10.2, Chapter 11: Sections 11.1,11.2,11.3,11.5, Chapter 12: Sections 12.1,12.3,12.4 ,

REFERENCE BOOK :-

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

YOGI VEMANA UNIVERSITY COLLEGE :: KADAPA
DEPARTMENT OF APPLIED MATHEMATICS
M.Sc., Mathematics
MATHEMATICS AND APPLICATIONS
Semester - III

NON-CORE PAPER

UNIT-I ChainRule -Time and Work.

UNIT-II Time and Distance.

UNIT-III Mensuration: Area, Volume and Surface Areas.

UNIT-IV Matrix Algebra: Matrix-Types of Matrices-Addition and subtraction of matrices-Multiplication of two matrices -Transpose of a matrix- Determinant of a matrix – Singular and Non singular matrices – Inverse of a matrix – Solving the equation by using Matrix Invertion method.

Scope and Standard as in " **OBJECTIVE ARITHMATIC**", by R.S.Aggarwal S.Chand and Company. Chapters 14,15,17,23,24

Scope and Standard as in of " **BUSINESS MATHEMATICS**" by **P.R.VITTAL** , Margham Publications. Chapter 2,

YOGI VEMANA UNIVERSITY COLLEGE :: KADAPA

DEPARTMENT OF APPLIED MATHEMATICS

M.Sc., MATHEMATICS

SEMESTER-IV

MA 401 : LEBESGUE MEASURE AND INTEGRATIONS

UNIT- I: Unions, Intersections and Compliments – Algebras of sets-Countable sets, Relations and Equivalences- Well Ordering and the Countable Ordinals, Open and Closed Sets of Real Numbers- continuous Functions – Borel sets.

UNIT - II: Lebesgue Measure : Introduction, Outermeasure, Measurable sets and Lebesgue measure, a non measurable set, Measurable functions, Little wood's three principles.

UNIT- III: The Lebesgue Integral : The Riemann integral, the Lebesgue integral of a bounded function over a set of finite measure, the integral of a non negative function, the general Lebesgue integral, convergence in measure.

UNIT- IV: Differentiation and Integration : Differentiation of Monotone function- Functions of bounded variations- Differentiation of an integral – Absolute continuity-Convex functions.

Scope and standard as in **"Real Analysis** "by H.L.Royden, Prentice Hall of India private limited, New Delhi, 2001-Third edition.

Chapter 1:Sections 1.3, 1.4, 1.6, 1.7 and 1.9, Chapter 2: Sections 2.5, 2.6, 2.7, Chapter 3, Chapter 4 and Chapter 5.

MA 402: GRAPH THEORY

UNIT I - Introduction to Graphs : Definition - Graphs As Models - Vertex Degrees - Sub graph paths and cycles - The Matrix Representation of Graphs - Fusion.

UNIT II Tress and connectivity : Definition and simple properties - Bridges -Spanning tress - Connector Problems - Shortest path Problem - Cut Vertices and connectivity.

UNIT III Euler tours and Hamiltonian cycles: Euler tours - The Chinese Postman Problem – Hamiltonian graphs - The Traveling salesman Problem.

UNIT IV Planar Graphs : Plane and Planar graphs - Euler's Formula - The platonic bodies - Kuratowski's Theorem - Non Hamiltonian plane graphs - The Dual of a plane graph.

Scope and Standard as in "**A First Look At Graph Theory**" By John Clark and Derek Allan Holton, Allied Publishers Ltd.

Chapters 1,2,3 and 5,

REFERENCE BOOKS :-

1. "Graph Theory With Application" J.A.Bondy and U.S.R.Murthy, Millon Press.
2. "Discrete Mathematical Structure and Graph Theory" – By Rao.
3. A Text Book of "Graph Theory and its Applications" – By B.Suryanarayana and G.K.Ranganath.

MA 403: NUMBER THEORY

UNIT I Arithmetical Functions and Dirichlet Multiplication: Introduction – The Mobius function $\mu(n)$ – The Euler totient function $\phi(n)$ –A relation connecting ϕ and μ - A product formula for $\phi(n)$ – The Dirichlet product of arithematical functions – Dirichlet inverses and the Mobius inversion formula – The Mangoldt function $\Lambda(n)$ – Multiplicative functions Multiplicative functions and Dirichlet multiplication – The inverse of a completely multiplicative function – Liouville's function – The divisor function $\sigma_\alpha(n)$ – Generalized Convolutions – Formal Power series – The Bell series of an Arithmetical function – Bell series and Dirichlet multiplications – Derivatives of arithmetical functions – The Selberg identity.

UNIT II Averages Of Arithmetic Functions : Introduction - The big on notation- Asymptotic equality of functions – Euler's summation formula – Some elementary asymptotic formulas – The average order of $d(n)$ - The average order of the divisor functions $\sigma_\alpha(n)$ – The average order of $\phi(n)$ – An application to the distribution of lattice points visible from the origin – The average order of $\mu(n)$ and of $\Lambda(n)$ – The partial sums of a Dirichlet product.

UNIT III Congruences: Definition and basic properties of congruences – Residue classes and complete residue systems – Linear congruences – Reduced residue systems and the Euler – Fermat theorem – Polynomial congruences modulo p. Lagrange's theorem – Applications of Lagrange's theorem – Simultaneous linear congruences – The Chinese remainder theorem – Application of the Chinese remainder theorem –Polynomial congruences with prime power moduli – The principle of cross – Classification – A decomposition property of reduced residue system.

UNIT IV Quadratic Residues and The Quadratic Reciprocity Law: Quadratic residues – Legender's symbol and its properties – Evaluation of $(-1 \mid p)$ and $(2 \mid p)$ – Gauss' lemma – The quadratic reciprocity law – Application of the reciprocity law – The Jacobi symbol.

Primitive Roots : The exponent of a number mod m. Primitive roots – Primitive roots and reduced residue systems – The non existence of primitive roots mod 2^α for $\alpha \geq 3$.

Scope and Standard as in "**Introduction to Analytical Number Theory**", by Tom. M. Apostol, Springer International Student Edition

Chapter 2, Chapter 3: Sections 3.1 to 3.10, Chapter 5, Chapter 9: Sections 9.1 to 9.7 ,

Chapter 10: Sections 10.1 to 10.3

REFERENCE BOOK :-

Niven , I and Zuckerman , H.S (1972) "**An Introduction to the Theory of Numbers**", 3rd Edition, New Yory " John Wiley and sons, Inc

Elective-III

45054-A

MA 404: MATHEMATICAL STATISTICS

UNIT I Probability : Sample space – Events – Probability – The addition rule – The multiplication rule – Bayes's Formula – Random variables – Discrete random variables – Density functions - Joint definition functions – Marginal and conditional distributions – Continuous random variables – Joint continuous Density functions.

UNIT II Some Particular Probability Distributions: Discrete variables – Continuous variables

UNIT III Sampling theory : Random sampling – Moments of Multivariate Distributions – Properties of E – sum of independent variables – Distribution of $\bar{X}$ from a normal Distribution – Distribution of X from a non –normal Distribution – Distribution of Linear functions – Distribution of the sample variance – Hypothesis testing Applications.

UNIT IV General Principles for Statistical Inference: Estimation – Testing Hypothesis – Testing goodness of fit: Multinomial Distribution – The χ^2 Test – Limitations on the χ^2 Test – Generality of χ^2

Scope and Standard as in **"Introduction to Mathematical Statistics"** by Paul G.Hoel John Wiley & sons. (Fourth Edition), 1971.

Chapters: 2,3,5,8 and 9

REFERENCE BOOKS :-

1. Hogg R.V. and Craig A.L. Introduction to Mathematical Staistics, American publication.
2. Fundamental of Mathematical Statistics, S.C.Gupta,V.K.Kapoor,Sultan Chand & sons

MA 404: THEORETICAL COMPUTER SCIENCE

UNIT-I: The Theory of Automata: Definition of an Automaton-Description of a Finite Automaton0 Transition Systems-Properties of Transition Functions-Acceptability of a string by a Finite Automation-Nondeterministic Finite state Machines –The Equivalence of DFA and NFDA Mealy and Moore models-Minimization of Finite Automata .

UNIT-II: Formal Languages: Basic Definition and Examples-Chomsky Classification of Languages- Languages and Their Relation- Recursive and Recursively Enumerable Sets-Languages and Automata

Regular Sets and Regular Grammars: Regular Expressions-Finite Automata and Regular Expressions- Pumping Lemma for Regular Sets – Application of Pumping Lemma – Closure properties of Regular set Regular sets and Regular Grammars

UNIT-III: Context Free languages: Context – free Languages and Derivations trees-Ambiguity in context free Grammars-Simplification of context free grammers –oramla forms for context-Free Grammars –Pumping lemma for context –free Languages-Decision algorithms for context-Free Languages.

UNIT-IV:Pushdown Automata : Basic Definitions- Acceptance by pda-Pushdown Automata and context Free Languages

Turing Machines: Turing Machine model –Representation of Turing Machins – Languages acceptability by Turing machines – Design of Turing Machines

Scope and standard as in "**Theory of Computer Science"** by Mishra (Automata , Languages and computation) K.L.P and Chandrasekharan, N. Published by Prenctic Hall of India , Second Edition (4^{th} printing) August 1998.

Chapter 2, Chapter 3, Chapter 4, Chapter 5, Chapter 6: Sections 6.11 6.2 and 6.3, Chapter 7: Sections 7.1 7.2, 7.3 and 7.4

REFERENCE : 1. Theoretical computer Sciences – Juraj Hromkovic Springer publication

2.Discrete Mathematics & Graph Theory, by Satynarayan Bhavanari.K. Syam Prasad, PHI PVT.Ltd., New Delhi Second Edition,2014.

Elective-IV
45055-A

MA 405: MATHEMATICAL MODELING

UNIT-1:- Mathematical Modelling Through Ordinary Differential Equations of First Order Linear Growth And Decay Models - Non Linear Growth And Decay Models - Compartment Models-Mathematical Modeling in Dynamics through Ordinary Differential Equations of First Order - Mathematical Modelling of Geometrical problems through Ordinary Differential Equations of First order.

UNIT-II:- Mathematical Modelling Through Systems of Ordinary Differential Equations of the First order.

Mathematical Modelling in population Dynamics – Mathematical Modelling of Epidemics through systems of Ordinary Differential Equations of First order – Compartment Models Through systems of Ordinary Differentional Equations – Mathematical Modelling In Economics based on Systems of Ordinary Differntal Equations of first order-Mathematical Modelling in Medicine, Arms race Battles and International Trade in terms of systems of Ordinary Differential Equations - Mathematical Modelling in Dynamics through systems of Ordinary Differential Equations of First order.

UNIT III :-Mathematical Modelling Through Ordinarry Differential Equations of Second order.

Mathematical \Modelling of planetary motions- Mathematical Modeling of Circular Motion And Motion of Satellites- Mathematical Modelling Through Linear Differential Equatins of Secnd Order-Miscellaneous Mathematical Models Through Ordinary Differential Equations of the Second Order.

UNITIV :- (A) Mathematical Modelling through Difference Equations:-

Basic Theory of Linear Difference Equations with constant Co-effcients - Mathematical Modelling through Difference Equations in Economics and Finance – Mathematical Modelling through Difference Equations In Population Dynamics and Genetics.

(B) Mathematical Modelling Through Partial Differential Equations:- Mass-Balance Equations –Momentum-Balance Equations.

Scope and Standard as in **"MATHEMATICAL MODELLING"** by J.N.Kapur, Wiley Eastern Limited (1988)

Chapter 2, Chapter 3, Chapter 4, Chapter 5: Sections 5.2 to 5.4, Chapter 6 : Sections 6.2 & 6.3

Elective-IV
45055-B

MA 405: FUZZY SETS AND FUZZY LOGIC

UNIT I : Fuzzy Sets : An overview – Basic Types and Concepts – Characteristics and significance of the Paradigm – Properties of α- Cuts – representation of Fuzzy sets – Extension Principle for Fuzzy Sets.

UNIT II :Operations on Fuzzy Sets : Types of Operations – Fuzzy complements – t-norms, t-conforms – combinations of operations- aggregation of Operations – Fuzzy Arithmetic – Fuzzy Nembers- Linguistic Varibles – Arithmetic Operations on Intervals – Arithmetic Operations on Fuzzy Numbers – Lattice of Fuzzy Numbers – Fuzzy Equations.

UNIT III: Fuzzy Relations : Crisp versus Fuzzy Relations – Projections and Cylindric Extensions – binary Fuzzy Relations – Binary Relations on a Single Set- fuzzy Equivalence Relations – Fuzzy Compatibility Relations - Fuzzy Ordering Relations – Fuzzy Morphisms – Sup – I Compositions of Fuzzy Relations – inf- w_i Compositions of Fuzzy Relations – Fuzzy Relation Equations - General Discussion – Problem Partitioning – Solution Method – fuzzy Relation Equations Based on sup – I compositions – Fuzzy Relation Equations Based on inf- w_i Compositions – Approximate Solutions – The use of Neural Networks.

UNIT IV :Possibility Theory : Fuzzy Measures – Evidence Theory- Possibility Theory – Fuzzy sets and Possibility Theory – Possibility Theory Versus – Orobability Theory – Fuzzy logic – Classical Logic – Multivalued Logics – Fuzzy Propositions – Fuzzy Quantifiers – Linguistic hedges – Inference from Conditional Fuzzy Propositions – Inference from Conditional and Qualified Propositions – Inference from quantified propositions.

Scope and standard as in **"Fuzzy sets and Fuzzy logic Theory and Applications"** by George J. Klir / Bo Yuan, PHI, 2001. Chapters 1 to 8,

DEPARTMENT OF APPLIED MATHEMATICS
Scheme of Examination for I, II , III & IV Semesters
Course: Mathematics
(With effect from Under CBCS 2018 – 2019)

Paper code	Title of the Paper	No of credits		Marks		Total Marks
				Internal	External	
SEMESTER -I						
15051	Algebra	5		30	90	120
15052	Real Analysis	5		30	90	120
15053	Ordinary Differential Equations	5		30	90	120
15054	Complex Analysis	5		30	90	120
15055	Numerical Methods	5		30	90	120
SEMESTER -II						
25051	Topology	5		30	90	120
25052	Galois Theory	5		30	90	120
25053	Partial Differential Equations	5		30	90	120
25054	Advanced Complex Analysis	5		30	90	120
25055	Fluid Dynamics	5		30	90	120
25056 Non-Core	**Business Mathematics**	**0**		**25**	**75**	**100**
SEMESTER -III						
35051	Functional Analysis	5		30	90	120
35052	Discrete Mathematics	5		30	90	120
35053	SemiGroups	5		30	90	120
35054-A Operations Research 35054-B Coding Theory		5	Elective -I	30	90	120
35055-A 'C' & Data Structures 35055-B Biomechanics		5	Elective -II	30	90	120
35056 Non Core	**Mathematics and Applications**	**0**		**25**	**75**	**100**
The student has to choose one from each of the Elective I and Elective II						
SEMESTER -IV						
45051	Lebesgue Measure Integration	5		30	90	120
45052	Graph Theory	5		30	90	120
45053	Number Theory	5		30	90	120
45054-A Mathematical Statistics 45054-B Theoretical computer science		5	Elective -III	30	90	120
45055-A Mathematical Modelling 45055-B Fuzzy sets and Fuzzy logic		5	Elective -IV	30	90	120
The student has to choose one from each of the Elective III and Elective IV						

Course Total Marks: 2400 (Core papers)

- **200 Non –Core**

Semester –I Theory : 600 marks **(25 Credits)**
Semester –II Theory : 600 marks **(25 Credits)**
Semester –III Theory : 600 marks **(25 Credits)**
Semester –IV Theory : 600 marks **(25 Credits)**

Examination Pattern: Each theory paper consists of section A **and** Section B .Section A consists of eight short questions, students has to Answer five out of eight questions and each short question carries **6** marks. Section B consists of four essay type questions with internal choice from each Unit carrying **15** marks.

- **The marks will not be considered for awarding the grade point but the candidate should pass since these are part of CBCS.**

PAPER CODE:

M.Sc. Degree Examination, Month – Year
I / II / III / IV Semesters
Department of Applied Mathematics
(With effect from under CBCS 2018-19)

Time: 3Hours **Max.Marks:90**

(No additional Sheet will be supplied)

Part –A **5 x 6 = 30**

Answer ***any five*** Questions
Each Question carries ***Six (6)*** Marks

1.
2.
3.
4.
5.
7.
8.

Part – B **4 x 15 = 60**

Answer ***All*** Questions
Each Question carries ***Fifteen (15) Marks***

Unit-I

9.

{OR}

10.

Unit-II

11.

{OR}

12.

Unit – III

13.

{OR}

14.

Unit – IV

15.

{OR}

16.

M.Sc., Mathematics Degree Examinations

Second / Third Semesters

Paper-VI – Business Mathematics / Mathematics and Applications

(No additional sheet will be supplied)

(NON-CORE SUBJECT)

Time : 3 hours Max. Marks : 75Marks

Part-A $5 \times 5 = 25 Marks$

Answer **Any Five (5)** of the following

Each question Carries **Five (5) marks**

1.
2.
3.
4.
5.
6.
7.
8

Part-B $4 \times 12\,{}^{1}/_{2} = 50$Marks

Answer **ALL** The Questions.

Each question Carries **$12\,{}^{1}/_{2}$Marks**

9.

{OR}

10

11.

{OR}

12.

13.

{OR}

14.

15.

{OR}

16.