

Two Year M. Sc. (Mathematics and Computing)

First Semester				
Sl. No.	Course No.	Name of the courses	L-T-P	Cr. Hrs.
1	AMC31101	Probability & Statistics	3-1-0	7
2	AMC31102	Ordinary and Partial Differential Equations	4-1-0	9
3	AMC31103	Discrete Mathematics	3-1-0	7
4	AMC31104	Digital Electronics and Computer Organization	3-1-0	7
5	AMC31105	Computer Programming	3-0-0	6
6	AMC31201	Statistics Lab	0-0-3	3
7	AMC31204	Digital Electronics and Computer Organization Lab	0-0-3	3
8	AMC31205	Computer Programming Lab	0-0-3	3
		Total	16-4-9 =29	48
Second Semester				
1	AMC32101	Complex Analysis and Measure Theory	3-1-0	7
2	AMC32102	Statistical Inference	3-1-0	7
3	AMC32103	Data Base Management Systems	3-0-0	6
4	AMC32104	Data Structures	3-0-0	6
5	AMC32105	Operating Systems	3-1-0	7
6	AMC32202	Statistical Inference Lab	0-0-3	3
7	AMC32203	Data Base Management Systems Lab	0-0-3	3
8	AMC32204	Data Structures Lab	0-0-3	3
9	AMC32205	Operating Systems Lab	0-0-3	3

10	AMC32501	Composite Viva Voce	0-0-0	4
		Total	15-3-12=30	49
Third Semester				
1	AMC33101	Functional Analysis	3-1-0	7
2	AMC33102	Software Engineering	3-1-0	7
3	AMC33103	Advanced Algebra	3-1-0	7
4		Elective-I	3-1-0	7
5		Elective-II	3-1-0	7
6	AMC33202	Software Engineering Lab	0-0-3	3
7	AMC33401	Project and Seminar	0-0-6	6
		Total	15-5-9=29	44
Fourth Semester				
1	AMC34101	Design and Analysis of Algorithm	3-0-0	6
2	AMC34102	Advance Numerical Methods	3-0-0	6
3	AMC34103	Topology	3-1-0	7
4	AMC34104	Optimization Techniques	3-1-0	7
5	AMC34105	Integral Transform and Integral Equations	3-1-0	7
6	AMC34201	Design and Analysis of Algorithm Lab	0-0-3	3
7	AMC34202	Advance Numerical Methods Lab	0-0-3	3
8	AMC34402	Seminar on Project	0-0-0	6
9	AMC34802	Project/Dissertation	0-0-6	6
10	SWC14701	Co-curricular Activity	0-0-0	
		Total	15-3-12=30	51

Elective I				
1	AME33101	Computer Networks	3-1-0	
2	AME33102	Celestial Mechanics	3-1-0	
3	AME33103	Sampling Theory	3-1-0	
4	AME33104	Stochastic Processes	3-1-0	
5	AME33105	Non-Linear Dynamics	3-1-0	

		and Chaos	
6	AME33106	Fluid Dynamics	3-1-0
7	AME33107	Mechanics of Solids	3-1-0
8	AME33108	Wavelets: Theory and Applications	3-1-0
9	AME33109	Computational Geometry	3-1-0
10	AME33110	Fuzzy Set Theory and its Applications	3-1-0
11	AME33111	Mathematical Hydrology	3-1-0
12	AME33112	Internet Technology	3-1-0
13	AME33113	Mathematical Modeling and Simulation	3-1-0
14	AME33114	Computational Fluid Dynamics	3-1-0
15	AME33115	Information and Coding Theory	3-1-0
16	AME33116	Parallel Computing	3-1-0
Elective II			
1	AME33117	Combinatorics	3-1-0
2	AME33118	Artificial Intelligence	3-1-0
3	AME33119	Computer Algebra	3-1-0
4	AME33120	Theory of Compiler Design	3-1-0
5	AME33121	Image Processing	3-1-0
6	AME33122	Financial Mathematics	3-1-0
7	AME33123	Software Reliability	3-1-0
8	AME33124	Finite Element Method: Theory and Applications	3-1-0
9	AME33125	Sobolev Spaces	3-1-0
10	AME33126	Industrial Statistics	3-1-0
11	AME33127	Mathematical Ecology	3-1-0
12	AME33128	Wave Propagation and Fracture in Solids	3-1-0
13	AME33129	Operator Theory	3-1-0
14	AME33130	Design of Experiments	3-1-0
15	AME33131	Magneto Hydrodynamics	3-1-0
16	AME33132	Time Series Analysis	3-1-0

Syllabus

First Semester

AMC 31101
Probability & Statistics **3-1-0**

Concept of frequency distribution, Probability: Addition, Multiplication, Baye's theorem. Moment generating and Characteristic function, Probability inequalities, Law of large numbers, Central Limit Theorem, Discrete and Continuous Probability distributions, Chi-square, t and F. Distribution of order statistics and range, Correlation and regression, Multiple and partial correlation, plane of regression, rank correlation and intra class correlation.

AMC 31102
Ordinary and Partial Differential Equations **4-1-0**

Section A: Ordinary Differential Equations

Initial value problems, Existence and Uniqueness theorem, Series solution around an ordinary point and a regular singular point, Method of Frobenius, Bessel, Legendre and Hypergeometric equations, Confluent Hypergeometric equation, Self adjoint eigen value problems, Green's functions, Second order boundary value problems, Sturm Liouville problems.

Section B: Partial Differential Equations

Fourier series, Linear and quasi linear equations, Partial Differential Equations of second order with constant and variable coefficients, Classification and reduction of second order equations to canonical form, Cauchy's, Neumann and Dirichlet's problems, Solution of Laplace and Poisson's equations in two- and three-dimensions by variable separable method, Solution of wave equation and unsteady heat equation in homogeneous, non-homogeneous cases.

AMC 31103
Discrete Mathematics **3-0-0**

Permutation, Combination, Use of generating function as enumerator of permutation and combination, Ordering of permutations and combination, Principal of Inclusion and Exclusion. Recurrence Relations and their solutions using generating function, Language and Grammar, Relation, Partial Ordering Relations and Lattices, Introduction to Graph Theory, Introduction to Tree, Spanning Tree, Boolean Algebra, Propositional and Predicate Calculus.

AMC 31104
Digital Electronics and Computer Organization **3-1-0**

Basic of Boolean Algebra and Minimization Techniques, Combinational and sequential circuits, Introduction to finite state machine concept, Basic Digital circuits, Shift Register and Flip-flops and counters, Semiconductor memories, Logic implementation on ROM, PAL, PLA and Gate Array.

Data Representation, Register, Transfer and Microoperations, Basic Computer Organization, Programming the Basic Compute, Microprogmmed Control, CPU, Instruction Cycle / Format, Addressing, Computer Arithmetic, I/O Organization, Memory Organization, Multiprocessors.

AMC 31105
Computer Programming **3-0-0**

Introduction, Constants, variables and Data types, Operators and expressions, I/O operations, Control Structures; Arrays, Pointers, The preprocessors, Classes and Objects; Constructors and Destructors, Function overloading; Operator overloading and Type conversions; Inheritance; Polymorphisms, Console oriented I/O operations, File management, Templates; Exception Handling.

AMC 31201
Statistics Lab **0-0-3**

Computation of various measures of central tendency, dispersion, skewness and kurtosis, Fitting of binomial, Poisson, Normal distributions, Computation of correlation coefficient, multiple and partial correlation coefficients, rank correlation and intra-class correlation coefficients, Determination of regression

lines and plane of regressions, computation of correlation coefficient for bi-variate data.

AMC 31204
Digital Electronics and Computer organization Lab 0-0-3

Verification of I/C 7400 and implementation of standard gates, Realization of Boolean expressions using only NAND gates, Binary adder, Binary subtractor, BCD adder, Binary comparator, Cascading of MUX, Latches and Flip-flops using gates and ICs, Counters, Multivibrators using IC 555.

Laboratory design of registers, shift registers, ALU, memory sub-systems, CPU (based on the choice of word size, instruction format, datapath and control unit), Introduction to hardware description languages.

AMC 31205
Computer Programming Lab 0-0-3

Laboratory experiments will be set in consonance with the materials covered in AMC31105. It includes programming assignments for practicing and designing on different programming.

Second Semester

AMC 32101
Complex Analysis and Measure Theory 3-1-0

Section A: Complex Analysis

Functions of a complex variable, their continuity and differentiability, Analytic functions, Complex Integration, Cauchy's theorem and Cauchy's Integral formula, Morera's Theorem, Power series, Taylor's, Laurent's Theorems, Cauchy's inequality, Liouville's theorem, fundamental theorem of algebra, Identity Theorem, Maximum Modulus Principle, Schwarz's Lemma, Calculus of residues, Contour integrals, Argument principle, Rouché's Theorem, Conformal mappings.

Section B: Measure Theory

Field, σ -field, Borel field, Measure, inner and outer measure, Measurable sets and Measurable functions, Measurable and Measure space, Extension of measures, Signed measures, Jordan-Hahn Decomposition Theorem, Lebesgue measure, Lebesgue integral, Monotone Convergence theorem, Fatou's lemma, Dominated Convergence theorem, Absolute continuity, Radon Nikodin theorem, Product measures, Fubini's theorem.

AMC 32102

Statistical Inference

3-1-0

Estimation: Criteria of a good estimator, related theorems and results, Uniformly minimum variance unbiased estimation, Rao-Blackwell theorem, Cramer-Rao inequality, Methods of estimation, Interval estimation, Test of hypotheses: Definition of various terms, Neyman-Pearson's lemma, likelihood ratio test, Tests for mean and variance in normal distribution (one and two population case), Tests for correlation and regression coefficients, paired t-test, chi-square test for goodness of fit, contingency tables, large sample tests through normal approximations, test of independence, Sequential Analysis, Non-Parametric tests, Analysis of Variance: One-way and two-way classifications.

AMC 32103

Data Base Management Systems

3-0-0

Database concepts ,Entity relationship model, relational network and hierarctial data models, Relational database design, functional and multivalued dependency, Normal form, data description languages, relational algebra and calculus, SQL, query facility and query optimization, Introduction to distributed databases implementation issues, Storage media and storage structure, file and index organization, Heap file, indexed file, B+ tree file , denie index, file with variable length records, Performance and evaluation.

AMC 32104

Data Structures

3-0-0

Introduction to data structures, Introduction to complexity of algorithms, Linear data structures viz. Array, Stacks, Queues,

Linked List, Nonlinear data structures : Trees and Graphs, 2-tree and Height balanced tree, Binary search trees, Searching Algorithms, Sorting Algorithms, Hashing and Hash functions, File organization methods.

AMC 32105
Operating Systems

3-1-0

Introduction to Operating System, Operating System Structures, Processes, Threads, Process Synchronization, CPU Scheduling, Deadlock, Memory Management, File System Implementation and I/O System.

AMC 32202

Statistical Inference Lab

0-0-3

Computation of estimates based on various properties, computation of interval estimates. Practical based on tests of hypotheses: one population and two population cases, tests of correlation and regression coefficients, paired t-test, contingency tables, Tests of goodness of fit. Practicals based on non-parametric tests and analysis of variance.

AMC 32203
Data Base Management Systems Lab

0-0-3

This will be based on the topics covered in the course AMC 32102, which emphasis on the experiments that supplement Structured Query Language (SQL), PL/SQL, Mini-projects implementation in RDBMS environment.

AMC 32204
Data Structures Lab

0-0-3

Laboratory experiments will be set in consonance with the materials covered in AMC 32104. This will include problems on arrays, stacks and queues, linked lists (addition, deletion, concatenation, merge), sorting and searching, and traversal techniques of trees and graphs.

AMC32205
Operating System Lab

0-0-3

It includes experiments that supplement the theory taught in AMC32105.

Third Semester

AMC 33101
Functional Analysis

3-1-0

Metric spaces, complete metric spaces, Banach contraction mapping theorem, Banach spaces; bounded linear functionals and bounded linear operators, dual spaces, Hahn-Banach theorem, uniform boundedness principle, open mapping and closed graph theorems, weak convergence, Hilbert spaces, orthonormal sets, Riesz representation theorem, bounded linear operators on Hilbert spaces.

AMC 33102
Software Engineering

3-1-0

The software process, computer based system engineering, project management, requirement and specification, software prototyping, software design, software reliability, software reuse, safety critical software, verification and validation, computer aided software testing, software cost estimation, quality management, process improvement, software maintenance, configuration management, software re-engineering.

AMC 33103
Advanced Algebra

3-1-0

Fields: Definition and examples, Ring of polynomials over a field, Field extensions, Algebraic and transcendental elements, Algebraic extensions, Splitting field of a polynomial, Algebraic closure of a field, Uniqueness. Normal, separable, purely inseparable extensions, Primitive elements of a field extension – simple extensions, Fundamental theorem of Galois. Solvability by radicals – Solutions of cubic and quartic polynomials, Insolvability of quintic and higher degree

polynomials, Geometric constructions, Cyclotomic extensions, Finite fields, Cyclotomic polynomials and its properties, Traces and norms.

Modules: Definition, examples and basic properties, Free modules, submodules and quotient modules, isomorphism theorems, Direct sum and direct products, Noetherian and Artinian rings and modules, structure of Artinian rings, Hilbert basis theorem, Jordan - Holder theorem, Radicals of modules, Nakayama lemma.

Elective I

Elective II

AMC 33202

Software Engineering Lab

0-0-3

Laboratory experiments will be set to supplement the theory taught in AMC33103, including programming and implementation for software design, testing and verification, Preparation of Test Cases etc. Working with the various CASE Tools like Caliber RM, Together Solo, Star Team etc.

Fourth Semester

AMC 34101

Design and Analysis of Algorithm

3-0-0

Preliminaries: Introduction to algorithms, Analyzing algorithms: space and time complexity, growth of functions, summations, recurrences, sets, etc. Greedy Algorithms: General characteristics, Graphs: minimum spanning tree, Theknapsack problem, scheduling, Divide and Conquer: Binary search, Sorting: sorting by merging, qucksort, Dynamic Programming: Elements of dynamic programming, The principle of optimality, The knapsack problem, Shortest paths, Chained matrix multiplication, Graph Algorithms: Depth-first search, Breadth-first search, Backtracking, Branch-and-bound, Polynomials and FFT: Representation of polynomials, The DFT and FFT, Efficient FFT implementation, Heuristic and Approximate

Algorithms: Heuristic algorithms, approximate algorithms, NP-hard approximation problems.

AMC 34102

Advance Numerical Methods

3-0-0

Solution of tridiagonal system, Complex root of non-linear equation, solution of simultaneous non-linear equations, Numerical evaluation of double and triple integrals with constant and variable limits and its application, Solution of integral equations, Solution of initial-value problem by single and multistep methods, Solution of linear and non-linear boundary-value problems, Solution of Characteristics value problems, Solution of Laplace and Poisson equations in two variables by five point formula, Solution of Laplace equation in two variables by ADI method, Solution of mixed boundary value problem, Algorithm for elliptic equation in three variables, Solution of parabolic partial differential equation in two variables by explicit and implicit methods, Solution of parabolic equation in three variables by ADE and ADI methods, Solution of hyperbolic equation in two variables by explicit and implicit methods and algorithm for hyperbolic equation in three variables, Stability of finite difference schemes for parabolic and hyperbolic equations.

AMC 34103

Topology

3-1-0

Topological spaces, Weak topology, Subspace topology, Product and quotient spaces, Continuous maps and homeomorphism, Connectedness, Paths, Equivalence classes of paths, Path connected spaces, Separation axioms Compact and locally compact spaces.

AMC 34104

Optimization Techniques

3-1-0

Stochastic programming: Chance constrained programming and two-stage programming. Dynamic programming: Single stage and multi-stage programming, forward and backward process, deterministic and probabilistic dynamic programming models. Interior point methods: Projective and scaling method

for linear programming. Network Problems: Spanning Tree Algorithms, PART& CPM, Maximal flow Problem, Goal Programming: Problem formulation, Algorithms and their applications, Simulation Modelling, Monte Carlo Technique.

AMC 34105

Integral Transform and Integral Equations

3-1-0

Section A: Definition of Laplace Transform, Linearity property, condition for existence of Laplace Transform; First & Second Shifting properties, Laplace Transform of derivatives and integrals, Unit step functions, Dirac delta-function, Differentiation and Integration of transforms, Convolution Theorem, Inversion, Periodic functions, Evaluation of integrals by L.T., Solution of boundary value problems, Fourier Integral formula, Fourier Transform, Fourier sine and cosine transforms, Linearity, Scaling, frequency shifting and time shifting properties, Self reciprocity of Fourier Transform, Convolution theorem, Application to boundary value problems.

Section B: Integral Equations: Basic concepts, Volterra integral equations, Relationship between linear differential equations and Volterra equations, Resolvent kernel, Method of successive approximations, Convolution type equations, Volterra equation of first kind, Abel's integral equation, Fredholm integral equations, Fredholm equations of the second kind, the method of Fredholm determinants, Iterated kernels, Integral equations with degenerate kernels, Eigen values and eigen functions of a Fredholm alternative, Construction of Green's function for BVP, Singular integral equations.

AMC 34201

Design and Analysis of Algorithm Lab

0-0-3

Laboratory experiments will be set based on the materials covered in AMC 34201. It includes programming assignments for practicing and designing on different algorithm design paradigms.

AMC 34202

Advance Numerical Methods Lab

0-0-3

This will be based on the topics covered in the course AMC34102, which emphasis to write the programs for Numerical Techniques.

Syllabus of Elective Papers

ELECTIVE I

AME 333101

Computer Networks

3-1-0

Introduction and layered network architecture, circuit switching, packet switching, Data link protocols, stop and wait, sliding window, HDLC, Queuing systems and other Markov systems, Delay analysis in data network, LAN protocols, CSMA/CD, token ring, FDDI, ATM analysis, Network layer-routing, Repeaters, bridges, gateways, TCP/IP, Internet protocols.

AME 333102

Celestial Mechanics

3-1-0

The Two Body Problem: Formulation of the two body problem. Integrals of area, angular momentum and energy, Equation of the relative orbit and its solution, Kepler's equation and its solution, Heliocentric and geocentric co-ordinates, computation of ephemeris, Parabolic and hyperbolic orbits, f and g series, Orbit computation by Laplace and Gauss methods, The Three Body problem: Lagrange's solution for the motion of three bodies, Restricted three body problem, Surfaces of zero relative velocity, Double points, Stability of straight line and equilateral triangle solutions, N - Body problem: The ten integrals of motion of the n-body problem, Transfer of origin to one of the particles, The perturbing function, Virial theorem.

AME33103

Sampling Theory

3-1-0

Finite population sampling: Basic principles of sample surveys, simple random sampling with and without replacement,

probability proportional to size sampling, Hurwitz-Thompson estimator, ordered and unordered estimates, stratified random sampling, allocation problems, post-stratification, ratio, regression and product method of estimation, double sampling, cluster sampling, two-stage sampling and systematic sampling, Non-sampling errors, non-response problems, Warner's randomized response technique for sensitive characteristics, measurement errors in sample surveys.

AME33104

Stochastic Processes

3-1-0

Definition and classification of general stochastic processes, Markov Chains: definition, transition probability matrices, classification of states, limiting properties, Markov Chains with Discrete State Space: Poisson process, birth and death processes, Renewal Process: renewal equation, mean renewal time, stopping time, Markov Process with Continuous State Space: Introduction to Brownian motion, Congestion Process: Queuing Process, M/M/1 Queue.

AME 33105

Non-Linear Dynamics and Chaos

3-1-0

Dynamical systems- Central manifold and Normal form, attractors, SIC, 1D map, Logistic map, Poincare' maps, generalized Baker's map, circle map. Bifurcations- Saddle-node, Transcritical, pitchfork, Hopf-bifurcation, Global bifurcations, Melnikov's method for homoclinic orbits, Strange attractors & fractals dimensions, Henon map and Rossler system, Box-counting, pointwise and correlation, hausdorff dimensions, Lyapunov exponent, Horseshoe map and symbolic dynamics, chaotic transitions, intermittency, crisis, quasiperiodicity, controlling & synchronization of chaos.

AME33106

Fluid Dynamics

3-1-0

Equations of motion for viscous fluid, similarity of flows, Reynolds number, Flow between parallel flat plates, steady flow in pipes, Flow between two concentric cylinders,

Application of parallel flow theory, Unsteady flow over a flat plate, Boundary layer concept, Boundary layer equations in two-dimensional flow, Boundary layer flow along the flat plates: Blasius solution, Shearing stress and Boundary layer thickness, Boundary layer on a surface with pressure gradient, Momentum integral theorems for Boundary layer, The Von Karman integral relation, Application of Momentum integral equation to Boundary layers: Von Karman-Pohlhausen method, Separation of boundary layer flow, Boundary layer control, Methods of Boundary layer control, Introduction to turbulent flow: Origin of turbulence, Reynold's modification of Navier-Stoke's equations for turbulent flow, Semi-empirical theory of turbulence.

AME33107

Mechanics of Solids

3-1-0

Analysis of stress, principal stresses, principal planes, maximum shearing stresses, Mohr's circle diagram, equations of deformation and strain, strain in form of displacement, compatibility concept, need and physical significance, stress-strain relation, Generalized Hook's Law, different types of symmetry, density function, Airy's stress function, wave propagation in unbounded elastic medium

AME33108

Wavelets: Theory and Applications

3-1-0

Fourier Analysis: Fourier and Inverse Fourier Transforms, Continuous-Time Convolution and the Delta Function, Fourier Transform of Square Integrable Functions, Fourier Series, Basic Convergence Theory and Poisson's Summation Formula. Wavelet Transforms and Basic Properties: The Gabor Transform, Basic Properties of Gabor Transforms, The Integral Wavelet Transforms, Dyadic Wavelets and Inversions, Basic Properties of Wavelet Transforms, The Discrete Wavelet Transforms, Orthonormal Wavelets, Wavelet frames & Multiband, Curvelets, Scaling Functions and Wavelets: Definition of Multiresolution Analysis and Examples, Properties Scaling Functions and Orthonormal Wavelet Bases, Construction of Orthonormal Wavelets, Daubechie's Wavelets and Algorithms.

AME33109**Computational Geometry****3-1-0**

Introduction: Historical perspective, Towards Computational Geometry, Data Structures, Geometric Preliminaries. Convex Hulls: Problem statement and lower bounds, Graham's scan, Jarvis's march, Quick hull technique, Divide-and-conquer algorithm, Dynamic convex hull algorithm, Extension and Applications. Point Searching: Point location problems, Location of a point in a planar subdivision, The slab method. Proximity: A collection of problems, Locus Approach, Voronoi diagram and its construction, Delaunay triangulations, Proximity problems solved by Voronoi diagram. Orthogonal Range Searching: 1-dimensional range searching, Kd-trees, Range trees, Higher-dimensional range trees. Window Searching: Interval Trees, Priority search trees, Segment trees. Polygon Triangulations: Art Gallery Problem, Guarding and triangulations, Triangulating a monotone polygon. Some Applications in VLSI / robotics etc. Sweep Techniques: Trapezoidalization, Intersection of segments, Union of rectangles.

AME33110**Fuzzy Set Theory and its Applications****3-1-0**

Basic concepts of fuzzy sets and fuzzy logic, Motivation, Fuzzy sets and their representations, Membership functions and their designing, Operations on fuzzy sets, Convex fuzzy sets, Alpha-level cuts, Geometric interpretation of fuzzy sets, Fuzzy numbers and Linguistic variables, Fuzzy rules, Composition of fuzzy relations, Arithmetic operations on fuzzy numbers, Fuzzy reasoning.

Fuzzy mapping rules and fuzzy implication rules, Fuzzy rule-based models for function approximation, Types of fuzzy rule-based models (the Mamdani, TSK, and standard additive models), Fuzzy implications and approximate reasoning, Fuzzy logic and probability theory, Possibility versus probability, Probability of a fuzzy event, Baye's theorem for fuzzy events, Probabilistic interpretation of fuzzy sets, Decision making in Fuzzy environment, Fuzzy Decisions, Fuzzy Linear programming, Fuzzy Multi criteria analysis, Multiobjective decision making theory.

AME33111**Mathematical Hydrology****3-1-0**

Introduction about an occurrence of groundwater, Groundwater and its contamination, Sources of Groundwater Contamination, Geological formations and their Properties, Darcy's Laws, Solute transport Mechanism, Advective-Dispersive Equation (ADE) and simple problems with Dirichlet type, Neumann type and Cauchy type boundary conditions, Analytical and Numerical Approaches. Groundwater Resources, Groundwater Resources of India.

AME33112**Internet Technology****3-1-0**

Introduction to Internet: Internet Architecture, Evolution and Internet Network Architecture, OSI Reference Model, TCP/IP; Internet Protocols: Introduction to IPv4 and IPv6, Need of Internet Protocols, Addressing Scheme, Subnet Masking, ICMP, Transport Layer Protocol: TCP, UDP; Internet Routing Protocols: RIP, OSPF, BGP; Other Protocols: ARP, RARP, BOOTP, DHCP, DNS; Mail Server & E-mail Protocol: SMTP, MIME, POP; Client-Server Approach: Client-Server Models; Voice & Multimedia over IP: Introduction to Real-Time Traffic, VoIP. Mobile IP: Introduction and Need of MIP, Agent Discovery, Registration, Data Transfer, Inefficiency in MIP; HTML Web Tools: Introduction to HTTP, HTTP Transaction, HTTP Request and Response Message, Introduction to WWW, Browser Architecture, HTML Page Creation (Static and Dynamic); JAVA Programming: Introduction to JAVA, Features of JAVA, Difference between Application and Applets, Creation and Compilation of Application and Applets.

AME33113**Mathematical Modeling and Simulations****3-1-0**

Deterministic and stochastic models, Characteristics, Classifications, tools, techniques, modeling approaches, Modeling diagram, Compartmental models, Dynamical systems and its mathematical models, Models from systems of natural sciences: single and interacting populations, prey-predator,

competition, Epidemic models, Modeling of physical, Atmospheric and mining systems: Models of Heating and Cooling, Henon-Heiles System, Models for traffic flow, computer data communications, Stock Market, Modeling El Nino, Lorenz's model for global atmospheric circulation, Model for detecting land mines, modeling the ventilation system of a mine, Model for thermal environment of underground shopping Mall, Modeling Engineering systems: Models from Mechanical and Electronics systems, Models for vehicle dynamics, Hunt's oscillator, Kicked Harmonic oscillator, RLC Circuit, Chua Circuit, MLC Circuit, Matlab programs to study the dynamics of the developed model systems.

AME33114

Computational Fluid Dynamics

3-1-0

Governing equation of Fluid Dynamics, conservation form, simple CFD techniques, Lax-Wendroff technique, Mac Cormack's techniques, finite volume method, application to Euler equations, upwind difference scheme, viscous flow solutions, staggered grid, SIMPLE Algorithm, SOLA Algorithm, boundary element method and application to potential flows.

AME 33115

Information and Coding Theory

3-1-0

Communication processes, Channel matrix, Probability relation in a channel, The measure of information, Entropy function – Properties of entropy function, Channel capacity, Special types of channels, Binary symmetric channel, Encoding, Block code, Binary code, Binary Huffman code, Shannon – Fano Encoding procedure, Noiseless coding theorem, Shannon's first theorem, Error – correcting codes, Examples of codes, Hadamard matrices and codes, Binary Colay code, Matrix description of linear codes, Equivalence of linear codes, The Hamming codes, The standard array, Syndrome decoding, Cyclic codes.

AME33116

Parallel Computing

3-1-0

Need, Parallelism in uniprocessors systems; Models of Parallel

computation; Topology of interconnection networks; review of pipelining, pipelined vector processing methods, Embedding other networks, Parallel algorithm design; Performance and scalability; Algorithms for array processors: sum, prefix computation, matrix multiplication; parallel sorting: odd-even transposition sorting, odd-even merging, enumeration sorting, bitonic sorting, odd-even merging network; Communication algorithms: One-to-all, all-to-one, all-to-all, Multiprocessor interconnection networks and algorithms; Dataflow computers; Parallel algorithms on systolic array; Reconfigurable processor array. Models of distributed computation; Design issues; Operating systems for distributed computing; Distributed algorithms and applications, Clock synchronization algorithms; Distributed memory systems; Message passing; Middleware; Point-to-point communication; Fault Tolerance; Fault tolerant routing.

ELECTIVE-II

AME33117

Combinatorics

3-1-0

Counting principles, multinomial theorem, set partitions and Stirling numbers of the second kind, permutations and Stirling numbers of the first kind, number partitions, Lattice paths, Gaussian coefficients, Aztec diamonds, formal series, infinite sums and products, infinite matrices, inversion of sequences, probability generating functions, generating functions, evaluating sums, the exponential formula, more on number partitions and infinite products, Ramanujan's formula, hypergeometric sums, summation by elimination, infinite sums and closed forms, recurrence for hypergeometric sums, hypergeometric series, Sieve methods, inclusion-exclusion, Mobius inversion, involution principle, Gessel-Viennot lemma, Tutte matrix-tree theorem, enumeration and patterns, Polya-Redfield theorem, cycle index, symmetries on N and R , polyominoes

AME33118

Artificial Intelligence

3-1-0

Problem solving, search techniques, control strategies, game playing (minimax), reasoning, knowledge representation through predicate logic, rule-based systems, semantic nets, frames, conceptual dependency formalism; Planning. Handling uncertainty: Bayesian Networks, Dempster-Shafer theory, certainty factors, Fuzzy logic; Learning through Neural nets -- Back propagation, radial basis functions, Neural computational models - Hopfield Nets, Boltzman machines. PROLOG programming, Applications of Artificial Intelligence.

AME33119

Computer Algebra

3-1-0

Algebraic numbers, Primes and factoring, Trapdoors and public key, Pseudo-random numbers.

The finite Fourier transforms, The fast Fourier transform, Polynomial rings in several variables,

Complexity with respect to multiplication, Shift registers and coding, Finite Boolean algebras,

Equivalence classes of switching functions, Monoids and automata.

AME33120

Theory of Compiler Design

3-1-0

Compiler structure, Lexical and syntax analysis, Data structures organization, symbol table management, intermediate code forms, static and dynamic memory allocation, code generation for arithmetic expressions and control structures, subroutine calls and parameter transmission, code optimization.

AME33121

Image Processing

3-1-0

Image processing systems, human visual systems, image transforms, image enhancement, restoration and denoising, segmentation, object recognition, compression, binary image processing, color image processing, digital filters, run length

coding, block coding, contour coding, DCT, JPEG, MPEG etc, MATLAB, MATHEMATICA applications in image processing.

AME33122

Financial Mathematics

3-1-0

Some Preliminary Notions and Facts from Probability theory, The Theory of Interest and Calculus, Conditional expectation, Comparison of Random variables, Random Processes I (Counting and Compound Processes, Markov chains, Modelling Claim and Cash Flows), Random Processes II (Brownian Motion and Martingales), The Itô Integral , The Itô formula, Survival Distributions, Life Insurance Models, Annuity Models, Bonds, forward contracts and future, Asian, European and American options, Preferences of Individuals, An individual Risk model for short period.

AME33123

Software Reliability

3-1-0

Basic Concept of Software Engineering, Halstead and McCab's model, Software Reliability Modeling, Markovian Models, Description of Specific Models, Parameter Estimation, Comparison of Software Reliability Models, Calendar Time Modeling, Failure Adjustment for Evolving Programs, Fault Seeding Model, Nelson's Model, Software Cost Modelling

AME33124

Theory and Applications

Finite Element Method:

3-1-0

Variational principles, Euler's equation, Approximations by piece-wise polynomial, Basis function, line element and quadratic elements, natural co-ordinate system of projective geometry and shape function, virtual work, principle of virtual displacement, isoparametric elements, Linear strain triangle, Rayleigh-Ritz method, Galerkin methods and projection methods, triangular elements, element strains and stress, three dimensional tetrahedral element, shape function, stiffness matrix, Boundary value problems, fluid mechanics, heat flow and wave propagation.

AME33125

Sobolev Spaces

3-1-0

Introduction, Test function spaces, Calculus with distributions, supports of distributions, Structure theorems, convolutions, Fourier transforms, L_1 , L_2 theory of Fourier Transform, Tempered distributions, Applications of distributions theory and Fourier transform to differential equations, Hilbert Space, The Sobolev Space $H^{m,p}(\Omega)$, The Sobolev Space $H^s(\mathbb{R}^n)$, Product and Convolution in $H^s(\mathbb{R}^n)$, The space H^{-s} , The Sobolev Space $H^1(\Omega)$, L^p – Sobolev Space of order s .

AME33126

Industrial Statistics

3-1-0

Control charts for variables and attributes, acceptance sampling by attributes, single, double and sequential sampling plans, OC and ASN functions, AOQL and ATI, acceptance sampling by variables, tolerance limits. Reliability analysis: Hazard function, distribution with DFR and IFR, series and parallel systems, life testing experiments.

AME33127

Mathematical Ecology

3-1-0

Single species models, Exponential, logistic, Gompertz growth, Harvest model, Discrete-time and Delay model, Interacting population model, chemostate, prey-predator, competition & mutualism models, Dynamics of exploited populations, spatially structured models, Age-structured models, sex-structured models, models of spread, two sex models, Leslie matrix.

AME33128

Wave Propagation and Fracture in Solids

3-1-0

Section A: Wave Propagation

Study of propagation of waves in elastic, visco-elastic and poro elastic medium, Waves in anisotropic medium, thermo elastic medium, study of surface waves (Rayleigh & Love waves) in Elastic and visco-elastic medium including layered medium reflection and refraction of waves in isotropic elastic medium

Section B: Fracture of Solids

Fracture theories (ductile and brittle materials), Von-Misses, Tresca and Griffith fracture criterion, Initiation and Propagation of elastic plastic come, creep and relaxation

AME33129**Operator Theory****3-1-0**

Spectral Theory of Linear Operators in Normed Spaces, Spectral Theory in Finite Dimensional Normed Spaces, Basic Concepts, Spectral properties of Bounded Linear Operators, Further Properties of Resolvent and Spectrum, Use of Complex Analysis in Spectral Theory, Banach Algebras, Further properties of Banach Algebra, Gelfand - Naimark theorem.

AME33130**Design of Experiments****3-1-0**

Design of experiments: Analysis of variance two-way classified data with m observations per cell, Basic principles of design of experiments, completely randomized design (CRD), randomized block design (RBD) and latin square design (LSD), Estimation of missing observations in RBD and LSD, incomplete block design and balanced incomplete block design (BIBD). Factorial experiments: 2^2 , 2^3 , 3^2 and 3^3 factorial experiments, Confounding in factorial experiments, Split-plot and simple lattice designs.

AME33131**Magneto Hydrodynamics****3-1-0**

Basic concepts of Magneto-hydrodynamics, Lorentz force, Frame of reference, Electromagnetic Body force, Fundamental equations of MHD, Derivation of magnetic induction equation, Ohm's law for a moving conductor, Hall and Conduction currents, Kinematic aspects of MHD. Electromagnetic Radiation, Magnetic Pressure, Pointing vector, Alfven's theorem, Alfven's wave, Magnetic energy, Dissipative effect, Plane polarized waves, MHD waves in compressible fluid, Electromagnetic boundary conditions, One-dimensional flows: MHD channel Flows, MHD Stokes flow, MHD Rayleigh's Flow, MHD Flow in Rotating Medium, MHD Heat Transfer.

AME33132

Time Series Analysis

3-1-0

Discrete parameter stochastic processes, strong and weak stationary, autocovariance and autocorrelation, Moving average, autoregressive, autoregressive moving average and autoregressive integrated moving average processes, Box-Jenkins models, Estimation of the parameters in ARIMA models, forecasting, Periodogram and correlogram analysis