SHRIG.S.INSTITUTEOFTECHNOLOGYANDSCIENCE,INDORE (GOVERNMENT AIDED AUTONOMOUS INSTITUTE)

DEPARTMENTOF
APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE

Syllabi of PG Subjects

(*Approved by B.O.S held on 17-07-2020 and Academic Council held on 11-11-2020*)

S.G.S.I.T.S./Syllabus/2020-2021

INDEX

S.No	Class	Semester	SubjectCode	SubjectNomenclature
1.	M.Sc.	I	MA 94105	ComputerAidedNumericalAnalysis
2.	M.Sc.	I	MA 94106	ComputerArchitecture
3.	M.Sc.	I	MA 94108	AdvanceDiscreteMathematicsandAlgebra
4.	M.Sc.	I	MA 94109	OrdinaryandPartialDifferentialEquations
5.	M.Sc.	II	MA 94205	MathematicalTheoryofComputation
6.	M.Sc.	II	MA 94206	DataProcessingand Computation
7.	M.Sc.	II	MA 94207	OperationsResearch
8.	M.Sc.	II	MA94208	RealandComplex Analysis
9.	M.Sc.	III	MA 94303	FunctionalAnalysisandIntegralEquations
10.	M.Sc.	III	MA 94304	ObjectOrientedProgrammingSystems
11.	M.Sc.	III	MA94352	StatisticalQualityControl,StochasticProcessand Reliability
12.	M.Sc.	III	MA94371	MathematicalandStatisticalModelling

DEPARTMENTOFAPPLIEDMATHEMATICSANDCOMPUTATIONALSCIENCE
M.Sc.ISemester
MA94105:COMPUTERAIDEDNUMERICALANALYSIS

HOURSPERWEEK			CREDITS			MAXIMUMMARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSEOBECTIVES

To differentiate between numerical methods and numerical analysis and to apply numerical analysis concepts for solving various analytical and real life problems.

COURSEOUTCOMES

After completing this course student will be able to

CO1: Acquire knowledge of numerical analysis and fundamentals of programming.

CO2: Solve the algebraic, transcendental and system of linear equation using numerical methods.

CO3: Develop the concept of interpolation and apply it in finding the differentiation and integration.

CO4: Utilize the concept and applications of difference equations.

CO5: Apply the numerical methods to solve ordinary and partial differential equations.

COURSECONTENTS

THEORY

Unit 1Errorsandapproximations,Numberrepresentation,NumericalAnalysisand numerical Methods, Numerical stability, ill condition and convergence, numerical algorithmand Numerical Flow Charts, an Introduction of MATLAB, overview ofC features its use in Numerical Methods.

Unit 2SolutionofAlgebraicandTranscendentalEquations:Bisection(orBolzano) method, method of false position, Newton Raphson method. Solution of Simultaneous algebraic equations: Direct method- Gauss Elimination methodGauss Jordan method, Iterative method-Jacobi's method, Gauss Seidal method.

Unit 3Interpolation: Introduction, Interpolating polynomial, Missing term techniques, Newton's forward and backward interpolation formula, central difference formula, Lagrange's interpolation formula for unequal distances. Numerical differentiation: derivatives from forward and backward interpolations, Numerical Integration: General quadrature formula, formulae derived from it.

Unit 4   Difference equations: Definition, formation of difference equations, linear difference equations with constant coefficients. Difference equations reducible to linear form.Simultaneous difference equations with constant coefficient.

Unit 5   Numerical solution of Ordinary Differential Equations: Initial value problem, Euler's method, Picard's method, Taylor's method, modified Euler's method, Runge method, Runge-Kutta method, Adams- Bashforth method, Milne's method. Numericalsolutionof Partial DifferentialEquations:Classificationofsecond order equations, finite difference approximations to partial derivatives. Elliptic, Parabolic and Hyperbolic equations.

ASSESSMENT
1. Internal Assessment for continuous evaluation, mid-term tests, , tutorials, class performance, etc. (30%).
2. EndsemesterTheoryExam(70%)

TEXTBOOKSRECOMMENDED
1.   K SankaraRao,Numerical methodsforScientistandEngineers,PrenticeHallofIndia.
2.   BalaguruswamyE.,Numericalmethods,TataMcGraw-HillPublishingCompanyLtd.,New Delhi.

REFERENCEBOOKS
1. PradeepNiyogi,NumericalAnalysisandAlgorithm,TataMcgraw-HillPublishingCom.Ltd, New Delhi.
2. JainN.K.,Iyengar,S.R.K.andJainR.K.,NumericalmethodsforscientificandEngineering Computations, Wile Eastern Ltd.,1984.
3. Steven C.ChapraandRaymondP.Candle,NumericalmethodsforEngineers,5[th]edition,Tata McGraw hill publishing company Ltd., New Delhi2006.

DEPARTMENT OFAPPLIEDMATHEMATICS ANDCOMPUTATIONALSCIENCE
M.Sc.ISemester
MA94106:COMPUTERARCHITECTURE

HOURSPERWEEK			CREDITS			MAXIMUMMARKS				
'I'	P	TU	I'	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSEOBJECTIVE

To introduce the general concepts of digital logic design and its applications, architecture of memory and I/O organization in a computer system and fundamentals concepts of parallel computing, pipeline processing, vector processing and array processing.

COURSEOUTCOMES

After completing this course student will be able to
CO1: Acquire the knowledge of number systems, general concepts of digital devices and their use in combinational and sequential logic circuit design and solve Boolean expression usingKarnaugh map method.
CO2:Discuss the working process, structure and organization of various parts of a system memory hierarchy and CPU.
CO3: Identify the internal organization of DMA, Input/Outputs processor and relations between their main components.
CO4:Explain the advanced concepts of parallel processing, different types of Inter processor arbitration techniques, inter processor communication and synchronization.
CO5:Analyze the fundamentals concepts of pipeline processing, vector processing, array processing and RISC/CISC architectures.

COURSECONTENTS

THEORY

Unit 1IntroductiontoCA:Numbersystem,VonNeumannModel,Digitaldevices: Logic gates , flip flops , Logic Design : Boolean Algebra , K-map , Method of simplification of Logic expression , Combinational & Sequential circuits.

Unit 2CPU Organization: ALU, Control unit, Registers, Memory organization, memory properties, Associative memory, Cache memory, machine language level,instruction types, Input Output Organization: I/O interface. Modes of transfer.

Unit 3Memory: Memory mapped I/O and I/O mapped I/O, programmed I/O, concepts of interrupts and DMA, I/O processors, concept of hardwired and micro programmed control instruction.

Unit4   Introductiontoadvancedarchitecture:Parallelprocessing,Interconnection   structure, Interprocessor Arbitration: Serial, Parallel and Dynamic arbitration Procedure, Interprocessor Communication and Synchronization, Cache Coherence.

Unit 5   Pipeline processing: Concepts , Arithmetic and Instruction Pipeline , Vector,and Array processing: vector operation, matrix multiplication, memory interleaving, Attachedarray Processor, SIMD Array Processor. Comparison of RISC and CISC.

ASSESSMENT
1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%).
2. EndsemesterTheoryExam(70%)

TEXTBOOKSRECOMMENDED
1.MorisMano,ComputerSystemArchitecture,PrenticeHall of India.
2. William Stallings, Computer Organization and Architecture, 7th Edition, Pearson Education
Prentice Hall of India,2009.

REFERENCEBOOKS
1. Andrew S.Tanenbaum, Structured Computer organizations, 5th Edition, Pearson Education
Prentice Hall of India,2006.
2. A.P.Godse and D.A. Godse, Computer Architecture, 4thEdition, Technical Publications
Pune,2009.

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. I Semester
MA94108: ADVANCE DISCRETE MATHEMATICS AND ALGEBRA

HOURS PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSE OBJECTIVE

To introduce the concept of set theory, Boolean algebra, Graph theory, Automata theory, theory of formal languages, grammars, ring and field theory.

COURSE OUTCOMES

After completing this course student will be able to
CO1: Use the basic concepts of set theory, Boolean algebra and mathematical logic for analyzing prepositions.
CO2: Illustrate various graphs, solving minimal weight problems and shortest path problems using suitable algorithm in graph theory.
CO3: Evaluate basic properties of formal languages, grammars and finite automata.
CO4: Develop the concepts of ring theory and modules theory with their properties.
CO5: Apply basic theory of vector space in field extensions.

COURSE CONTENTS

THEORY

Unit 1 Formal Logic: Basic preliminaries Sets, functions, relations (equivalence relations and poset) for logic and subsequent development; statements, symbolic representation and tautologies, Quantifiers, Predicates, Propositional and Predicate calculus, Proofs & method of proofs, Algebra and Lattices: Boolean expression, Logic gates and circuits, Karnaugh maps, Lattices, Distributive lattice.

Unit 2 Graph Theory: Definition of (Undirected) Graphs, Paths, Circuits, Cycles and Subgraphs, Degree of Vertex, Connectivity, Complete regular and bipartite graphs and Complete Bipartite Graphs, Kuratowskis Theorem (Statement only) and its uses, planer graphs and their properties, Euler's formula for connected Planer Graphs, Graph colourings, directed graphs, Trees and Binary Trees, Spanning Trees, Cut-sets, Minimal Spanning Trees, Euler's Theorem on the existence of Eulerian paths and circuits, Directed Graphs, In degree and Out degree of a vertex, weighted undirected graphs, Matrix representation of Graph.

Unit 3	Introduction to Languages, Operation on Languages, Regular Expression,Regular Languages, Grammars, Language generated by a grammar, Types of Grammars, Finite State Automata, Pumping Lemma , Finite State Machine, Turing Machine.

Unit 3   Introduction to Languages, Operation on Languages, Regular Expression,Regular Languages, Grammars, Language generated by a grammar, Types of Grammars, Finite State Automata, Pumping Lemma , Finite State Machine, Turing Machine.

Unit 4   Algebra: Review of basic concepts of group theory.Rings: Some basicconcepts, Algebra over fields, ideals, Minimal, Maximal & prime ideals, PID and UFD, Euclidean domain, Polynomial rings. Modules : Definition of modules, properties of modules, sub modules, linear sum of two sub modules, direct sum of sub modules , homomorphism of modules, kernel of a homomorphism, cyclic modules.

Unit 5   Vectorspace:Reviewof BasicConcepts.Field:Extensionfield,Algebraic and Transcendental Extension field, roots of Polynomial, finite field.

ASSESSMENT
1. Internal Assessment for continuous evaluation,mid-term tests, tutorials, class performance, etc. (30%).
2. EndsemesterTheoryExam(70%)

TEXTBOOKSRECOMMENDED
1. Herstein, I.N, Topics in Algebra, Vikas Publications, Delhi-6, 1969.
2.SwapanK.Sarkar, AText Book ofDiscrete Mathematics, S. Chand &Company Ltd., Delhi,2003.
3.S. Lipschutz M. Lipson,Schaum'sOutline of Theory and Problems of Discrete Mathematics,2nd edition TataMcGraw Hill Publishing Company Ltd., NewDelhi,1997

REFERENCEBOOKS
1. ArtinMichael,Algebra,PearsonEducationInc.,2007.
2. S.A.Wiitala, Discrete Mathematics, AUnified Approach, McGraw Hill Company, Singapore, 1987.

DEPARTMENTOFAPPLIEDMATHEMATICSANDCOMPUTATIONALSCIENCE
M.Sc.ISemester
MA94109:ORDINARYANDPARTIALDIFFRENTIALEQUATIONS

HOURSPERWEEK			CREDITS			MAXIMUMMARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSEOBJECTIVE

To introduce the concept of Ordinary Differential Equations, Partial Differential Equationsand their applications.

COURSEOUTCOMES

After completing this course student will be able to
CO1: Solve the problems based on existence and uniqueness of solutions of an initial value problem of first order using the concept of Lipschitz condition.
CO2: Develop the concepts of existence and uniqueness of solutions of an initial value problem of n-th order linear differential equations and apply Wronskian and its properties to analyze linear dependence of solutions.
CO3: Classify PDE and solve their canonical form.
CO4: Apply and solve PDE in various coordinate systems using the method of separation of variables.
CO5: Acquire the knowledge of Green's function and its applications in solving Laplace, Wave equation and Helmholtz theorem.

COURSECONTENTS

THEORY
Unit1   TheoryofOrdinaryDifferentialEquation:InitialandBoundaryValueProblems, Picard's Iterations, Lipschitz conditions, Sufficient conditions for being Lipschitzian in termsofpartialderivatives,ExamplesofLipschitzianandNon-Lipschitzianfunctions, Picard'sTheoremforlocal existenceand uniquenessof solutionsof aninitialvalue problem of first order which is solved for the derivative, examples ofproblems without solutions and of equations where Picard's iterations do not converge

Unit 2Theory of Ordinary Differential Equation: Existence & Uniqueness for Ordinary Differential Equation, Wronskian and Linear independence, Initial value problem fornth order differential equation, Linear equations with variable coefficients, Lipschitzcondition.

Unit 3Fundamental concepts of partial differential equation, Elliptic differential Equations, Parabolic Differential equations, Hyperbolic Differential Equations.

Unit 4 Method of separation of variables: Laplace, Diffusion and Wave equations in Cartesian, cylindrical and spherical polar coordinates, Boundary value problems for transverse vibrations of strings and heat diffusion in a finite rod, Classification of linear integral equations, Relation between differential and integral equation.

Unit 5 Green's Functions: Introduction, Green's Function for Laplace Equation, Green's Function for the Wave Equation-Helmholtz Theorem.

ASSESSMENT
1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%).
2. End semester Theory Exam (70%)

TEXTBOOKS RECOMMENDED

1. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall of India, New Delhi, 1968.
2. Zafar Ahsan, Differential Equations and their Application, Prentice-Hall of India Pvt. Ltd., New Delhi, 2004.

REFERENCE BOOKS

1. Sankara Rao, K., Introduction to Partial Differential Equations, Prentice Hall of India Pvt. Ltd., New Delhi ,1997.
2. Friedrich Sauvigny, Partial Differential Equations, Springer London Heidelberg 2006.
3. I.N. Sneddon: Elements of Partial Differential Equations, McGraw-Hill Pub.,1957.
4. T. Amaranath: An Elementary Course in Partial Differential Equations, Narosa Pub. 2005.

DEPARTMENTOFAPPLIEDMATHEMATICSANDCOMPUTATIONALSCIENCE
M.Sc.IISemester
MA94205:MATHEMATICALTHEORYOFCOMPUTATION

HOURSPERWEEK			CREDITS			MAXIMUMMARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSEOBJECTIVE

To introduce the concepts of mathematical foundations of computation using automata theory, formal languages and grammar, turing machine with their complexity and computability.

COURSEOUTCOMES

After completing this course student will be able to
CO1: Acquire the knowledge of basic concepts of set theory, graphs, preposition and predicate calculus.
CO2: Create the ideas of finite automata and its different types together with formal languages and grammars, regular grammar and regular languages.
CO3: Use the fundamental concepts and properties of context-free languages , context- free grammar and solve various problems by applying normal form techniques for context free-grammars.
CO4: Analyze and design Pushdown Automata machine for given CF language.
CO5: Gain deeper knowledge of Turing machines and solve computational problems regarding their computability and complexity**.**

COURSECONTENTS
THEORY

Unit 1Introduction: Review of sets, Relations and Functions, Graphs, Trees, Principal of Induction, Languages and Grammers-Fundamental Concepts, Preposition and Predicate Calculus.

Unit 2Theory of Automata:Definition of Automata; Description of finite Automata-Deterministic finite Accepters (DFAs), Non-deterministic finite Accepters (NFAs),Regular expression, Regular Grammars and Languages, Properties of Regular Languages, Pumping Lemma for Regular Languages.

Unit 3 Context Free Languages: Contextfree-grammars and Derivation Trees, Parsing and ambiguity, Normal form for Context free-grammars -Chomsky and Greibach normal form, Pumping Lemma for Context Free languages, Properties of Context Free languages.

Unit 4 Pushdown Automata: Basic Definition of Pushdown Automata, Non Deterministic Pushdown Automata and Deterministic PushdownAutomata, Pushdown Automata and Context Free languages.

Unit 5 Turing Machines: Definition of a Turing Machine, Turing Machine as Language, Accepters, Turing's Thesis, Universal Turing Machine, Linear Bounded Automata, Computational complexity theory- P and NP Problems.

ASSESSMENT
1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%).
2. EndsemesterTheoryExam(70%)

TEXTBOOKSRECOMMENDED
1. Peter Linz, An Introduction to Formal Languages and Automata, 2nd Edition, Narosa Publishing House,1997.
2. K.L.P.Mishra, N.Chandrasekaran, TheoryofComputer Science Automata, Language and Computation, 3rd Edition, Prentice Hall of India,2007.

REFERENCEBOOKS
1. H. R. Lewis and C.H.Papadimitriu , Elements of the theoryof Computations, Prentice Hallof India Pvt. Ltd., New Delhi;1999.
2. Robert N. Moll, Michael A. Arbib , A.J.Kfoury, An introduction to formal language theory, Springer Verlag, New York,1988.
3. Michael Sipser, Introduction to the TheoryofComputations, PWS Publishing Company Boston,1997.

DEPARTMENTOFAPPLIEDMATHEMATICSANDCOMPUTATIONALSCIENCE
M.Sc.IISemester
MA94206:DATAPROCESSINGANDCOMPUTATION

HOURSPERWEEK			CREDITS			MAXIMUMMARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSEOBJECTIVE

To introduce the concept ofdata models, Structured QueryLanguage (SQL), network and hierarchical data model and data base methodologies

COURSEOUTCOMES

After completing this course student will be able to

CO1: Acquire the knowledge of basic concepts of various data model used in database design.

CO2: Design ER modeling, relational modeling and apply relational database
theory to describe relational algebra expression.

CO3: Write SQL queries to retrieve information from databases and develop the concepts
and importance of indexing, view and sequences.

CO4: Analyze the basic concepts of Normalization theory, network and hierarchical
data models.

CO5: Use the concept of transaction processing, concurrency control and recovery system
in database.

COURSECONTENTS

THEORY

Unit 1   Basics concepts, Data Models: Categories Schema, Instances and database state, Database architecture and data independence, database languages.

Unit 2   Data Models: Entityrelationships models, Relational Data Models, Relational algebra: Basic Relational algebra operations.

Unit 3StructuredQuerylanguages(SQL):DataTypes,BasicQuiresinSQL,insert, delete & update statementsin SQL,indexing,sequences andVIEW in SQL (LAB).

Unit4   NetworkandHierarchicaldatamodels,Normalizationtheory.

Unit 5   Database methodologies and DBA, Transaction Management: Basic concepts of Transactions, Concurrency Control and Recovery system, Query Processing.

ASSESSMENT
1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%).
2. EndsemesterTheoryExam(70%)

TEXTBOOKSRECOMMENDED

1. RamezElmasri and ShamkantB.Navathe, Fundamentals of Database Systems, 7th Edition, Pearson,2016.

2. H.F Korth, A. Silberchatz and S.Sudarshan, Database Systems Concepts,6th Edition McGraw Hill,2010.

REFERENCEBOOKS

1. J.DWaldmenGalgolia,PrinciplesofDatabaseSystems,1984.
2. Fundamentals ofDatabase Management System, RenuWigand EktaWalia,Indian Society for Technical Education, New Mehrauli Road, NewDelhi-110016.

DEPARTMENTOFAPPLIEDMATHEMATICSANDCOMPUTATIONALSCIENCE
M.Sc.IISemester
MA94207:OPERATIONSRESEARCH

HOURSPERWEEK			CREDITS			MAXIMUMMARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSEOBJECTIVE

To introduce operation research for solving assignment, transportation, sequencing, Dynamic and Non-Linear Programming problems.

COURSEOUTCOMES

After completing this course student will be able to

CO1: Formulate and solve linear programming problems using graphical, Simplex, dual Simplex and Big M methods.

CO2: Solve Assignment, Transportation and Game Theory problems.

CO3: Apply sequencing and scheduling problems.

CO4: Utilize the basic concepts related to information theory and its applications.

CO5: Construct and apply dynamic programming problems and non-linear programming problems.

COURSECONTENTS

THEORY

Unit 1IntroductiontoOperationsresearch,MathematicalformationofLinearProgramming problems, Graphical solution as two phase method, Linear Programming problems, Simplex method, Big M method, Duality in linear programming, Dual simplex method, degeneracy.

Unit 2Assignment and Transportationproblems, Game theory: Simple and mixed strategy game, two persons zero sum games, Dominance property.

Unit 3Sequencingandscheduling:Sequencingproblemwithnjobsandmmachines, optimalsequencealgorithm,CriticalpathdeterminationbyCPMandPERT methods.

Unit 4Information Theory: Basics ideas, Communication system, Noisy and noiseless channel, Channel matrix, Mathematical Definition of information, Measure of uncertainty and properties of entropy function, Channel capacity, efficiency and redundancy encoding, Shannon Fano method.

Unit5   Dynamic and Non-linear programming: Concept of dynamic programming, decision tree and Bellman's principle of optimality, Solution of problem with finite number of stages, minimum path problem. Lagrangian method, Kuhn-Tucker conditions, Quadratic programming.

ASSESSMENT
1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%).
2. End semester Theory Exam (70%)

TEXTBOOKS RECOMMENDED

1. Taha H.A, Operations Research: An Introduction, McMillian Co., NewYork.

2. Gupta, Kanti Swaroop, Gupta P.K. and Manmohan, Operations Research, Sultan Chand and Sons, NewDelhi.

REFERENCE BOOKS

1. R.Pannerselvam, Operations Research, Prentice Hall of India Pvt. Ltd., NewDelhi, 2004.
2. S.D.Sharma, Operations Research, KedarNath & Co. Meerut.

DEPARTMENTOFAPPLIEDMATHEMATICSANDCOMPUTATIONALSCIENCE
M.Sc.IISemester
MA94208:REALANDCOMPLEXANAYSILS

HOURSPERWEEK			CREDITS			MAXIMUMMARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSEOBJECTIVE

To introduce the concept ofLebesgue measure theory, Fourier Series, Real and Complex Analysis.

COURSEOUTCOMES

After completing this course student will be able to
CO1: Acquire the knowledg of measurable sets, measurable functions and Lebesgue integration.
CO2: Develop the concepts of Fourier series with its convergent criteria and consequences of Riemann- Lebesgue theorem.
CO3: Use the concept of analytic functions, conformal mappings and their properties, application of mean value property, Poisson and Schwartz's theorem.
CO4: Solve the integration of function of complex variable using Cauchy's theorem and integral formula.
CO5: Explain the concept of Cauchy residue theorem and its application.

COURSECONTENTS

THEORY

Unit 1Measure theory, function of bounded variation, measurable non-measurable sets, Borel sets, measurablefunctions, Lebesgue integral for bounded function over aset of finite measure, Lebesgue integral for unbounded function, theorems on convergence in measure, Lebsegue class L^P.

Unit 2Fourierseries:ConvergentcriteriaofFourierseries,Convergentproblem,Dirichlet's Conditions,Riemann-Lebesgue Theorem and its Consequences and Fourier analysis.

Unit 3 Concept of analytic function, C-R equations, Conjugate function, harmonic functions, the mean value property, Poisson's formula, Schwarz's theorem and the reflection principle. Conformality, areas and closed curves analytic function in regions, Conformal mapping, length and area, linear transformation, the linear groups, cross-ratio symmetry and oriented circles, use of level surface.

Unit4 Complex Integration: Line integrals, Rectifiable arcs, Cauchy's theorem for a rectangle, Cauchy's theorem for a circular disk. The index of a point with respect to a closed curve. Cauchy's integral formula.

Unit 5 The general form of Cauchy's theorem and calculus of residues: chains and cycles, simple connectivity, Exact differentials in simply connected regions, Residue theorem, the argument principle, Branch points.

ASSESSMENT
1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%).
2. End semester Theory Exam (70%)

TEXTBOOKS RECOMMENDED
1. Alhfors L.V., Complex Analysis (3rd Edition), McGraw Hill, Inc. Singapore, 1979.
2. Royden H.L., Real Analysis (3rd Edition), Collier Macmillan International, New York, 1987.

REFERENCE BOOKS
1. SE.C. Titchmarsh, The Theory of Functions, 2nd edition, Oxford University Press, London, 1939.
2. Singh Bijendra, Karanjgaokar Varsha, Chandel R.S., Complex Analysis, Gaura Pustak Sadan, Agra.

DEPARTMENTOFAPPLIEDMATHEMATICSANDCOMPUTATIONALSCIENCE
M.Sc.IIISemester
MA94303:FUNCTIONALANALYSISANDINTEGRALEQUATIONS

HOURSPERWEEK			CREDITS			MAXIMUMMARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSEOBJECTIVE

To introduce the conceptsofTopological space, Normed linear space, Hilbert space, Finite dimensional spectral theory and Integral Equations.

COURSEOUTCOMES

After completing this course student will be able to
CO1: Acquire the knowledge of continuous functions, homeomorphisms, compact spaces, connected spaces and separation axioms over various topological spaces.
CO2: Explain the proof and application of some famous theorems as; Hahn-Banach theorem, closed graph theorem and Uniform bounded principle in functional analysis.
CO3: Analyze the concept of Hilbert space and its properties, application of Bessel's inequality, Riesz representation theorem.
CO4: Use the concept of various operators with their properties, application of spectral theorems and fixed-point theory.
CO5: Solve the problems on integral equation and use of green's function in boundary value problems.

COURSECONTENTS

THEORY

Unit 1TopologicalSpace:Definition,OpenSet,ClosedSet,Neighborhood,filter, Countable Space, Separation axioms, Continuous mapping, Homomorphism, Connectedness and Compactness.

Unit 2Normed Linear Spaces**:** Branch space, Quotient space, continuous linear transformation, Hahn Banach theorem and its consequences, Conjugate space and separability. The Natural imbedding of the normed linear closed graph theorem, The uniform boundedness principle.

Unit 3   Hilbert Spaces: Definition and some of its properties, orthonormal complements,theprojectiontheorem,orthonormalsets.TheBessel'sinequality,Fourier expansion and parseval's equation (without proof) Riesz representation theorem.

Unit 4 Finite Dimensional Spectral Theory: Basic preliminary definitions of adjoint of an operator,selfadjointoperators,normalandunitaryoperators,Andtheir   properties. Projections, the spectral theorem, fixed-point theory and itsapplications.

Unit 5 Integral Equations: Preliminary concepts, formulation of integral equations and Classificationoflinearintegral equations.Integral differential equations, conversions of ordinary differential equations to integral equations.Solutions of integral equations with separable kernels. Characteristics number and eigenfunctions, fredholm determinant method. Construction of Green'sfunctions and its use in solving the boundary value problems, reductions of B.V.problems to integral equations. Resolvantkernal of the integral equations, method of successive approximation, convolution type kernels integral transform methods.

ASSESSMENT
1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%).
2. EndsemesterTheoryExam(70%)

TEXTBOOKSRECOMMENDED
1. B.k.Lahiri,Elementsoffunctionalanalysis,TheworldpressPvt.Ltd.,Calcutta,1982.
2. KarsnovM.,KiselvA.,MakAernkog,ProblemsandExerciseinIntegralEquations.

REFERENCEBOOKS
1. A.H. Siddhiqui, Functional Analysis. WithApplications, TataMcGraw HillPublishing Company Ltd., New Delhi, 1986.
2. G. F. Simmons, "Introduction to Topology and Modern Analysis," McGraw Hill Book Company, Inc.,NewYork,1963.

DEPARTMENTOFAPPLIEDMATHEMATICSANDCOMPUTATIONALSCIENCE
M.Sc.IIISemester
MA94304:OBJECTORIENTEDPROGRAMMINGSYSTEMS

HOURSPERWEEK			CREDITS			MAXIMUMMARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSEOBJECTIVE

Todevelopprogrammingskills,learnthebasicconceptsofOOPS,   object-orientedprogram analysis, design and testing.

COURSEOUTCOMES

After completing this course student will be able to

CO1: Use the basic concepts and importance of object oriented programming system, difference between structured oriented and object oriented programming features.

CO2: Apply the concepts of objects, classes, function overloading, operator overloading for developing programs.

CO3: Develop the concepts of inheritance, polymorphism and its different types.

CO4: Investigate principles and different methods of object-oriented analysis and design.

CO5: Acquire the knowledge of basic aspects of object-oriented program testing with its different methods, techniques of Rapid Prototyping and UML.

COURSECONTENTS

THEORY

Unit 1Introduction to Object Oriented Programming fundamentals, Comparison with procedural programming,Basicconceptsof objectorientedprogramming,Merits and demerits of OO methodology, Elements of the object model.

Unit 2Object oriented concepts: Concepts of objects and classes, attributes and methods, Accessmodifiers,staticmemberofaclass,Instances,Messagepassing, Constructors and destructor, data abstraction, encapsulation and data hiding.

Unit 3   Inheritance: purpose and itstypes, Polymorphism: Introduction, Method of overriding and overloading, compile time and run time polymorphism.

Unit 4Introduction to object oriented analysis and design: Design concepts, use cases, class diagrams, State Transition diagrams, object diagrams.

Unit 5   Rapid prototyping: Overview, method process and techniques, object oriented testing: Concepts, methods, UML pattern.

ASSESSMENT
1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%).
2. EndsemesterTheoryExam(70%)

TEXTBOOKSRECOMMENDED

1.GradyBooch, Objected Oriented Analysis and Design with Applications, Addison Wesley, 2nd Edition California 1994.

2.Balaguruswamy, Object Oriented Programming using C++, TataMc-Graw publication, 1995.

REFERENCEBOOKS

1.James Martin,Principles of ObjectOrientedAnalysis andDesign,PrenticeHall.

2.Timothy A. Budd, An Introduction to   Object Oriented Programming, 3rdEdition,PearsonEducation,2008.

DEPARTMENTOFAPPLIEDMATHEMATICSANDCOMPUTATIONALSCIENCE
M.Sc.IIISemester
MA94352:STATISTICALQUALITYCONTROL,STOCHASTICPROCESSANDRELIABILITY

HOURSPERWEEK			CREDITS			MAXIMUMMARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSEOBJECTIVE

To introduce the concept of reliability, sampling theory, statistical quality controland stochastic process.

Course Outcomes
AfterCompletionofthecourse,studentsareableto
   CO1: Examine the concept ofreliabilitytoanalysethe systemfailures
   CO2 : Design and utilize thesamplingtechniquesto testthehypothesis
   CO3 : Analysethe qualitycontrol ofdata usingstatisticalmethod
   CO4: Explain the fundamental concepts of control charts and causes of variation
   CO5 : Usetheconcept ofstochasticprocessto predictthefuture

COURSECONTENTS
THEORY

   Unit 1   Reliability:Introduction,ABriefideaofrandomvariable,samplespace probability distributions, evaluation of system reliability.

   Unit 2   SamplingTheory:Samplingdistribution,lawoflargenumberandcentrallimit theorem, theory of estimation, Test of Hypothesis.

   Unit 3   Statistical Quality Control: Aims, objectives and advantages of SQC, Techniques of SQC , Control charts for variablesand attributes, Process capabilities.

   Unit 4   Acceptance Sampling: Definition, Acceptance, Sampling Plans: Single, Double andsequentialsamplingplans,OperatingCharacteristicsCurves(O.C.), producer's and consumer's risk. A brief idea of Taguchi method.

Unit 5 Stochastic Process: Classification of stochastic process, Autocorrelation function. Poissonian process-Queuing and birth and death process; Markovian process. Renewal theory.

ASSESSMENT
1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%).
2. EndsemesterTheoryExam(70%)

TEXTBOOKSRECOMMENDED
1. A.BaisnabandM.Jana,ElementsofProbabilityandStatistics,TataMacGrawHillPublishing Company Ltd., New Delhi,1993.
2. RameshSircar,StatisticalTechniquesandApplications,NewControlBookAgency,8/1, Chintaman Das Lane,Calcutta.

REFERENCEBOOKS
1. Balaguruswamy,A TextBook of Reliability,TataMc-GrawHill education Pvt.Ltd.2002
2. Papoulis,Athanasios,Probability,RandomVariablesandStochasticProcess,Mc-GrawHill BookCo.,2014.

DEPARTMENTOFAPPLIEDMATHEMATICSANDCOMPUTATIONALSCIENCE
M.Sc.IIISemester
MA94371:MATHEMATICALANDSTATISTICALMODELLING

HOURSPERWEEK			CREDITS			MAXIMUMMARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	--	4	--	--	30	70	--	--	100

COURSEOBJECTIVE

To introduce the concept ofsimulation techniques to implement the Markov process, neural network and fuzzy system.

Course Outcome

After completing this course student will be able to

CO1: Design and apply the modeling and simulation techniques to a variety of engineering problems.

CO2: Acquire the knowledge of Markov chain and reliability for quality improvement of manufactured products and components.

CO3: Gain deeper the concepts of artificial neural networks and apply training algorithms to solve the formalized problem using neural network models.

CO4: Use neural networks for practical applications such as character recognition and acquire concept of neural dynamical models.

CO5: Discuss basic knowledge of fuzzy sets and fuzzy logic and apply it for practical application.

CONTENTS

THEORY

Unit 1   SimulationMethod:Definitionofsimulation,applicationofsimulationmethods, Monte Carlo Methods and its applications, Evolutionary Techniques.

Unit2   MarkovProcess:ApplicationtoReliabilityandotherproblems.

Unit3   Neural Network: Basic Idea, Artificial neural network and its building blocks, Terminologies learning rules, back propagation network and its rule, feedback network, Adaline and madaline network, Neurons as function of singlemonotocity, single and multiplayer neural network, neural dynamical systems and state spaces, neural dynamic, activation models, additive neuronal dynamics.

Unit 4   Neural Network (contd.):Passive membrane decay, Perceptrons LMS Algorithms, linear stochastic approximation, The back propagation, Functional link network.

Unit 5   Fuzzy System: Definition of Fuzzy sets and set operations, Brief idea of theory of possibility, Fuzzy functions, Fuzzy Algebra, Brief idea of fuzzy statistics, Brief idea of modeling of system under uncertain environments.

ASSESSMENT
1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%).
2. EndsemesterTheoryExam(70%)

TEXT BOOKS RECOMMENDED
1. S.N.Sivananda,S.Sumathi,S.N.Deepa,IntroductiontoNeuralNetworkusingmatlab6.0,Tata McGraw Hill Publishing Company Ltd., New Delhi,2006.
2. Ganesh,IntroductiontoFuzzySetsandFuzzyLogic,PrenticeHallofIndiaLtd.,New Delhi,2006.

REFERENCE BOOKS
1. H.Simon,NeuralNetworksandLearningMachines3rdEdition,PrenticeHall,Canada2008.
2. K.K.Vinoth,Neural NetworkandFuzzyLogic,1stEdition,KATSONBook,2009.