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

DEPARTMENTOF
APPLIEDMATHEMATICS ANDCOMPUTATIONALSCIENCE

Syllabi of PG Subjects

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	MA 94208	RealandComplex Analysis
9.	M.Sc.	III	MA 94301	FunctionalAnalysisandIntegralEquations
10.	M.Sc.	III	MA 94302	ObjectOrientedProgrammingSystems
11.	M.Sc.	III	MA94351	StatisticalQualityControl,StochasticProcessand Reliability
12.	M.Sc.	III	MA94370	MathematicalandStatisticalModelling

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. I Semester
MA94105: COMPUTER   AIDED NUMERICAL ANALYSIS

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

COURSE OBECTIVES

To introduce the concept of numerical methods to solve algebraic, transcendental, difference and differential equations and Interpolation problems.

COURSE OUTCOMES

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.

COURSE CONTENTS

Unit-1   Errors and approximations, Number representation, Numerical Analysis and numerical Methods, Numerical stability, ill condition and convergence, numerical algorithm and Numerical Flow Charts, an Introduction of MATLAB, overview ofC features its use in Numerical Methods.

Unit-2   Solution of Algebraic and Transcendental Equations: Bisection (or Bolzano) method, method of false position, Newton Raphson method. Solution of Simultaneous algebraic equations: Direct method- Gauss Elimination method Gauss Jordan method, Iterative method-Jacobi's method, Gauss Seidal method.

Unit-3   Interpolation: Introduction, Interpolating polynomial, Missing term techniques, Newton's forward and backward interpolation formula, central differenceformula, 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. Numerical solution of Partial Differential Equations: Classification of second order equations, finite difference approximations to partial derivatives. Elliptic, Parabolic and Hyperbolic equations.

TextBooks
1. KSankaraRao,NumericalmethodsforScientistandEngineers,PrenticeHallof India.
2. BalaguruswamyE.,Numericalmethods,TataMcGraw-HillPublishingCompany Ltd., New Delhi.

Referencebooks
1. PradeepNiyogi,NumericalAnalysisandAlgorithm,TataMcgraw-HillPublishing Com.Ltd, New Delhi.
2. JainN.K.,Iyengar,S.R.K.andJainR.K.,Numericalmethodsforscientificand Engineering Computations, Wile Eastern Ltd., 1984.
3. Steven C. Chapra and Raymond P. Candle, Numerical methods for Engineers,5th edition, Tata McGraw hill publishing company Ltd., New Delhi 2006.

Assessment
1. InternalAssessmentforcontinuousevaluation,mid-termtests,,tutorials,class performance, etc. (30%).
2. End semesterTheoryExam(70%)

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. I Semester
MA94106:COMPUTER ARCHITECTURE

PERIODPER WEEK			CREDITS			MAXIMUMMARKS				
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 computer architecture, CPU organization, memory and pipeline processing.

COURSE OUTCOMES

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 using Karnaugh 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.

COURSE CONTENTS

Unit-1   Introduction to CA : Number system , Von Neumann Model , Digital devices :Logic gates , flip flops , Logic Design :Boolean Algebra , K-map , Method of simplification of Logic expression , Combinational & Sequential circuits.

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

Unit-3   Memory: 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.

Unit-4   Introduction to advanced architecture: Parallel processing, Intreconnection structure , Interprocessor Arbitration : Serial , Parallek and Dynamic arbitration Procedure, Intreprocessor Communication and Synchronization, Cache Coherence.

Unit-5   Pipeline processing : Concepts ,Arithmetic and Instruction Pipeline , Vector, and Array processing: vector operation, matrix multiplication, memory inter leaving, Attached array Processor, SIMD Array Processor. Comparison of RISC and CISC.

TextBooks

1. Moris Mano, Computer System Architecture, Prentice Hall Of India.
2. WilliamStallings,ComputerOrganizationandArchitecture,7thEdition,PearsonEducation Prentice Hall of India, 2009.

ReferenceBooks

1. AndrewS.Tanenbaum,StructuredComputerorganizations,5thEdition,Pearson Education Prentice Hall of India, 2006.
2. A.P.Godse and D.A. Godse, ComputerArchitecture, 4thEdition, Technical Publications Pune, 2009.

Assessment
1. InternalAssessmentforcontinuousevaluation,mid-termtests,seminar,tutorials,classperformance, etc. (30%)
2. End semesterTheoryExam(70%)

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

PERIODPER WEEK			CREDITS			MAXIMUMMARKS				
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 algebra, lattices, graph theory and vector spaces.

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

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 andPredicate 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 & 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 colorings, directed graphs,Trees andBinaryTrees, SpanningTrees, Cut-sets, Minimal Spanning Trees,Euler's Theorem on the existence of Eulerian paths and circuits, Directed Graphs, Indegree and Outdegree of a vertex, weighted undirected graphs, Matrix representation of Graph.

Unit-3   Introduction to languages and Grammars, FSM & Automata.

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

Unit-5 Vector space: Review of Basic Concepts . Field: Extension field, Algebraic andTranscendental Extension field, roots of Polynomial, finite field .

TextBooks

1. Herstein,I.N,TopicsinAlgebra,VikasPublications,Delhi-6,1969.
2. SwapanK.Sarkar,ATextBookofDiscreteMathematics,S.Chand&Company Ltd., New Delhi, 2003.
3. S.LipschutzM.Lipson,Schaum'sOutlineofTheoryAndProblemsofDiscrete Mathematics,2nd edition Tata McGraw HilPublishing Company Ltd., New Delhi,1997.

Referencebooks

1. ArtinMichael,Algebra, PearsonEducation Inc.,2007.
2. S.A.Wiitala,DiscreteMathematics,AUnifiedApproach,McGrawHill Company,Singapore, 1987.

Assessment

1. InternalAssessmentforcontinuousevaluation,mid-termtests,seminar,tutorials,classperformance, etc. (30%)
2. End semesterTheoryExam(70%)

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. I Semester
MA94107:ORDINARY AND PARTIAL DIFFRENTIAL EQUATIONS

PERIODPER WEEK			CREDITS			MAXIMUMMARKS				
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 to ordinary and partial differential equations, Power series solution, and Laplace and Fourier transform methods for solving ODE and PDE.

COURSE OUTCOMES

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.

COURSE CONTENTS

Unit-1   Theory of Ordinary Differential Equation: Existence & Uniqueness for Ordinary Differential Equation, Wronskian and Linear independence , Initial value problem for nth order differential equation , Linear equations with variable coefficients , Lipschitz condition .

Unit-2   Power Series, Method for solution of legendre, Bessel Lagurre equations.

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

Unit-4   Green's Functions : Introduction, Green's Function for Laplace Equation, Green's Function for the Wave Equation-Helmholtz Theorem.

Unit-5   Laplace and Fourier transform methods for solving Ordinary Differential Equation and Partial Differential Equation.

TextBooks

1. SankaraRao, K., Introduction to Partial Differential Equations, Prentice Hall of India Pvt. Ltd., New Delhi 1997.
2. ZafarAhsan, Differential Equations and theirApplication, Prentice-Hall of India Pvt. Ltd., New Delhi , 2004.

Referencebooks

1. Kapoor N. M. , A text book of Differential equation, Pitamber Publishing Company Pvt. Ltd. , New Delhi , 1998 .
2. FriedrichSauvigny,PartialDifferentialEquations,SpringerLondonHeidelberg2006.

Assessment

1. InternalAssessmentforcontinuousevaluation,mid-termtests,seminar,tutorials,classperformance, etc. (30%)
2. End semesterTheoryExam(70%)

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. II Semester
MA94205:MATHEMATICAL THEORY OF COMPUTATION

PERIODPER WEEK			CREDITS			MAXIMUMMARKS				
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 sets, graphs, automata, context free languages and turing machines.

COURSE OUTCOMES

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.

COURSE CONTENTS

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

Unit-2   Theory 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 RegularLanguages, Pumping Lemma forRegular Languages.

Unit-3   Context Free Languages :-Context free-grammars and Derivation Trees, Parsingand 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 Pushdown Automata, Pushdown Automata and Context Free languages.

Unit-5 Turing Machines:-Definition of a Turing Machine, Turing Machine as Language, Accepters,Turing'sThesis,UniversalTuringMachine,LinearBoundedAutomata, Computational complexity theory- P and NP Problems.

TextBooks

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

Referencebooks

1. H.R. LewisandC.H.Papadimitriu,ElementsofthetheoryofComputations,Prentice Hall of India Pvt. Ltd., New Delhi; 1999.
2. Robert N. Moll , MichaelA.Arbib ,A.J.Kfoury ,An introduction to formal language theory , Springer Verlag, New York ,1988.
3. MichaelSipser,IntroductiontotheTheoryofComputations,PWSPublishing Company, Boston, 1997.

Assessment
1. InternalAssessmentforcontinuousevaluation,mid-termtests,seminar,tutorials,classperformance, etc. (30%)
2. End semesterTheoryExam(70%)

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. II Semester
MA94206:DATA PROCESSING AND COMPUTATION

PERIODPER WEEK			CREDITS			MAXIMUMMARKS				
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 data models, Structured Query Language(SQL),network and hierarchical data model and data base methodologies

COURSE OUTCOMES

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.

COURSE CONTENTS

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

Unit-2   Data Models: Entity relationships models, Relational Data Models, Relational algebra: Basic Relational algebra operations.

Unit-3   Structured Query languages (SQL) : Data Types, Basic Queries in SQL, insert, delete & update statements in SQL, indexing, sequences and VIEW in SQL.(LAB).

Unit-4   Network and Hierarchical data models, Normalization theory.

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

TextBooks

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems,7th Edition, Pearson, 2016.
2. H.F Korth, A. Silberchatz andS.Sudarshan, Database SystemsConcepts,6thEdition McGraw Hill, 2010.

Referencebooks

1. J.DWaldmenGalgolia,PrinciplesofDatabaseSystems,1984.
2. Fundamentals of Database Management System,Renu Wig and EktaWalia,Indian Society for Technical Education, New Mehrauli Road, New Delhi-110016.

Assessment

1. InternalAssessmentforcontinuousevaluation,mid-termtests,seminar,tutorials,classperformance, etc. (30%)
2. End semesterTheoryExam(70%)

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. II Semester
MA94207:OPERATIONS RESEARCH

PERIODPER WEEK			CREDITS			MAXIMUMMARKS				
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 operation research for solving assignment,transportation,sequencing,Dynamic and Non-Linear Programming problems.

COURSE OUTCOMES

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.

COURSE   CONTENTS

Unit-1   Introduction to Operations research, Mathematical formation of Linear Programming problems, Graphical solution as two phase method ,Linear Programming problems, Simplex method, Big M method, Duality in linear programming, Dual simplex method, degeneracy.

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

Unit-3   Sequencing and scheduling: Sequencing problem with n jobs and m machines, optimal sequence algorithm, Critical path determination by CPM and PERT methods.

Unit-4   Information 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.

Unit-5   Dynamic and Non-linear programming: Concept of dynamiprogramming, 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.

TextBooks
1. TahaH.A, Operations Research: An Introduction, McMillian Co., NewYork.
2. Gupta, Kanti Swaroop, Gupta P.K. and Manmohan, Operations Research, Sultan Chand and Sons, New Delhi.

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

Assessment
1. InternalAssessmentforcontinuousevaluation,mid-termtests,seminar,tutorials,classperformance, etc. (30%)
2. End semesterTheoryExam(70%)

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. II Semester
MA94208:REAL AND COMPLEX ANAYSILS

PERIODPER WEEK			CREDITS			MAXIMUMMARKS				
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 Fourier Series, Real and Complex Analysis.

COURSE OUTCOMES

After completing this course student will be able to
CO1: Acquire the knowledge 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

Unit-1   Measure theory, function of bounded variation, measurable non-measurable sets, Borel sets, measurable functions, 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-2   Fourier series: Convergent criteria of Fourier series, Convergent problem, Dirichlet's Conditions, Riemann-Lebesgue Theorem and its Consequences and Fourier analysis.

Unit-3   Concept of analytic function, C-R equations and harmonic functions, analytic function, the mean value property, Poisson's formula, Schwarz's theorem and the reflection principle. Conformality, linear transformation and Conformal mapping: areas and closed curves analytic function in regions, conformal mappings, the

linear groups, cross-ratio symmetry and oriented circles, use of level surface.

Unit-4   Complex Integration: 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, Elementary idea of Riemann mapping theorem, The Monochromy theorem, Branch points.

TextBooks

1.   AlhforsL.V.,ComplexAnalysis(3rdEdition),McGrawHill,Inc.Singapore,1979.
2.   RoydenH.L.,Real Analysis(^{3rd}Edition),CollierMacmillanInternational,New York, 1987.

 Referencebooks

   1.   S   E.C.Titchmarsh,TheTheoryof   Functions,2nd edition,OxfordUniversity Press,London,1939.
   2.   SinghBijendra,KaranjgaokarVarsha,ChandelR.S.,ComplexAnalysis,GauraPustakSadan , Agra.

Assessment

1. Assessmentforcontinuousevaluation,mid-termtests,seminar,tutorials,classperformance, etc. (30%).
2. End semesterTheoryExam(70%).

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. III Semester
MA94301:FUNCTIONAL ANALYSIS AND INTEGRAL EQUATIONS

PERIODPER WEEK			CREDITS			MAXIMUMMARKS				
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 concepts of Topological space, Normed linear space Hilbert space, Finite dimensional spectral theory and Integral Equations.

COURSE OUTCOMES

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 problem.

COURSE CONTENTS

Unit-1   Topological Space : Definition, Open Set, Closed Set, Neighbourhood , filter , Countable Space, Separation axioms, Continuous mapping, Homomorphism, Connectedness and Compactness.

Unit-2   Normed 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, the projection theorem, orthonormal sets. The Bessel'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, self adjoint operators, normal and unitary operators, And theirproperties. Projections, the spectral theorem, fixed-point theory and its applications.

Unit-5   Integral Equations: Preliminary concepts, formulation of integral equations, and classification of linear integral equations. Integral differential equations, conversions of ordinary differential equations to integral equations.Solutions of integral equations with separable kernels. Characteristics number and eigen functions, fredholm determinant method. Construction of Green's functions andits 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.

TextBooks

1. B.k. Lahiri,Elementsoffunctionalanalysis,TheworldpressPvt.Ltd.,Calcutta,1982.
2. KarsnovM.,KiselvA., MakAernkog,ProblemsandExercisein IntegralEquations.

Referencebooks

1. A.H.Siddhiqui,FunctionalAnalysis.WithApplications,TataMcGrawHillPublishing Company Ltd., New Delhi, 1986.
2. G.F.Simmons,"IntroductiontoTopologyandModernAnalysis,"McGrawHillBook Company, Inc., New York, 1963.

Assessment
1. InternalAssessmentforcontinuousevaluation,seminar,mid-termtests,tutorials,class performance, etc. (30%).
2. End semesterTheoryExam(70%)

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. III Semester
MA94302:OBJECT ORIENTED PROGRAMMING SYSTEMS

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

COURSE OBJECTIVE

The objective of the course is to develop skills such as program design and testing as well as the implementation of programs using object-oriented features.

COURSE OUTCOMES

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.

COURSE CONTENTS

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

Unit-2   Object oriented concepts: Concepts of objects and classes, attributes and methods, Access modifiers, static member of a class, Instances, Message passing, Constructors and destructor , data abstraction, encapsulation and data hiding.

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

Unit-4   Introduction 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.

TextBooks

1. GradyBooch,ObjectedOrientedAnalysisandDesignwithApplications,Addison Wesley, 2nd Edition California 1994.
2. Balaguruswamy,ObjectOrientedProgrammingusingC++,TataMc-Grawpublication,1995.

Referencebooks

1.   JamesMartin,PrinciplesofObjectOrientedAnalysisandDesign,Prentice Hall.
2.   Timothy A. Budd, An Introduction to Object Oriented Programming, 3rdEdition,Pearson Education,2008.

Assessment

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

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. III Semester
MA94351: STATISTICAL QUALITY CONTROL,
STOCHASTIC PROCESS AND RELIABILITY

PERIODPER WEEK			CREDITS			MAXIMUMMARKS				
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 reliability, sampling theory, statistical quality control and stochastic process.

COURSE OUTCOMES

After completing this course student will be able to

CO1: Examine the concept of reliability to analyze the system failures.

CO2 : Design and utilize the sampling techniques to test the hypothesis.

CO3 : Analyze the quality control of data using statistical method.

CO4: Explain the fundamental concepts of control charts and causes of variation.

CO5 : Use the concept of stochastic process to predict the future.

COURSE CONTENTS

Unit-1   Reliability:Introduction,ABriefideaofrandomvariable,samplespaceprobability distributions, evaluation of system reliability.

Unit-2   Sampling Theory: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 variables and attributes, Process capabilities.

Unit-4   AcceptanceSampling:Definition,Acceptance,SamplingPlans:Single,Double and sequential sampling plans, Operating Characteistics Curves (O.C.), producer'sandconsumer'srisk.AbriefideaofTaguchimethod.

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

TextBooks

1. A. Baisnaband M. Jana, Elements ofProbability and Statistics, Tata MacGrawHill Publishing Company Ltd., New Delhi, 1993.
2. RameshSircar,StatisticalTechniquesandApplications,NewControlBookAgency, 8/1, Chintaman Das Lane, Calcutta.

Referencebooks

1. BalaguruSwamy,ATextBookofReliability,TataMc-GrawHilleducation Pvt.Ltd.2002
2. Papoulis,Athanasios, Probability, RandomVariables and Stochastic Process, Mc-graw Hill Book Co.,2014.

Assessment

1. Internal Assessment for continuous evaluation,,mid-term tests, seminars, tutorials, classperformance, etc. (30%)
2. End semesterTheoryExam(70%)

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
M.Sc. III Semester
MA94370:MATHEMATICAL AND STATISTICAL MODELLING

PERIODPER WEEK			CREDITS			MAXIMUMMARKS				
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 simulation techniques to implement the markov process, neural network and fuzzy system.

COURSE OUTCOMES

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.

COURSECONTENTS

Unit-1   Simulation Method: Definition of simulation, application of simulation methods, Monte Carlo Methods and its applications, Evolutionary Techniques.

Unit-2   MarkovProcess:Application toReliabilityandother problems.

Unit-3   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 single monotocity, single and multiplayer neural network, neural dynamical systems and state spaces, neural dynamic, activation models, additive neuronal dynamics.

Unit-4   Neural Network(contd.): Passivemembranedecay,Perceptrons LMSAlgorithms, linear stochastic approximation, The back propagation, Functional link network.

Unit-5   FuzzySystem: Definition of Fuzzysets and set operations, Brief idea of theoryof possibility, Fuzzy functions, Fuzzy Algebra, Brief idea of fuzzy statistics, Brief idea of modeling of system under uncertain environments.

Text Books
1. S.N.Sivananda,S.Sumathi,S.N.Deepa,IntroductiontoNeuralNetworkusing   matlab6.0, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.
2. Ganesh,IntroductiontoFuzzy SetsandFuzzy Logic,PrenticeHallofIndiaLtd.,New Delhi, 2006.

Reference books
1. H.Simon,NeuralNetworksandLearningMachines3rdEdition,PrenticeHall,Canada 2008.
2. K.K.Vinoth,NeuralNetworkandFuzzyLogic,1stEdition,KATSONBook,2009.

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