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UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMILNADU

M.Sc., MATHEMATICS -CURRICULUM – REGULATION 2020

COURSE STRUCTURE

Course Code	Course Title	L	T	P	C
	SEMESTER I				
20212AEC11	Algebra	6	0	0	4
20212AEC12	Real Analysis	7	0	0	4
20212AEC13	Ordinary Differential Equations	6	0	0	4
20220SEC14	C++ Programming	6	0	0	4
20212DSC15_	Discipline Specific Elective – I	5	0	0	4
20212RLC16	Research Led seminar	-	-	-	1
	Total	**30**	**0**	**0**	**21**
	SEMESTER II				
20212AEC21	Complex Analysis	5	1	0	4
20212AEC22	Measure Theory and Integration	5	0	0	4
20212SEC23	Mathematical Methods	6	0	0	4
20212AEC24	Graph Theory	5	0	0	4
20212DSC25_	Discipline Specific Elective – II	5	0	0	4
20212RMC26	Research Methodology	3	0	0	2
20212BRC27	Participation in Bounded Research	-	-	-	2
	Total	**29**	**1**	**0**	**24**
	SEMESTER III				
20212AEC31	Topology	6	0	0	5
20212SEC32	Stochastic Process	6	1	0	5
20212AEC33	Advanced Numerical Analysis	6	1	0	5
20212DSC34_	Discipline Specific Elective – III	5	0	0	4
202__OEC	Open Elective	4	0	0	3
20212SRC36	Participation in Scaffold Research (Societal Project)	-	-	-	2
	Total	**27**	**2**	**0**	**24**
	SEMESTER IV				
20212AEC41	Functional Analysis	5	1	0	5
20212SEC42	Visual Programming	6	1	0	5
20212AEC43	Number Theory	6	0	0	5
20212DSC44_	Discipline Specific Elective – IV	5	0	0	4
20212PRW45	Project Work	0	0	0	6
20212PEE	Programme for Exit Examination	0	0	0	2
	Total	**22**	**2**	**0**	**27**
	Total Credits for the Programme				**96**

Discipline Specific Electives

Semester	Discipline Specific Elective Courses
I	a) 20212DSC15A- Classical Dynamics b) 20212DSC15B- Fluid Dynamics
II	a) 20212DSC25A- Mathematical Probability b) 20212DSC25B- Mathematical Modelling
III	a) 20212DSC34A- Cryptography b) 20212DSC34B- Algebraic Coding Theory
IV	a) 20212DSC44A- Combinatorial Mathematics b) 20212DSC44B- Design And Analysis of Algorithm

Open Electives

Semester	Open Elective Courses
III	a) 20211OEC-Writing For the Media b) 20213OEC-Bio-medical Instrumentation c) 20214OEC-Green Chemistry d) 20215OEC-Herbal Medicines e) 20220OEC-M-Marketing f) 20261OEC- Financial Service g) 20280OEC-Counselling and Psychology

Credit Distribution:

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	12	04	04	-	01	-	21
II	09	03	04	-	05	-	21
III	10	05	04	02	02	-	23
IV	10	05	04	-	06	02	29
Total	**41**	**17**	**16**	**02**	**14**	**02**	**92**

H.O.D.

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M.Sc., MATHEMATICS
SYLLABUS

SEMESTER – I
Core I: ALGEBRA

Course Title
20212AEC11 Core –I - Algebra

Objectives:

1. Group Theory is the fundamental building blocks for the Abstract Algebra.
2. To study the algebraic aspects of Real and Complex numbers.
3. Module is a third algebraic Model - Applicable to geometry and physics.

UNIT I:

Group theory: Sylow's theorem — direct products — finite abelian groups.

UNIT II:

Ring theory: Polynomial rings — polynomials over the rational field polynomial ring over commutative rings — modules.

UNIT III:

Field: Extension fields — roots of polynomials — more about roots

UNIT IV:

Field: the elements of Galois theory — Finite fields

UNIT V:

Linear transformations — the algebra of linear transformations, Hermition, Unitary and normal transformations.

Reference

1. Topics in Algebra — 1.N. Herstein

Learning Outcomes:

1. Understand the concept of Group Theory, Ring Theory.
2. A knowledge of Linear Transformations.
3. An understanding of the analysis of Fields.
4. Research inquiry and analytical thinking abilities

Course Title
20212AEC12 Core –II Real Analysis

Objectives:

1. To introduce the motion of Reimann – stieltjes integral.
2. To study the infinite series and infinite sequences of functions.
3. To study the multivariate differential calculus.

UNIT I:

Riemann — Stielties — integral

UNIT II:

Infinite series and infinite products

UNIT III:

Sequences of functions

UNIT IV:

Multivariable Differential Calculus

UNIT V:

Implicit functions and Extremum problems

Reference:

Mathematical Analysis Tom. M.Apostol. 2nd Edition Narosa Publishing House— 1985

Unit I Chapter— 7(7.1—7.25)
Unit II Chapter — 8(8.1 — 8.18)
Unit III Chapter — 9(9.1 — 9.6, 9.8-9.13)
Unit IV Chapter— 12(12.1—12.5, 12.7— 12.14)
Unit V Chapter— 13(13.1 — 13.6)

Learning Outcomes:

Students will be able to

1. Know the motion of the Riemann-Stieltjes integral, prove elementary properties of the Riemann integral and the Fundamental Theorem of Calculus.
2. Describe the Infinite series and Infinite Products, Sequences of Functions.
3. An understanding of Multivariable Differential Calculus and Implict Functions and Extremum problem.

Course Title
20212AEC13 Ordinary Differential Equations

Objectives:

1. Teaching the theory and applications to students preparing for advanced training in applied sciences and social sciences.
2. Presenting in easy and lucid language the results of oscillations, boundry valued problems (BVP) and elements of control theory.
3. Justifying the inclusion of qualitative theory to students who that it is out of place.
4. Emphasing the importance of the study of Boundary problems, both in Mathematics and applied sciences.
5. Studying about the stability of stationary solutions.

UNIT I:

Systems of linear diffrentia1 equations — Chapter 4

UNIT II:

Existence and uniqueness of solutions Chapter 5

UNIT III:

Boundary value problems — Chapter — 7

UNIT IV:

Oscillations of second order equations — Chapter 8

UNIT V:

Stability of linear and nonlinear system — Chapter 9

Reference

Ordinary differential Equations and Stability Theory — S.G.GEO. V.Ragavendra, V.Lakshmikanthan

Learning Outcomes :

Upon completing this course students should be able to:

1. Solve first order equations, systems of periodic coefficients and use these methods to solve applied problems.
2. A knowledge of Sturm-Liouville Problem.
3. Understanding about the stability of stationary solutions.

Course Title
20220SEC14 C++ Programming

Objectives

- Utilise Object Oriented techniques to design C++ programs.
- Use the standard C++ library.
- Exploit advanced C++ techniques

UNIT 1:

Beginning with C++ - what is C++ - applications — simple program — structure of C program — creating the source file — compiling and linking — tokens, expressions and control structures — user defined data types — derived data types — declarations of variables — reference — variables

UNIT II:

Operations in C++ - Manipulators — types cast operator — expressions and implicit conversions — operator over loading — operator precedence — control structures — Functions in C — the main function — functions prototyping. call by reference — return by reference — function overloading

UNIT III:

Class and object — introduction — C structures revisited — C++ program with class — arrays within class — static member function — arrays of objects — returning objects — returning objects — constant member functions — pointers to members.

UNIT IV:

Constructors and destructors — introduction — constructors — parameterized constructors — multiple constructors in a class — copy constructor — dynamic constructor — two dimensional Arrays — destructors — operators over loading and type conversions — defining operator loading — manipulation strings using operations — type conversions.

UNIT V:

Inheritance: extending classes — introduction — defining derived classes — single inheritance — multiple inheritance — virtual base classes — abstract classes — nesting classes.

Reference:

Object Oriented Programming with C++ - E.Balagurusamy.

Learning Outcomes:

At the end of the course, the student should be able to:

- Able to understand and design the solution to a problem using object-oriented programming concepts.
- Able to reuse the code with extensible Class types, User-defined operators and function Overloading

- Understand functions and parameter passing.
- Understand object-oriented design and programming
- Understand dynamic memory allocation and pointers

Course Title
20212DSC15A Elective Classical Dynamics

Objectives.

1. Classical mechanics afford the student an opportunity to master many of mathematics techniques.
2. It is certainly true that classical mechanics today is far from being a closed subject.
3. Alternative means exist in the curriculum for acquiring the mathematics needed in other branches.

UNIT I:

Introductory Concepts—Chapter 1(1.1 — 1.5)

UNIT II:

Lagrange's equations — Chapter 2

UNIT III:

Special applications of Lagrange's equations — Chapter 3

UNIT IV:

Hamilton equations — Chapter 4

UNIT V:

Hamilton Jacobi theory — Chapter 5

Reference

CLASSICAL DYNAMICS — Donald T.Greenwood, PHI, India.

Learning Outcomes:

Students who successfully complete the course will demonstrate the following outcomes by tests, homework, and written reports:

1. A knowledge of mechanical systems , virtual work Energy and Momentum.
2. Understanding the concept and Applications Lagrange's Equation.
3. A knowledge of Hamilton's Principal function.

Course Title
20212DSC15B Elective- Fluid Dynamics

Objectives:

1. To introduce the behavior of fluid in motion.
2. To study the application of complex analysis in the analysis of flow of fluids.

UNIT I

Real fluids and ideals fluid — velocity of a fluids at a point-streamlines and path lines: steady and unsteady flows — the velocity potential — The velocity vector — local and particle rates of change — the Equations of continuity — Worked examples — Accelerations of a fluids — Pressure at a point in a fluid at rest — Pressure at a point in moving fluids — Conditions at a Boundary to two invisid immiscible fluids — Euler's equations of motions — Bernoulli's equation — worked examples.

UNIT II

Some flows involving axial symmetry — some special two — Dimensional flow — impulsive Motion. Some three — dimensional flows: Introductions — sources, skins and doublets — images in a rigid infinite plane — Axis-symmetric flows: stokes stream functions.

UNIT III

Some two — Dimensional Flows: meaning of a two — Dimensional flow — Use of cylindrical polar coordinates — The steam function — The complex potential for two Dimensional, irrotational, incompressible flow — complex velocity potentials for standard two — dimensional flows — some worked examples — The Milne — Thomson circle theorem and applications — The theorem of Blasius.

UNIT IV

The use of conformal transformation and Hydrodynamical Aspects — stress components in real fluids — relations between Cartesian components of stress — Translational motion of fluid element — The rate of strains Quadric and principal stresses — Some further properties of the rate of strains quadric — stress Analysis in fluid motion — Relations between stress and rate of strain — The coefficient of viscous fluids

UNIT V

Some solvable problems in viscous flow — steady viscous flow in tubes of uniform cross section — Diffusion of vorticity — Energy. Dissipation due to viscosity — steady flow past a fixed sphere — Dimensional Analysis; Reynolds Number — prandtl's Boundary layer.

Reference:

Fluids dynamics by F. Chorlton (CBS Publisher & Distributors, Delhi- 110032) 1985.

Unit I : Chapter 2.Sec 2.1 to 2.9 and Chapter 3.Sec 3.1 to 3.6
Unit II : Chapter 3.Sec 3.9 to 3.11 and Chapter 4.Sec 4.1,4.2, 4.3, 4.5
Unit III : Chapter 5.Sec 5.1 to 5.9 except 5.7
Unit IV : Chapter 5.Sec 5.10 and Chapter 8:Sec 8.1 to 8.9
Unit V : Chapter 8.Sec 8.lO to 8.l6

General References

Fluids Dynams shanty swarup, Krishna prakasan mandir Meerut 1984.

Learning Outcomes:

Students who successfully complete the course will demonstrate the following outcomes by tests, homework, and written reports:

1. A knowledge of behaviour of fluid in motion.
2. A knowledge of Two Dimensional and conformal mappring.
3. A knowledge of solving problems in viscous flow-steady viscous flow

SEMESTER – II

Course Title
20212AEC21 Complex Analysis

Objectives:

1. To introduce the students to the fascinating world of complex analysis which is different from analysis of real variable.
2. To introduce the concepts of harmonic functions , elliptic functions and periodic functions.

UNIT I:

Harmonic functions — power series expansions partial fraction and factorization — entire functions.

UNIT II:

The Riemann zeta function — normal families.

UNIT III:

The Riemann mapping theorem — conformal mapping of polygons — Chapter 6(6.1, 6.2)

UNIT IV:

A closer look at harmonic functions — the Dirichiet's problem Harmonic measures — Chapter 6 sec 3.4 and 5(5.1 only)

UNIT V:

Simple periodic functions — double periodic functions — the weierstrass theory Chapter 7 sec 1,2,3(3.1. 3.2, 3.3)

Reference

Complex Analysis L.V. Ahlfors 3rd edition McGraw Hill

Learning Outcomes:

On completion of this unit successful students will be able to:

1. Understand the significance of harmonic functions, Reimann zeta function.
   A knowledge of periodic functions, the weierstrass
2. Research inquiry and analytical thinking abilities
3. Abilities in conformal mapping

Course Title
20212AEC22 Measure Theory and Integration

Objectives:
To gain understanding of the abstract measure theory and definition and main properties of the integral. To construct Lebesgue's measure on the real line and measurability in product space. To explain the basic advanced directions of the theory.

UNIT I

Measure on Real line — Lebesgue outer measure — Measurable sets — Regularity — Measurable function — Borel and Lebesgue measurability.

UNIT II

Integration of non-negative functions — The General integral — Integration of series — Riemann and Lebesgue integrals.

UNIT III

Abstract Measure spaces — Measures and outer measures — Completion of a measure — Measure spaces — Integration with respect to a measure.

UNIT IV

Convergence in Measure — Almost uniform convergence — Signed Measures and Hahn Decomposition — The Jordan Decornpostion.

UNIT V

Measurability in a Product space — The product Measure and Fubini’s Theorem.

Reference:

[I] G.De Barra, Measure Theory and Integration, New age international (p) Limited.

UNIT — I : Chapter II: Sections 2.1 to 2.5
UNIT—Il : Chapter III: Sections 3.1 to 3.4
UNIT — Ill : Chapter V: Sections 5.1 to 5.6
UNIT— IV : Chapter VII: Sections 7.1 to 7.2, Chapter VIII: Sections 8.1 and 8.2
UNIT —VI : Chapter X: Sections 10.1 to 10.2

Reference(s)

1. Measure and Integration. Second Edition by M.E.Munroe Addison — Wesley publishing company, 1971.
2. P.K.Jain, V.P.Gupta, Lebesgue Measure and integration, New Age International Pvt Limited Publishers, New Delhi, 1986. (Reprint 2000)
3. Richard L. Wheeden and Antoni Zygmund, Measure and Integral: An Introduction to Real Analysis, Marcel Dekker Inc. 1977.
4. Inder, K.Rana, An Introduction to Measure and Integration, Narosa Publishing House, New Delhi,1997.

Learning Outcomes:

To introduce the concepts of *measure* and *integral with respect to a measure*,

To show their basic properties,

To provide a basis for further studies in Analysis, Probability, and Dynamical Systems.

Knowledge in measure spaces

Course Title
20212AEC23 Mathematical Methods

Objectives:

To introduce the concept of Calculus of variations, Fourier Transforms, Hankel Transform, Linear Integral Equations, Method of successive approximations.

UNIT I

Calculus of variations — Maxima and Minima — the simplest case — Natural boundary and transition conditions variational notation — more general case — constraints and Lagrange's multipliers — variable end points — Sturm - Liouville problems.

UNIT II

Fourier transform — Fourier sine and cosine transform — Properties Convolution — Solving integral equations — Finite Fourier transform — Finite Fourier sine and cosine transforms — Fourier integral theorem Parseval's identity.

UNIT III

Hankel Transform: Definition - Inverse formula — Some important results for Bessel function — Linearity property — Hankel Transform of the derivatives of the function — Hankel Transform of differential operators — Parsavaj's Theorem.

UNIT IV

Linear Integral Equations — Definition, Regularity conditions — special kind of kernels — eigen values and eigen functions — convolution integral — the inner and scalar product of two functions — Notation — reduction to a system of' Algebraic equations — examples — Fredholm alternative — examples — an approximate method.

UNIT V

Method of successive approximations: Iterative scheme — examples — Volterra Integral equation examples — some results about the resolvent kernel. Classical Fredholm Theory: the method of solution of Fredholm — Fredholm's first theorem — second theorem — third theorem.

References

1. Ram.P.Kanwal — Linear Integral Equations Theory and Practise, Academic Press 1971.
2. F.B.Hildebrand. Methods of Applied Mathematics II ed. PHI, ND 1972.
3. A.R.Vasishtha. R.K.Gupta, Integral Transforms, Krishna Prakashan Media Pvt Ltd. India, 2002.

UNIT — I : Chapter 2:Sections 2.1 to 2.9 of [2]
UNIT — II : Chapter 7 of [3]
UNIT — III : Chapter 9 of [3]
UNIT— IV : Chapter 1 and 2 of [1]
UNIT—V : Chapter 3 and4 of [1]

Learning Outcomes:
On completion of this unit successful students will be able to:

1. Understand the significance of Caluculus of Variations, Fourier Transforms and Hankel Transform.
2. A knowledge of linear integral equations and Method of successive approximations.
3. Skillness in transformation form one function into another function
4. Applications

Course Title
20212AEC24 Graph Theory

Objectives

1. To give a rigorous study of the basic concepts of Graph Theory.
2. To study the applications of Graph Theory in other disciplines.

UNIT I

Basic Results Basic Concepts - Subgraphs - Degrees of Vertices - Paths and Connectedness Operations on Graphs - Directed Graphs:

UNIT II

Connectivity Vertex Cuts and Edge Cuts - Connectivity and Edge - Connectivity, **Trees**:Definitions, Characterization and Simple Properties - Counting the Number of Spanning Trees - Cayley's Formula.

UNIT III

Independent Sets and Matchings Vertex Independent Sets and Vertex Coverings - Edge Independent Sets -Matchings and Factors - Eulerian Graphs - Hamiltonian Graphs.

UNIT IV

Graph Colourings Vertex Colouring - Critical Graphs - Triangle - Free Graphs - Edge Colourings of Graphs - Chromatic Polynomials.

UNIT V

Planarity Planar and Nonplanar Graphs - Euler Formula and its Consequences - K5 and K3,3 are Nonplanar Graphs - Dual of a Plane Graph - The Four-Colour Theorem and the Heawood Five-Colour Theorem-Kuratowski's Theorem.

Textbook

1. R. Balakrishnan, K. Ranganathan, A Textbook of Graph Theory, Springer International Edition, New Delhi, 2008.

UNIT I Chapter I & II: 1.1 to 1.4, 1.7, 2.1, 2.2
UNIT II Chapter III & IV: 3.1, 3.2, 4.1, 4.3 to 4.4
UNIT III Chapter V & VI: 5.1 to 5.4, 6.1, 6.2
UNIT IV Chapter VII: 7.1 to 7.4, 7.7
UNIT V Chapter VIII: 8.1 to 8.6

References 1. J.A. Bondy, U.S.R. Murty, Graph Theory with Applications, Mac Milan Press Ltd., 1976.
2. Gary Chartrand, Linda Lesniak, Ping Zhang, Graphs and Digraph,CRC press,2010.
3. F.Harary, Graph Theory, Addison - Wesley, Reading, Mass., 1969.

Course Title
20212DSC25A Elective -Mathematical Probability

Objectives:

The goal of the subject is to extend and master students' knowledge of probability and statistical and to provide theoretical background for studying and applying advanced statistical methods. Students are introduced to probability theory and mathematical statistics. They learn to understand important distributions, present statistical data, and fundamental statistical concepts. Emphasis is placed on evaluation the processes encountered in the real reality and on formulation of problems that are investigated by sampling.

UNIT I

Measure theory — Classes of sets. Singular distributions Probability measures and their distribution functions.

UNIT II

Random Variables — Expectation — Independence — General Definitions — Properties of mathematical expectation — Independence.

UNIT III

Convergence concept — Various modes of convergence — Almost sure convergence — Borel — Cantelli lemma — Vague convergence — continuation — Uniform integrability — convergence of moments.

UNIT IV

Law of large numbers and random series — simple limits theorem’s — weak law of large numbers — convergence of series — strong law of large numbers.

UNIT V

Characteristic function — General properties — convolutions — Uniqueness and inversion — convergence theorems.

Reference

A course in Probability Theory — Second Edition — by Kai Lai Chung, Academic Press, New York

Unit I : Chapter 2
Unit II : Chapter 3
Unit III : Chapter 4
Unit IV : Chapter 5 (Sec.5.l to 5.4 Only)
Unit V : Chapter 6 (Sec.6.l to 6.3 Only)

GENERAL REGERENCE

Modern Probability theory — BR.Bhat, Willy Eastern Limited 0989).

Learning Outcomes:
Knowledge and understanding understand the place of probability theory knowledge in cognitive process, describe the basic probability theory and mathematical statistics concepts; Special abilities and skills.
1. Calculate the probabilities of events with an appropriate choice of the method of calculation;
2. Be familiar with the types of random variables, be able write them, calculate their numerical characteristics;
3. Evaluate numerical characteristics of the sample and interpret the meanings of the parameters of population.
4. Formulate and test hypotheses, draw the appropriate conclusions.
5. Understand impotent distribution

Course Title
20212DSC25B Elective- Mathematical Modelling

Objectives:

Mathematical modelling can be used for a number of different reasons. How well any particular objective is achieved depends on both the state of knowledge about a system and how well the modelling is done.

1. Developing scientific understanding - through quantitative expression of current knowledge of a system.
2. Test the effect of changes in a system;
3. Aid decision making, including (i) tactical decisions by managers; (ii) strategic decisions by planners.

UNIT I

Microbial population models, single-species, non — age — structured population models.

UNIT II

Age — structured population models.

UNIT III

Epidemic models.

UNIT IV

Models in genetics.

UNIT V

Mathematical models in Pharmacokinetics.

Reference:

Mathematical models in Biology and Medicine By J.N.Kapur, Affiliated East — West Press Pvt. Ltd., New Delhi

Unit I : Chapter 2,3
Unit II : Chapoter 4
Unit III : Chapter 8
Unit IV : Chapter 9
Unit V : Chapter 10

General References

1. Mathematical Modelling J N Kapur Wiley Eastern Ltd New Delhi.
2. Theory of Ordinary Differential Equations with Equations with applications in biology and Engineering Ahmad & Mohana Rao Affiliated East — West Pvt Ltd New Delhi, (1999).

Learning Outcomes:

Having successfully completed this module, you will be able to demonstrate knowledge and understanding of:

1) The concept of mathematical modelling.
2) The mathematical descriptions of some real systems.
3) Correct methodology when developing mathematical models.
4) Skill in applications
5) Designing and developing the solutions.

20212RMC26 **Research Methodology**

AIM:

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES:

- To understand the approaches towards and constraints in good research.
- To identify various statistical tools used in research methodology
- To appreciate and compose the manuscript for publication
- To train in MATLAB platform for basic computational programming and analysis

OUTCOME:

Ability to develop research questions and the various research strategies, and compile research results in terms of journal manuscripts.

PREREQUISITES:

Research Methodology course in UG level or equivalent knowledge.

UNIT I: Introduction to Research Methodology

Objectives of research – Types of research – Significance of research. Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT II: Database and Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Chemical Abstract Service – Reviews – Monographs – Literature search.

UNIT III: Data Analysis :

Precision and accuracy – Reliability – Determinate and random errors – Distribution of random errors – Normal distribution curve – Statistical treatment of finite samples – t test and F test (ANOVA) co -variance (ANCOVA) correlation and multiple regression.

UNIT IV: Thesis and Paper writing:

Conventions in writing – General format – Page and chapter format – Use of quotations and footnotes – Preparations of tables and figures – References – Appendices.

UNIT V: Application of MATLAB:

Numerical Integration - Numerical integration, ordinary differential equations, partial differential equations, boundary value problems

Fourier Analysis - Fourier transforms, convolution.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
3. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
4. A Guide to MATLAB: For Beginners and Experienced Users by Brian R. Hunt (Editor), Ronald L. Lipsman, J. Rosenberg
5. Introduction to MATLAB for Engineers by by William J. Palm III

SEMESTER – III

Course Title
20212AEC31 Core IX- Topology

Objectives:

1) The subject of topology is of interest in its our right and it also serves to lay the foundations for future study in analysis, in Geometry and in Algebraic Topology.
2) To develop the students' abilities through hard thinking.
3) To train the students to develop analytical thinking.

UNIT I

TOPOLOGICAL SPACES: Topological spaces' — Basis for a topology- The order topology — The product topology on X x Y — The subspace topology — Closed sets and limit points.

UNIT II

CONTINUOUS FUNCTIONS: Continuous functions — the product topology — The metric topology.

UNIT III

CONNECTEDNESS: Connected spaces — connected subspaces of the Real line — Components and local connectedness.

UNIT IV

COMPACTNESS: Compact spaces — compact subspaces of the Real line — Limit Point Compactness — Local Compactness.

UNIT V:

COUNTABILITY AND SEPERATION AXIOMS: The Countability Axioms — The separation Axioms — Normal spaces — The Urysohn Lemma — The Urysohn metrization Theorem — The Tietz extension theorem.'

Reference:

James R.Munkres, Topology(2nd Edition) Pearson Education Pvt. Ltd., New Delhi — 2002 (Third Indian Reprint)

UNIT — I Chapter 2: Sections 12 to 17
UNIT — II Chapter 2: Sections 1 8to 2l(Ornit Section 22)
UNIT — III Chapter 3: Sections 23 to 25
UNIT — IV Chapter 3: Sections 26 to 29
UNIT — V Chapter 4: Sections 30 to 35.

Reference(s)

1. J.Dugundji, Topology, Prentice Hall of India, New Delhi, 1975.
2. George F.Sinmons, Introduction to Topology and Modern Analysis, McGraw Hill Book Co., 1963.
3. .J.L.Kelly, General Topology, Van Nostrand, Reinhold Co., New York.
4. L.Steen and J.Seeback, Counter examples in Topology, HoIt, Rinehart and Winston, New York, 1970
5. S.Willard, General Topology, Addison — Wesley, Mass., 1970.

Learning Outcomes:

Upon successful completion of this course, the student will be able to: (Knowledge based) distinguish among open and closed sets on different topological spaces;

1) know the two fundamental topologies: discrete and indiscrete topologies.
2) Identify precisely when a collection of subsets of a given set equipped with a topology forms a topological space;
3) Understand when two topological spaces are homeomorphic;
4) Identify the concepts of distance between two sets; connectedness, denseness, compactness and separation axiom.

Course Title
20212AEC32 Core X – Stochastic Process

Objectives

The objective of this course is to provide the fundamentals and advanced concepts of random process to support graduate coursework and research in engineering. The required mathematical foundations will be studied at fairly rigorous level and the applications of the probability theory and random processes to engineering problems will be emphasized. The simulation techniques will also be studied and MATLAB will be used as a software tool for bridging the probability theory and engineering applications.

UNIT I

Elements of Stochastic Processes — Two simple examples of Stochastic processes — Classification of general Stochastic processes — Defining a Stochastic Processes — Markov chains — Definitions — Examples of Markov Chain — Transition probability matrices of a Markov chain — classification of states of a Markov chain — Recurrence — more on Recurrence.

UNIT II

The basic limit theorem of Markov chains and applications — Discrete renewal equation — proof of theorem — Absortion probabilities — criteria for recurrence — Random walk.

UNIT III

Classical Examples of continuous time Markov chains — General pure birth processes and Poisson processes — more about Poisson processes — A counter model — birth and death processes — Differential equations of birth and death processes — Examples of birth and death processes.

UNIT IV

Renewal processes — Definition of Renewal process and related concepts — Some examples of Renewal Processes — More on some special Renewal processes — Renewal equations and elementary Renewal theorem — The Renewal Theorem — Applications of Renewal theorem.

UNIT V

Martingales — Preliminary definitions and examples — Super martingales and Sub martingales — The optional sampling theorem.

Reference

A First course in Stochastic Processes — second Edition by Samuel Karlin and M . Taylor, Academic Press New York.

Unit I : Chapterl(l.2,l.3,l.4Only) , Chapter 2 (2.1 to 2.5 and 2.7 Only)
Unit II : Chapter 3 (3.1 to 3.4 and 3.7 Only)
Unit III : Chapter 4 (4.1 to 4.6 Only)
Unit IV : Chapter 5 (5.1 to 5.6)
Unit V : Chapter6(6.1,6.2,6.3 Only)

General references

1. “Stochastic Processes” S.K Srinivasan and K.M. Mehata, Tata Mcgraw — Hill Publishing Company Ltd., New Delhi.
2. “Stochastic Processes” JMedhi, Second Edition Wiley Eastern Ltd., New Del/it

Learning Outcomes

1.On successful completion of the course, students should be able to:
2. Explain fundamentals of probability theory, random variables and random processes.
3. Understand the mathematical concepts related to probability theory and random processes
4, Understand the characterization of random processes and their properties.
5. Formulate and solve the engineering problems involving random processes.
6. Analyze the given probabilistic model of the problem.
7. Make precise statements about random processes.

8. Use computational techniques to generate simulation results.

Course Title
20212AEC33 Advanced Numerical Analysis

Objectives:

1) Derive appropriate numerical methods to solve algebraic and transcendental equations.
2) Develop appropriate numerical methods to solve a differential equation.
3) Derive appropriate numerical methods to evaluate a derivative at a value.
4) Derive appropriate numerical methods to solve a linear system of equations.
5) Derive appropriate numerical methods to calculate a definite integral.

Unit – I

Transcendental polynomials equation: Introduction, Methods based on first and second degree equation: secant method - Newton Raphson method - Muller method - Chebyshev method - Rate of convergence. Polynomials Equations: Birge-Vieta method - Bairstow method -Graeffe's root squaring method.

Unit – II

System of linear algebraic equation and Eigen values problems: Jacobi iteration method, Gauss-Seidal iteration method successive over relaxation method. Eigen values and vectors.

Unit – III

Interpolation and approximation – Hermite Interpolation – Bivariate interpolation – Lagrange bivariate interpolation- Newton's bivariate Interpolation for equispaced points – approximations – Gram-Schemidt orthoganalizing process – Chebyshev polynomials.

Unit – IV

Numerical Integration: Methods based on interpolation-Newton-Cotes methods-trapezoidal rule-Simpson's rule-Methods based on undetermined coefficients-Gauss-Legendre integration methods-Labotto integration method-Radau Integration Method and Gauss-Chebystew Integration methods.

Unit – V

Ordinary Differential Equations: Numerical methods – Euler method – Backward Euler method – Mid point method – Taylor series method – Runge Kutta methods – Implicit Runge – Kutta method.

TEXT BOOK:

Numerical methods for scientific and Engineering Computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain III – Edition.

Unit: I – Chapter-2 Sec 2.3, 2.4, 2.5, 2.8
Unit: II – Chapter-3 Sec 3.4, 3.5, 3.6
Unit: III – Chapter-4 Sec 4.5, 4.7, 4.8
Unit: IV – Chapter-5 Sec 5.6, 5.7, 5.8
Unit: V – Chapter-6 Sec 6.2, 6.3, 6.4.

Learning Outcomes

Students will be able to

1) Solve an algebraic or transcendental equation using an appropriate numerical method.
2) Solve a differential equation using an appropriate numerical method.
3) Evaluate a derivative at a value using an appropriate numerical method.
4) Solve a linear system of equations using an appropriate numerical method.
5) Calculate a definite integral using an appropriate numerical method.
6) Skill in finding the roots of the given equation

Course Title
20212DSC34A Elective- Cryptography

Objectives:

1) Understand the basic concept of Cryptography and Network Security their mathematical models.
2) Understand mathematical foundation required for various cryuptographic Algorithms.

UNIT I:

Simple cryptosystem — enciphering matrices.

UNIT II:

Idea of public key cryptography — RSA — discrete log.

UNIT III:

Knap sack pseudo primes — Rho method

UNIT IV:

Fermat factorization and factor bases — continued fraction method.

UNIT V:

Basic facts — elliptic curve cryptosystems — elliptic curve factorization.

Reference:

A course in Number Theory and Cryptography — N.Koblitz, Springer — verlog, New York 1987.

Learning Outcomes

1) Analyze key agreement algorithms to identify their weaknesses.
2) Describe the ethical issues related to the misuse of computer security.
3) Develop code to implement a cryptographic algorithm or write an analysis report on any existing security product.

Course Title
20212DSC34B Elective- Algebraic Coding Theory

Objective:

- To equip students with the basic understanding of the fundamental concept of Coding Theory as they are used in communications.
- To enhance knowledge of codes. Error, Tree Codes,cyclic codes.
- To guide the student through the implications and consequences of fundamental theories and laws of coding theory with reference to the application in modern communication and computer systems

UNIT I

The communication channel. The coding problem. Types of codes. Block codes. Error — detecting and Error — Correcting codes. Linear codes. The hamming metric. Description of linear block codes by matrices. Dual codes. Standard Array. Syndrome. Step — by — step decoding modular representation.

UNIT II:

Error — Correction capabilities of linear codes. Bounds on minimum Distance for block codes. Plotkin bound. Hamming sphere packing bound. Varshamov — Gilbert — Sacks bound. Bounds for Burst — Error detecting and correcting codes. Important linear block codes. Hamming codes. Golay codes. Perfect codes. Quasi — perfect codes. Reed — Muller codes. Codes derived from Hadmard matrices. Product codes. Concatenated codes.

UNIT III:

Tree codes. Convolutional codes. Description of linear tree and convolutional codes by matrices. Standard Array. Bounds on minimum distance for convolutional codes. V. G. S bound. Bounds for Burst — error detecting and correcting convolutional codes. The Lee metric, packing bound for Hamming code w.r.t. Lee metric. The Algebra of polynomial residue classes. Galois fields. Multiplicative group of a Galois field. Cyclic codes. Cyclic codes as ideals.

UNIT IV:

Matrix description of cyclic codes. Hamming and Golay codes as cyclic codes. Error detection with cyclic codes. Error — connection procedure for short — ended cyclic codes. Pseudo cyclic codes. Code symmetry. Invariance of codes under transitive group of permutations. Bose — Chaudhary — Hocquenghem (BCH) codes. Reed — Soloman (RS) codes.

UNIT V:

Majority — Logic decodable codes. Majority — Logic Decoding. Singleton bound. The Griesmer bound, Maximum — distance separable (MDS) codes. Generator and Parity — check matrices of MDS codes. Weight distribution of MDS code. Necessary and sufficient conditions for a linear code to be an MDS code. MDS codes from RS codes. Abramson codes. Closed — loop burst — error correcting codes (fire codes). Error locating codes.

References

1. Raymond Hill,' A First Course in Coding Theory "Oxford University Press. 1986.
2. Man Young Rhee, Error Correcting Coding Theory " MacGraw Hill Inc., 1989.
3. W.W. Peterson and E.J. Weldon, Jr., Error — Correcting Codes. M.I.T. Press. Combridge, Massachusetts, 1972.
4. E.R. Beriekamp. Algebraic Coding Theory, MacGraw Hill Inc., 1968.
5. F.J. Macwilliams and N.J.A. Sloane, Theory of Error Correcting Codes" North — Roland Publishing Company, 1977.

Learning Outcomes

Upon completion of this course, students should be able to:

1) Define channel capacities and properties using Shannon's Theorems.
2) Construct efficient codes for data on imperfect communication channels.
3) Generalize the discrete concepts to continuous signals on continuous channels.

SEMESTER – IV

Course Title
20212AEC41 Core XII-Functional Analysis

Objectives:

1) To study about Converges, Hilbert spaces and Bessels's inequality.
2) To study about Spectral Theory.
3) To study about convergences in L(X,Y) – Uniform boundedness and The Gelfand Neumark theorem and Banach Algebra.

UNIT I

Algebraic Systems: Groups — Rings — The structure of rings — Linear spaces - The dimension of a linear space — Linear transformations — Algebras — Banach Spaces : The definition and some examples — Continuous linear transformations — The Hahn — Banach theorem — The natural imbedding of N in N** - The open mapping theorem — The conjugate of a operator.

UNIT II

Hilbert Spaces: The definition and some simple properties — Orthogonal complements — Orthonormal sets — The conjugate space H* - The adjoint of an operator — Self-adjoint operators — Normal and unitary operators — Projections.

UNIT III

Finite-Dimensional Spectral Theory: Matrices — Determinants and the spectrum of an operator — The spectral theorem — A survey of the situation.

UNIT IV

General Preliminaries on Banach Algebras: The definition and some examples — Regular and singular elements — Topological divisors of zero — The spectrum — The formula for the spectral radius — The radical and semi- simplicity.

UNIT V

The Structure of Commutative Banach Algebras: The Gelfand mapping — Applications of the formula $r(x) = \lim \|x^n\|^{1/n}$ - Involutions in Banach Algebras
— The Gelfand-Neumark theorem.

Reference:

Introduction to Topology and Modern Analysis, G.F.Simmons, McGraw-Hill International Ed. 1963.

UNIT-I: Chapters 8 and 9
UNIT-lI : Chapter 10
UNIT-III : Chapter II
UNIT-IV : Chapter 12
UNIT-V : Chapter 13

Reference(s)

1. Walter Rudin, Functional Analysis, TMH Edition, 1974.
2. B.V.Limaye, Functional Analysis, Wiley Eastern Limited, Print, 1985.
3. K.Yosida, Functional Analysis, Springer-Verlag, 1974.
4. Laurent Schwartz, Functional Analysis, Courant Institute of mathematical Sciences, New York University, 1964.

Learning Outcomes

Upon successful completion of this course, the student will be able to: (Knowledge based) distinguish among open and closed sets on different topological spaces;

1) know the two fundamental topologies: discrete and indiscrete topologies.
2) Identify precisely when a collection of subsets of a given set equipped with a topology forms a topological space;
3) Understand when two topological spaces are homeomorphic;
4) Identify the concepts of distance between two sets; connectedness, denseness, compactness and separation axioms.
5) Research inquiry and analytical thinking abilities

Course Title
20212AEC42 Core XIII – Visual Programming

Objectives

Learn to design and develop Windows-based business applications using Visual Basic.NET programs that meet commercial programming standards.

- To learn the basic principles of visual programming
- To study the necessary skills to create software solutions using visual programming
- Understood the Open Data Base Connectivity using Visual programming.
- To inculcate knowledge on Programming and Project Development using Visual Basic.

UNIT I

Introduction to Visual Basic — Integrated Development Environment (IDE) features — VB Editor — Customizing the IDE — Anatomy of a form — Working with form properties — setting form's properties — Introducing form events and form methods.

UNIT II

Variables in Visual Basic: Declaring variables — Data types — Null value. Error value — Empty value - The scope of a variable Module level variables — Constants — Creating your own constants — Scope of a constant — Converting data types — Arrays — Declaring arrays — Fixed size arrays — Dynamic arrays — Preserve Keyword - ReDim — Writing code in Visual Basic — The anatomy of a procedure — Subroutine and functions — Language constructs — For .... Next, The While loop, Select case - End select, Exit statement. With structure.

UNIT III

Selecting and Using controls — Introduction to standard controls -- Command buttons - Text boxes — labels — Option buttons — Check boxes — Frame controls — List boxes — Combo boxes — Image objects — Picture boxes — Timer — Scroll bars - File system Controls (Drive, DirList, File List boxes)

UNIT IV

Introduction to Built — in ActiveX Control — Tool bar — The Tree view control — The List view control — The Image list control — Common Dialog Control — Status bar control Rich textbox control — Menu editor.

UNIT V

DDE Properties — DDE Methods — OLE properties — Active Control Creation and Usage and ActiveX DLL creation and usage - Database access — Data Control — field control — Data grid record set using SQL to manipulate data — Open Data Base Connectivity.

Reference:

1. Mohammed Azam, Programming with Visual Basic 6.0 — Vikas Publishing House Pvt, Ltd — 2002
2. Content Development Group, Visual Basic 6.0 — Tata McGraw Hill Publishing Company Limited — 2002.

Learning Outcomes

Upon completion of this course, the student will be able to:

- Design, create, build, and debug Visual Basic applications.
- Explore Visual Basic's Integrated Development Environment (IDE).
- Implement syntax rules in Visual Basic programs.
- Write Windows applications using forms, controls, and events
- Write and apply decision structures for determining different operations.
- Write and apply loop structures to perform repetitive tasks.
- Students are able to design a IDE enabled software solution to representative problems.
- Students can use DDE data I/O components to read and write raster and vector data files.
- Students can use OLE map components to develop a custom Windows Forms based application with a map and legend.

Course Title
20212AEC43 Number Theory

Objectives:

The objective is for the students to obtain a foundational knowledge of elements of Number Theory through step-by-step proofs of classical theorems, as well as to sharpen their skills through problem-solving.

UNIT I :

Fundamentals of Congruence's : Basic properties of Congruence's – Residue-Riffling. Solving Congruence's: Linear Congruence's-the theorems of Fermat and Wilson Revisited-the Chinese remainder Theorem-polynomial congruence's.

UNIT II :

Arithmetic functions: Combinatorial study of $\varphi\varphi$ (n) – Formulae for d(n) and $\sigma(n)\sigma(n)$-Multiplicative arithmetic functions. The Mobius inversion formula. Primitive roots: properties of reduced systems-primitive roots modulo P.

UNIT III :

Quadratic Residues: Euler's Criterion-the Legendre symbol-the quadratic Reciprocity law-Applications of the Quadratic reciprocity law, Distribution of quadratic residues: Consecutive residues and non residues-consecutive triples and Quadratic residues.

UNIT IV:

Sum of squares: Sums of two squares-Sums of four squares. Elementary partition theory; Introduction-graphical representation-Euler's partition theorem-searching for partition identities.

UNIT V :

Partition generating functions: Infinite products as generating functions-Identities between infinite series and products-partition identities: History and introduction-Euler's pentagonal number theorem-The Roger's Ramanujan identities-Series and Product identities.

TEXT BOOK: Scope and treatment as in "Number Theory" by George E.Anderews, Hindustan Publishing Corporation (India) Delhi-110 007 (1989).

Unit I : Chapters IV and V
Unit II : Chapters VI and VII
Unit III : Chapters IX and X
Unit IV : Chapters XI and XII
Unit V : Chapters XIII and XIV

Learning Outcomes:

On satisfying the requirements of this course, students will have the knowledge and skills to:

1. Solve problems in elementary number theory
2. Apply elementary number theory to cryptography
3. Develop a deeper conceptual understanding of the theoretical basis of number theory and cryptography
4. Research inquiry and analytical thinking abilities

Course Title
20212DSC44A Elective –Combinatorial Mathematics

Objectives:

The main objective is to learn how rigorous mathematical tools can be made for the purpose of doing mathematics with help of computers.

UNIT I

Basic combinational numbers.

UNIT II

Generating functions and Recurrence relations symmetric functions.

UNIT III

Multinomials — Inclusion and exclusion principles — permutations with forbidden positions.

UNIT IV

Necklace problem and Burnsides' Lemma — Cycle Index of a permutations group.

UNIT V

Polya's theorems and their immediate applications — Binary operations on permutations groups.

Reference

Combinatorics theory and applications by V. Krishnamurthy.

Unit I	:	Chapter I (Pages 1 — 15)
Unit II	:	Chapter I (Pages 26— 61)
Unit III	:	Chapter I (Pages 66 — 98)
Unit IV	:	Chapter 11 (Pages 99— 121)
Unit V	:	Chapter II (Pages 122 — 159)

General Reference

Introductory Combinatorics — Kenneth P.Bogart — Pitman Publishing mc, MashJIeld, Mass achusetts.

Learning Outcomes

Upon successful completion of Math 315 - Combinatorics, a student will be able to:

- Apply diverse counting strategies to solve varied problems involving strings, combinations, distributions, and partitions,
- Write and analyze combinatorial, algebraic, inductive, and formal proofs of combinatoric identities,
- Recognize properties of graphs such as distinctive circuits or trees.

- will become familiar with fundamental combinatorial structures that naturally appear in various other fields of mathematics and computer science.
- They will learn how to use these structures to represent mathematical and applied questions, and they will become comfortable with the combinatorial tools commonly used to analyze such structures.

Course Title
20212DSC44B Elective- Design And Analysis of algorithms

Objectives:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

UNIT I INTRODUCTION

What is an algorithm? — Algorithm specification — Performance analysis — Randomized algorithms.

UNIT II ELEMENTARY DATA STRUCTURES

Stacks and Queues — Trees — Dictionaries — Priority Queues — Graph representations.

UNIT III DESIGN OF ALGORITHM METHODS

Divided — And — Conquer — General method — Binary search — finding the maximum and minimum in a set of items — Merge sort — Quick sort.

UN1T IV DESIGN OF ALGORITHM METHODS CONTINUATION

The Greedy method — The general method — Tree vertex Splitting Problem — Tree traversal and search techniques — Techniques for Binary trees — Techniques for Graphs — Breadth first search and depth first search traversal — Connected components and spanning trees — Backtracking — General method — the 8 — Queens Problem — Branch and Bound method — Travelling sales person algorithm.

UNIT V ALGEBRAIC PROBLEMS

Algebraic problems — The general method — Evaluation and Interpolation — The Fast Fourier transform — Modular arithmetic — Even faster evaluation and interpolation.

Reference

1. Eills Horowitz,. Sartaj Shani and Sanguthevar Rajasekaran — Fundamentals of Computer Algorithm — Galgotia Publications Pvt Ltd 2000.

Unit I	Chapter 1 (sections; 1.1,1.2,1.3.1 to 1.3.4, 1.4.1 to 1.4.3)
Unit II	Chapter 2 (section ; 2.1 to 2.4,2.6)
Unit III	Chapter 3 (sections 3.1 to 3.5)
Unit IV	Chapter 4 (sections 4.1, 4.3) Chapter 6 (sections 6.1 to 6.3) Chapter 7 (sections 7.1, 7.2) Chapter 8 (sections 8.1, 8.3)
Unit V	Chapter 9 (sections 9.1 to 9.5)

References

1. Aho A. V, Hopcroft, J.E. and Ullman, J.D.. The Design and Analysis of Computer Algorithms. Additor Wesley Reading Mass (1974)
2. Goodman, S. E and Hedetniemi, S.T Introduction to the design and analysis of algorithms (McGraw Hill international Edition 1987).

Learning Outcomes

Students who complete the course will have demonstrated the ability to do the following:

1) Argue the correctness of algorithms using inductive proofs and invariants.
2) Analyze worst-case running times of algorithms using asymptotic analysis.
3) Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms and analyze them. Compare between different data structures. Pick an appropriate data structure for a design situation

Course Title
20211OEC **Open Elective -Writing for the Media**

Aim:

- To equip students to enter into the realm of mass media.

Objective:

- To comprehend the intricacies of mass media
- To know about the barriers to mass communication
- To understand the function of mass media
- To learn the different kinds of news
- To enhance the different kinds of writing for media

Outcome:

- Understand the intricacies of mass media
- Learn to write for the media

UNIT-I

Mass communication- Barriers to mass communication and mass culture- Function of mass media - Media effects, Qualities of media men.

UNIT-II

News- Hard and soft news- Expected and unexpected news- Box news- Follow up news-Scoop-Filters- Human interest stories- Recognizing and evaluation news.

UNIT-III

News and views- News analysis, Editorial, Columns, Article, Middle reviews, Letters-Features.

UNIT-IV

Reporting- Crime, Court, Election, Legislature, Sports, Development Investigative, Interpretative depth.

UNIT-V

Writing for Media-Inverted pyramid style-Feature style-TV/Broadcast, New style writing TV/Radio Documentaries- Writing Advertisements-Practical

ReferenceBook:-

Author	**Title of the book**	**Edition / Year**	**Publisher**
Susan	Journalism		
John Hogenberg	Professional Journalism	2012	
M.James Neal	News Writing and Reporting		Surjeet Publication
M.V Komath	The Journalist’s Handbook		
D.S Mehta	Mass Communication &Journalism		

Course Title
Open Elective – Applicable Mathematical Techniques

Objectives:

1) Understand the basic concept of Interpolation.
2) To enhance the knowledge about Assignment Problems, Replacement Problems, Decision Analysis and Game Theory.

UNIT I

Interpolation with unequal intervals: Newton's, Lagrange's, and inverse interpolation

UNIT II

Assignment Problems

UNIT III

Replacement Problems

UNIT IV

Decision Analysis

UNIT V

Game Theory

References

1. For unit I, "Numerical Methods in Science and Engineering" M.K.Venkatraman
2. For units II to V, "Operations Research",Kantiswarup, P.K. Gupta and Manmohan

Learning outcomes

By the end of this course,

- Students using OR techniques in business tools for decision making
- Students develop Assignment problem and Replacement problems
- Understand the concept of decision analysis and game theory
- Students gets the knowledge about interpolation

20213OEC OPEN ELECTIVE PAPER
BIOMEDICAL INSTRUMENTATION

Aim:

- To understand the concepts and application of electronic Instrumentation in the Medical field.

Objective:

- Understanding basic principles and phenomena in the area of medical diagnostic instrumentation,
- Theoretical and practical preparation enabling students to maintain medical instrumentation

UNIT – I: BIO ELECTRIC SINGNALS AND ELECTRODES

Fundamentals of medical instrumentation – Sources of biomedical signals – basic medical instrumentation – Intelligent medical instrumentation system – Origin of Bio electric signals – Recording Electrodes – Silver – Silver chloride electrodes – Electrodes for ECG – Electrodes for EEG – Electrodes for EMG.

UNIT – II: RECORDING SYSTEM AND RECORDERS

Basic recording system – General consideration for signal conditions – Preamplifiers – Biomedical signal analysis technique – main amplifier and driver stage – Writing systems – direct writing recorders – the ink jet recorders – Electrocardiograph, Electroencephalograph – Electromyography and other Biomedical recorders.

UNIT – III: MEASUREMENT AND ANALYSIS TECHNIQUES

Electro cardiography – measurements of Blood pressure - measurements of Blood flow and cardiac output, Respiratory therapy Equipment – Origin of EEG – Action Potentials of the brain – evoked potentials – Placement of electrodes – Recording set up – Analysis of EEG.

UNIT – IV: MAGNETIC RESONANCE AND ULTRASONIC IMAGILG SYSTEMS

Principles of NMR Imaging system – Image reconstruction Techniques – Basic NMR components – Biological efforts of NMR Imaging – Advantages of NMR Imaging System – Diagnostic ultra Sound – Physics of ultrasonic waves – metical ultra sound – basic pulse – echo apparatus, A – Scan – echocardiograph(M mode).

UNIT – V: ADVANCED BIO MEDICAL SYSTEMS

Pacemakers – Need for Cardiac pacemaker – External Pace makes – Implantable Pace makers – recent development in Implantable Pacemakers – Pacing system Analyzer – Defibrillator – Pacer – Cardioverter – Physiotherapy and electro therapy equipment – High frequency heat therapy – short wave diathermy – microwave and ultrasonic therapy – pain relief through electrical simulation.

OUTCOMES:

- Define basic medical terms and physical values that can be handled by medical instrumentation,
- Describe methods and implementation of electrical and nonelectrical medical parameters diagnostic,
- demonstrate measuring of basic medical parameters,
- Calculate basic parameters of the equipment for using in electro diagnostic and electro therapy,
- Apply safety standards and select disposal method and procedures for electrical diagnostic equipment.

Books for Study

1. R.S Khandpur, Handbook of Biomedical instrumentation, Tata McGraw Hill publishing company Limited. New Delhi,(2003). (Unit I,II,IV & V)
2. Lestlie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Bio medical instrumentation and measurements, PHI, New Delhi.(Unit-III)

Book for Reference

1. M.Arumugam, Biomedical Instrumentation, Anuradha Agencies, Kumbakonam (2000).

Course Title
20220OEC M-Marketing

OBJECTIVES

- Understand Mobile Business strategies.
- To understand Mobile marketing tools and techniques.
- To know Mobile technologies.

UNIT I Introduction

Mobile Marketing Campaign, Fortune 500 and Mobile Marketing, consumers engagement with mobile, Terminologies.

UNIT II Businesses Vs mobile marketing

classic mistakes in mobile marketing, laying foundation for successful mobile marketing campaign, understanding technology behind mobile marketing – Android, iOS, Windows Phone.

UNIT III

Strategic thinking about Mobile marketing campaign, Mobile Marketing Tools – setting up mobile website for different firms, using SMS, MMS and apps to drive customers to business and other ways to attract customers.

UNIT IV Location Based Marketing

LBS, NFC, Bluetooth and LBA, 2D codes, Tablet, Other Mobile Applications, Business Firms connecting to customers using Mobile – case study, Mobile Marketing for B2B companies, Mobile E-commerce to Drive Revenue.

UNIT V Mobile Payments

Present and Future Mobile Technology, Mobile Application Development.

OUTCOMES

- Upon Completion of the course, the students should be able to:
- Analyze various mobile marketing strategies.
- Market Mobile based Applications.
- Apply various tools in mobile marketing.

REFERENCE BOOKS:

1. Go Mobile: Location Based Marketing, Apps, Mobile Optimized Ad Campaigns, 2D codes and other Mobile Strategies to Grow your Business, Jeanne Hopkins, Jamie Turner, John Wiley&Sons Inc., 2012.
2. M- Commerce, Paul Skeldon, Crimson Publishing, 2012.
3. M-Commerce Technologies, Services and Business Models, Norman Sadeh , Wiley 2002.
4. Mobile Commerce, Opportunities, Applications and Technologies of Wireless Business, Paul Mary, Tom Jell, Cambridge University Press, 2001.

Course Title
20214OEC Open Elective-Green Chemistry

Aim:

- To reduce the soil and water pollution in environment.

Objectives:

- To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Outcomes:

- To understand the environmental status and evolution.
  - To know about the Pollution and its prevention measures.
  - To familiarize the green chemistry.
  - To learn about the bio-catalytic reactions.
  - To understand about the vitamins and antiobiotics.

Unit I - Introduction

Introduction-Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness - Dilution is the solution to pollution-Pollution prevention.

Unit II - Principles

Green Chemistry – Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting to much attention - Why should chemist pursue the Goals of Green Chemistry - The roots of innovation – Limitations.

Unit III - Bio Catalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentation Antibiotics – Vitamins - Bio catalyses synthesis of industrial chemicals by bacterial constructs - Future Tends.

Unit IV - Green House Effect

Green house effect and Global Warming – Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of CO2 - Impact of green house effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points.

Unit V - Green Analytical Methods

Future trends in Green Chemistry - Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control

References:

1. Introduction to Green Chemistry – M.Rayan and M.Tinnes
2. New Trends in Green Chemistry – V.K.Ahluwalia and M.Kidwai

Course Title
20215OEC **Open Elective -**Herbal Medicine

Aim:

- Be able to advise and educate effectively to create a comprehensive wellness plan incorporating herbal, dietary and lifestyle recommendations integrating self-awareness and lessons of nature

Objective

- Possess knowledge of traditional herbal systems as well as an understanding of the principles and practices of modern Western herbalism
- Demonstrate the ability to critically analyze herbal research and contribute to the current body of herbal literature
- Know how to integrate knowledge of raw materials, formulation, and herbal pharmacy for product development purposes
- Know how to effectively educate individuals and groups about herbs
- Be able to demonstrate basic skills in herb identification, harvesting, and preparation
- Be able to address potential safety concerns including herb-drug interactions

Outcomes

- Accurately gather information regarding past and current health status while differentiating between phenomena and the client's interpretation of phenomena
- Synthesize the above information to create a comprehensive assessment of health inputs and processes
- Work with clients to develop individualized goals and a plan for health and wellness

Unit I

Tribal medicine – methods of disease diagnosis and treatment – Plants in folk religion – Aegle marmelos, Ficus benghalensis, Curcuma domestica, Cyanodon dactylon and Sesamum indicum.

Unit II

Traditional knowledge and utility of some medicinal plants in Tamilnadu – Solanum trilobatum, Cardiospermum halicacabum, Vitex negundo, Adathoda vasica, Azadirachta indica, Gloriosa superba, Eclipta alba, Aristolochia indica and Phyllanthus fraternus.

Unit III

Plants in day today life – Ocimum sanctum, Centella asiatica, Cassia auriculata, Aloe vera. Nutritive and medicinal value of some fruits (Guava, Sapota, Orange, Mango, Banana, Lemon, Pomegranate) and vegetables - Greens (Moringa, Solanum nigrum Cabbage).

Unit IV

Allergens – types – sources – active principles – Chemical nature – Cell modifiers – Lectins – mutagens, teratogens – Allergic reactions with known examples.

Unit V

Cardiovascular diseases – blood pressure – cardiac drugs of plant origins – alkaloids, anticoagulants – basic mechanism of action. Pulmonary / respiratory disorders – asthma – bronchitis – common cold – allergy – Remedy from plants.

References

1. Tribal medicine – D.C. Pal & S.K. Jain Naya Prakash, 206, Bidhan Sarani, Calcutta , 1998
2. Contribution to Indian ethnobotany – S.K. Jain, 3rd edition, Scientific publishers, B.No. 91, Jodhpur, India. 2001
3. A Manual of Ethnobotany – S.K.Jain, 2nd edition, 1995.
4. Kumar, N.C., An Introduction to Medical botany and Pharmacognosy. Emkay Publications, New Delhi. 1993.
5. Rao, A.P. Herbs that heal. Diamond Pocket Books (P) Ltd., New Delhi, 1999

COURSE TITLE
20261OEC FINANCIAL SERVICES

AIM

To analyze the various financial institutions and their services.

OBJECTIVES

I. To gain knowledge on financial services.

II. To understand importance of various services including banking, insurance, mutual funds.

UNIT – I

Financial system-An Overview: Indian Financial System-Global Financial System-Financial Services Environment- Credit Rating –Factoring and Forfeiting –Leasing

UNIT – II

Financial Markets –An Overview: Definition-Role-Functions-Constituents-Financial Instruments-Capital Market instruments-Indian money and Capital Market-Global Financial Markets.

UNIT – III

Money Market –An Overview: Definition-Characterstistics-Objectives-Imporatance-Functions-Segment-Financial Institutions-Indian Money Market-Global Money Market

Unit – IV

Capital Market: Money Market-Characteristics-Functions-New financial Instruments-measures of Investor Protection-Indian Capital Market-Major Issues

Unit-V

Stock Exchange: History of Stock Exchange-Functions-Indian Stock Exchanges-Organization structure-Regulations of Stock Exchange –Recent Developments

OUTCOME

To introduces meaning and functions of Financial Intermediaries
To understand the role of merchant bank and its services
To provide information regarding management of mutual funds and Regulations
To understand the role and functions of financial services Marketing
To know the structure and types of debt Instruments
To realize Foreign Exchange Market

REFERENCE BOOKS

1. Gordon ,Natarajan – Financial Market and Services.
2. Dr. S. Gurusamy – Financial services and Market.
3. Kucchol S.C. – Financial Management
4. Pandey I.M. – Financial Management.

Course Title
20280OEC **Open Elective - Counselling and Psychology**

Aim:

- To acquaint with counselling and its process

Objectives:

- To learn the fundamental concepts of counselling.
- To know the nature of different determinates.
- To familiarize with the approaches of counselling

Out Come:

- Learn counselling and its process

UNIT I

Definition of Counselling
Counselling as a Solution to Human Problems
Counselling-Expectations & Goals

UNIT II

Personality Determinates, Intellectual Determinates, Emotional Determinates
Social Determinates

UNIT III

Approaches to Counselling
Counselling Process

UNIT IV

Psychological Testing
Diagnosis

UNIT V

Educational Counselling
Family Counselling

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