J. S. UNIVERSITY, SHIKOHABAD

B.TECH

3rd Semester& 4thSemester
(Computer Science Engineering)

SCHEME
&
SYLLABUS

[Effective from the session 2015-16]

STUDY AND EVALUATION SCHEME FOR
B.Tech (Computer Science Engineering).

SEMESTER - THIRD

S.No.	Subject Code	Name of Subject	L	T	P	D	Sessional	End Exam	Total	Duration
			Periods Per Week				Evaluation Scheme			
THEORY SUBJECT										
1	BTAS-31	Engg Mathematics-III	4	1	-	-	50	100	150	3
2	BTCS-31	Data Structure Using C	4	1	-	-	50	100	150	3
3	BTCS-32	Discrete Structures & Graph Theory	4	1	-	-	50	100	150	3
4	BTCS-33	Computer Based Numerical & Statistical Techniques	4	1	-	-	50	100	150	3
5	BTEC-34	Switching Theory & Logic Design	4	1	-	-	25	50	75	2
6	BTIP-31	Industrial Psychology	4	1	-	-	25	50	75	2
7	BTAC-31	Human Value & Professional Ethics*	2	-	-	-	25	50	75	2
PRACTICA/DRAWING SUBJECTS										
8	BTCS-31P	Data Structures Using C Lab	-	-	2	-	20	30	50	3
9	BTCS-33P	Numerical Techniques Lab	-	-	2	-	20	30	50	3
10	BTCS-34P	Advance Programming Lab	-	-	2	-	20	30	50	3
11	BTEC-34P	Logic Design Lab.	-	-	2	-	20	30	50	3
12	BTGD-30	Games//Social and Cultural Activities + Discipline (25 + 25)							50	
								Grand Total	1000	

*Human values & Professional Ethics will be offered as a compulsory audit course for which passing marksare 30% in End Semester Examination and 40% in aggregate.

NOTE:- (1) Each period will be 50 minutes duration.

      (2) Each session will be of 16 weeks.

      (3) Effective teaching will be at least 14 weeks.

      (4) Remaining periods will be utilised for revision etc.

[BTAS-31]   Engg Mathematics-III

Unit – I: Function of Complex variable

Analytic function, C-R equations, Harmonic Functions, Cauchy's integral theorem, Cauchy'sintegral formula, Derivatives of analytic functions, Taylor's and Laurent's series, Singularities,Zeroes and Poles, Residue theorem, Evaluation of real integrals of the type

Unit – II: Integral Transforms

Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems,Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensionalheat transfer equations, wave equations and Laplace equationsZ- transform and its application to solve difference equations.

Unit – III: Statistical Techniques

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of leastsquares, Fitting of straight lines, Polynomials, Exponential curves, Correlation, Linear, non –linear and multiple regression analysis, Binomial, Poisson and Normal distributions, Tests ofsignifications: Chi-square test, t-test

Unit – IV: Numerical Techniques – I

Zeroes of transcendental and polynomial equations using Bisection method, Regula-falsi methodand Newton-Raphson method, Rate of convergence of above methods.

Interpolation: Finite differences, Newton's forward and backward interpolation, Lagrange's andNewton's divided difference formula for unequal intervals**.**

Unit – V: Numerical Techniques –II

Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss-Seidal method.Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson's one third andthree-eight rules,Solution of ordinary differential equations (first order,second order and simultaneous) byEuler's, Picard's and fourth-order Runge- Kutta methods.

Test Books:-

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.

2. Jain, Iyenger Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi

Reference Books:-

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House,.

2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.

[BTCS-31]   Data Structure Using C

Unit - I
Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Timeand Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.Abstract Data Types (ADT)Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, andColumn Major Order, Application of arrays, Sparse Matrices and their representations.Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List,Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representationand Addition, Generalized Linked List .

Unit – II
Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stackin C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Towerof Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues,Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementationof queues in C, Dequeue and Priority Queue.

Unit – III
Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and DynamicRepresentation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and LinkedRepresentation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binarytrees, Traversing Threaded Binary trees, Huffman algorithm.

Unit – IV
Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List,Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component,Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and ShortestPath algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks

Unit – V
Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort,Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration forInternal Sorting.Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm,AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .Hashing: Hash Function, Collision Resolution StrategiesStorage Management: Garbage Collection and Compaction.

References :
1. Aaron M. Tenenbaum,YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", *Galgotia Publications* Pvt Ltd Delhi India.
3. A.K. Sharma ,Data Structure Using C, Pearson Education India.

[BTCS-32]   Discrete Structures & Graph Theory

Unit-I
Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs,Set Identities.Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality ofrelations, Order of relations.Functions: Definition, Classification of functions,Operations on functions, Recursively defined functions.Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Basecases.

Unit-II
Algebraic Structures: Definition, Groups, Subgroupsand order, Cyclic Groups, Cosets, Lagrange's theorem,Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementaryproperties of Rings and Fields, Integers Modulo n.

Unit-III
Partial order sets: Definition, Partial order sets,Combination of partial order sets, Hasse diagram.Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and CompleteLattice,Morphisms of lattices.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Booleanexpressions. Simplificationof Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Booleanalgebra. Combinational and sequential Circuits

Unit-IV
Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability,Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.Predicate Logic: First order predicate, well formedformula of predicate, quantifiers, Inferencetheory of predicate logic.

Unit-V
Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs,Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring .Recurrence Relation & Generating function: Recursive definition of functions, Recursivealgorithms, Method of solving recurrences.Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle.

References :

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to
Computer Science, McGraw-Hill
3. Y. N. Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010**.**

[BTCS-33]   Computer Based Numerical & Statistical Techniques

● **Unit –I :**

Computer Arithmetic and Errors: Floating Point Arithmetic, Machine epsilon, Round off Error,Chopping Error, Truncation Error, Associative and Distributive Law in Floating Point arithmetic, InherentError, Error propagation, Numerical Instability

Roots of Equation: Secant Method, Newton Raphson Method and Fixed point Iteration Methods forSimple roots and derivation of their rate of convergence, Aitken Acceleration of Convergence, ModifiedNewton Raphson Method for Multiple roots, Birge-Vieta Method for Polynomials, Bairstrow Method forquadratic factors, Computer Algorithms of these methods.

● **Unit –II**

Interpolation: Algorithms and Error Analysis of Lagrange and Newton divided difference interpolations,Relationship in various difference operators, Piecewise Linear Interpolation, Cubic Spline Interpolation,Natural Spline, ChebshevPolynomial Approximations, Lanczos Economization of Power Series

Curve fitting: Linear and Non Linear Least Squares Approximation, ill Conditioning in Least SquaresMethods, Gram-Schmidt Process of Orthogonalization. Computer Algorithms of Least Square Curve Fitting

● **Unit – III**

Differentiation: Methods based on Interpolation and Finite Differences, Richrdson Extrapolation

Integration: Error Analysis of Trepezoidal and Simpson Methods, Newton Cotes Integration Methods,Guassian Integration Methods: Guass Legendre Method, Lobatto Integration Method and Radau IntegrationMethod, Error Terms in Integration Methods

● **Unit – IV**

Solution of Simultaneous Linear Algebraic Equations: Guass Elimination Method, ill ConditionedSystems, Condition Number, Successive Over Relaxation Method, Rate of Convergence

Solution of Ordinary Differential equations: Single Step Methods-Runge-Kutta Second Order, Third Order and Fourth Order Methods, Multi Step Method-Predictor- Corrector Method

Statistical Techniques: Statistical Hypotheses, Test of Hypotheses, Type-I and Type-II Errors, Level ofSignificance, Test involving Normal Distribution

Recommended Books:

oNumerical Methods: M.K. Jain, S.R.K. Iyenger and R.K. Jain

oApplied Numerical Analysis: Curtis F. Gerald and Patrick O. Wheatley

oSchaum's Outline of Theory and Problems of Statistics: Murray R. Spiegel

[BTEC-34]   Switching Theory & Logic Design

UNIT-1

Digital system and binary numbers: Signed binary numbers,binary codes.Gate-level minimization: The map method up to four variable,don't care conditions, POS simplification, NAND and NORimplementation, Quine Mc-Clusky method (Tabular method).

UNIT-2

Combinational Logic: Combinational circuits, analysisprocedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders,encoders, multiplexers

UNIT-3

Synchronous Sequential logic: Sequential circuits, storageelements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure.Asynchronous Sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flowtable, race free state assignment, hazards.

UNIT-4

Registers and counters: Shift registers, ripple counter,synchronous Counter, other counters.Memory and programmable logic: RAM, ROM, PLA, PAL.

Text Book: M. Morris Mano and M. D. Ciletti, "Digital Design", 4th Edition, Pearson Education
Reference Books:
1. Hill & Peterson, "Switching Circuit & Logic Design", Wiley.
2. Mohammad A. Karim and Xinghao Chen, "Digital Design-Basic concepts and
Principles", CRC Press Taylor & Francis group, 2010.

[BTIP-31] Industrial Psychology

Unit-I

Introduction to Industrial Psychology – Definitions & Scope. Major influences on industrial Psychology- Scientific management and human relations schools Hawthorne Experiments

Unit-II

Individual in Workplace Motivation and Job satisfaction , stress management. Organizational culture, Leadership & group dynamics.

Unit-III

Work Environment & Engineering Psychology-fatigue. Boredom, accidents and safety.Job Analysis, Recruitment and Selection – Reliability & Validity of recruitment tests.

Unit –IV

Performance Management : Training & Development.

References :

 1. Miner J.B. (1992) Industrial/Organizational Psychology. N Y : McGraw Hill.

2. Blum & Naylor (1982) Industrial Psychology. Its Theoretical & Social Foundations CBS Publication.

3. Aamodt, M.G. (2007) Industrial/Organizational Psychology : An Applied Approach (5th edition) Wadsworth/Thompson : Belmont, C.A

. 4. Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi : Tata McGraw Hill

[BTAC-31] Human Value & Professional Ethics

Module-1

Course introduction, Needs Basic guidelines

> 1 Understand the need , basic , guidelines content for process value education.
> 2. Self Exploration what is it? It content and process, Natural Acceptence and experiential Validation as the mechanism for self exploration.
> 3 Continues happiness and Prosperty- A look at continues human Aspiration.
> 4 Understanding Happiness and Prosperty correctly- A critical appraisal of the current senerio.
> 5 Method to fulfilled the human aspiration
>
> Module -2
> Understanding Harmony in human Being (Harmony in Myself)

1. Understanding Harmony as a co – existence of the sentient I and the Material Body.
2. Understanding the need of self (I) and body sukh and suvidha.
3. Understanding the body of an instrument of I (being Doar, seer and enjoyer.
4. Understanding the Charactersticks and activities of (I)

Module -3

Understanding harmony in the Family and Society

1. Understanding harmony in the Family and basic unit of Human interaction.
2. Understanding values in human – Human relationship meaning of nayaya and program for the fulfillment of ensure abhay and tripti.
3. Understanding the meaning of Vishvas difference between intension and competence.
4. Understanding the Harmony in the society (society being an Extension of family - samadhan , Samriddi , Abhay,sahastitva and comprehension of Human goals.

Module -4

   Understanding the harmony in the Nature and existence – whole Existence as Co- existence.

1   Understanding the harmony in the Nature.
2   Interconnectedness and mutual fulfillment among the four order of Nature –recyclability ,andself regulation in nature.
3   Holistic prception of Harmony at all levels of existence.

Module – 5 Implication of the above Holistic understanding of Harmony on professional ethics.

1   Natural acceptance of human values.
2   Deffinativeness of ethical human conduct.
3   Basic for humanistic education. Humanstick constitution and human universal order.
4   Case studies of typical holistic technologies , Management model and Production system.
5   Strategy for transition from the presnt stage of universal order.
    A - At the level of individual : as socialy and ecologically responsible engineers technologist and manager.
    B- At the Level of Society as mutually enriching institution and organisations

[BTCS-31P]DATA STRUCTURE USING C LAB

Program in C or C++ for following:
1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.
Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

[BTCS-33P]   NUMERICAL TECHNIQUES LAB

Write Programs in 'C' Language:
1. To deduce error involved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
3. To implement Newton's Forward and Backward Interpolation formula.
4. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation formula
5. To implement Newton's Divided Difference and Langranges Interpolation formula.
6. To implement Numerical Differentiations.
7. To implement Numerical Integration using Trapezoidal, Simpson 1/3 and 0Simpson 3/8 rule.
8. To implement Least Square Method for curve fitting.
9. To draw frequency chart like histogram, frequency curve and pie-chart etc.
10. To estimate regression equation from sampled data and evaluate values of standard deviation, t-statistics, regression coefficient, value of R2 for atleast two independent variables.
Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

[BTCS-34P] ADVANCE PROGRAMMING LAB

LIST OF EXPERIMENTS:

1. Programs using Functions and Pointers in C
2. Programs using Files in C
3. Programs using Classes and Objects
4. Programs using Operator Overloading
5. Programs using Inheritance, Polymorphism and its types
6. Programs using Arrays and Pointers
7. Programs using Dynamic memory allocation
8. Programs using Templates and Exceptions
9. Programs using Sequential and Random access files
Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

[BTEC-34P] LOGIC DESIGN LAB

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet,

Concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.

2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.

3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.

4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.

5. Implementation of 4x1 multiplexer using logic gates.

6. Implementation of 4-bit parallel adder using 7483 IC.

7. Design, and verify the 4-bit synchronous counter.

8. Design, and verify the 4-bit asynchronous counter.

9. Mini Project (Imp)

[BTIS-41] Industrial Sociology

[BTAC-31] Cyber Security

UNIT-1

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

UNIT-2

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats - Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce-Electronic Payment System, eCash,Credit/Debit Cards. Digital Signature, public KeyCryptography.

UNIT-3

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control,CCTV and intrusion Detection Systems, Backup Security Measures.

UNIT-4

Security Policies, Why Policies should be developed, WWW policies, Email Security policies, PolicyReview Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement ofthe Policies.Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; ITAct 2000 Provisions,Intellectual Property Law: Copy Right Law, Software License, Semiconductor Lawand Patent Law.

References :

1. Charles P. Pfleeger, Shari LawerancePfleeger, "Analysing Computer Security ", Pearson Education India.

2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.

3.Dr. Surya Prakash Tripathi, RitendraGoyal, Praveen kumar Shukla ,"Introduction to Information Security and

Cyber Law" Willey Dreamtech Press.

SCIENCE BASED OPEN ELECTIVES
[BTOE-41] INTRODUCTION TO SOFT COMPUTING
(Neural Networks, Fuzzy Logic and Genetic Algorithm)

Unit-I : Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions,Neural network architecture: single layer and multilayer feed forward networks, recurrent networks.Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.

Unit-II : Neural Networks-II (Back propogation networks)
Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back opogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.

Unit-III : Fuzzy Logic-I (Introduction)
Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV : Fuzzy Logic –II (Fuzzy Membership, Rules)
Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications&Defuzzificataions, Fuzzy Controller, Industrial applications.

Unit-V : Genetic Algorithm(GA)
Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.

Text Books:
1. S. Rajsekaran& G.A. VijayalakshmiPai, "Neural Networks,Fuzzy Logic and Genetic
Algorithm:Synthesis and Applications" Prentice Hall of India.
2. N.P.Padhy,"Artificial Intelligence and Intelligent Systems" Oxford University Press.

Reference Books:
3. SimanHaykin,"Neural Netowrks"Prentice Hall of India
4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.

[BTOE-42] NANO SCIENCES

UNIT -1 :
Introduction:
Difinition of Nano-Science and Nano Technology, Applications of Nano-Technology.
Introduction to Physics of Solid State:
Structure: Size dependence of properties; crystal structures, face centered cubic nanoparticles; Tetrehedrally bounded semiconductor structures; lattice vibrations.
Energy Bands: Insulators, semiconductor and conductors; Reciprocal space; Energy bands and gaps of semiconductors; effective masses; Fermi Surfaces.
Localized Particles: Acceptors and deep taps; mobility; Excitons.

UNIT-2
Quantum Theory For Nano Science:
Time dependent and time independent Schrodinger wave equations. Particle in a box, Potential step: Refelection and tunneling(Quantum leak). Penetration of Barrier, Potential box(Trapped particle in 3D:Nanodot), Electron trapped in 2D plane(Nano sheet), Quantum confinerment effect in nano materials.
Quantum Wells, Wires and Dots
Preparation of Quantum Nanostructure; Size and Dimensionality effect, Fermigas; Potential wells; Partial confinement; Excitons; Single electron Tunneling, Infrared etectors; Quantum dot laser Superconductivity.
Properties of Individual Nano particles
Metal Nano clusters: Magic Numbers; Theoretical Modelling of Nanopraticles; geometric structure; electronic structure; Reactivity; Fluctuations Magnetic Clusters; Bulle to Nano structure.
Semi conducting Nanoparticles: Optical Properties; Photofragmentation; Coulmbic explosion.
Rare Gas & Molecular Clusters: Inert gas clusters; Superfluid clusters molecular clusters.

UNIT-3

Growth Techniques of Nanomaterials:
Lithograpahic and Nonlithograpahic techniques, Sputtering and film deposition in glow discharge, DC sputtering technique(p-$CuAlO_2$ deposition). Thermal evaporation technique, E-beam evaporation, Chemical Vapour deposition(CVD), Synthesis of carbon nano-fibres and multi-walled carbon nanotubes, Pulsed Laser Deposition, Molecular beam Epitoxy, Sol-Gel Techniuqe (No chemistry required), Synthesis of nanowires/rods, Electrodeposition, Chemical bath deposition, Ion beam deposition system, Vapor-Liquid–Solid (VLS) method of nanowires.

UNIT -4
Methods of Measuring Properties:
Structure: Crystallography, particle size determination, surface structure,
Microscopy: Scanning Prob Microscopy (SPM), Atomic Force Microscopy (AFM), Field Ion Microscopy, Scanning Electron Microscopy, Transmission Elecrtron Microscopy (TEM)
Spectroscopy: Infra red and Raman Spectroscopy, X-ray Spectroscopy, Magnetic resonance, Optical and Vibrational Spectroscopy, Luninscence.

UNIT-5
Buckey Ball:
Nano structuresofcarbon(fullerene):
Carbon nano-tubes: Fabrication , structure. electrical, mechanical, and vibrational properties and applications. Nano diamond, Boron Nitride Nano-tubes, single elecron transistors, Moelcular machine, Nano-Biometrics, Nano Robots.

Text/Reference Books:
1. C.P.Poole Jr F.J. Owens, "Introduction to Nanotechnology".
2. "Introduction to S.S. Physics" - (7th Edn.) Wiley 1996.

[BTOE-43] LASER SYSTEMS AND APPLICATIONS

UNIT-I & II
Introduction:
Review of elementary quantum physics, Schrodinger equation, concept of coherence, absorption, spontaneous emission and stimulated emission processes, relation between Einstein's A and B coefficients, population inversion, pumping, gain, optical cavities.

UNIT-III & IV
Lasers & Laser Systems:
Main components of Laser, principle of Laser action, introduction to general lasers and their types. Three & four level Lasers, CW & Pulsed Lasers, atomic, ionic, molecular, excimer, liquid and solid state Lasers and systems, short pulse generation and Measurement.

UNIT-V
Applications:
Laser applications in medicine and surgery, materials processing, optical communication, metrology and LIDAR and holography.

Text/ Reference Books:
1. K.R. Nambiar, "Laser Principles, Types and Application" New Age International.
2. S. A. Ahmad, "Laser concepts and Applications" New Age Internati

[BTOE-44] SPACE SCIENCES

1. Introduction:
Introduction to space science and applications, historical development
2. Solar System:
Nebular theory of formation of our Solar System.Solar wind and nuclear reaction as the source of energy.
Sun and Planets: Brief description about shape size, period of rotation about axis and period of revolution, distance of planets from sun, Bode's law, Kepler's Laws of planetary motion, Newton's deductions from Kepler's Laws, Newton's

Law of gravitation, correction of Kepler's third law, determination of mass of earth, determination of mass of planets with respect to earth. Brief description of Asteroids, Satellites and Comets.

3. Stars:
Stellar spectra and structure, stellar evolution, nucleo-synthesis and formation of elements.
Classification of stars: Harvard classification system, Hertzsprung-Russel diagram,
Luminosity of star, variable stars; composite stars (white dwarfs, Neutron stars, black hole, star clusters, supernova and binary stars); Chandrasekhar limit.

4. Galaxies:
Galaxies and their evolution and origin, active galaxies and quasars.

5. Creation of Universe:
Early history of the universe, Big-Bang and Hubble expansion model of the universe, cosmic microwave background radiation, dark matter and dark energy.

Text Books / Reference Books:
1. K. S. Krishnaswami, "Astrophysics: A modern Perspective" New Age International.
2. K. S. Krishnaswami, "Understanding cosmic Panorama" New Age International.

[BTOE-45] POLYMER SCIENCE AND TECHNOLOGY

UNIT –I & II
POLYMERS:
Introduction, chemistry of polymer synthesis, polymer reaction kinetics, physical properties and characterization of polymers, effect of structure on properties of polymers, organic polymers.Introduction to high performance polymers and composites and their processing.

UNIT –III & IV
POLYMERIZATION:
Introduction, step-growth polymerization, free radical chain growth polymerization, emulsion polymerization, ionic and cationic polymerization, chain statistics and rubber elasticity.

UNIT – UNIT –V & VI
PREPARATION AND APPLICATIONS:
Preparation, properties and technical applications of thermo-plastics (PVC, PVA), thermostats (PF, UF) and elastomers (SBR, GR-N), silicones.Application of polymers in space, ocean, electronics, medical, agriculture, automobile, sports and building construction.

[BTOE-46] NUCLEAR SCIENCE

UNIT-I
Nucleus and Its Basic Features:
Nuclear structure; nuclear forces and their properties, nuclear stability, nuclear radius and its meassurement, nuclear spin, nuclear magnetic and electrical moments.

UNIT-II
Nuclear Models:
Single particle model, liquid drop model and semi-emperical mass formula, nuclear potential and shell model, collective model.

UNIT-III
Nuclear Reaction:
Nuclear reaction and laws of conservation, types of nuclear reaction, mechanism of nuclear reaction, nuclear fission & binuclear fusion and their explanation by liquid drop model.

UNIT-IV
Nuclear Decay:
Decay constant, half life period and mean life, alpha decay, beta decay, gamma decay, interaction of nuclear radiation with matter.

Nuclear Instruments-I

Mass spectrograph,: General principle, Aston's Mass Spectrograph.
UNIT-V
Nuclear Instruments-II
Accelerators: Van de Graph Generator, Cyclotron, Synchrotron.
Detectors: G M Counter, Scintillation counter, cloud chamber, Bubble Chamber, production and detection of neutrons and Gamma-photon.
Application of Nuclear Techniques: Nuclear magnetic resonance, positron emission topography, radiotracer techniques and applications in material science and agriculture.
Text Books:
1. Tayal, "Nuclear Physics" Himalaya Publishing House.
2. S.N. Ghosal, "Nuclear Physics" S. Chand & Co.
Reference Books:
6. Roy & Nigam, "Nuclear Physics" John Wiley & sons.
7. W.E. Burcham, "Nuclear Physics" Longmans Publications.

[BTOE-47]   MATERIAL SCIENCE

UNIT-I
Introduction: Historical perspective, importance of materials, Brief review of modern & atomic concepts in Physics and Chemistry. Atomic models, Periodic table, Chemical bonding.
Crystallography and imperfections:
Concept of unit cell, space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices.X-ray crystallography techniques, imperfections, Defects & Dislocations in solids. .
UNIT-II
Mechanical Properties and Testing: Stress strain diagram, Ductile and brittle materials, stress Vs strength, toughness, hardness, fracture, fatigue and creep. Testing, such as Strength testing, Hardness testing, Impact testing, Fatigue testing Creep testing, Non-destructive testing (NDT)
Micro Structural Exam: Microscope principle and methods, Preparation of samples and microstructure exam and grain size determination, comparative study of microstructure of various metals and alloys, such as Mild steel, CI, Brass.
Phase Diagram and Equilibrium Diagram: Uniary and Binary diagrams, Phase rules, Types of equilibrium diagrams: solid solution type, eutectic type and combination type, Iron-carbon equilibrium diagram.
UNIT-III
Ferrous materials: Iron and steel manufacture, furnaces, various types of carbon steels, alloy steels and cast irons, its properties and uses.
Heat Treatment: various types of heat treatment, such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams.
Non-Ferrous metals and alloys: Non-ferrous metals, such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various types of Brass, Bronze bearing materials their properties and uses. Aluminum alloys, such as Duralumin, Other advanced materials/alloys.
UNIT-IV
Magnetic properties: Concept of magnetism- Dia, para, ferro magnetic materials, Hysteresis, Soft and hard magnetic materials, Magnetic Storages.
Electric Properties: Energy band, concept of conductor, insulator and semi conductor. Intrinsic and extrinsic semi-conductors, P-n junction and transistors, Basic devices and their applications.diffusion of Solid
Super conductivity and its applications, Messier effect. Type I& II superconductors. High Temp. superconductors.
UNIT-V
Ceramics: Structure, types, properties and applications of ceramics. Mechanical/Electrical behaviour and processing of ceramics.
Plastics: Various types of polymers/plastics and their applications. Mechanical behaviour and processing of plastics, Future of plastics.
Other Materials: Brief description of other materials, such as optical and thermal materials, concrete, composite materials and their uses.
Other Materials: Brief description of other materials, such as optical and thermal materials, concrete, composite materials and their uses.

Performance of materials in service: Brief theoretical consideration of fracture, fatigue, and corrosion and its control.
Text / Reference Books:
1. W.D. Callisster Jr. "Material Science & Engineering Addition" - Wesly Publishing Co.
2. Van Vlash, "Elements of Material Science & Engineering", John Wiley & Sons

[BTOE-48]   DISCRETE MATHEMATICS

UNIT-I
Set Theory: Definition of Sets, Venn Diagrams, complements, cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), proofs of some general identitites on sets, pigeonhole principle.
Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation.
Function: Definition and types of function, composition of functions, recursively defined functions.
UNIT-II
Propositional logic: Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction , normal forms(conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification.
Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.
UNIT-III
Combinatories: Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (n_{th} order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)
Unit-IV
Algebraic Structure: Binary composition and its properties definition of algebraic structure; Groyas Semi group, Monoid Groups, Abelian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).
UNIT-V
Graphs:
Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number.
Tree: Definition, types of tree(rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder, postorder).
Finite Automata: Basic concepts of Automation theory, Deterministic finite Automation(DFA), transition function, transition table, Non Deterministic Finite Automata (NDFA), Mealy and Moore Machine, Minimization of finite Automation.
Text/Reference Books:
1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill, 2002.
2. V. Krishnamurthy, "Combinatories:Theory and Applications", East-West Press.

[BTOE-49] APPLIED LINEAR ALGEBRA
UNIT-1
Fields, Vector-spaces, sub-spaces, linear-combination, linear-dependence and independence.Basis, dimensions and coordinates (each and every fact to be illustrated by suitable examples).
UNIT-2
Linear-transformation, definition and examples, matrix representation, similarity, range and kernel, rank-nullity theorem and its consequences.

UNIT-3

Singular and non singular linear transformations, sum and product of linear transformations, vector space of linear transformations, nilpotent linear transformations.

UNIT-4

Inner product spaces, definition and examples, orthogonality, Cauchy-Schwartz Inquality, Minkowski Inequality, polarization Identity, complete ortho normal set, Bessel's Inequality, Gram-Schmidt's orthogonalization process.

UNIT-5

Linear functional, definition and examples, vector space of linear functional, dual vector spaces, adjoint, self adjoint, unitary and normal operators, examples and properties, eigen values and eigen vectors, diagonalisation of linear operators, quadratic forms, principle axis theorem(without proof), some applications to engineering problems.

TEXT/REFERENCE BOOKS

1. Dym, H. Linear Algebra in action, University Press.2012
2. Halmos, P.R.: Finite Dimensional Vector Spaces (1990) Narosa.