SANJAY GANDHI INSTITUTE OF ENGINEERING & TECHNOLOGY

Syllabus & Evaluation Scheme

(Effective from Session 2017-2018)

On

Choice Based Credit System (CBCS)

Computer Science and Engineering

Bachelor of Technology (B.Tech.)

2nd Year (III & IV Semester)

NEHRU GRAM BHARATI VISHWAVIDYALAYA

KOTAWA-JAMUNIPUR-DUBAWAL

ALLAHABAD

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REVISED SYLLABUS & EVALUATION SCHEME

B.Tech. (Computer Science and Engineering)

[Effective from the session 2017-18]

Year-2nd, Semester-III

S. No.	Subject Code	Subject	Periods			Evaluation Scheme				Subject Total	Credits
						Sessional Exam.			ESE		
			L	T	P	CT	Assig/ Att.	Total			
THEORY											
1.	EAS-301/ EOE-030 to 039	Engg. Mathematics-III/ Science Based Open Elective	3	1	0	20	10	30	70	100	4
2.	EVE-301/ EAS-302	Human Values & Professional Ethics/ Environment & Ecology	3	0	0	20	10	30	70	100	3
3.	EEC-301	Digital Logic Design	3	0	0	20	10	30	70	100	3
4.	ECS-301	Discrete Structure & Theory of Logic	3	0	0	20	10	30	70	100	3
5.	ECS-302	Computer Organization and Architecture	3	0	0	20	10	30	70	100	3
6.	ECS-305	Data Structures	3	1	0	20	10	30	70	100	4
PRACTICAL / TRAINING / PROJECT											
7.	EEC-351	Digital Logic Design Lab	0	0	2	30	20	50	50	100	1
8.	ECS-351	Discrete Structure & Logic Lab	0	0	2	30	20	50	50	100	1
9.	ECS-352	Computer Organization Lab	0	0	2	30	20	50	50	100	1
10.	ECS-355	Data Structures Using C/Java Lab	0	0	2	30	20	50	50	100	1
First Year Engineering Programme for B.Tech. 2nd Year lateral entry students belonging to B.Sc. Stream											
11.	EME-101	Elements of Mechanical Engineering*	3	1	0	20	10	30	70	100*	-
12.	ECE-151	Computer Aided Engineering Graphics*	0	0	3	30	20	50	50	100*	-
		Total	**18**	**2**	**8**	**240**	**140**	**380**	**620**	**1000**	**24**

L - Lecture
T - Tutorial
P - Practical
CT - Cumulative Test
Assig/Att. - Assessment/Assignment/Attendance
ESE - End Semester Exam.

***B.Tech. 2nd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects EME-101/EME-201 and ECE-151/ECE-251 of the first year Engineering Programme along with the second year subjects.**

REVISED SYLLABUS & EVALUATION SCHEME

B.Tech. (Computer Science and Engineering)

[Effective from the session 2017-18]

Year-2nd, Semester-IV

S. No.	Subject Code	Subject	Periods			Evaluation Scheme				Subject Total	Credits
						Sessional Exam.			ESE		
			L	T	P	CT	Assig/ Att.	Total			
THEORY											
1.	EOE-040, to 049/ EAS-401	Science Based Open Elective/ Engg. Mathematics-III	3	1	0	20	10	30	70	100	4
2.	EAS-402/ EVE-401	Environment & Ecology/ Human Values & Professional Ethics	3	0	0	20	10	30	70	100	3
3.	EEC-405	Introduction to Microprocessors	3	0	0	20	10	30	70	100	3
4.	ECS-401	Operating Systems	3	0	0	20	10	30	70	100	3
5.	ECS-402	Software Engineering	3	0	0	20	10	30	70	100	3
6.	ECS-403	Theory of Automata and Formal Languages	3	1	0	20	10	30	70	100	4
PRACTICAL / TRAINING / PROJECT											
7.	ECS-451	Operating System Lab	0	0	2	30	20	50	50	100	1
8.	ECS-452	Software Engineering Lab	0	0	2	30	20	50	50	100	1
9.	ECS-453	TAFL Lab	0	0	2	30	20	50	50	100	1
10.	ECS-454	Python Language Programming Lab	0	0	2	30	20	50	50	100	1
First Year Engineering Programme for B.Tech. 2nd Year lateral entry students belonging to B.Sc. Stream											
11.	EME-201	Elements of Mechanical Engineering*	3	1	0	20	10	30	70	100*	-
12.	ECE-251	Computer Aided Engineering Graphics*	0	0	3	30	20	50	50	100*	-
		Total	**18**	**2**	**8**	**240**	**140**	**380**	**620**	**1000**	**24**

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List of Science Based Open Electives:

1. EOE030/040 Manufacturing Process
2. EOE031/041 Introduction to Soft Computing
3. EOE032/042 Nano Science
4. EOE033/043 Laser System and Application
5. EOE034/044 Space Science
6. EOE035/045 Polymer Science & Technology
7. EOE036/046 Nuclear Science
8. EOE037/047 Material Science
9. EOE038/048 Discrete Mathematics
10. EOE039/049 Applied Linear Algebra

EAS-301: ENGINEERING MATHEMATICS - III

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Unit - I

Function of Complex variable: Analytic function, C-R equations, Harmonic Functions, Cauchy's integral theorem, Cauchy's integral 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

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

Unit – III

Numerical Techniques–I: Zeroes of transcendental and polynomial equations using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals.

Unit – IV

Numerical Techniques–II: Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss- Seidel method. Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson's one third and three-eight rules, Solution of ordinary differential equations (first order, second order and simultaneous) by Euler's, Picard's and fourth-order Runge- Kutta methods.

Unit – V

Numerical Techniques-III: Boundary Value Problem, Finite Difference Method, Eigen Value Problems, Condition Number, Polynomial Method, Power Method, Numerical solution of partial differential equations, Elliptic, parabolic and Hyperbolic equations.

OR

Integral Transforms: Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations, Z- transform and its application to solve difference equations.

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.
3. JN Kapur, Mathematical Statistics, S. Chand & company Ltd.
4. BS Grewal, Higher Engineering Mathematics, Khanna Publishers.

Reference Books:

1. RK Jain & SRK Iyenger, Advance Engineering Mathematics, Narosa Publication House.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
3. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Pvt. Limited, New Delhi
4. E. Balagurusamy, Numerical Methods, Tata McGraw-Hill Publishing Company Limited, New Delhi
5. T. Veerajan& T. Ramchandrandran, Theory & Problems in Numerical Methods, TMH, New Delhi.

EAS-302/EAS-402: ENVIRONMENT & ECOLOGY

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UNIT-I

Definition, Scope & Importance, Need For Public Awareness- Environment definition, Eco system - Balanced ecosystem, Human activities - Food, Shelter, Economic and social Security.

Effects or human activities on environment-Agriculture, Housing, Industry, Mining and Transportation activities, Basks of Environmental Impact Assessment. Sustainable Development.

UNIT-II

Natural Resources- Water Resources- Availability and Quality aspects. Water borne diseases, Water Induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material cycles- Carbon, Nitrogen and Sulphur Cycles.

Energy - Different types of energy, Electro-magnetic radiation. Conventional and Non-Conventional sources - Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Biogas. Hydrogen as an alternative future source of Energy.

UNIT-III

Environmental Pollutlon and their effects. Water pollution, Land pollution. Noise pollution, Public Health aspects, Air Pollution, Solid waste management, e-waste management.

Current Environmental Issues of Importance: Population Growth, Climate Change and Global warming- Effects, Urbanization, Automobile pollution. Acid Rain Ozone Layer depletion, Animal Husbandry.

UNIT-IV

Environmental Protection- Role of Government, Legal aspects, initiatives by Non-Governmental organizations (NGO), Environmental Education, Women Education.

Text Books:

1. Environmental Studies-Benny Joseph-Tata McgrawHill-2005.
2. Environmental Studies- Dr. D.L. Manjunath, Pearson Education-2006.
3. Environmental Studies – R. Rajagopalan -Oxford Publication- 2005.
4. Text book of Environmental Science & Technology- M. Anji Reddy- US Publication.

Reference Books:

1. Principle of Environmental Science and Engineering - P. Venugoplan Rao, Prentice Hall of India.
2. Environmental Science and Engineering Meenakshi, Prentice Hall India.

EVE-301/EVE-401: HUMAN VALUES & PROFESSIONAL ETHICS

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UNIT-I: Course Introduction – Need, Basic Guidelines, Content and Process for Value Education.

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration – What is it? – Its content and process; 'Natural Acceptance' and Experiential Validation – As the mechanism for self exploration
3. Continuous Happiness and Prosperity – A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facilities – the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly – A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT-II: Understanding Harmony in the Human Being – Harmony in Myself?

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' – ***Sukh and Suvindha***
9. Understanding Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: ***Sanyam and Swasthya****;* correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure ***Sanyam and Swasthya*** – Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT-III: Understanding Harmony in the Family and Society – Harmony in Human – Human Relationship

13. Understanding harmony in the Family - the basic unit of human interaction
14. Understanding values in human – human relationship; meaning of Nyaya and program for its fulfillment to ensure ***Ubhay-tripti***; Trust (***Vishwas***) and Respect (***Samman***) as the foundational values of relationship
15. Understanding the meaning of ***Vishwas***; Difference between intention and competence
16. Understanding the meaning of ***Samman***, Difference between respect and differentiation; the other salient values in relationship
17. Understanding the harmony in the society (society being an extension of family): ***Samadhan, Samridhi, Abhay, Sah-astitiva*** as comprehensive Human Goals
18. Visualizing a universal harmonious order in society – Undivided Society (***Akhand Samaj***), Universal Order (***Sarvbhaum Vyawastha***) – from family to world family!
    – Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT-IV: Understanding Harmony in the Nature and Existence – Whole existence as Co-existence

19. Understanding the harmony in the Nature
20. Interconnectedness in the mutual fulfillment among the four orders of nature – recyclability and self-regulation in nature
21. Understanding Existence as Co-existence (***Sah-astitva***) of mutually interacting units in all-pervasive space
22. Holistic perception of harmony at all levels of existence – Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT-V: Implications of the above Holistic Understanding of Harmony on Professional Ethics

23. Natural acceptance of human values
24. Definitiveness of Ethical Human Conduct
25. Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
26. Competence in professional ethics:
    (a) Ability to utilize the professional competence for augmenting universal human order,
    (b) Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems,
    (c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
27. Case studies of typical holistic technologies, management models and production systems
28. Strategy for transition from the present state to Universal Human Order:

(a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers,
(b) At the level of society: as mutually enriching institutions and organizations.

Text Book:

1. R. R. Gaur, R. Sangal, G.P. Bagaria, 2009, ***A Foundation Course in Value Education***.

Reference Books:

1. Ivan Illich, 1974, ***Energy & Equity***, The Trinity Press , Worcester, and HarperCollins, USA
2. PL Dhar, RR Gaur, 1990, ***Science and Humanism***, Commonwealth Purblishers.
3. A.N. Tripathy, 2003, ***Human Values***, New Age International Publishers.
4. E.G. Seebauer & Robert L. Berry, 2000, ***Fundamentals of Ethics for Scientists & Engineers***, Oxford University Press
5. M. Govindrajran, S. Natrajan & V.S. Senthil Kumar, ***Engineering Ethichs (including Human Values)***, Eastern Economy Edition, Prentice Hall of India Ltd.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, ***http://www.uptu.ac.in***
2. Story of Stuff, ***http://www.storyofstuff.com***
3. Al Gore, ***An Inconvenient Truth***, Paramount Classics, USA
4. Charlie Chaplin, ***Modern Times***, United Artists, USA
5. IIT Delhi, ***Modern Technology - The Untold Story***
6. Gandhi A., Right Here Right Now, Cyclewala Productions

EEC-301: DIGITAL LOGIC DESIGN

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Unit - I

DIGITAL SYSTEM AND BINARY NUMBERS: Number System and its arithmetic, Signed binary numbers, Binary codes, Cyclic codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).

Unit – II

COMBINATIONAL LOGIC: Combinational Circuits: Analysis Procedure, Design procedure, Binary adder-subtractor, Decimal adder, Binary multiplier, Magnitude comparator, Multiplexers, Demultiplexers, Decoders, Encoders.

Unit - III

SEQUENTIAL LOGIC AND ITS APPLICATIONS: Storage elements: latches & flip flops, Characteristic Equations of Flip Flops, Flip Flop Conversion, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters: Johnson & Ring Counter.

Unit - IV

SYNCHRONOUS & ASYNCHRONOUS SEQUENTIAL CIRCUITS: Analysis of clocked sequential circuits with state machine designing, State reduction and assignments, Design procedure. Analysis procedure of Asynchronous sequential circuits, circuit with latches, design procedure, Reduction of state and flow table, Race-free state assignment, Hazards.

Unit – V

MEMORY & PROGRAMMABLE LOGIC DEVICES: Digital Logic Families: DTL, DCTL, TTL, ECL & CMOS etc., Fan Out, Fan in, Noise Margin; RAM, ROM, PLA, PAL; Circuits of Logic Families, Interfacing of Digital Logic Families, Circuit Implementation using ROM, PLA and PAL; CPLD and FPGA.

Text Books:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.
3. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.

Reference Books:

1. D.P. Kothari and J.S. Dhillon, “Digital Circuits and Design”, Pearson Education.
2. A. Anand Kumar, “Fundamentals of Digital Circuits”, PHI Learning Pvt. Ltd.

ECS-301: DISCRETE STRUCTURES & THEORY OF LOGIC

L T P
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Unit – I

Set Theory: Introduction, Combination of sets, Multi sets, ordered pairs, Set Identities.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, 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 Base cases.

Unit-II

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism’s, Definition and elementary properties 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 Complete Lattice, Morphisms of lattices.
Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. 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 formed formula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

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

References:

1. Liu and Mohapatra, “Elements of Discrete 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.
4. R. P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
5. B. Kolman, R.C. Busby, and S.C. Ross, “Discrete Mathematical Structures”, PHI Learning Private Limited, Delhi India.
6. Norman L. Biggs, “Discrete Mathematics”Oxford Higher Education.
7. Biswal, “Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
8. Goodaire and Parmenter, “Discrete Mathematics with Graph Theory”, PHI Learning Private Limited, Delhi India.
9. Lipschutz, “Discrete Mathematics” McGraw Hill
10. Deo N., “Graph Theory with Applications to Engineering and Computer Science”, PHI Learning Private Limited, Delhi India

ECS-302: COMPUTER ORGANIZATION AND ARCHITECTURE

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Unit – I

Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register bus and memory transfer, Processor organization, general register organization, stack organization and addressing modes, Look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design.

Unit – II

Instruction types, formats, instruction cycles and sub cycles (fetch, execute etc) , micro-operations, execution of a complete instruction, Hardwire and micro-programmed control: micro-programme sequencing, concept of horizontal and vertical microprogramming.

Unit – III

Basic concept and hierarchy, semiconductor RAM memories, 2D & 2½D memory organization. ROM memories, Cache memories: concept and design issues & performance, address mapping and replacement, Auxiliary memories: magnetic disk, magnetic tape and optical disks, Virtual memory: concept implementation.

Unit – IV

Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions, Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors, Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

Unit – V

Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws, Pipelining and Memory Hierarchy Basic and Intermediate Concepts, Linear and Nonlinear Pipeline Processors, Optimization of Cache Performance.

Reference Books:

1. Patterson, "Computer Organization and Design" Elsevier Pub. 2009
2. William Stalling, " Computer Organization", PHI
3. M. Morris Mano, "Computer System Architecture", Pearson Learning
4. Miles Murdocca, Vincent Heuring "Computer Architecture and Organisation: An Integrated Approch" 2nd Edition
5. Kai Hwang, "Advance Computer Architecture", TMH
6. Vravice, Hamacher & Zaky, "Computer Organization", TMH
7. John P Hays, "Computer Organization", McGraw Hill
8. Tannenbaum, "Structured Computer Organization", PHI
9. P Pal Chaudhry, "Computer Organization & Design" PHI
10. Dezso and Sima, "Advanced Computer Architecture", Pearson
11. Alan Clements "Computer Organization and Architecture" , Cengage Learning
12. Behrooz Parhami "Computer Architecture", Oxford

ECS-305: DATA STRUCTURES

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Unit – I

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and 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, and Column 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 Representation and Addition, Generalized Linked List.

Unit – II

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of 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 implementation of queues in C, Dequeue and Priority Queue.

Unit – III

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, 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. Transitive Closure and Shortest Path 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 for Internal 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 Strategies

Storage Management: Garbage Collection and Compaction.

References:

1. Aaron M. Tenenbaum, Yedidyah Langsam 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. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
4. Thareja, “Data Structure Using C” Oxford Higher Education.
5. A. K. Sharma, “Data Structure Using C”, Pearson Education India.
6. Rajesh K. Shukla, “Data Structure Using C and C++” Wiley Dreamtech Publication.
7. Michael T. Goodrich, Roberto Tamassia, David M. Mount “Data Structures and Algorithms in C++”, Wiley India.
8. P. S. Deshpandey, “C and Data structure”, Wiley Dreamtech Publication.
9. R. Kruse etal, “Data Structures and Program Design in C ”, Pearson Education
10. Berztiss, A. T.: Data structures, Theory and Practice:, Academic Press.
11. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill.
12. Adam Drozdek “ Data Structures and Algorithm in Java”, Cengage Learning.

EEC-351: DIGITAL LOGIC DESIGN LAB

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0 0 2

Objective: To understand the digital logic and create various systems by using these logics.

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.

ECS-351: DISCRETE STRUCTURE & LOGIC LAB

L T P
0 0 2

Understanding of mathematical computation software such as Mapple, Prolog to experiment the followings:

1. Working of Computation software
2. Discover a closed formula for a given recursive sequence vice-versa
3. Recursion and Induction: Practice of proof techniques
4. Practice of various set operations
5. Testing of set operating using software
6. Counting
7. Combinatorial equivalence
8. Permutations and combinations
9. Difference between structures, permutations and sets
10. Implementation of a recursive counting technique
11. N digit binary sequences not having adjacent 1's
12. Probability simulation
13. The Birthday problem
14. Poker Hands problem
15. Baseball best-of-5 series: Experimental probabilities
16. Comparison of theoretical probability with experimental probability
17. Baseball: Binomial Probability
18. Basketball: One and one
19. Expected value problem
20. Binary relations

ECS-352: COMPUTER ORGANIZATION LAB

L T P
0 0 2

EXPERIMENTS:-

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER and Implementing 4x1 and 8x1 MULTIPLEXERS.
4. Verify the excitation tables of various FLIP-FLOPS.
5. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
6. Design of an 8-bit ARITHMETIC LOGIC UNIT.
7. Design the data path of a computer from its register transfer language description.
8. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
9. Write an algorithm and program to perform matrix multiplication of two n * n matrices on the 2-D mesh SIMD model, Hypercube SIMD Model or multiprocessor system.
10. Study of Scalability for Single board Multi-board, multi-core, multiprocessor using Simulator

ECS-355: DATA STRUCTURE USING C / JAVA LAB

L T P
0 0 2

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.

EEC-405: INTRODUCTION TO MICROPROCESSOR

L T P
3 0 0

Unit – I

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing.

Unit – II

Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.

Unit – III

Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.

Unit – IV

Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.

Unit – V

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.
Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References:

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, “Microprocessors and Interfacing”, Tata McGraw Hill.
3. Yu-cheng Liu, Glenn A. Gibson, “Microcomputer Systems: The 8086 / 8088 Family -Architecture, Programming and Design”, Second Edition, Prentice Hall of India.
4. Barry B. Brey, “The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium IV, Architecture, Programming & Interfacing”, Eighth Edition, Pearson Prentice Hall, 2009.
5. Peter Abel, “IBM PC Assembly language and programming”, Fifth Edition, Prentice Hall of India Pvt. Ltd.
6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Pearson education.

ECS-401: OPERATING SYSTEMS

L T P
3 0 0

Unit – I

Introduction: Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Re-entrant Kernels, Monolithic and Microkernel Systems.

Unit – II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

Unit – III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit – V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Andrew S. Tanenbaum, "Modern Operating System", PHI Learning
3. Tanenbaum /Woodhaull "Operating System Design and Implementation", Pearson Publication.
4. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
5. Flynn, "Understanding Operating System" , Cengage.
6. D M Dhamdhere, "Operating Systems : A Concept basedApproach", McGraw Hill.
7. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
8. Stuart E. Madnick& John J. Donovan.Operating Systems.McGraw Hill.
9. A. K. Sharma, "Operating System", University Press.
10. Achyut S Godbole, Atul kahate , "Operating System", McGraw Hill

ECS-402: SOFTWARE ENGINEERING

L T P
3 0 0

Unit – I

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit – II

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit – III

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit – IV

Software Testing : Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.
Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit – V

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

References:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh, "Software Engineering", Cengage Learning.
8. P fleeger, Software Engineering, Macmillan Publication

ECS-403: THEORY OF AUTOMATA AND FORMAL LANGUAGES

L T P
3 1 0

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

Unit – V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
2. K.L.P. Mishra and N. Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI Learning Private Limited, Delhi India.
3. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. Y. N. Singh "Mathematical Foundation of Computer Science", New Age International.
5. Malviya ,AK "Theory of Computation and Application " BPaperback Publications
6. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", Pearson Publication.
7. K. Krithivasan and R. Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
8. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
9. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Learning.
10. Katuri Viswanath, "Introduction to Mathematical Computer Science, An" Universities Press.

ECS-451: OPERATING SYSTEMS LAB

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1. To implement CPU Scheduling Algorithms
   - FCFS
   - SJF
   - SRTF
   - PRIORITY
   - ROUND ROBIN
2. Simulate all Page Replacement Algorithms
   - FIFO
   - LRU
3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

ECS-452: SOFTWARE ENGINEERING LAB

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For any given case/ problem statements do the following:

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java. (Model to code conversion)
10. Perform reverse engineering in java. (Code to Model conversion)
11. Draw the deployment diagram.

ECS-453: TAFL Lab

L T P
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Understanding of software like JFLAP for experimenting with formal languages :

1. Deterministic Finite Automata (DFA)
2. Nondeterministic Finite Automata (NFA)
3. Conversion of NFA to DFA
4. DFA Minimization
5. DFA to regular grammar conversion
6. DFA to regular expression conversion
7. Combining automata
8. Regular expression to DFA conversion
9. Mealy and Moore machine
10. Pushdown automata
11. Single tape Turing machine
12. Multi-tape Turing machine
13. Context free grammars (CFG) with single symbols
14. CFG with multiple symbols
15. LL Parsing
16. LR Parsing
17. Regular expressions
18. Regular pumping lemma
19. Context free pumping lemma
20. CFG to Chomsky Normal form transformation

ECS-454: PYTHON LANGUAGE PROGRAMMING LAB

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Write a Python program to: -

1. Demonstrate the working of ‘id’ and ‘type’ functions
2. To find all prime numbers within a given range.
3. To print ‘n terms of Fibonacci series using iteration.
4. To demonstrate use of slicing in string
5.
   a. To add 'ing' at the end of a given string (length should be at least 3). If the given string already ends with 'ing' then add 'ly' instead. If the string length of the given string is less than 3, leave it unchanged. Sample String : 'abc' Expected Result : 'abcing' Sample String : 'string' Expected Result : 'stringly'
   b. To get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.
6.
   a. To compute the frequency of the words from the input. The output should output after sorting the key alphanumerically.
   b. Write a program that accepts a comma separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically.
7. Write a program that accepts a sequence of whitespace separated words as input and prints the words after removing all duplicate words and sorting them alphanumerically.
8. To demonstrate use of list & related functions
9. To demonstrate use of Dictionary& related functions
10. To demonstrate use of tuple, set& related functions
11. To implement stack using list
12. To implement queue using list
13. To read and write from a file
14. To copy a file
15. To demonstrate working of classes and objects
16. To demonstrate class method & static method

17. To demonstrate constructors
18. To demonstrate inheritance
19. To demonstrate aggregation/composition
20. To create a small GUI application for insert, update and delete in a table using Oracle as backend and front end for creating form

The lab experiments for this course have to ensure that the following concepts of PYTHON LANGUAGE are covered during lab classes:

Installing Python; basic syntax, interactive shell, editing, saving, and running a script, the concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; reading input from console, writing to console, comments in the program; understanding error messages; Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while);
String manipulations: subscript operator, indexing, slicing a string; other functions on strings: string module, strings and number system, format functions: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers
Lists, tuples, sets, and dictionaries: basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries, Array in Python
Regular Expressions: re modules, match function, search function, modifiers and patterns
Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions, scope and global statements, Lambda expressions, Importing Modules, math Module & Random Modules, creating own module.
Exception Handling: Exceptions, except clause, try and finally clause user defined exceptions File Handling: manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file;
Simple Graphics: "turtle" module; simple 2d drawing - colors, shapes; digital images, image file formats. Graphical user interfaces: event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames
Database: cx_ Oracle module, Connections, Executing Queries, calling procedure and functions, Using GUI to access Database
Object Oriented Programming: Concept of OOP: Abstraction, Encapsulation, Inheritance, and Polymorphism in Python, classes, objects, attributes and methods; defining classes; design with classes, constructors and destructors, inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; aggregation and composition

The reference books for this lab course are suggested as below:

1. John M. Sewart, "Python for Scientist", Cambridge Universities Press.
2. Reema Thareja, "Python Programming" Oxford Higher Education.
3. Robert Sedgewick,Kevin Wayne, Robert Dondero, "Introduction to Programming in Python" Pearson
4. Mrak Litz, " Learning Python",O' Reilly
5. Mark Pilgrim, "Dive into Python", Apress
6. James L. Young, "Python made Simple and Practical ", Kindle Edition (paperback)
7. Y.Daniel Liang "Introduction to Programming using Python" Pearson

SCIENCE BASED OPEN ELECTIVES

EOE-030/EOE-040: MANUFACTURING PROCESS

Unit- I Engineering Materials

Materials and Civilization, their socio economic impact. Engineering Materials their classification and applications.

Metals & Alloys: Properties and Applications

Mechanical Properties of Materials: Strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, malleability, toughness, hardness, resilience, hardness, machine ability, formability, weld ability. Elementary ideas of fracture fatigue & creep.

Steels and Cast Irons: Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel.

Alloys of Non Ferrous Metals: Common uses of various non-ferrous metals (Copper, Zink, Tin, Magnesium, Lead, Aluminum etc.) & alloys and its composition such as Cu-alloys: Brass, Bronze, Alalloys.

Unit-II Basic Metal Forming & Casting Processes.

Forming Processes: Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube - drawing/making and Extrusion, and their uses.

Press-work: Die & Punch assembly, cutting and forming, its applications. Hot-working versus cold - working.

Casting: Pattern: Materials, types and allowances. Type and composition of Molding sands and their desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses.

Unit-III Machining and Welding Operations and their Applications

Machining: Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding.

Welding: Introduction, classification of welding processes. Gas-welding, types of flames and their applications. Electric-Arc welding. Resistance welding. Soldering & Brazing processes and their uses.

Unit-IV Misc. Topics/ Processes

Heat Treatment Processes: Introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening.

Manufacturing Establishment: Plant location. Plant layout–its types. Types of Production. Production versus Productivity.

Non-Metallic Materials: Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials.

Misc. Processes: Introduction to Galvanizing and Electroplating.

Reference Books:

1. “Processes and Materials of Manufacture”, Lindberg, PHI.
2. “Manufacturing Engineering And Technology”, Kalpakjian and Schmid, Pearson.
3. “Manufacturing Processes”, Kalpakjian and Schmid, Pearson.
4. “Manufacturing Processes”, H. N .Gupta, R. C. Gupta, Arun Mital, New Age.

EOE-031/EOE-041: INTRODUCTION TO SOFT COMPUTING

Unit- I

Neural Networks-I (Introduction &Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multiplayer 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, multiplayer perception model; back propogation learning methods, effect of learning rule co-efficient back propagation algorithm, factors affecting back propagation 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 & Defuzzifications, 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. Vijayalakshmi Pal, “Neural Networks Fuzzy Logic and Genetic Algorithm Synthesis and Applications" Prentice Hall of India.
2. N.P. Pady, "Artificial Intelligence and Intelligent Systems" Oxford University Press.

Reference Books:

3. Siman Hykin, "Neural Networks' Trentice Hall of India.
4. Timothy J Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
5. Kumar Satish, "Neural Networks" Tata Me Graw Hill.

EOE-032/EOE-042: NANO SCIENCE

UNIT-I

Introduction: Definition of Nano-Science and Nano Technology, Applications of Nano-Technology.

Quantum Theory for Nano Science: Particle in a box, Potential step: Reflection and tunneling (Quantum leak). Penetration of Barrier, Potential box (Traped particle in 3D: Nanodot).

Physics of Solid State Structures: 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-II

Quantum Nanostructure: Preparation of quantum wells, Wires and Dots, Size and Dimensionality effect, Fermi gas; Potential wells; Partial confinement; Single electron Tunneling, Infrared detectors; Quantum dot laser superconductivity.

Properties of Individual Nano Particles: Metal nano clusters; Magic numbers; Theoretical modeling of nanoparticles; geometric structure; electronic structure; Reactivity, Fluctuations, Magnetic clusters; Bulk to nanostructure, semiconducting nanoparticles, Optical Properties, Photofragmentation, Coulombic Explosion. Rare Gas & Molecular clusters; Inert gas clusters; Superfluid clusters; Molecular clusters.

UNIT-III

Growth Techniques of Nanomaterials: Litho and Nonlithograpahic techniques, RF Plasma, Chemical methods, Thermolysis, Pulsed laser method, Self-assembly, E-beam evaporation, Chemical Vapour Deposition, Pulsed Laser Deposition.

UNIT-IV

Methods of Measuring Properties: Structure: X-ray Diffraction Technique, Particle size determination, surface structure. Microscopy: Scanning Probe Microscopy (SPM), Atomic Force Microscopy (AFM), Field Ion Microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy(TEM). Spectroscopy: Infra red and Raman Spectroscopy, X-ray Spectroscopy, Magnetic resonance, Optical and Vibrational Spectroscopy, Luminescence.

UNIT-V

Carbon Nano Materials: Bucky Ball and Carbon Nano- Tubes: Nano structures of carbon (fullerene), Fabrication, Structure. Electrical, Mechanical and Vibrational properties and applications. Nano Diamond, Boron Nitride Nano-tubes, Single Electron Transistors, Molecular Machine, Nano-Biometrics, Nano Robots.

Text/Reference Books:

1. C.P. Poole Jr F.J. Owens, “Introduction to Nanotechnology”.
2. C.Kittel “Introduction to S.S. Physics”-(7th Edn.) Wiley 1996.
3. H.S. Nalwa “Handbooke of Nanostructured Materials & Nanotechnology” vol. 5. Academic Press 2000.

EOE-033/EOE-043: LASER SYSTEMS AND APPLICATIONS

UNIT-I

Basic Principle of Modern Physics: Black body radiation, Atomic structure, Spectral series of hydrogen atom, Polarization, Absorption and florescence of X-ray, Energy distribution in electrons, Probability of distribution of free electrons, Free electron in metals, Energy level in free electrons, Application of Schrodinger equation in potential well, potential step, tunneling effect.

UNIT-II

Elements and Techniques of Laser: Concept of coherence, Temporal and Spatial coherence, Coherence length and time, Brightness and Intensity, Directionality and Monochromacity. Absorption, Spontaneous and Stimulated Emission process and Einstein’s coefficients. Population inversion, Pumping and pumping schemes, laser gain, Optical cavities and its types.

UNIT-III

Principle of Laser & General Lasers: Main components of Laser, Principle of Laser action, Introduction to general lasers and their types. Three & four level Lasers, Continuous Wave Lasers, Pulsed Lasers, Q-switch lasers.

UNIT-IV

Types of Laser Systems:

Solid state Lasers: Neodymium laser, Nd-Yag laser, Nd-Glass laser and Alexandrite laser.

Liquid Lasers: Dye laser, Tuning in Dye laser, Model-Locked Ring Dye laser.

Gas Laser: Ionic lasers, Argon ion laser, Krypton ion laser, He-Cadmium laser, Copper vapour laser, Carbon dioxide laser and Excimers laser.

Semiconductor Laser: Characteristics of semiconductor lasers, Semiconductor diode lasers, Hetrojunction lasers, Homojunction lasers, Quantum well lasers.

UNIT-V

Laser Applications:

Material Processing: Material processing with lasers, Interaction mechanism, Material processing mechanism, Drilling, Cutting and Welding process with laser. Laser hardening.

Medical Science: Medical lasers, Laser diagnostic, Laser in ophthalmology, laser in glaucoma, Laser for general surgery, Laser in dermatology, laser in dentistry, Laser in medicine.

Optical Communication: Optical source for fiber optical communication, powering and coupling, Transmission, Hologram their characteristics. LIDAR.

Reference Books:

1. K.R. Nambiar, "Laser Principles, Types and Application" New Age International.
2. S.A. Ahmad, "Laser concepts and Applications" New Age International.
3. A.K. Katiyar, C. K. Pandey and Manisha Bajpai, Fundamentals of Laser Systems and Applications.

EOE-034/EOE-044: SPACE SCIENCE

UNIT-I

Introduction: Important Individual Contributions [Pre Telescopic: Ptolemy, Copernicus, Brahe and Keplar. Post Telescopic Era: Galileo, Newton, Hubble, Gauss, Riemann, Einstein and Hawkins]. Various International Organizations involved in the development of space Science (NASA, ESA, ISRO).

UNIT-II

Space Observations: Problems related to Eye and Atmosphere and their Remedies, Distance in Space and Magnitude, Measurement Techniques, Non-Optical Telescopic Techniques used in space observation (Covering entire Electromagnetic Region).

UNIT-III

Solar System: Nebular theory of formation of our Solar System. Sun-its origin and fate, Source of Energy and Solar wind. Brief description of Planets about shape, size, period of rotation about axis and period of revolution, distance of planets from sun. Bode's law, Keplar'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.

UNIT-IV

Stars and Galaxy: Stellar Evaluation and Stellar Remnants, 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. Galaxies: Galaxies and their evolution and origin, active galaxies and quasars.

UNIT-V

Cosmology: Hubble Law, Redshift and Expansion of the Universe, Cosmic Microwave, Background Radiations, Matter density in Universe, Cosmological principle, Important Models of Universe (Steady State and Big Bang), Dark Matter and Dark Energy.

Text Books / Reference Books:

1. Baidyanath Basu, T. Chattopadhyay, S.N. Biswas " An Introduction to Astrophysics" PHI 2nd Edition.
2. K. S. Krishnaswami, "Astrophysics: A modern Perspective" New Age International.

EOE-035/EOE-045: POLYMER SCIENCE AND TECHNOLOGY

UNIT-I

Basic Concepts of Polymers: A brief History, what are polymer, how are polymers made, Classification of polymers

UNIT-II

Chemistry of Polymerization: Introduction, Chain polymerization, step growth polymerization. Miscellaneous Polymerization reactions. polymerization Techniques.

UNIT-III

Molecular Weight and Size: Average molecular weight, Number average and weight average molecular weight. Sedimentation and viscosity-average molecular weight. Molecular weight and degree of polymerization. Polydispersity and molecular weight distribution in polymers. Practical significance of polymer molecular weight. Size of polymer molecules.

UNIT-IV

Polymer Degradation: What is polymer degradation, types or degradation, thermal and mechanical degradation, Degradation by ultrasonic waves. photodegradtion, degradation by high energy radiation, oxidative degradation, hydrolytic degradation.

UNIT-V

Preparations and Applications: Preparation, properties and technical applications of thermoplastics, thermosetting, elastomer and synthetic fibres. Silicones. Applications of polymers in aerospace, ocean, electronics, medical, agriculture, automobile, Sports and building constructions.

EOE-036/EOE-046: NUCLEAR SCIENCE

UNIT-I

Nucleus and Its Basic Features: Nuclear structure, Nuclear forces and their properties, Nuclear binding energy, Nuclear stability, Nuclear radius and its measurement, 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-Q value, Nuclear fission and their explanation by liquid drop model, Nuclear fusion and its applications.

UNIT-IV

Radioactivity: Radioactive disintegration, Decay constant, Half life period and Mean life, Alpha decay, Beta decay, Gamma decay, Interaction of nuclear radiation with matter.

UNIT-V

Accelerators: Mass spectrograph: General principle, Aston's Mass Spectrograph Van de Graph Generator, Cyclotron and 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.

Reference Books:

1. Tayal, "Nuclear Physics" Himalaya Publishing House.
2. S.N. Ghosal, "Nuclear Physics" S. Chand & Co.
3. S. B. Patel, "Nuclear Physics: An Introduction New Age International.
4. H. B. Lal, "Introductory Nuclear Physics" United Book Depot.

5. Wang, “Introductory Nuclear Physics”, PHI Learning
6. Roy & Nigam, “Nuclear Physics” John Wiley & sons.

EOE-037/EOE-047: 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 micro structure 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: Unitary 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 behavior and processing of ceramics.

Plastics: Various types of polymers/plastics and their applications. Mechanical behavior 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

3. V. Raghvan, “Material Science”, Prentice Hall of India
4. Narula, “Material Science”, Tata Mc.Graw Hill
5. Srivastava, Srinivasan, “Science of Materials Engineering” New Age International.

EOE-038/EOE-048: DISCRETE MATHEMATICS

UNIT-I

Relation: Definition, types of relation, composition of relations, pictorial representation of relation, properties of relation, partial order relation.

Function: Definition and types of functions, composition of functions, recursively defined functions.

Group: Monoid, Semi-group, Abelian Group, Properties of groups, Cyclic Group, Permutation groups, Caley’s Theorem, Rings and Fields (definition, examples and standard results)

UNIT-II

Propositional logic: Introduction to 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 proofs: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.

UNIT-III

Combinatorics: Mathematical induction, recursive mathematical definitions, basics of counting, Cardinality and Countability, Pigeonhole principle, permutations, combinations, inclusion-exclusion.

UNIT-IV

Recurrence relations (n^{th} order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function, properties of generating functions (G.F.), Solution of recurrence relation using G.F, solution of combinatorial problem using G.F.

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).

Text/Reference Books:

1. Kenneth H. Rosen, “Discrete Mathematics and its Applications”, Mc.Graw Hill, 2002.
2. J.P.Tremblay& R. Manohar, “Discrete Mathematical Structure with Applications to Computer Science” Mc.Graw Hill, 1975.
3. V. Krishnamurthy, “Combinatories:Theory and Applications”, East-West Press.
4. Seymour Lipschutz, M.Lipson, “Discrete Mathemataics” Tata McGraw Hill, 2005.
5. Kolman, Busby Ross, “Discrete Matheamatical Structures”, Prentice Hall International.

EOE-039/EOE-049: APPLIED LINEAR ALGEBRA

UNIT-I

Fields, Vector-spaces, sub-spaces, linear-combination, linear-dependence and independence. Basis and dimensions (each and every fact to be illustrated by suitable examples).

UNIT-II

Linear-transformation, definition and examples, matrix representation, similarity, range and kernel, rank-nullity theorem and its consequences.

UNIT-III

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

UNIT-IV

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

UNIT-V

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.

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