SYLLABUS PRESCRIBED FOR FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING COMPUTER SCIENCE & ENGINEERING / COMPUTER ENGINEERING SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : THIRD

3KS01/3KE01MATHEMATICS – III

SECTION-A

UNIT-I: Ordinary differential equations:- Complete solution, OperatorD, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations.

UNIT-II: Laplace transforms:- definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method.

UNIT-III: a) Difference equation:- solution of difference equations of first order Solution of difference quations of higher order with constant co-efficients b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z transforms (linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

SECTION-B

UNIT-IV: a) Fourier transforms:- Definition, standard forms, inverse Fourier trnasforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals. b) Partial differential equation of first order of following form:- (i) f (p,q)=0; (ii) f (p,q,z)=0; (iii) f (x,p)=g (y,q); (iv) Pp+Qq=R (Lagranges Form); (v) Z=px+qy+f(p,q) (Clairaut form)

UNIT-V: Complex Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method conformal mappings (translation, rotation, magnification and bilinear 79transformation),singular points, expansion of unction in Taylor's and Laurent's series.

UNIT –VI: Vector calculus:- Scalar and vector point functions, Differentiation of vectors, Curves in pace, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals, irrotational and solenoidal vetor fields.

BOOKS RECOMMENDED:-

1)Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar

2)A Text Book of Differential Calculas by Gorakh Prasad.

3)Engg. Mathematics by Chandrika prasad.

4)Advancing Engg. Mathematics by E.K.Kreyzig.

5)A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.

6)Higher Engg. Mathematics by B.S.Grewal.

7)Control System by Gopal and Nagrath.

8)Integral transforms by Goyal & Gupta.

3KS 02/3KE02 PROGRAMMING METHODOLOGY

Objectives:

·Study of the basic concepts of Java such as operators, classes, objects, inheritance, packages and exception handling.

·Study of concepts like enumerations, generics, logging, API,

assertions, Applets, AWT.

·Preparing the students to learn Object Oriented Programming Methodology.

SECTION A

Unit I: Introduction to Object Oriented Programming: Introduction, Need of OOP, Principles of Object-Oriented Languages, Procedural Language Vs OOP, Application of OOP, Java Virtual Machine, Java features, Program Structures. Java Programming Constructs: Variables, Primitive data types, Identifier, Literals, Operators, Expressions, Precedence Rules and Associativity, Primitive Type Conversion and Casting, Flow of Control.

Unit II: Classes and Objects: Classes, Objects, Creating Objects,Methods, Constructors, Cleaning up Unused Objects, Class Variable and Methods, this keyword, Arrays, Command Line Arguments.

Unit III: Inheritance: Inheritance vs. Aggregation, Method Overriding, super keyword, final keyword, Abstract class. Interfaces, Packages and Enumeration: Interface, Packages, java.lang package, Enum type.

SECTION B

Unit IV: Exception: Introduction, Exception handling Techniques, User-defind exception, Exception Encapsulation and Enrichment. Input/Output: The java.io.file Class, Reading and Writing data, Randomly Accessing a file, Reading and Writing Files using I/O Package.

Unit V: Applets: Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag, get Document Base () and get Code Base () methods, Applet Context Interface, Audio clip, Graphic Class, Color, Font, Font Metrics.

Unit VI: Event Handling: Introduction, Event delegation Model, java.awt.event Description, Sources of events, Event Listeners, Adapter classes, Inner Classes. Abstract Window Toolkit: Introduction, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Textfield and Textarea, Container Class, Layouts, Menu, Scrollbar.

Text Book:

Sachin Malhotra and Saurabh Choudhary: Programming in Java, Oxford University Press 2010.

Reference Books:

1. Herbert Schildt: Java Complete References (McGraw Hill)

2.E. Balagurusamy: Programming with Java (McGraw Hill)

3.Khalid Mughal: A Programmer's Guide to Java Certification, 3rd Edition (Pearson)

4.Liang: A text Book of Java Programming, (PHI)

5.Sharnam Shah and Vaishali Shah: Core Java for Beginners,(SPD),2010.

3KS 03/3KE03ELECTRONIC DEVICES AND CIRCUITS

Objectives: ·Study of the basic electronic device Semiconductor diode and zener diode and its applications.

·Study of electronic device Bipolar Junction Transistors and its applications.

·Study of electronic device Field Effect Transistors and its applications.

80 81·Study of Optoelectronic devices.

SECTION-A

Unit I: pn-Junction Diode, Characteristics and Parameters, Diode Approximation, DC load line analysis, Temperature effects, Diode AC models, Zener diodes, Half- Wave Rectifications, Full-Wave Rectifications, Half-Wave Rectifier Power Supply, Full-Wave Rectifier Power Supply, RC and AC Power Supply Filters.

Unit II: BJT operation, BJT Voltages and Currents, BJT Amplification: Current and Voltage, BJT Switching, Common-Base Characteristics, Common-Emitter Characteristics, Common- Collector Characteristics, Transistor testing.

Unit III: DC Load Line and Bias Point, Base Bias, Collector-to-Base Bias, Voltage-Divider Bias, Comparison of Basic Bias Circuits, Troubleshooting BJT Bias Circuits, Bias Circuit Design.

SECTION-B

Unit IV: Junction Field Effect Transistors, n-Channel and p-Channel JFET, JFET Characteristics, JFET Data Sheets and Parameters, FET Amplifications and Switching, MOSFETs: Enhancement MOSFET, Depletion _Enhancement MOSFET, VMOSFET, Comparision of p-Channel and p-Channel FETs.

Unit V: BJT Phase Shift Oscillators, BJT Colpitts Oscillator, BJT Hartley Oscillator, BJT Wein Bridge Oscillator, Oscillator Frequency stabilization: Frequency Stability, Piezoelectric Crystals, Crystal Equivalent Circuit, Crystals Control of Oscillators.

Unit VI: Optoelectronic Devices: Light Units, Light-Emitting Diodes, Seven-Segment Displays, Photoconductive Cells, Photodiodes and Solar Cells, Phototransistors, Optocouplers, Phtomultipler Tube, Laser Diode.

Text Book:

David A. Bell: Electronic Devices and Circuits, Fifth Edition, Oxford University Press.

Reference Books:

1.Malvino: Principles of Electronics, TMH.

2.Millman & Halkies: Electronic Devices & Circuits, McGraw Hill.

3.Millman & Halkies: Integrated Electronics, McGraw Hill.

4.Millman: Microelectronic, McGraw Hill.

5.Roberts and Sedra: SPICE, Second Edition, Oxford University Press.

6.Sedra and Smith: Microelectronic Circuits, Oxford University Press.

3KS 04/3KE04 DISCRETE STRUCTURE

Objectives: ·Learn basic terminology, formal logic, proofs, sets, relations, functions, recursion

·Use formal logic proof and logical reasoning to solve problems

·Relate the ideas of mathematical induction to recursion and

recursively defined structures

·Learning graphs, trees and related algorithms

·Relate interpret and apply these concepts to various areas of Computer Science

SECTION A

UNIT I: Mathematical Logic: Statements & Notation, Connectives, Equivalence Formula, Duality Law, Tautological Implication, Normal forms, Parenthesized Infix notation and Polish Notations.

UNIT II: Theory of inference: The theory of inference for the statement calculus, Validity using truth tables, Predicate calculus, Inference theory of the Predicate Calculus.

UNIT III: Set Theory: Basic concepts, Venn Diagrams, Representation of Discrete Structure, Relation and ordering, Partial Ordering, Functions, Recursions, Sets and predicates.

SECTION B

UNIT IV: Algebraic Structures: Semi-groups and Monoids, Product & Quotients of semi-groups, Polish expression & their compilation, Groups, Product and Quotients of Groups.

UNIT V: Lattice & Boolean Algebra: Lattices, partially ordered sets, Boolean algebra, Functions on Boolean Algebra, Boolean Functions as Boolean Polynomials, Minimization of Boolean Functions.

UNITVI: Graph Theory: Basic concepts, Paths, Reachability & connectedness, Matrix representation of graphs, Trees: tree searching, Undirected trees, Minimal spanning trees.

Text Book:

J.P.Trembley,R.Manohar:"Discrete Mathematical Structures with application to Computer Science" 1988(MCG)

Reference Books:

1.C.L.Liu : "Combinational Mathematies" Mc Graw Hill, 1988

2Stanant "Discrete Structure" Prentice Hall.

3.C.L.Liu "Element of Discrete Mathematics" Second Edition McGraw Hill, 1987

4.Norman L.Biggs "Discrete Mathematics" Second Edition,Oxford 82 83University Press, Indian Edition.

5.N. Chandrasekaran & M. Umaparvathi, “Discrete Mathematics” PHI (EEE) 2010.

6.Purna Chandra Biswal, “Discrete Mathematics & Graph Theory” Second Edition, PHI (EEE)2009.

7.Chakraborty and Sarkar,” Discrete Mathematics” Oxford University Press, Indian Edition,2011.

3KS 05 / 3KE05 COMPUTER ORGANIZATION

Objectives: ·To understand the relationship between instruction set architecture, micro architecture, and system architecture and their roles in the development of the computer.

·Be aware of the various classes of instruction: data movement, arithmetic, logical and flow control.

·Explain how interrupts are used to implement I/O control and data transfers.

·Understand how a CPU’s control unit interprets a machine –level instructions.

·Identify various types of buses in Computer systems.

·Understand memory hierarchy.

·Understand various peripheral devices.

SECTION-A

Unit-I: Basic Structure of Computer: Hardware & Software, Addressing Methods, Program Sequencing, Concept of Memory Locations & Address, Main Memory Operation, Instructions & Instruction Sequencing, Addressing Modes, Basic I/O Operations, Stacks, Queues & Subroutines.

Unit-II: Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Consideration, Microprogrammed Control, Microinstructions, Microprogram Sequencing, Microinstruction Pre-fetching, Emulation.

Unit-III: I/O Organization: Accessing I/O Devices, Interrupts, Direct Memory Access, Bus arbitration, I/O Hardware, Processor Bus and Interfacing Circuits, Standard I/O Interfaces, SCSI Bus, Backplane Bus Standard.

SECTION-B

Unit-IV: Memory Unit: Basic Concepts, Semiconductor RAM Memories, Internal Organization, Static & Dynamic RAMs, ROMs, Speed, Size & Cost Considerations. Cache Memories: Performance onsiderations. Virtual Memories, Address Translation, Memory Management Requirements.

Unit-V: Arithmetic: Number representation, Design of Fast Adders, Signed Addition and Subtraction. Multiplication of Positive numbers, Booth’s Algorithm, Integer Division, Floating-Point Numbers and related operations.

Unit-VI: Computer Peripherals: Input-Output Devices like Video displays, Video terminals, Graphics input devices, Printers. Online storage devices: Magnetic disks, Magnetic tape, Systems, CD-ROM systems. Communication devices: Modems.

Text-Book:

V.Carl Hamacher & S. Zaky: Computer Organization, Fourth Edition, McGraw-Hill (ISE).

References:

1.Stallings. W: Computer Organization & Arcitecture, Fifth Edition, Pearson Education.

2.Tenanbaum A.S: Structured Computer Organization, Fifth Edition Pearson Education.

3.Hayes J.P: Computer Architecture & Organization, Fourth Edition, McGraw- Hill.

4.M. Mano & Kime Logie: Computer Design Fundamentals, Second Edition, Pearson Education.

3KS 06 / 3KE06 Programming Methodology Lab. : Minimum Eight

experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

3KS 07 / 3KE07 Electronic Devices & Circuits Lab. : Minimum Eight

experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

3 KS 08 / 3 KE 08COMPUTER LABORATORY I

[WEB TECHNOLOGY]

Unit I: HTML: HTML Coding, Basic Web Graphics, Web Page Design & Site Building, Adding Multimedia to the Web.

Unit II:Paint Shop Pro/Photoshop: Photoshop components, working with Photoshop, Image Basics, File Formats, color Palette, Layers, Creating New Images, Brushes, Grids & Gides, Scaling & Positioning Images, Moving & Merging Layers, Tool Palette, Screen Capturing, Grey styling, Animation.

Unit III: Image Handling: Scanning Images, Adding Text to the Images, Designing Icons, Creating Background Images, Color Models, Color Calibration, Creating Gradients, Oil Paint Effect. 84 85

Unit IV: Multimedia: Creating Clippings, Animation with Sound Effects, Adding Audio or Video, Windows Media Player Active x control, Agent Control, Embedding VRML in a web Page, Real Player Active x Control.

Unit V: Applications: Flash, Working with Layers, Working with Movies, The Drawing Tools, Color Selection, Symbols, Flash Buttons, Flash Menu Smart Clip, Interactivity with Action Script, Frame Actions and the Timeline, Exporting Animation, Applications in Flash.

TEXT BOOK:

1.Meenakshi G. M., "Web Graphics", Scitech Publications (India) Pvt. Ltd.,2007.

REFERENCE BOOKS:

1.Joel Sklar, "Textbook of Web Design", Cengage Learning.

2.James L. Mohler & Jon M. Duff, "Designing Interctive Web Sites", Cengage Learning.

3.Dr. Raja Subramanian, "Creating Web Sites in Engineering", University Science Press (An Imprint of Laxmi Publication Pvt. Ltd.).

4.Uttam K. Roy, "Web Technologies", Oxford University Press. Minimum eight xperiments/programming assignments must be completed based on the above syllabus covering each of the units.

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SEMESTER : FOURTH

4KS01/ 4KE01DATA STRUCTURES

OBJECTIVES: ·Study the representation and use of primitive data types and built in data structures.

·Study how the data structures are allocated and used in memory.

·Study common applications of each of the data structures.

·Implement the user defined data structures in a high level language

SECTION A

Unit I: Data structures basics, Mathematical /algorithmic notations & functions, Complexity of Algorithms, Sub-algorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms. 08Hrs

Unit-II: Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multi- demensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sprase matrices. 08Hrs

Unit-III: Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion opeartions on linked lists. Header linked lists, Two- way linked lists. 08Hrs

SECTION B

Unit-IV: Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues. 08Hrs

Unit-V: Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Heap and heapsort. Path length & Huffnan's algorithm. General trees. 08Hrs

Unit-VI : Graph theory, sequential representations of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Radix sort. 08Hrs

Text Book:

Seymour Lipschutz: Data Structures with C, Schaum's Outline Series, Mc Graw-Hill, International Editions.

References:

1.Forouzan, Gilberg, Mahalle, Jogalekar: Data Structures and Algorithms, CENGAGE Learning.

2.Reema Thareja: Data Structures using C, Oxford University Press, 2011.

3.Arpita Gopal: Magnifying Data structures, PHI(EEE), 2010.

4.Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.

5.Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.

6. Standish: Data Structures in Java, Pearson Education.

4KS02/ 4KE02 ANALOG & DIGITAL ICS

AIM To understand the functions of various digital and analog ICs and their applications in the design of electronic circuits.

OBJECTIVES :

•To get the knowledge about the characteristics and operation of 86 87different analog ICs.

•To study the applications of the above ICs in the design of electronic circuits.

•To get basics knowledge about digital ICs and digital systems.

•To study the design of combinational circuits and sequential circuits.

Unit-I : OPERATIONAL AMPLIFIERS : Characteristics of ideal op amp, Virtual Short, differential amplifier, offset currents and voltages, Slew rate, 741 IC Specifications, inverting and non- inverting amplifiers, adder/ subtractor, integrator, differentiator, Schmitt Trigger, analog multiplier.

Unit-II :TIMERS & PHASE LOCKED LOOP : Timers: Block schematic of timer IC 555, Application of timer 555 as astable, monostable, bistable multivibrator, Delayed timer, Saw tooth generators. Phase Locked Loops: Operation of phase lock loop system, transfer characteristics, lock range, capture range, study of PLL IC-LM 565 and its application as AM detector, FM detector and Frequency Translator.

Unit-III. NUMBER SYSTEMS : Binary, Octal, Hexadecimal, Conversions between Number Systems, BCD, Gray and Excess 3 Representations, r s and (r- 1)s Complements, Subtraction using 1s and 2s. Complements, Binary to Gray, Gray to Binary Conversions, Alpha numeric codes.

Unit-IV :BOOLEAN FUNCTIONS USING GATES : Boolean theorems, Minterm and maxterm epresentation, SOP and POS forms, Karnaugh maps, Tabulation methods, Logic gates – Truth tables, Realization of Boolean functions using Gates, Universal Gates.

Unit-V :COMBINATIONAL CIRCUITS : Half and Full adders, Parallel binary adder, BCD adder, Half and Full subtractor, magnitude comparator, Decoder, Encoder, Multiplier, ROM, PLA, Boolean Expression Implementation using these ICs.

Unit-VI : SEQUENTIAL CIRCUITS : Flip Flops – SR, JK, T, D, Characteristic equations, Excitation Tables, Design of counters using Excitation tables, Synchronous and Asynchronous Counters, 7490, 74161 Counter IC specifications, Ring and Johnson Counters, Shift Registers, 74194 Shift Register IC pecifications.

Text Books:

1.Ramakant A.Gayakwad, „OP-AMP and Linear ICs, Prentice Hall, 1994.

2.M.Morris Mano “Digital Design” (2/e) (PHI). Reference Books :

1.R F. Coughlin;F.F.Driscoll: Operational Amplifiers & Linear Integrated Circuits, Pearson

2.Sedra & Smith : Microelectronics Circuits, 5e, Oxford University Press

3.Jain R.P. “Modern Digital Electronics” (TMH).

4.Mano M. & Kime “Logic & Computer Design Fundamentals” (2/e) (Pearson Education).

4KS03/ 4KE03OBJECT ORIENTED PROGRAMMING

SECTION A

Unit I: Objects & Classes in C++: Declaring & using classes, Constructors, Objects as function arguments, Copy Constructors, Static class data, Arrays of Objects, C++ String class.

Unit II: Operator Overloading: Overloading Unary & Binary Operators, Data Conversion, Pitfalls of perator Overloading, Pointers & Arrays, Pointers & Functions, New & Delete Operators, Pointers for Objects.

Unit III: Inheritance in C++: Derived Class & Base Class, Derived class Constructors, Function overloading, Class hierarchies, Public & Private Inheritance, Multiple Inheritance, Containership: Classes within Classes.

SECTION B

Unit IV:Virtual Function Concepts: Abstract Classes & Pure Virtual Functions, Virtual Base classes, Friend functions, Static Functions, Assignment & copy initialization, the this pointer, Dynamic type information.

Unit V:Streams & Files in C++: Stream Classes, stream errors, disk file I/O with streams, File Pointers, Error handling in file I/O, File I/O with member functions, Overloading the extractions & Insertions operator, Memory as a Stream Object, Command Line Arguments, Multifile Programs.

Unit VI: Function Template, Class template, Exception Syntax, Multiple exceptions, Exception with Arguments, Introduction to Standard Template Library, Algorithms, Sequential Containers, Iterates, Specialized iterates, associative containers, Function objects.

Text Book:

Robert Lafore: Object Oriented Programming in C++, Galgotia Publication.

88 89Reference Books:

1.Herbert Schildt: C++: Complete Refernce,TMH.

2.Bjarne Stroustrupe: C++ Programming Language, Addision Wesley.

3.Venugopal: Mastering C++, TMH.

4.Lipmann: C++ Primer, Addision Wesley.

5.Sourav Sahay: Object Oriented Programming with C++, Oxford University Press.

4KS04/ 4KE04ASSEMBLY LANGUAGE PROGRAMMING

SECTION-A (8 hrs/unit)

Unit I: 8086 architecture and pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation.IP & Data registers, Pointer, Index registers. Memory addresses generation.

Unit II: 8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming : Integer instructions and computations: Data transfer instructions, Arithmetic instructions and their use in 8086 programming.

Unit III: 8086 programming: logical instructions. Shift and rotate instructions and their use in 8086 programming. 8086 flag register and Flag control instructions, compare instruction, control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

SECTION B

Unit IV:The 8086 stack segment and stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Parameter passing, Concept of Macros, Status saving on stack. Concept of recursion at assembly program level. 8086 Programming using subroutines, recursion and macros.

Unit V: 8086 I/O: Types of input output, isolated I/O interface, input output data transfers, I/O instructions and bus cycles. Programmable Peripheral Interface 8255 PPI: pin diagram, internal organization, modes of operation. 8086 I/O programming using 8255.

Unit VI: 8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. Programmable Interrupt Controller 8259: pin diagram, internal organization, modes of operation. 8086 Interrupt-driven programming using 8259.

TEXT BOOKS:

1.W. A. Triebel & Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)

2.Liu & Gibson: The 8088/8086 Microprocessor (2/e) (PHI)

REFERENCES:

1.Barry B. Brey : The Intel Microprocessor Architecture, Programming & Interfacing (6/e)(PHI)

2.Ray & Bhurchandi: Advanced Microprocessors & Peripherals (TMH).

3.John P Uffenbeck, “8086/8088 Families: Designing, Programming and Interfacing”. Prentice Hall .

4KS05/ 4KE05 THEORY OF COMPUTATION

SECTION A

Unit I: Alphabet, Language, Operations, Finite State Machine, Definitions, Finite Automation Model, Acceptance of Strings and Languages. Non Deterministic Finite Automata, Deterministic Finite Automata, Equivalence between NFA and DFA. Conversion of NFA into DFA, Equivalence between two FSM's, Moore and Mealy Machines.

Unit II: Regular Sets, Regular Expressions, Identity Rules. Manipulation of Regular Expressions, Equivalence between RE and FA. Inter Conversion, Pumping Lemma, Closure Properties of Regular Sets (proofs not required), Regular Grammars, Right Linear and Left Linear Grammars, Equivalence between Regular Linear Grammar and F A inter conversion between RE and RG.

Unit III: Context Free Grammar, Derivation trees, Chomsky Normal Form, Greibach Normal Form, Push down automata, Definition, Model, Acceptance of CFL, Equivalence of CFL and PDA, Interconversion, Enumeration of properties of CFL (proofs omitted).

SECTION B

Unit IV : Turing Machine, Definition, Model, Design of TM, Computable Functions, Recursive enumerable language, Church's hypothesis, Counter machine, Types of TM's.

Unit V: Chomsky hierarchy of languages, Linear bounded automata and Context Sensitive Language, Introduction of DCFL and DPDA, Decidability of problems.

Unit VI:Undecidability: Properties of recursive & non-recursive enumerable languages, Universal Turing Machine, Post- correspondence problem, Introduction to recursive function theory.

90 91Text books:

1.Hopcraft H.E. & Ullman J: Introduction to Automata Theory,

Languages and Computation,

2.Peter Linz: An Introduction to Formal Languages and Automata (Chapter 1 to 12 except 6.3 & 7.4),

Reference Books:

1.Rajendra Kumar: Theory of Automata, Languages & Computation, TMH, 2010.

2.Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.

3.K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, Mc Graw Hill,2010.

4.John C. Martin: Introduction to Languages and the Theory of Automata.

5.Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation.

6.Mishra & Chandrashekharan: Theory of Computation.

7.C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press,2011.

4KS06/4KE06 Data Structures Lab. : Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4KS07/4KE07 Analog & Digital IC's Lab. : Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4KS08/4KE08 Object Oriented Programming Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4KS09/4KE09 Assembly Language Programming Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos. ES-1 to ES-4 i.e. at the end of this syllabus.