COMPUTER SYSTEM ORGANIZATION

Objectives: Students to be familiarize the basic principles of computer architecture, Design and Multi Processing, Types of data transfer, Concept of semi conductor memories which is useful for research work in field Computer System

Basic Structure of Computer:

Structure of Desktop Computers, CPU: General Register Organization- Memory Register, Instruction Register, Control Word, Stack Organization, Instruction Format, ALU, I/O System,bus,CPU and Memory Program Counter, Bus Structure, Register Transfer Language- Bus and Memory Transfer, addressing modes.

Control Unit Organization:

Basic Concept of Instruction, Instruction Types, Micro Instruction Formats, Fetch and Execution cycle, Hardwired control unit, Micro-programmed Control unit- microprogram sequencer Control Memory, Sequencing and Execution of Micro Instruction.

Computer Arithmetic:

Addition and Subtraction, Tools Compliment Representation, Signed Addition and Subtraction, Multiplication and division, Booths Algorithm, Division Operation, Floating Point Arithmetic Operation.design of Arithmetic unit

I/O Organization:

I/O Interface – PCI Bus, SCSI Bus, USB, Data Transfer: Serial, Parallel, Synchronous, Asynchronous Modes of Data Transfer, Direct Memory Access(DMA), I/O Processor.

Memory Organization:

Main memory- RAM, ROM, Secondary Memory – Magnetic Tape,Disk, Optical Storage, Cache Memory: Cache Structure and Design, Mapping Scheme, Replacement Algorithm, Improving Cache Performance, Virtual Memory,memory management hardware

Multiprocessors:

Characteristics of Multiprocessor, Structure of Multiprocessor- Inter-processor Arbitration, Inter-Processor Communication and Synchronization. Memory in Multiprocessor System, Concept of Pipelining, Vector Processing, Array Processing, RISC And CISC,Study of Multicore Processor – Intel, AMD.

Reference Books:

1. Morris Mano , “Computer System Organization ” PHI
2. Alan Clements: “Computer Organization and Architecture”, Cengage Learning
3. Subrata Ghosal: “Computer Architecture and Organization”, Pearson
4. William stalling ,“Computer Architecture and Organization” PHI
5. M. Usha, T.S. Shrikant: “Computer System Architecture and Organization”, Willey India
6. Chaudhuri, P.Pal: “Computer Organization and Design”, PHI
7. Sarangi: “Computer Organization and Architecture”,Mc- Graw Hills

List of Practicals

1. Study of Multiplexer and Demultiplexer
2. Study of Half Adder and Subtractor
3. Study of Full Adder and Subtractor
4. WAP to add two 8 bit numbers and store the result at memory location 2000
5. WAP to multiply two 8 bit numbers stored at memory location 2000 and 2001 and stores the result at memory location 2000 and 2001.
6. WAP to add two 16-bit numbers. Store the result at memory address starting from 2000.
7. WAP which tests if any bit is '0' in a data byte specified at an address 2000. If it is so, 00 would be stored at address 2001 and if not so then FF should be stored at the same address.
8. Assume that 3 bytes of data are stored at consecutive memory addresses of the data memory starting at 2000. Write a program which loads register C with (2000), i.e. with data contained at memory address 2000, D with (2001), E with (2002) and A with (2001).
9. Sixteen bytes of data are specified at consecutive data-memory locations starting at 2000. Write a program which increments the value of all sixteen bytes by 01.
10. WAP to add t 10 bytes stored at memory location starting from 3000. Store the result at memory location 300A.

ANALOG & DIGITAL COMMUNICATION

Objective: To familiarize students with the fundamentals of analog and digital communication systems and provide students with tools for communication signal analysis .The students familiarize with various techniques for amplitude modulation and demodulation of analog signals

Signal Analysis: Time domain and frequency domain representation of signal, Fourier Transform and its properties, Transform of Gate, Periodic gate, Impulse periodic impulse sine and cosine wave, Concept of energy density and power, Power density of periodic.

Amplitude Modulation: Introduction of modulations techniques and its applications, Amplitude modulation, Equation and its frequency domain representation, Bandwidth, Power distribution. AM suppressed carrier waveform equation and frequency domain representation Generation (Balance/Chopper modulator) and synchronous detection technique, errors in synchronous detection. Introduction to SSB and VSB.

Angle Modulation
Modulation equation and their relative phase and frequency deviations, modulation index frequency spectrum, NBFM and WBFM, Bandwidth comparison of modulation techniques.

Signal Sampling & Analog Pulse Communication
Sampling of signal, sampling theorem for low pass and Band pass signal, PAM, TDM. Channel Bandwidth for PAM-TDM signal, Type of sampling instantaneous (Natural and Flat Top), Aperture effect, PPM, PDM.

Digital Communication
Digital signal Quantization, Quantization error, PCM, S/N Ratio, Companding, Data Rate, Baud Rate, Bit Rate, Multiplexed PCM signal, DPCM), DM, ADM).
Digital modulations techniques, ASK, BPSK, DPSK, offset and non-offset QPSK, M-Ary PSK, BFSK, M-Ary FSK, QAM).

References:
1. Singh & Sapre, Communication System, TMH
2. B.P. Lathi & Zhi Ding, Modern Digital and Analog Communication System, 4th Edition, Oxford University Press.
3. Taub & Shilling, Communication System, TMH
4. George Kennedy & Davis, Electronic Communication System, 4rth Edition, TMH.
5. Abhay Gandhi, Analog & Digital Communication: Theory & Lab Work, Cengage Learning, India.

List of Experiments (Expandable)
1. Study of sampling process and signal reconstruction and aliasing.
2. Study of PAM PPM and PDM
3. Study of PCM transmitter and receiver.
4. Time division multiplexing (TDM) and De multiplexing
5. Study of ASK PSK and FSK transmitter and receiver.
6. Study of AM modulation and Demodulation techniques (Transmitter and Receiver) Calculate of parameters
7. Study of FM modulation and demodulation (Transmitter and Receiver) & Calculation of parameters
8. To construct and verify pre emphasis and de-emphasis and plot the wave forms.
9. Study of super hetrodyne receiver and characteristics of ratio radio receiver.
10. To construct frequency multiplier circuit and to observe the waveform
11. Study of AVC and AFC.

THEORY OF COMPUTATION

Objective: The purpose of this subject is to cover the underlying concepts and techniques used in Theory of Computation. In this syllabus we cover finite automata, pushdown automata, Context free grammars and Turing machines.

Automata: Basic machine, FSM , Transition graph, Transition matrix, Deterministic and nondeterministic FSM'S, Equivalence of DFA and NDFA, Mealy & Moore machines, minimization of finite automata, Two-way finite automata. Regular Sets and Regular Grammars: Alphabet, words, Operations, Regular sets, Finite automata and regular expression, Myhill-Nerode theorem Pumping lemma and regular sets, Application of pumping lemma, closure properties of regular sets.

Context –Free Grammars: Introduction to CFG, Regular Grammars, Derivation trees and Ambiguity, Simplification of Context free grammars, Normal Forms (Chomsky Normal Form and Greibach Normal forms).

Pushdown Automata: Definition of PDA, Deterministic Pushdown Automata, PDA corresponding to given CFG, CFG corresponding to a given PDA. Context Free Languages:
The pumping lemma for CFL's, Closure properties of CFL's, Decision problems involving CFL's.

Turing Machines: Introduction, TM model, representation and languages acceptability of TM Design of TM,Universal TM & Other modification, Church's hypothesis, composite & iterated TM. Turing machine as enumerators.Properties of recursive & recursively enumerable languages,Universal Turing machine

Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, examples of these problems like satisfy ability problems, vertex cover problem, Hamiltonian path problem, traveling sales man problem, Partition problem etc.

Suggested Reading:

1. John E. Hopcroft, Jeffery Ullman,"Introduction to Automata theory, Langauges & computation" , Narosa Publishers.
2. K.L.P Mishra & N.Chandrasekaran,"Theory of Computer Science", PHI Learning
3. Daniel I.A. Cohen,"Introduction to Computer Theory",Wiley India.
4. John C Martin, "Introdution to languages and theory of computation", McGraw Hill
5. Anami & Aribasappa , " Formal Languages and Automata Theory",Wiley India

ANALYSIS & DESIGN OF ALGORITHM

Objective: Student will be able to learn algorithm designing, various problem solving strategies like divide and conquer approach, Greedy strategy, Dynamic Programming, Backtracking etc.

Algorithms, Designing algorithms, analyzing algorithms, asymptotic notations, heap and heap sort. Introduction to divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, merge sort, quick sort, strassen's matrix multiplication.

Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum spanning trees, knapsack problem, job sequencing with deadlines, single source shortest path algorithm

Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, multistage graph, reliability design, Floyd-Warshall algorithm

Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph coloring problem etc. Introduction to branch & bound method, examples of branch and bound method like traveling salesman problem etc. Meaning of lower bound theory and its use in solving algebraic problem, introduction to parallel algorithms.

Binary search trees, height balanced trees, 2-3 trees, B-trees, basic search and traversal techniques for trees and graphs (In order, preorder, postorder, DFS, BFS), NP-completeness.

References:

1. Coremen Thomas, Leiserson CE, Rivest RL; Introduction to Algorithms; PHI.
2. Horowitz & Sahani; Analysis & Design of Algorithm
3. Dasgupta; algorithms; TMH
4. Ullmann; Analysis & Design of Algorithm;
5. Michael T Goodrich, Robarto Tamassia, Algorithm Design, Wiely India.

List of Experiments(expandable):

1. Write a program for Iterative and Recursive Binary Search.
2. Write a program for Merge Sort.
3. Write a program for Quick Sort.
4. Write a program for Strassen's Matrix Multiplication.
5. Write a program for optimal merge patterns.
6. Write a program for Huffman coding.
7. Write a program for minimum spanning trees using Kruskal's algorithm.
8. Write a program for minimum spanning trees using Prim's algorithm.
9. Write a program for single sources shortest path algorithm.
10. Write a program for Floye-Warshal algorithm.
11. Write a program for traveling salesman problem.
12. Write a program for Hamiltonian cycle problem.

PROGRAMMING SYSTEM (A)(JAVA)

Objective: To introduce and understand students to programming concepts and techniques using the Java language and programming environment, class, objects , also learn about lifetime, scope and the initialization mechanism of variables and improve the ability general problem solving abilities in programming. Be able to use the Java SDK environment to create, debug and run simple Java program.

Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods,Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI,Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle

Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. E. Balaguruswamy, “Programming In Java”; TMH Publications
2. The Complete Reference: Herbert Schildt, TMH
3. Deitel & Deitel, ”JAVA, How to Program”; PHI, Pearson.
4. Cay Horstmann, Big JAVA, Wiley India.
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall

List of Program :

1. Installation of J2SDK
2. Write a program to show Scope of Variables
3. Write a program to show Concept of CLASS in JAVA
4. Write a program to show Type Casting in JAVA
5. Write a program to show How Exception Handling is in JAVA
6. Write a Program to show Inheritance
7. Write a program to show Polymorphism
8. Write a program to show Access Specifiers (Public, Private, Protected) in JAVA
9. Write a program to show use and Advantages of CONTRUCTOR
10. Write a program to show Interfacing between two classes
11. Write a program to Add a Class to a Package
12. Write a program to show Life Cycle of a Thread
13. Write a program to demonstrate AWT.
14. Write a program to Hide a Class
15. Write a Program to show Data Base Connectivity Using JAVA
16. Write a Program to show “HELLO JAVA ” in Explorer using Applet
17. Write a Program to show Connectivity using JDBC
18. Write a program to demonstrate multithreading using Java.
19. Write a program to demonstrate applet life cycle.
20. Write a program to demonstrate concept of servlet.

PROGRAMMING SYSTEM (B) (DOT NET TECHNOLOGIES)

Introduction .NET framework, features of .Net framework, architecture and component of .Net, elements of .Net.

Basic Features Of C# Fundamentals, Classes and Objects, Inheritance and Polymorphism, Operator Overloading, Structures. Advanced Features Of C# Interfaces, Arrays, Indexers and Collections; Strings and Regular Expressions, Handling Exceptions, Delegates and Events.

Installing ASP.NET framework, overview of the ASP .net framework, overview of CLR, class library, overview of ASP.net control, understanding HTML controls, study of standard controls, validations controls, rich controls. Windows Forms: All about windows form, MDI form, creating windows applications, adding controls to forms, handling Events, and using various Tolls

Understanding and handling controls events, ADO.NET- Component object model, ODBC, OLEDB, and SQL connected mode, disconnected mode, dataset, data-reader Data base controls: Overview of data access data control, using grid view controls, using details view and frame view controls, ado .net data readers, SQL data source control, object data source control, site map data source.

XML: Introducing XML, Structure, and syntax of XML, document type definition (DTD), XML Schema, Document object model, Presenting and Handling XML. xml data source, using navigation controls, introduction of web parts, using java script, Web Services

References:

1. C# for Programmers by Harvey Deitel, Paul Deitel, Pearson Education
2. Balagurusamy; Programming in C#; TMH
3. Web Commerce Technology Handbook by Daniel Minoli, Emma Minoli , TMH
4. Web Programming by Chris Bates, Wiley
5. Alex Mackey, " Introduction.NET 4.5 ", Wiley India
6. ASP .Net Complete Reference by McDonald, TMH.
7. ADO .Net Complete Reference by Odey, TMH

List of Experiments/ program (Expandable):

1. Working with call backs and delegates in C#
2. Code access security with C#.
3. Creating a COM+ component with C#.
4. Creating a Windows Service with C#
5. Interacting with a Windows Service with C#
6. Using Reflection in C#
7. Sending Mail and SMTP Mail and C#
8. Perform String Manipulation with the String Builder and String Classes and C#:
9. Using the System .Net Web Client to Retrieve or Upload Data with C#
10. Reading and Writing XML Documents with the XML Text-Reader/-Writer Class and C#
11. Working with Page using ASP .Net.
12. Working with Forms using ASP .Net
13. Data Sources access through ADO.Net,
14. Working with Data readers , Transactions
15. Creating Web Application.

PROGRAMMING SYSTEM (C) PYTHON

Introduction: Basic syntax, Literal Constants, Numbers, Variable and Basic data types, String, Escape Sequences, Operators and Expressions, Evaluation Order, Indentation, Input Output, Functions, Comments.

Data Structure: List, Tuples, Dictionary and Sets.

Control Flow: Conditional Statements - If, If-else, Nested If-else. Iterative Statement - For, While, Nested Loops. Control statements - Break, Continue, Pass.

Object oriented programming: Class and Object, Attributes, Methods, Scopes and Namespaces, Inheritance, Overloading, Overriding, Data hiding.

Exception: Exception Handling, Except clause, Try finally clause, User Defined Exceptions.

Modules and Packages

Standard Libraries: File I/0, Sys, logging, Regular expression, Date and Time, Network programming, multi-processing and multi-threading.

References

- Timothy A. Budd: Exploring python, McGraw-Hill Education.
- R.Nageshwar Rao ,"Python Programming" ,Wiley India
- Think Python: Allen B. Downey, O'Reilly Media, Inc.

PROGRAMMING SYSTEM (D) MATLAB

MATLAB: An Overview, Brief history of MATLAB, About MATLAB, Installation of MATLAB, Help browser, Arranging the desktop, Basic functions of Matlab, Mostly used symbols in MATLAB, debugging in Matlab; Building MATLAB expressions: MATLAB datatype, command handling, MATLAB basics.

MATLAB Vector and Matrix: Scalar and vector, elementary features in a vector array, matrices, eigen values and eigen vectors, matrix operations, matrix operators, creating matrix arrangement, indexing array value, other operations, mathematical operations on array, array types

Graphics in MATLAB: 2D plots, parametric plots, contour lines and implicit plots, field plots, multiple graphics display function, 3D plots, multivariate data, data analysis.

MATLAB programming introduction to M-files,MATLAB editors, M files, scripts, functions, MATLAB error and correction, MATLAB debugger; Digital Image Processing with MATLAB (Image Processing).

MATLAB in neural networks: About neural networks, Human and artificial neuron, Architecture of neural networks (feed-forward, feedback, network layers), The McCuulloch- Pitts Model of Neuron, The Perceptron, Transfer function, neural network toolbox, Actual model, applications of neural network.

REFERENCES:

1.S. Swapna Kumar, S V B Learning: MATLAB – Easy way of learning, PHI Learning, 2016

2. Amos Gilat , "An Introduction with Applications ", 4 ed , wiley India

MATERIAL SCIENCE

COURSE OBJECTIVE

The primary objective of the course is to introduce concepts about the properties, characteristics, applications and limitations of engineering materials emphasis on material available locally.

COURSE CONTENT

Introduction to material science and engineering: Atomic structure and bonding in materials. Types of material, Recent advances and future trends: (Smart & Nano materials) Crystal structure of materials, crystal systems, unit cells and space lattices, crystalline solids and their role in influencing various properties.

Metals & Alloys: Mechanical behavior of metals and alloys, Tensile & compressive stress-strain relations, fracture toughness, fatigue, creep, wear and abrasion. Microstrcture, properties and applications of ferrous and non-ferrous alloys, low alloy steels, aluminum alloys, copper alloys, stainless steels, cast irons, superalloys.

Introduction to SF6: Physical properties, Electrical properties, SF6as a dielectric and insulating material, Specification of SF6 gas for GIS application, Handling of SF6 gas before use, Equipment for handling the SF6 Gas, Advantages and Applications of SF6.

Ceramics, Polymers, Composites: Structure, defects and properties of Ceramics materials, processing and applications of traditional and advanced ceramics. Thermal, electrical, magnetic, optical and mechanical behavior of ceramics.

Classification of Polymers, Polymerization, Structure and Properties, additives for polymer products, Homo polymers and co-polymers, Elastomers and Thermoplastic elastomers, Polymer Blends and Alloys, Liquid crystal polymers, Polymer foams, Properties and applications of polymers.

Properties and applications of various composites, metal matrix and ceramic matrix composite, Bone-a natural composite materials. Classification of composite materials, Laws of mixtures, Factors affecting composite properties, Interfacial bonding, Mechanical Behavior of Composites: Young's Modulus and strength considerations for continuous FRCs and short FRCs.

Electrical Properties: Electrical conduction in metals, Concept of energy band diagram for materials - conductors, semiconductors and insulators, electrical conductivity, effect of temperature on conductility, intrinsic and extrinsic semiconductors, dielectric properties. Compound semiconductors, Electrical properties of ceramics, Nano-electronics.

Magnetic and optical properties: Origin of magnetism in metallic and ceramic materials, Para-magnetism, diamagnetism, anti-ferro magnetism, ferromagnetism, ferrimagnetism, magnetic hysteresis, effect of temperature, soft and hard magnetic materials and their properties. Reflection, refraction, absorption and transmission of electromagnetic radiation in solids.

Advanced Materials and Tools: Smart materials, exhibiting ferroelectric, piezoelectric, opto-electric, semiconducting behavior, lasers and optical fibers, photoconductivity and superconductivity, nanomaterials, synthesis, properties and applications, biomaterials, photoconductivity and superconductivity, nanomaterials, Ultra-light Materials and Metallic Foams: Definition and processing, characterization of cellular metals, properties.

COURSE OUTCOME

Student after successful completion of course must possess an understanding of the basics of materials, in terms of their structural, optical, electrical, magnetic and mechanical properties.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment.

Text Book:

1. William D. Callister, David G. Rethwisch 'Callister's Material Science and Engineering', Willey.
2. William F Smith, Javad Hashemi, Ravi Prakash 'Material science and engineering', McGraw Hill.

References:

1. L. Solymar, D. Walsh & R. R.A. Syms 'Electrical Properties of Materials', Oxford university press.
2. James F.Shackelford, Madanapalli K.Muralidhara 'Introduction to Materials Science for Engineers
3. V. Rajendran ' Materials Science' McGraw Hill education Pvt. Limited.
4. Ian P. Jones ' Materials Science for Electrical and Electronics Engineers' Oxford uni. press
5. Asleland, Fulay, Wright, Balani 'The Science and Engineering of Materials', Cengage learning.
6. K. M. Gupta and Nishu Gupta 'Advanced Electrical and Electronics Materials' Willey.
7. M. S. Naidu, "Gas Insulated Substations", IK International Publishing House.

SYSTEM ENGINEERING

COURSE OBJECTIVE

This course in systems engineering examines the principles and process of creating effective systems to meet application demands. The course is organized as a progression through the systems engineering processes of analysis, design, implementation, and deployment with consideration of verification and validation throughout.

COURSE CONTENT

What is System Engineering, Origin, Examples of Systems requiring systems engineering, Systems Engineer Career Development Model, Perspectives of Systems Engineering, Systems Domains, Systems Engineering Fields, System Engineering Approaches.
Structure of Complex Systems, System Building Blocks and Interfaces, Hierarchy of Complex Systems, System Building Blocks, The System Environment, Interfaces and Interactions, Complexity in Modern Systems.
Concept Development and Exploration, Originating a New System, Operations Analysis, Functional Analysis, Feasibility, System Operational Requirements, Implementation of Concept Exploration.
Engineering Development, Reducing Program Risks, Requirements Analysis, Functional Analysis and Design, Prototype Development as a Risk Mitigation Technique, Development Testing, Risk Reduction.
Integration and Evaluation, Integrating, Testing, And Evaluating The Total System, Test Planning And Preparation, System Integration, Developmental System Testing, Operational Test And Evaluation, Engineering For Production, Transition From Development To Production, Production Operations.

COURSE OUTCOME

After successful completion of the course, students would be able to Plan and manage the systems engineering process and examine systems from many perspectives (such as software, hardware, product, etc.) Students can distinguish critical functions, diagnose problems, and apply descoping strategies and judge the complexity of production and deployment issues.

EVALUATION

Evaluation will be a continuous and integral process comprising classroom and external assessment.

REFERENCES:

1. Alexander Kossiakoff, William N Sweet, "System Engineering Principles and Practice, Wiley India
2. Blanchard Fabrycky, Systems engineering and analysis, Pearson
3. Dennis M. Buede, William D.Miller, "The Engineering Design of Systems: Models & Methods" Wiley India
4. JeffreyL Whitten, Lonnie D Bentley, "System Analysis and Design Methods"
5. Richard Stevens, Peter Brook," System Engineering – Coping with complexity, Prentice Hall