RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Choice Based Credit System

Information Technology, IV-Semester

Data Base Management System

Course Objectives:
The main objectives of the course are

1. To understand fundamental knowledge of file system, database concepts and use of relational database.
2. To study of different data model and conceptual design using ER diagram.
3. Students can use SQL operations to manipulate the database and learn how to design and create a good database using functional dependencies and normalization.
4. The course provides an overview of transaction management, concurrency control, distributed database and Big Data.

Basic Concepts: Introduction to DBMS, File system vs DBMS, Advantages of database systems, Database System architecture, Data models, Schemas and instances, Data independence, Functions of DBA and designer, Entities and attributes, Entity types, Key attributes, Relationships, Defining the E-R diagram of database.

Relational Model: Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, Entity-Relationship model :Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features –generalization, specialization and aggregation

SQL: Data definition in SQL, update statements and views in SQL: Data storage and definitions, Data retrieval queries and update statements, Query Processing & Query Optimization: Overview, measures of query cost, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans. Case Study of ORACLE and DB2.

Relational Database design: Functional Dependency –definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization –1NF, 2NF, 3NF, Decomposition using FD-dependency preservation, lossless join, BCNF, Multi-valued dependency, 4NF, Join dependency and 5NF

Introduction of transaction, transaction processing and recovery, Concurrency control: Lock management, specialized locking techniques, concurrency control without locking, Protection and Security Introduction to: Distributed databases, Basic concepts of object oriented data base system.

Course Outcomes:
After successful completion of this course, the students would be able to:

1. Compare file system and DBMS and explain how DBMS is better than traditional File Processing Systems.
2. Analyze the physical and logical database designs, database modeling, relational, hierarchical, and network models

3. Analyze and renovate an information model into a relational database schema and to use a DDL, DML and DCL utilities to implement the schema using a DBMS.
4. Formulate data retrieval queries in SQL and Relational Algebra.
5. Demonstrate an understanding of functional dependencies, normalization theory and apply such knowledge to the design of a database.
6. Demonstrate and explain terms like Transaction Processing, Concurrency Control, distributed database and big data.

Reference Books:

1. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill.
2. Elmasri, Navathe, "Fundamentals of Database Systems", Pearson.
3. Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB publications.
4. S. Sharma, J. Agrawal, S. Agrawal, "Advanced Database Management System", Dreamtech Press.
5. Leon & Leon, "Fundamental of Data Base Management System", TMH

List of Experiments:

1. To perform various SQL Commands of DDL, DML, DCL.
2. Write SQL Commands such as Insertion, deletion and updation for any schema.
3. To execute Nested Queries, Join Queries, order-by, having clause and string operation.
4. To perform set operators like Union, Intersect, Minus on a set of tables.
5. To execute various commands for GROUP functions (avg, count, max, min, Sum).
6. Write a PL/SQL block for transaction application using Triggers.
7. Write a DBMS program to prepare report for an application using function.
8. Designing of various Input screens/Forms.
9. Create reports using database connectivity of Front end with back end.
10. Create database Design with normalization and implementing in any application.

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Choice Based Credit System

Information Technology, IV-Semester

Operating System

Course Objectives:
This course provides a comprehensive introduction to understand the fundamental principles, techniques and approaches related to CPU, memory and files which requires the complete knowledge of operating systems. The course will highlight the various functionality of CPU scheduling, memory management, disk management and security of operating system.

Software, type of software, introduction to Operating Systems, function, services, types of operating systems, kernel, system call, process concept, process states, process control block, type of scheduler, context switching, threads, type of threads, multithreading model.

Process management, concepts of CPU scheduling, scheduling criteria, scheduling algorithms, algorithm evaluation, multiple processors scheduling, cooperating process, Interprocess communication, process synchronization, critical section problem, semaphores, classical problems of synchronization.

Deadlock, necessary conditions, resource allocation graph, deadlock prevention, deadlock avoidance, deadlock detection, deadlock recovery, introduction to memory management, address binding, logical and physical addressing, MMU, contiguous memory allocation, memory management techniques, single partition, multi-partition, best fit, worst fit, first fit.

Paging, paging issues, TLB, page fault, segmentation, segmentation with paging, effective access time, concepts of virtual memory, demand paging, demand segmentation, page replacement algorithms, allocation of frames, thrashing, security in operating system, security techniques.

File system, file and directory concepts, attributes, operation, file type, directory structure, LINUX file system, FAT, I-node, file access methods, allocation methods, free space managements, disk management, disk access time, disk scheduling algorithm.

Course Outcomes:
On the completion of this course students will be able to understand:
1. The services and functions of operating systems.
2. Design issues associated with operating systems.
3. Various process management concepts including scheduling, synchronization, deadlocks.
4. The concept of multithreading, memory management, disk management and file system.
5. Protection and security mechanisms.
6. Various types of operating systems including Linux.

Reference Books:

1. Silberschatz,"Operating system", Willey Pub.
2. S.Haldar and Alex A. Arvind " Operating Systems" 2nd Edition Pearson.
3. D. M. Dhamdhere, "Operating System- A concept- Based Approach", TMH.

4. Pabitra Pal Choudhury, “Operating System-Principle and Design”, PHI Learning.

List of Experiment

1. Program to implement FCFS CPU scheduling algorithm.
2. Program to implement SJF CPU scheduling algorithm.
3. Program to implement Priority CPU Scheduling algorithm.
4. Program to implement Round Robin CPU scheduling algorithm.
5. Program to implement classical inter process communication problem (producer consumer).
6. Program to implement classical inter process communication problem (Reader Writers).
7. Program to implement classical inter process communication problem (Dining Philosophers).
8. Program to implement FIFO page replacement algorithm.
9. Program to implement LRU page replacement algorithm
10. Program to implement LFU and optimal page replacement.

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Choice Based Credit System

Information Technology, IV-Semester

Communication Systems

Course Objectives:

The study of communication systems starts with the concept of analog communication. In this course time and frequency representation of information is given. The objective of this course is to be familiar with the basic building blocks of communication systems such as modulator and demodulator. Different types of analog modulation techniques are given in this course.

Signals and Systems: Block diagram of a communication system, signal-definition, types of signals continuous, discrete, deterministic, non-deterministic, periodic, non-periodic, energy, power, analog and digital signals. Electromagnetic Spectra, Standard signals- DC, sinusoidal, unit step, ramp, signum, rectangular pulse, impulse(delta) signal. System definition, classification of systems, linear, nonlinear, time variant, time invariant, causal, non causal, stable and unstable systems. Transmission media-Guided and unguided media, twisted pair, Unshielded twisted pair and Shielded twisted pair, coaxial cable and fiber optic cable, radio waves, microwaves and infrared transmission.

Fourier transforms: Time domain and frequency domain representation of signal, Fourier Transform and its properties, conditions for existence, Transform of Gate, unit step, constant, impulse, sine and cosine wave. Shifting property of delta function, convolution, time and frequency convolution theorems.

Amplitude modulation: Modulation, need of modulation, types of modulation techniques, amplitude modulation (DSB-FC), modulation index, frequency spectrum of AM wave, linear and over modulation, power relation in AM, transmission efficiency, modulation by a complex signal, bandwidth of AM, AM modulators, square law and switching modulator, advantages and disadvantages of AM.

Demodulation of AM: Suppressed carrier amplitude modulation systems, DSB-SC, SSB-SC, VSB-SC systems, comparison of various amplitude modulation systems. Demodulation of AM, square law and envelope detector, synchronous detection of AM, Low and high power AM transmitters, AM receivers, TRF and superheterodyne receivers, sensitivity, selectivity and fidelity of receivers.

Angle modulation: Introduction and types of angle modulation, frequency modulation, frequency deviation, modulation index, deviation ratio, bandwidth requirement of FM wave, types of FM. Phase modulation, difference between FM and PM, Direct and indirect method of FM generation, FM demodulators- slope detector, Foster seeley discriminator, ratio detector. Introduction to pulse modulation systems, PAM, PPM, PWM systems, frequency and time division multiplexing.

Course Outcomes:

At the end of this course students will be able to understand the communication of information over the communication channel. Students will understand how information signal of low frequency can be transmitted with the help of modulation techniques over a long distance. Students will be able to differentiate different modulation techniques such as AM, SSB, DSB and FM.

Reference Books:

1. Singh & Sapre, "Communication Systems", TMH.
2. W. Tomasi "Electronic Communications Systems", Pearson Education Pvt. Ltd.
3. Taub & shilling, "Communication Systems", TMH.
4. Abhay Gandhi, "Analog and Digital Communication", CENGAGE Learning.

List of Experiments:

1. AM Modulation and Demodulation (Envelope Detector)
2. Frequency modulation using reactance modulator.
3. Frequency modulation using varactor modulator.
4. Pulse Amplitude Modulation and Demodulation
5. Pre-emphasis and De-emphasis
6. Analog Multiplexing.
7. Amplitude Modulation using Pspice
8. Receiver characteristics (selectivity, sensitivity, fidelity).
9. Operation of foster-seeley loop detector.
10. Operation of ratio detector.

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Choice Based Credit System

Information Technology, IV-Semester

Computer Architecture

Course Objectives

The objective of course is to understand the basic structure and operation of computer system. Students will be able to know the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division. To study the different ways of communicating with I/O devices and standard I/O interfaces, hierarchical memory system including cache memories and virtual memory, concept of pipeline.

Computer architecture and organization, computer generations, von Neumann model, CPU organization, CPU organization, Register organization, Various CPU register, Register Transfer, Bus and Memory Transfers, Arithmetic, Logic and Shift micro-operations, Arithmetic logic shift unit.

The arithmetic and logic unit, Fixed-Point representation: integer representation, sign-magnitude, 1's and 2's complement and range, Integer arithmetic: negation, addition and subtraction, multiplication, division, Floating-Point representation, Floating-Point arithmetic, Hardwired micro-programmed control unit, Control memory, Micro-program sequence.

Central Progressing Unit (CPU), Stack Organization, Memory Stack, Reverse Polish Notation. Instruction Formats, Zero, One, Two, Three- Address Instructions, RISC Instructions and CISC Characteristics, Addressing Modes, Modes of Transfer, Priority Interrupt, Daisy Chaining, DMA, Input-Output Processor (IOP).

Computer memory system, Memory hierarchy, main memory: RAM, ROM chip, auxiliary and associative memory, Cache memory: associative mapping, direct mapping, set-associative mapping, write policy, cache performance, Virtual memory: address space, memory space, address mapping, paging and segmentation, TLB, page fault, effective access time, replacement algorithm.

Parallel Processing, Pipelining General Consideration, Arithmetic Pipeline, and Instruction Pipeline, Vector Operations, Matrix Multiplication, and Memory Interleaving, Multiprocessors, Characteristics of Multiprocessors.

Course Outcomes

On the completion of this course students will be able to understand:

1. Basic structure of computer system, arithmetic operations,
2. The organization of the Control unit, Memory unit, I/O unit.
3. The concept of memory management, interleaving and mapping.
4. The concept of DMA and pipeline.

Reference Books:-

1. M. Morris Mano, “Computer System Architecture”, Pearson.
2. Dr. M. Usha, T.S. Srikanth, “Computer System Architecture and Organization”, Willey India.
3. William Stallings, ”Computer Organization and Architecture”, Pearson.
4. V. Rajaraman, T. Radhakrishnan, “Computer Organization and Architecture”, PHI.

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Choice Based Credit System

Information Technology, IV-Semester

JAVA

Course Objectives:

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
2. Understand fundamentals of object-oriented programming in Java and be familiar of the important concepts like class, inheritance and multithreading, AWT and JDBC.
3. Students will able to use the Java SDK environment to create, debug and run simple Java programs.

Object-Oriented Programming , overview of Java, Installation, First Simple Program, Compilation process , Java Keywords , Identifiers , Literals, Comments, Data Types, Variables, Arrays, Declaration a variable, Dynamic initialization, the scope and life time of variable, type conversion and casting, Operators, Control Statements,

Class Fundamentals, Simple Class , Abstract Classes, Declaring Objects, Introducing Methods, Constructors, this Keyword, Garbage Collection, finalize Method, Overloading Methods, Overloading Constructors, Using Objects as Parameters, Inheritance, Creating a Multilevel Hierarchy, Packages and Interfaces, Exception Handling, Multithreaded

The Applet Class: Applet Basics, The Applet Class, Applet Architecture, Applet Initialization and Termination , Simple Applet Display Methods, Simple Banner Applet, Using the Status Window, The HTML APPLET Tag, Passing Parameters to Applets, Improving the Banner Applet.

Introducing the AWT: Working with Windows, Graphics, and Text, AWT Classes, Window Fundamentals, Component, Container, Panel, Frame, Working with Frame Windows, Handling Events in a Frame Window, AWT Controls, Layout Managers, and Menus, Adding and Removing Controls, GridLayout, BorderLayout, introduction to swing and servlet.

Event Handling, Two Event Handling Mechanisms, The Delegation Event Model, Events, Event Sources, Event Listeners, Event Classes, The MouseEvent Class and others, JDBC: JDBC-ODBC bridge, the connectivity model, the driver manager, navigating the result set object contents, the JDBC exceptional classes, connecting to remote database.

Course Outcomes:

On the completion of this course students will be able to understand:

1. The concepts of object oriented programming.
2. The basic terminology used in computer programming and write, compile and debug programs in JAVA language.
3. The different data types, decision structures, loops, functions to design programs.
4. Develop program using the java collection API as well as the java standard class library.

Reference Books:

1. E. Balagurusamy, “Programming with java A Primer”, McGrawHill.
2. Sharanam Shah, “ Core Java 8 for Beginners”, Shroff Publisher.
3. Naughton & Schildt, “The Complete Reference Java 2”, Tata McGraw Hill.
4. Horstmann & Cornell, “Core Java 2” (Vol I & II), Pearson.

List of Experiments:

1. Write a program that accepts two numbers from the user and print their sum.
2. Write a program to calculate addition of two number using prototyping of methods.
3. Program to demonstrate function overloading for calculation of average.
4. Program to demonstrating overloaded constructor for calculating box volume.
5. Program to show the detail of students using concept of inheritance.
6. Program to demonstrate package concept.
7. Program to demonstrate implementation of an interface which contains two methods declaration square and cube.
8. Program to demonstrate exception handling in case of division by zero error.
9. Program to demonstrate multithreading.
10. Program to demonstrate JDBC concept using create a GUI based application for student information.
11. Program to display “Hello World” in web browser using applet.
12. Program to add user controls to applets.
13. Write a program to create an application using concept of swing.
14. Program to demonstrate student registration functionality using servlets with session management.

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Choice Based Credit System

Information Technology, IV-Semester

Material Science

Course Objective – It will help students to learn basics of materials, properties of magnetism , technology related to semiconductor and issues and challenges of E- waste .

Course Contents

Introduction – Classification of materials, relationships in materials , atomic structure, electron in atoms, periodic table , quantum states , origin of permanent magnetic moment and magnetic parameters, types of metal alloys. Optical fibre and its properties, Toxic heavy materials with pros and cons, built – up of CRT, LCD and LED.

Magnetic materials – terminology and classification , electron spin , ferromagnetism , domain structure, hysteresis loop, soft and hard magnetic materials. Structure of crystalline solids – face centered ,body centered , hexagonal closed packed crystal structure. Ceramic crystal: radius ratio rules and ceramic density computations, polymer structure- crystallinity and polymer crystals.

Semiconductor Technology and Measurements – crystal growth and wafer preparation , methods of p –n junction formation , growth and deposition of dielectric layers, metal decomposition techniques, bipolar and MOS integration. Parameters for measurements conductivity type, resistivity, drift mobility and diffusion length, minority carrier lifetime.

E- Basics of E-Waste, Generation of E-Waste in india, Composition of E-waste**,** Component of E-waste, Life Cycle of E-waste**,** E-waste generation in organized sector and unorganized sector, E-waste in the global context,Growth of electrical and electronic industry in India, Environment concerns & health hazards, Laws regarding E-waste management.

Mechanism of WEEE/E-waste Trade, WEEE/E-waste Life Cycle, Components of WEEE/E-waste Management, Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union, Obligations of the Producer under the WEEE, Barriers to Recycling of WEEE, Restrictions of Hazardous Substances (RoHS)Directive, Comparative WEEE/e-waste management in Switzerland and India, E-waste projection and recycling.

Course outcome –

1. Understanding of magnetic materials , properties of toxic heavy materials .
2. Learning of crystalline solids and polymer structures
3. Creating understanding of semiconductor technology and measurements
4. Learning basics of E- waste management

References:

1. R Balasubramaniam “Callister’s Material Science and Engineering Second edition” ,Wiley
2. M S Tyagi “ Introduction to Semiconductor Materials and Devices” , Wiley

3. Charles M. Gilmore “Materials Science and Engineering Properties ” Cengage Learning
4. http://rajyasabha.nic.in/rsnew/publication_electronic/E-Waste_in_india.pdf
5. https://www.epa.gov/sites/production/files/2014-05/documents/india.pdf
6. NPCS Board of Consultants & Engineers "The Complete Technology Book on E-Waste Recycling(Printed Circuit Board, LCD, Cell Phone, Battery, Computers)", Asia Pacific Business Press Inc.

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Choice Based Credit System

Information Technology, IV-Semester

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, SystemEngineering 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