Syllabus

for

B.Sc. (Honours) Computer Science

Department of CSIT

Guru Ghasidas Vishwavidyalaya Bilaspur C.G.

(A Central University)

Session: 2021-22

SEMESTER-I

S. No.	Subject Code	Title	Credits	Marks Internal/ External		Total
1	BSC-101 (CIUATT1) (CORE - 1)	Programming Methodology	3 (3Th)	30	70	100
2	BSC-102 (CIUATT2) (CORE - 2)	Computer System Architecture	5 (4Th+1Tu)	30	70	100
3	BSC-103 (CIUATG1) (GE – I)	(GE – I)	5 (3Th+2P)	30	70	100
4	BSC-104 (CIUATL1) (SEC - I)	(SEC - I)	2 (2Th)	30	70	100
5	BSC-105 (CIUATA1) (AEC – I)	(AEC – I)	2(2Th)	30	70	100
6	BSC-106 (CIUALT1) (Practical – Core-1)	Programming using C++	2 (2P)	30	70	100
		Total	19			600

List of GE Courses (5 credit)

1. Object Oriented Programming Concept
2. Introduction to DBMS

List of AEC Courses (2 credit)

1. Information Communication Technology
2. Internet Technology

List of SEC Courses (2 credit)

1. HTML and Introduction to JAVA Script
2. Introduction to WEB Technology

SEMESTER-II

S. No.	Subject Code	Title	Credits	Marks Internal / External		Total
1	(CIUBTT1) (CORE - 3)	Data Structure	**3 (3Th)**	30	70	100
2	(CIUBTT2) (CORE - 4)	Discrete Structures	**5 (4Th+1Tu)**	30	70	100
3	(CIUBTG1) (GE-II)	(GE-II)	**5 (3Th + 2 P)**	30	70	100
4	(CIUBTA1) (AEC - 2)	(AEC - 2)	**2 (2Th)**	30	70	100
5	(CIUBTL1) (SEC - I)	(SEC - I)	**2(2Th)**	30	70	100
6	(CIUBLT1) (Practical – 2)	Lab: Data Structure	**2 (2P)**	30	70	100
		Total	**19**			600

List of GE Courses (5 credit)

1. Introduction to Programming in C
2. Introduction to LINUX Operating System

List of AEC Courses (2 credit)

1. Introduction to JAVA
2. Introduction to Data Communication

List of SEC Courses (2 credit)

1. Introduction to IoT
2. Introduction to Logics of Computer

Semester-III

S.No.	Subject Code	Title	Credits	Marks * Internal / External		Total *
1	BSC-301 (CIUCTT1) (CORE - 5)	Operating System	5	30	70	100
2	BSC-302 (CIUCTT2) (CORE - 6)	Introduction to Algorithms Design	3	30	70	100
3	BSC-303 (CIUCTT3) (CORE - 7)	Computer Networks	5	30	70	100
4	BSC-304 (CIUCTG1) (GE - III)	(GE - III)	5	30	70	100
5	BSC-305 (CIUCTL2) (Practical –3)	(Lab:- Introduction to Algorithms Design)	2			100
6	BSC-306 (CIUCTA1) (AEC - III)	AEC – III	2			100
		Total	22			600

List of GE Courses (5 credit)
1. Introduction to microprocessor.
2. Introduction to Management Information Systems

List of AEC Courses (2 credit)

1. E-Commerce
2. PC Package

Semester-IV

S.No.	Subject Code	Title	Credits	Marks * Internal/	External	Total *
1	BSC-401 (CIUDTT1) (CORE - 8)	Software Engineering	5	30	70	100
2	BSC-402 (CIUDTT2) (CORE - 9)	DBMS	5	30	70	100
	BSC-403 (CIUDTT3) (CORE - 10)	Object Oriented Programming using JAVA	3	30	70	100
3	BSC-403 (CIUDTG1) (GE-IV)	(GE - IV)	5	30	70	100
4	BSC-404 (CIUDTA1) (AEC-IV)	AEC IV	2	30	70	100
5	BSC-405 (CIUDLT3) (Practical –4)	Programming Lab in JAVA	2			100
		Total	22			600

List of GE Courses (5 credit)
1. System Software
2. Operating Systems

List of AEC Courses (2 credit)

1. Ethics and Cyber-awareness
2. Introduction to Business Analytics

Semester-V

S.No.	Subject Code	Title	Credits	Marks * Internal / External		Total *
1	BSC-501 (CIUETT1) (CORE - 11)	Internet Technologies	5	30	70	100
2	BSC-502 (CIUETT2) (CORE - 12)	Introduction to Artificial Intelligence	5	30	70	100
3	BSC-503 (CIUETD1) (DSE – I)	Image Processing / Soft Computing	3	30	70	100
4	BSC-504 (CIUETD2) (DSE-II)	Information Security / Data analytics	5	30	70	100
5	BSC-404 (CIUDTA1) (AEC- V)	AEC V	2			100
6	BSC-505 (CIUELD1) (Practical DSE - I)	(Practical based on Image Processing / Soft Computing (DSE - I)	2			100
		Total	22			600

List of AEC Courses (2 credit)

1. Multimedia Technology
2. Operation Research & Optimization Techniques

Semester-VI

S.No.	Subject Code	Title	Credits	Marks * Internal /	External	Total *
1	BSC-601 (CIUFTT1) (CORE - 13)	Computer Graphics	5	30	70	100
2	BSC-602 (CIUFTT2) (CORE - 14)	Machine Learning	5	30	70	100
3	BSC-603 (CIUFTD1) (DSE – III)	Data Mining / Internet of Things	3	30	70	100
4	BSC-604 (CIUFTD2) (DSE-IV)	Theory of Computation / Cloud Computing	5	30	70	100
5	BSC-605 (CIUFLD1) (Practical – 3)	(Practical based on Data Mining / Internet of Things (DSE - III)	2			100
6	BSC-606 (CIUFLF1)	Project	2			100
		Total	22			600

* As per University (GGV) Provisions

Semester –I

(Core-I)

Programming Methodology

COURSE OBJECTIVES:

- To understand how C++ improves C with object- oriented features.

- To learn how to write functions for efficiency and performance.

- To learn the syntax and semantics of the C++ programming language.

- To learn how to design C++ classes for code reuse. Data Types, Variables, Constants, Operators and Basic I/O

1. **Introduction & Basic Concepts of C++**

Overview of Object-Orientation, Programming, Using main() function, Compiling and

Executing Simple Programs in C++, Declaring, Defining and Initializing Variables, Scope

of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types,

Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Formatted

and Console I/O (cin, cout), Using Basic Header Files.

2. Expressions, Conditional Statements and Iterative Statements

Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator

Expressions), Understanding Operators Precedence in Expressions, Conditional

Statements, understanding syntax and utility of Iterative Statements (while, do-while, and

for loops), Use of break and continue in Loops, Using Nested Statements.

3. Functions and Arrays

Utility of functions, Call by Value, Call by Reference, Functions returning value, Inline

Functions, Return data type of functions, Functions parameters, Differentiating between

Declaration and Definition of Functions, Command Line Arguments.

Creating and Using One Dimensional Arrays (Declaring and Defining an Array,

Initializing an Array), Two- dimensional Arrays, Introduction to Multi-dimensional arrays.

4. Pointers and References in C++

Understanding a Pointer Variable, Simple use of Pointers, Pointers to Pointers, Pointers to

structures, Problems with Pointers, Passing pointers as function arguments, Returning a

pointer from a function, Using references as function arguments and function return

values.

5. Using Classes in C++

Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors,

Constructor Overloading, Function overloading in classes, Class Variables & Functions,

Objects as parameters, specifying the Protected and Private Access, Copy Constructors.

6. Overview of Function Overloading and Operator Overloading

Need of Overloading functions and operators, Overloading functions by number and type

of arguments, looking at an operator as a function call, Overloading Operators (including

assignment operators, unary operators).

7. Inheritance, Polymorphism and Exception Handling

Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism

(Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch and

throw, multiple catch statements).

COURSE OUTCOMES:

After completion of this course students should able to understand -

-The fundamental programming concepts and methodologies which are essential to

building good C/C++ programs.

-To practice the fundamental programming methodologies in the C/C++ programming

language via laboratory experiences.

To code, document, test, and implement a well- structured, robust computer program using

the C/C++ programming language.

Reference Books

1. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003

2. BjarneStroustrup, "The C++ Programming Language", 4 th Edition, Addison-Wesley , 2013.

3. BjarneStroustroup, "Programming -- Principles and Practice using C++", 2nd

Edition, Addison-Wesley 2014.

4. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill

Education, 2008.

5. Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.

5. John R. Hubbard, "Programming with C++", Schaum's Series, 2nd Edition, 2000.

6. Andrew Koeni, Barbara, E. Moo, "Accelerated C++", Published by Addison-Wesley , 2000.

7. Scott Meyers, "Effective C++", 3rd Edition, Published by Addison-Wesley, 2005.

8. Harry, H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide",

First Create space Inc, O-D Publishing, LLC USA.2014

9. Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.

10. Stanley B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Published by

(Core-II)

Computer System Architecture

COURSE OBJECTIVE:
- To study the basic organization and architecture of digital computers (CPU, memory, I/O, software).
- Discussions will include digital logic and microprogramming.
- Understanding and utilization of digital computers.
- To make students understand the basic structure, operation and characteristics of digital computer.
- To familiarize the students with arithmetic and logic unit as well as the concept of the concept of pipelining.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To make students know the different ways of communicating with I/O devices and standard I/Ointerfaces.

SYLLABUS:
1 **Fundamentals of Digital Electronics:** Data Types, Complements, Fixed-Point Representation, Floating-Point Representation, Other Binary Codes, Error Detection Codes, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Sequential Circuits.
2 **Register Transfer and Micro operations:** Register Transfer Language, Register Transfer, Bus & Memory Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operation.

3 **Basic Computer Organization:** Instruction codes, Computer Registers, Computer Instructions, Timing & Control, Instruction Cycles, Memory Reference Instruction, Input - Output & Interrupts, Complete Computer Description & Design of Basic Computer.

4 Processor and Control Unit: Hardwired vs. Micro programmed Control Unit, General Register Organization, Stack Organization, Instruction Format, Data Transfer & Manipulation, Program Control, RISC, CISC, Pipelining – Pipelined data path and control– Handling Data hazards & Control hazards.

5 Memory and I/O Systems: Peripheral Devices, I/O Interface, Data Transfer Schemes, Program Control, Interrupt, DMA Transfer, I/O Processor. Memory Hierarchy, Processor vs. Memory Speed, High-Speed Memories, Cache Memory, Associative Memory, Interleave, Virtual Memory, Memory Management.

6 Parallelism: Instruction-level-parallelism – Parallel processing challenges   – Flynn's classification – Hardware multithreading – Multicore processors

REFERENCE BOOKS:-
1. M. Mano, Computer System Architecture, Pearson Education 1992
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004th
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8 Edition, Prentice Hall of India,2009
4. M.M. Mano , Digital Design, Pearson Education Asia,2013
5. Carl Hamacher, Computer Organization, Fifth edition, McGraw-Hill, 2012.

COURSE OUTCOME:
- An ability to perform computer arithmetic operations.
- An ability to understand control unit operations.
- An ability to design memory organization that uses banks for different word size operations.
- An ability to understand the concept of cache mapping techniques.
- An ability to conceptualize instruction level parallelism.

GE -1 Courses

Object Oriented Programming Concept

- Introduction to Object Oriented Concepts: A Review of structures, Procedure–Oriented Programming system,

- Object Oriented Programming System,

- Comparison of Object-Oriented Language with C,

- Console I/O, variables and reference variables, Function Prototyping, Function Overloading.

- Class and Objects: Introduction, member functions and data, objects and functions.

- Inheritance basics, using super, creating multi-level hierarchy, method overriding.
- Exception handling

Textbooks:

1. Sourav Sahay, Object Oriented Programming with C , 2nd Ed, Oxford University Press,2006

2. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.

Reference Books:

1. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806

2. Herbert Schildt, The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.

3. Stanley B.Lippmann, Josee Lajore, C++ Primer, 4th Edition, Pearson Education, 2005.

4. Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited.

5. Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning.

6. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.

<u>Introduction to DBMS</u>

Course Objectives: The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

SYLLABUS:
1. Introduction Characteristics of database approach, data models, database system architecture and data Independence. Entity Relationship(ER) Modelling, Entity types, relationships, constraints.

2. Relation data model Relational model concepts, relational constraints, relational algebra, SQL queries

3. Database design: Mapping ER/EER model to relational database, functional dependencies, Lossless decomposition, and Normal forms (up to BCNF).

4. Transaction management ACID properties, concurrency control

5. File Structure and indexing Operations on files, File of Unordered and ordered records, overview of File organizations, Indexing structures for files (Primary index, secondary index, clustering index), Multilevel indexing using B and B + trees.

BOOKS RECOMMENDED:
1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6 th Edition, Pearson Education, 2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3 rd Edition, McGraw-Hill, 2002.
3. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6 th Edition, McGraw 4. Hill, 2010. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education,2013.

LEARNING OUTCOMES:
* Upon successful completion of this course, students should be able to:
* Describe the fundamental elements of relational database management systems
* Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
* Design ER-models to represent simple database application scenarios
* Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
* Improve the database design by normalization.
* Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.

List of AEC Courses

Information Communication Technology

COURSE OBJECTIVES:
This course aims at acquainting the students with basic ICT tools which help them in their day-to-day life as well as in office and research.

UNIT-I: Fundamentals of Internet: Internet applications & threats, Internet addressing, URL and its parts, Browsers and utility of Browsers, Search Engines, Introduction to Social Networking apps: Twitter, Tumblr, LinkedIn, Facebook, flickr, Skype, yahoo, YouTube, WhatsApp

UNIT-II: Introduction to Electronic mail: Email Addresses, Domain Names, Mailers, parts of an E-mail Message, Composing E-mail Message, Mail Management through pop client apps online/offline.

UNIT-III: Overview of Internet security: E-mail threats and secure E-mail, Viruses and antivirus software, Firewalls, Cryptography, Digital signatures, Copyright issues.

UNIT-IV: Google Apps: Google drive, Google documents, Google spread sheets, Google Slides and Google forms, Google Meet, Google Classroom

UNIT-V: GOI digital initiatives in higher education: SWAYAM, SwayamPrabha, National Academic Depository, National Digital Library of India, E-Sodh-Sindhu, Virtual labs, e-acharya, e-Yantra and NPTEL.

REFERENCE BOOKS:
1. In-line/On-line: Fundamentals of the Internet and the World Wide Web – by Raymond Greenlaw Publishers: McGraw Hill Education
2. Internet Technology and Web Design, McGraw Hill Education India.
3. Information Technology – The Breaking Wave, Dennis Curtin, Kunal Sen, Kim Foley and Cathy Morin, TMH.

COURSE OUTCOMES:
Students would
- Understand the literature of social networks and their properties.
- Explain which network is suitable for whom.
- Develop skills to use various social networking sites like twitter, flickr etc.
- Learn few GOI digital initiatives in higher education.
- Apply skills to use online forums, docs, spreadsheets, etc. for communication, collaboration and research.
- Get acquainted with internet threats and security mechanisms.

Internet Technology

Course Objectives:
➢ Define terms related to the Internet.
➢ Describe how the Internet is changing the world.
➢ Understand how computers are connected to the Internet.
➢ Demonstrate the ability to use the World Wide Web.
➢ Understand and apply Internet Etiquette.
➢ Demonstrate an understanding of and the ability to use electronic mail.
➢ Understand the principles of Internet services such as Listserv Mailing Lists, Usenet Newsgroups, and Instant Messaging.
➢ Find information on the Internet.

Syllabus

1. **Introduction to computer network:** LAN, MAN, WAN, wireless LAN, internet, intranet, extranet, LAN topologies,
2. **Network devices:** NIC, repeaters, hub, bridge, switch, gateway and router.
3. **Internet Terms:** Web page, Home page, website, internet browsers, URL, Hypertext, ISP, Web server, download and upload, online and offline.
4. **Internet Applications:** www, telnet, ftp, e-mail, social networks, search engines, Video Conferencing, e-Commerce, m-Commerce, VOIP, blogs.
5. **Introduction to Web Design:** Introduction to hypertext markup language (html) Document type definition, creating web pages, lists, hyperlinks, tables, web forms, inserting images, frames, hosting options and domain name registration.
6. **Customized Features:** Cascading style sheet (css) for text formatting and other manipulations.
7. **JavaScript Fundamentals:** Data types and variables, functions, methods and events, controlling program flow, JavaScript object model, built-in objects and operators.

Reference Books:

1. Andrew S. Tanenbaum, David J. Wetherall Computer Networks (5th Edition), PHI, 2010
2. B. A. Forouzan, Data Communication and Networking, TMH, 2003.
3. D.R. Brooks, An Introduction to HTML and Javascript for Scientists and Engineers, Springer W. Willard, 2009
4. HTML A Beginner's Guide, Tata McGraw-Hill Education, 2009.
5. J. A. Ramalho, Learn Advanced HTML 4.0 with DHTML, BPB Publications, 2007

Course Outcomes:

- After completing this course satisfactorily, a student will:
- Analyze a web page and identify its elements and attributes. ·
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client-side programming).
- Create XML documents and Schemas.

List of SEC Courses

HTML and Introduction to JAVA Script

COURSE OBJECTIVES:

- To impart the basic concepts of HTML
- To understand concepts about web Pages and CSS
- To Understand basic concepts about JavaScript .

To understanding about creating web pages and step by step approach in making the web pages attractive and interactive with the help of HTML Tags, CSS and embedding JavaScript in HTML.

SYLLABUS:

UNIT I: **INTRODUCTION TO HTML**
Introduction: Overview of HTML, need of HTML, Use of it, HTML Tags: concept of Tag, types of HTML tags, structure of HTML program **Text formatting through HTML**: Paragraph attributes, line breaks, background formatting **Emphasizing material in a web page**: Heading styles, drawing lines, text styles. Text styles and other text effects-centering, spacing, controlling font size & color Lists: Using unordered and ordered lists.

UNIT II: **TABLES, LINKS and FRAMES**
Handling Tables: Use of table tag and its attributes. **Linking Documents**: Concept of hyperlink, types of hyperlinks **Frames:** Introduction To frames, using frames & frameset tags, targeting named frames.

UNIT III: **INTRODUCTION TO CSS**
Introducing CSS, Types of CSS, Use of color attributes, Use of background and Text attributes in CSS, External Style Sheets.

UNIT IV: **INTRODUCTION TO JAVA SCRIPT**
Overview of Java Script: advantages, client side java Script, capturing user input, writing JavaScript into HTML ,**Basic JavaScript Techniques:** Data types, literals, variables, operators and expressions Java Script Programming .

UNIT V: **JAVA SCRIPT CONSTRUCTION**

JavaScript Decision Making and Branching Statements: If and else if, while and do while loop. **JavaScript Functions**: Function declaration, Types of functions in Java Script- Built in functions, User defined functions, **Dialog boxes**: Alert dialog box, prompt dialog box, confirm dialog box.

REFERENCE BOOKS:
1. Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI by Ivan Bayross (bpb publication)
2. HTML5 by Mark Pilgrim O'Reilly publication
3. D.R. Brooks, An Introduction to HTML and JavaScript for Scientists and Engineers, Springer W. Willard,2009
4. HTML A Beginner's Guide, Tata McGraw-Hill Education, 2009.
5. J. A. Ramalho, Learn Advanced HTML 4.0 with DHTML, BPB Publications, 2007

COURSE OUTCOMES:
After completion of this course students should have-
- Ability to analyze the usability of a web site.
- Ability to Implement basic JavaScript.
- Ability to Create attractive web Pages using CSS.
    - Ability to have knowledge of client side scripting language concepts.

Introduction to WEB Technology

COURSE OBJECTIVES:
This course is useful for making Web page and how to host web site on internet. Along with that Students will also learn about the protocols & application involves in internet technology.

UNIT-I: Introduction to WWW: Protocols and Applications, Web browser, Web server, DNS, dynamic IP, domain registration, introduction to web design tools and frameworks, Web design principles, static web page, interactive web page, responsive web design.

UNIT-II: Introduction to HTML: Html tags and simple HTML forms, XML, Cascading Style Sheet

UNIT-III: Introduction to JavaScript: why client-side scripting is necessary, JavaScript datatypes, literals, operators, conditions & loops, functions.

UNIT-IV: Introduction to PHP: why server-side scripting is necessary, PHP datatypes, literals, operators, conditions, loops, arrays and functions, simple PHP page.

UNIT-V: Introduction to database connectivity: simple SQL commands, database & user creation in MySQL, PHP mySQL connection using mysqli, simple database connectivity page.

REFERENCE BOOKS:
1. Steven Holzner,"HTML Black Book", Dremtech press.
2. Web Technologies, Black Book, Dreamtech Press
3. Web Applications: Concepts and Real World Design, Knuckles, Wiley-India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.
COURSE OUTCOMES:
Students would have
- capable to make web site
- knowledge about hosting web site on internet.

- knowledge about what are the technologies used in internet.
- knowledge about what are the protocols used in internet
- knowledge about the use of database in the web page

Semester -II

Data Structures

COURSE OBJECTIVES:
- To impart the basic concepts of data structures and algorithms
- To understand concepts about searching and sorting techniques
- To Understand basic concepts about stacks, queues, lists, trees andgraphs.
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental datastructures

1. **Arrays**
2. Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation)

3. **Stacks**
Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack

4. **LinkedLists**
Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular representation of Stack in Lists; Self Organizing Lists; Skip Lists

5. **Queues**
Array and Linked representation of Queue, De-queue, Priority Queues

6. **Recursion**
Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation)

7. **Trees**
Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion , Recursive and Iterative Traversals on Binary Search Trees); Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees).

8. **SearchingandSorting**
Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Insertion Sort, Shell Sort, Comparison of Sorting Techniques

9. **Hashing**
Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collusion by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect HashingFunction.

ReferenceBooks:
1. Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, CengageLearning,

2012.
2. SartajSahni, Data Structures, "Algorithms and applications in C++", Second Edition, Universities Press,2011.
3. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures UsingC and C++:, Second edition, PHI,2009.
4. Robert L. Kruse, "Data Structures and Program Design in C++",Pearson,1999.
5. D.S Malik, Data Structure using C++,Second edition, Cengage Learning,2010.
6. Mark Allen Weiss, "Data Structures and Algorithms Analysis in Java", PearsonEducation, 3rd edition,2011
7. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using Java, 2003.
8. Robert Lafore, "Data Structures and Algorithms in Java, 2/E", Pearson/ MacmillanComputer Pub,2003
9. John Hubbard, "Data Structures with JAVA", McGraw Hill Education (India)Private Limited; 2 edition,2009
10. Goodrich, M. and Tamassia, R. "Data Structures and Algorithms Analysis inJava", 4th Edition,Wiley,2013
11. Herbert Schildt, "Java The Complete Reference (English) 9th EditionPaperback", Tata McGraw Hill,2014.
12. D. S. Malik, P.S. Nair, "Data Structures Using Java", CourseTechnology, 2003.

COURSE OUTCOMES:

After completion of this course students should have-

- Ability to analyze algorithms and algorithm correctness.
- Ability to summarize searching and sorting techniques
- Ability to describe stack, queue and linkedlist operation.
- Ability to have knowledge of tree and graphs concepts.

Discrete Structures

COURSEOBJECTIVES:

- To develop logical application to computer science.
- The subject enhances one's ability to reason and ability to present a coherent and mathematically

accurateargument.

1.Introduction: (15 Lectures) Sets - finite and Infinite sets, uncountably Infinite Sets; functions, relations, Properties of Binary Relations, Closure, Partial Ordering Relations; counting - Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion andExclusion.

2.Growthof Functions:

Asymptotic Notations, Summation formulas and properties, Bounding Summations, approximation by Integrals

3.Recurrences:

Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem

4.GraphTheory

Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representaion, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees.

5.PrepositionalLogic

 Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory

Recommended Books:

1. C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics,2
   McGraw Hill, 1985,Edition , Tata
2. Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition ,McGrawHill 2006

3. T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009

4. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms ,John wiley Publication,1988

5. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers,2009

6. D.J. Hunter, Essentials of Discrete Mathematics, Jones and Bartlett Publishers,2008

COURSE OUTCOMES:
After completing this course satisfactorily, a student will:
- Be able to construct simple mathematical proofs and possess the ability to verifythem.

- Have substantial experience to comprehend formal logicalarguments.
- Be skillful in expressing mathematical properties formally via the formal language of propositional logic and predicatelogic.
- Be able to specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties thatthese objects possess.

List of GE II Courses

Introduction to Programming in C

Origin & Introduction to C : About C, Evolution of C, Structure of a C program, Compiling a C program, Simple C program, Character set in C, Keywords in C, Basic data types, Qualifiers used with basic data types, Variables in C, Type declaration, Input function, Output function and format specifiers, arithmetic operators, Unary operators, Relational and logical operators, address operator, conditional operator, Hierarchy o f operators.

Decision Making, looping & Branching: Control statements, if statement, if else statement, for statement, while loop, do while loop, switch statement, break statement, continue statement, goto statement.

Arrays & String Handling : Introduction to arrays, advantages of arrays, single dimensional arrays, multidimensional arrays, array declaration, array initialization, accessing data from array, Character arrays, String Variables, Reading & writing strings, string handling functions.

Pointers & User Defined Functions : Introduction to pointers, pointer variables, pointers and arrays, pointers to pointers, array of pointers, 2 dimensional arrays and pointers, Introduction to functions, advantages of functions, declaring a function, calling a function, passing arguments to a function.

Structure, Union & File Management: Declaring structure and union File Management: Defining & opening a file, closing a file, I/O operations on file.

Readings:

1.A. K. Saxena, Programming Language C : Anamaya Publishers, New Delhi.
2.Y. Kanetkar, Let Us C, BPB Publicat ion.
3.B.S. Gottfried, Schaum's outline of Theory and Problems o f Programming with C, McGraw-Hill.

Introduction to LINUX Operating System

COURSE OBJECTIVES:
In this course, the learners will be able to understand related to the following:
1. Understand the basic components of free and open-source Operating Systems and their interactions.
2. Select the policies for Process Management.
3. Understand the basics of writing shell programs.

UNIT-I:

Introduction to Linux: History, various distributions, File System and architecture of the Linux, features and advantages of Linux, basic commands, PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip

UNIT-II:
GREP**:** Operation, grep Family, Searching for File Content. SED: Scripts, Operation, Addresses, commands, Applications, grep and sed. AWK**:** Execution, Fields and Records, Scripts, Operations, Patterns, Actions.

UNIT-III:
Introduction to Shell: Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, FILTERS: Filters and Pipes, concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files. Shell and Shell Programming: Types of Shell, Linux variables, Iteration, control and if statement, conditional executions, tests, Array, case statement, Strings and substrings, functions, local and global shell variable (export command).

UNIT-IV:
File handling utilities, security by file permissions, disk utilities, text processing utilities and backup utilities, Security commands, networking commands

UNIT-V:
Process & signals: Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, starting new processes: waiting for a process, zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec, signals functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets. File locking: creating lock files, locking regions, use of read and write with locking, competing locks, other lock commands, deadlocks

REFERENCE BOOKS:
4. Unix concept and Programming, Sumitabha Das, McGraw Hill education
5. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson
6. Advanced Programming in the UNIX Environment, W. Richard. Stevens, Pearson Education

COURSE OUTCOMES:
   Student would be
   - Explain the structure and functions of operating systems along with their components, types and working.
   - Able to write Shell Programming using Linux commands.

List of AEC Courses

Introduction to JAVA

COURSES OBJECTIVES:
The course aims to provide exposure
• Programming in the Java programming language,
• Knowledge of object-oriented paradigm in the Java programming language,
• The use of Java in a variety of technologies and on different platforms.

Syllabus:-
Unit -I. Introduction to Java Understanding the semantic and syntax differences between C++ and Java,

Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators Doing Basic Program Output, Decision Making Constructs (conditional statements and loops)

Unit-II Arrays, Strings and I/O Creating & Using Arrays (One Dimension and Multi-dimensional), Java Strings: The Java String class, Collection in Java.

Unit-III Object-Oriented Programming Overview Principles of Object-Oriented Programming, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes. Inheritance: Single Level and Multilevel, Method Overriding,

Unit-IV Abstract Classes Interfaces and Packages Using Standard Java Packages (util, lang, io, net), Exception Handling Exception types, uncaught exceptions, throw, built-in exceptions .

Unit-V Thread creating single and multiple threads, using in File handling

Reference Books:
1. Y. Kanetkar, Let Us C, BPB Publication.
2. B.S. Gottfried, Schaum's outline of Theory and Problems of Programming with C, McGrawHill.
3. Programming in ANSI C - Balaguruswami, TMH 2.
4. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI
5. A.K. Saxena, Programming Language C : Anamaya Publishers, New Delhi.
6. C The Complete Reference - H.Sohildt, TMH 3.
7. Computer fundamentals and programming in C – Pradip Dey & Manas Ghosh, OXFORD

Course outcome:-
On successful completion of this course, student should be able to:
• Knowledge of the structure and model of the Java programming language, (knowledge)
• Use the Java programming language for various programming technologies (understanding) • Develop software in the Java programming language, (application)
• Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)

Introduction to Java Lab

Practical:
1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of .length in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. Write a program that show working of different functions of String and StringBufferclasss
8. Write a program to show multithreading.
9. Write a program to show Constructor.
10. Write a program to show use of super and this keyword.
11. Write a program to show how multiple inheritance can be done.
12. Write a program to show the demonstrate in Package.
13. JAVA 2. Write a program to show Constructor.
14. Write a program to demonstrate hierarchical class.
15. Write a program to show use of abstract method.
16. Write a program to show passing by reference.
17. Write a program to demonstrate hierarchical class.
18. Write a program to show use of super and this keyword.
19. Write a program to show multithreading.

20. Write a program to show use of Exception Handling.

Introduction to Data Communication

COURSE OBJECTIVE: After completion of the course student will be able to:
1. Understand basic terminology of networking.
2. Evaluate the functions of various layers and their roles.

UNIT I : Introduction to Networks and Data Communications, Goals and Applications of Networks, Network structure and architecture, The Internet, Protocols and Standards, Layered Tasks, The OSI reference model, TCP / IP, Addressing, Line Coding Review.

UNIT II: Physical Layer, Transmission Media: Guided and unguided, Network Topology Design, Data Link Layer: Error detection and Correction, Framing, Flow and Error Control Protocols, Networking devices.

UNIT III: Multiple Access: Random Access Protocols, CDMA, CSMA/CD, CSMA/CA, Controlled Access, Channelization, Wired LANs: IEEE Standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11, Bluetooth IEEE 802.16

UNIT IV: Network Layer: Point-to Point Networks routing, Congestion control, Internetworking -TCP/IP, IP packet, IPv4, IPv6, Transport Layer Protocol: UDP and TCP, ATM, session Layer, Network Sniffing tools

UNIT V : Application Layer: File Transfer, Electronic mail, Virtual Terminals, Cryptography, Network Security, Network Attacks

REFERENCES:
1. Forouzan, Data Communication & Networking, McGrawhill Education
2. Lathi, B. P. & Ding, Z., (2010), Modern Digital and Analog Communication Systems,Oxford University Press
3. Stallings, W., (2010), Data and Computer Communications, Pearson.
4. Andrew S. Tanenbaum, "Computer Networks" Pearson.
5. Ajit Pal, "Data Communication and Computer Networks", PHI
6. Dimitri Bertsekas, Robert G. Gallager, "Data Networks", Prentice Hall, 1992

COURSE OUTCOME: After completion of the course student will be able to:
1. Identify the issues and challenges in the architecture of a network.
2. Understand the ISO/OSI seven layers in a network.
3. Realize protocols at different layers of a network hierarchy
4. Recognize security issues in a network.

List of SEC Courses
Introduction to Internet of things

COURSE OBJECTIVES:
1. To learn the concepts of Sensors, Wireless Network and Internet
2. To learn and implement use of Devices in IoT technology.
3. To understand how to program on embedded and mobile platforms including different Microcontrollers like Raspberry Pi,

4. Learn basic python programming for IoTapplications
5. To learn and design different applications in IoT.

SYLLABUS

1. Introduction to IoT: Definition, Characteristics, Applications, Evolution, Enablers, Connectivity
Layers, Addressing, Networking and Connectivity Issues. Relevant Protocols About IOT.

2. Basics of Networking Communication Protocols, Sensor Network, Machine to Machine
Communication.

3. Introduction to Python Programming, Introduction to Raspberry Pi, Implementation of IoT with
Relevant Software Language.

4. Industrial IoT, Case Studies: Agriculture, Healthcare, Activity Monitoring etc.

REFERENCE BOOKS

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and
Anupama C. Raman (CRCPress).
2. Internet of Things: A Hands-on Approach", by A Bahga and Vijay Madisetti (Universities Press)

COURSE OUTCOME

1. After the completion of the course, the students will be able design some IOT based prototypes
2. Describe what IoT is and how it works today
3. Recognize the factors that contributed to the emergence of IoT
4. Design and program IoT devices.

Introduction to Logics of Computer

1. **Number System**: Binary, Octal and Hexadecimal number system, Conversion from one number system to
another, Binary arithmetic, Representing negative numbers, BCD codes, ASCII codes, EBCDIC codes, Excess three code, Gray code, Floating point representation, 1's complement and 2's compliment, arithmetic representation of signed binary numbers, 9's complement and 10's compliment system.

2. **Digital Devices**: Logic Gates, Flip-Flops, Latches, Registers, Shift registers, Buffers/ Drivers, Encoders, Decoders, code converters, Counters, Multiplexer, De multiplexers.

3. **Logic Design**: Boolean algebra, Minimum Boolean expression, Karnaugh map method of simplification of logic expression, Arithmetic circuits: Half-adder, Full- Adder, n-bit adder, Adder-subtractor, Multiplication of binary number.

4. **Memory Unit: Elementary** idea of semiconductor memories, ROM, PROM, EPROM, EEPROM, RAM, SRAMS, DRAMS, Memory cells A to D and D to A converters.

5. **Application of electronics in computers**: Register transfer logic, Processor Logic design, Control

Logic design, Digital

Integrated Circuits.

READINGS:

1.   M. Morris Mano, Digital Design, 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003/Pearson

Education (Singapore) Pvt. Ltd., New Delhi, 2003.

2.   Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 5d., Tata McGraw Hill

Publishing Company Limited, New Delhi, 2003.

3.   R.P.jain, Modern Digital Electronics, 3ed., Tata McGraw-Hill publishing company limited , New Delhi,

2003.

4.   S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 2nd ed., Vikas Publishing

House Pvt. Ltd, New Delhi, 2004

5.   Charles   H.Roth.   "Fundamentals   of   Logic   Design",   Thomson   Publication Company,2003.

<div align="center">**Semester-III**</div>

<u>Operating Systems</u>

COURSE OBJECTIVES:

In this course students will understand operating system architecture and functioning along with in-depth knowledge of internals and working of OS modules like process, management, storage management, file system, security and protection.

1. Introduction

Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems , time sharing systems; operating systems for personal computers & workstations,

process control & real time systems.

2. OperatingSystemOrganization
Processor and user modes, kernels, system calls and system programs.

3. ProcessManagement

System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter-process communication; deadlocks. Physical and virtual address space; memory allocation strategies –fixed and variable partitions, paging, segmentation, virtual memory.

5. File andI/OManagement
Directory structure, file operations, files allocation methods, device management.

6. ProtectionandSecurity

Policy mechanism, Authentication, Internal access Authorization.

RecommendedBooks:
1. A Silberschatz, P.B. Galvin, G. Gagne, Operating SystemsConcepts,8   Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern OperatingSystems, 3 rdEdition, Pearson Education2007.
3. G. Nutt, Operating Systems: A Modern Perspective,2 Edition Pearson Education 1997.th
4. W. Stallings, Operating Systems, Internals & Design Principles ,5 India.2008. Edition, Prentice Hall of M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill1992.

COURSE OUTCOMES:
Upon successful completion of the course students will be ableto:

- understand what is an operating system and the role itplays
- A high-level understanding of the structure of operating systems, applications, and therelationship betweenthem.
- Some knowledge of the services provided by operatingsystems.

Exposure to some details of major OSconcepts.

Introduction to Algorithms Design

COURSE OBJECTIVES::

In this course students will learn paradigms and approaches used to analyze and design algorithms andto appreciate the impact of algorithm design in practice. They will be able to explain different computational models, order notation and various complexity measures (e.g., running time, disk space) to analyze the complexity/performance of different algorithms and also learn various advanced design and analysis techniques such as greedy algorithms, dynamicprogramming.

Introduction to Algorithms

1. 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.

2. 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

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

4. 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.

5. 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.

6. Lower Bounding Techniques: Decision Trees, Balanced Trees, Red-Black Trees
   Advanced Analysis Technique: Randomized Algorithm, DistributedAlgorithm, Heuristics

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, RobartoTamassia, Algorithm Design, Wiely India
6. Rajesh K Shukla: Analysis and Design of Algorithms: A Beginner's Approach; Wiley

List of Experiments(expandable):

1. Write a test program to implement Divide and Conquer Strategy . Eg: Quick sort algorithm for sorting list of integers inascending order
2. Writea program to implement Merge sort algorithm for sorting a list of integers in ascendingorder.
3. Write program to implement the DFS and BFS algorithm for agraph.
4. Write program to implement backtracking algorithm for solving problems likeN- queens
5. Write a program to implement the backtracking algorithm for the sum of subsetsproblem
6. Write program to implement greedy algorithm for job sequencing withdeadlines.
7. Writea program to implement Dijkstra's algorithm for the Single source shortest path problem.
8. Writea program that implements Prim's algorithm to generate minimum cost spanning tree.
9. Write a program that implements Kruskal's algorithm to generate minimum cost spanning tree
10. Write program to implement Dynamic Programming algorithm for the 0/1

Knapsackproblem.
11. Write program to implement Dynamic Programming algorithm for the Optimal Binary Search TreeProblem.
12. Write a program for Iterative and Recursive Binary Search.
13. Write a program for Strassen's Matrix Multiplication.
14. Write a program for optimal merge patterns.
15. Write a program for Huffman coding.
16. Write a program for minimum spanning trees using Kruskal's algorithm.
17. Write a program for minimum spanning trees using Prim's algorithm.
18. Write a program for single sources shortest path algorithm.
19. Write a program for Floye-Warshal algorithm.
20. Write a program for traveling salesman problem.
21. Write a program for Hamiltonian cycle problem

COURSE OUTCOMES:
After successful completion of this course, student will be ableto

● Analyze the asymptotic performanceof algorithms.
● Write rigorous correctness proofs foralgorithms.
● Demonstrate a familiarity with majoralgorithms and datastructures.
● Apply important algorithmic design paradigms and methods ofanalysis.
Synthesize efficient algorithms in common engineering designsituations.

Computer Networks

COURSE OBJECTIVES:
● Build an understanding of the fundamental concepts of computer networking.
● Familiarize the student with the basic taxonomy and terminology of the computer networkingarea.
● Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.

1. Introduction toComputerNetworks
Network definition; network topologies; network classifications; network protocol; layered network

architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

2. Data Communication FundamentalsandTechniques

Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques-FDM, TDM; transmission media.

3. Networks Switching Techniques andAccessmechanisms
Circuit switching; packet switching- connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for datatransfer.

4. Data Link Layer FunctionsandProtocol

Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.

5. Multiple Access ProtocolandNetworks

CSMA/CD protocols; Ethernet LANS; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways; Routing; routing algorithms; network layer protocol of Internet –IP protocol, Internet control protocol. Transport services-error and flow control, Connection establishment and release- three way handshake.

8. Overview of Applicationlayerprotocol
Overview of DNS protocol; Overview of WWW &HTTP protocol.

Reference Books
1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM,2007.
2. A. S. Tanenbaum: Computer Networks, Fourth edition, PHI ,2002

COURSE OUTCOMES:
After completing this course the student must demonstrate the knowledge and ability to:
- Independently understand basic computer networktechnology.
- Understand and explain Data Communications System and itscomponents.
- Identify the different types of network topologies andprotocols.   Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
   Identify the different types of network devices and their functions within anetwork

List of GE Courses

INTRODUCTION TO MICROPROCESSOR

Unit-I
Introduction: Microprocessor evolution and types, microprocessor architecture and operation of its components, addressing modes, interrupts, data transfer schemes, instruction and data flow, timer and timing diagram. Interfacing devices. Architectural advancement of microprocessor. Typical microprocessor development schemes. (11)
Unit-II
*-bit Microprocessors: Pin diagram and internal architecture of 8085 microprocessor, registers, ALU, Control & statu, interrupt and machine cycle. Instruction sets. Addressing modes. Instruction formats Instruction Classification: data transfer, arithmetic operations, logical operations, branching operations, machine control and assembler directives.
Unit-III

16-bit Microprocessor: Architecture of 8086 microprocessor: register organization, bus interface unit, execution unit, memory addressing, memory segmentation. Operating modes. Instruction sets, instruction format, Types of instructions. Interrupts: hardware and software interrupts.

Unit-IV

Programming: Assembly language programming based on intel 8085/8086. Instructions, data transfer, arithmetic, logic, branch operations, looping, counting, indexing, programming techniques, counters and time delays, stacks and subroutines, conditional call and return instructions

Unit-V

Peripheral Interfacing: Peripheral Devices: 8237 DMA Controller, 8255 programmable peripheral interface, 8253/8254programmable timer/counter, 8259 programmable interrupt controller, 8251 USART and RS232C.

Books 1.

Gaonkar , Ramesh S , "Microprocessor Architecture, Programming and Applications with 8085", Penram International Publishing.

2. Ray A K , Bhurchandi K M , "Advanced Microprocessors and Peripherals", TMH

3. Hall D V ,"Microprocessor Interfacing', TMH

4. Liu and Gibson G A , " Microcomputer System: The 8086/8088 family'' ,PHI

5. Aditya P Mathur, " Introduction to Microprocessor", TMH

6. Brey, Barry B, "INTEL Microprocessors", PHI

7. Renu Sigh & B.P.Sigh, "Microprocessor, Interfacing and Applications 8. M Rafiqzzaman, "Microprocessors, Theory and Applications",

INTRODUCTION TO MANAGEMENT INFORMATION SYSTEMS

Course Objective: Information Systems (IS) enables new approaches to improve efficiency and efficacy of business models. This course will equip the students with understanding of role, advantages and components of an Information System. The objective of the course is to help students integrate their learning from functional areas, decision making process in an organization and role of Information Systems to have a vintage point in this competitive world.

Unit I: Basic Concepts of Information System Role of data and information, Organization structures, Business Process, Systems Approach and introduction to Information Systems.

Unit II: Types of IS Resources and components of Information System, integration and automation of business functions and developing business models. Role and advantages of Transaction Processing System, Management Information System, Expert Systems and Artificial Intelligence, Executive Support Systems and Strategic Information Systems.

Unit III: Architecture & Design of IS Architecture, development and maintenance of Information

Systems, Centralized and Decentralized Information Systems, Factors of success and failure, value and risk of IS.

Unit IV: Decision Making Process Programmed and Non- Programmed decisions, Decision Support Systems, Models and approaches to DSS

Unit V: Introduction to Enterprise Management technologies Business Process Reengineering, Total Quality Management and Enterprise Management System viz. ERP, SCM, CRM and Ecommerce.

Text:
• Management Information Systems, Effy OZ, Thomson Leaning/Vikas Publications
• Management Information Systems, James A. O'Brein, Tata McGraw-Hill
• Management Information System, W.S Jawadekar, Tata Mc Graw Hill Publication.
• Management Information System, David Kroenke, Tata Mc Graw Hill Publication.
• MIS: Management Perspective, D.P. Goyal, Macmillan Business Books.
• MIS and Corporate Communications, Raj K. Wadwha, Jimmy Dawar, P. Bhaskara Rao, Kanishka Publishers.
• MIS: Managing the digital firm, Kenneth C. Landon, Jane P. Landon, Pearson Education.

List of AEC Courses

PC Packages

UNIT I

Fundamentals of Computer: Introduction to computer, Applications of computer, Components of computers, Input-output devices (key boards, mouse, track ball, light pen, cards, printers, plotters, scanners), Secondary storage devices (floppy disk, magnetic disk, Winches er disk, optical disk) Types of software, Translators (compiler, interpreter, assembler), Introduction to data communication and network.

UNIT II

MS-Word: Introduction to Ms-Office, Ms-Access, Ms Excel. Parts of window of word (Title bar, menu

bar, status bar, ruler) , Creation of new documents, opening document ,insert a document into another document. Page setup, margins, gutters, font properties, A!ignment, page breaks, header footer deleting ,moving, replace, editing text in document. Saving a document, spell checker, printing a document. Creating a table, entering and editing, Text in tables. Changing format of table, height width of row or column. Editing, deleting Rows, columns in table. Borders, shading, Templates, wizards, Drawing objects, mail merge

UNIT III

MS-Power Point: Introduction to Ms power point. Power point elements (templates wizard Views, color schemes ,Exploring power point menu (opening & closing menus, working With dialogues boxes), adding text, adding title, moving text area, resizing text Boxes, adding pictures. Starting a new slide, saving presentation, printing slides .Views (slide View slide sorter, notes view, outline view) .Formatting & enhancing text formatting, Choosing transitions. Creating a graph, displaying

slide show, adding multimedia .Slide transitions. Timing slide display, adding movies & sounds. Using

a pick look Wizards to change format.

UNIT IV

MS-Excel: Introduction to Worksheet/Spreads, Features of excel. Describe the excel Window, different functions on different data in excel, creation of graphs, editing it and formatting, changing

chart type to 2d chart or 3d chart, creation of worksheet, adding, deleting, moving the text in worksheet, linking different sheets, sorting the data, querying the data, filtering the data (auto and advance filters), What-if analysis, printing a worksheet.

UNIT V

MS-Access: Introduction, Understanding Databases. Creating the tables. entering records in table, deleting table, modifying table fields, linking tables, Queries. Forms, formatting forms, relating a form to tables, Reports(building reports, formatting report. displaying the information of table using reports Adding Graphs to your reports. .

References: 1. PC Computing by R.K. Taxali.

2. PC Software by Rachpal Singh & Gurinder Singh

E-Commerce

OBJECTIVES: The course should enable the students to:
1. Describe e-commerce framework.
2. Explain electronic system for payment.
3. Describe the use of e-commerce in advertising and marketing.
4. Understand business documents and digital library.
5. Understand the usage of multimedia systems for e-commerce.

Syllabus :
1. Introduction, Definition, Objectives, Advantages and disadvantages, Forces driving E-Commerce, Traditional commerce Vs. E-Commerce, E-Commerce opportunities for industries, Growth of E-Commerce.
2. E-Commerce Models: Business to consumer(B2C), Business to Business(B2B), Consumer to Consumer(C2C).   Electronic Payment Systems: Special features required in payment systems, Types of E-payment systems, E-Cash, E-cheque, credit card, debit card, Smart Card, Electronic Purses.
3. E-Marketing, E-Customer Relationship Management, E-Supply Chain Management.
4. Security Issues in E-Commerce: Security risk of E-Commerce, Types of threats, Security tools and risk management approach. Cyber laws, Business Ethics, EDI Application in business.

Readings:
1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.
2. Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH
3. P. Loshin, John Vacca, "Electronic commerce", Firewall Media, New Delhi

LEARNING OUTCOMES:
1. Understand the basic concepts of E-commerce
2. Demonstrate an retailing in E-commerce by using the effectiveness of market research
3. Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra organizational
4. Describe about Consumer Search and Resource Discovery
5. Describe the key features of Internet, Intranets and Extranets and explain how they relate to each other

Semester-IV

Software Engineering

1. Introduction

The Evolving Role of Software, Software Characteristics, Changing Nature ofSoftware, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

2. Requirement Analysis

Software Requirement Analysis, Initiating Requirement EngineeringProcess, Requirement Analysis and Modeling Techniques, Flow   Oriented   Modeling, Need for SRS, Characteristics and Components of SRS.

3. Software Project Management
Estimation in Project Planning Process, Project Scheduling.

4. Risk Management
Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan.

5. Quality Management
Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects.

6. Design Engineering
Design Concepts, Architectural   Design Elements, Software   Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design.

7. Testing Strategies & Tactics

 Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White-Box Testing and their type, Basis Path Testing.

Recommended Books:

1. R.S. Pressman, Software Engineering: A Practitioner_s Approach (7th Edition), McGraw-Hill, 2009.
2. P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.
3. K.K. Aggarwal and Y. Singh, Software Engineering (2nd Edition), New Age International Publishers, 2008.
4. I. Sommerville, Software Engineering (8th edition), Addison Wesley, 2006.

Database Management Systems Theory

1. Introduction
Characteristics of database approach, data models, database system architecture and data Independence.

2. Entity Relationship(ER) Modelling

Entity types, relationships, constraints.

3. Relation data model

Relational model concepts, relational constraints, relational algebra, SQLqueries

4. Database design
5. Mapping ER/EER model to relational database, functional dependencies,Lossless decomposition, Normalforms(upto BCNF).

6. Transaction Processing
ACID properties, concurrency control

7. File Structure and Indexing
Operations on files, File of Unordered and ordered records, overview of File organizations, Indexing structures for files(Primary index, secondary index, clustering index), Multilevel indexing using B and B^+ trees.

Books Recommended:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6   Edition, Pearson Education, 2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6   Edition, McGraw Hill, 2010.

4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education,2013.

Object Oriented Programming using JAVA

OBJECTIVES:
The course should enable the students to:
I. Understand the basic object oriented programming concepts and apply them in problem solving.
II. Illustrate inheritance concepts for reusing the program.
III. Demonstrate on the multi-tasking by using multiple threads.
IV. Develop data-centric applications using JDBC.
V. Understand the basics of java console and GUI based programming.

COURSE LEARNING OUTCOMES (CLOs):
1. Use object oriented programming concepts to solve real world problems.
2. Explain the concept of class and objects with access control to represent real world entities.
3. Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
4. Use overloading methodology on methods and constructors to develop application programs.
5. Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords.
6. Describe the concept of interface and abstract classes to define generic classes.
7. Use dynamic and static polymorphism to process objects depending on their class.
8. Illustrate different techniques on creating and accessing packages (fully qualified name and import statements).
9. Understand the impact of exception handling to avoid abnormal termination of program using checked and unchecked exceptions.

Unit-I   OOPS CONCEPTS AND JAVA PROGRAMMING

OOP concepts: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object oriented programming paradigm.
Java programming: History of java, comments data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow statements, jump statements, simple java stand alone programs, arrays, console input and output, formatting output, constructors ,methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, exploring string class.

Unit-II   MULTIPLE INHERITANCE ,INTERFACES AND PACKAGES

Inheritance: Inheritance hierarchies, super and subclasses, member access rules, super keyword, preventing inheritance: final classes and methods, the object class and its methods; Polymorphism: dynamic binding, method overriding, abstract classes and methods; Interface: Interfaces VS Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface; Packages: Defining, creating and accessing a package, understanding
CLASSPATH, importing packages.

Unit-III   EXCEPTION HANDLING AND MULTITHREADING

Exception Handling: Benefits of exception handling, the classification of exceptions , exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes.
Multithreading: Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication.

Unit-IV   FILES AND CONNECTING TO DATABASE

Files: streams, byte streams, character stream, text input/output, binary input/output, random access file operations, file management using file class: Connecting to Database, querying a database and processing the results, updating data with JDBC.

Unit-V GUI PROGRAMMING AND APPLETS

GUI Programming with Java: The AWT class hierarchy, introduction to swing, swings Vs AWT, hierarchy for swing components.Containers: JFrame, JApplet, JDialog, Jpanel, overview of some swing components: JButton, JLabel, JTextField, JTextArea, simple applications.Layout management: Layout manager types, border, grid and flow.Applets: Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet, passing parameters to applets.

Text Books:

1. Herbert Schildt and Dale Skrien, "Java Fundamentals – A comprehensive Introduction", McGraw Hill, 1st Edition, 2013.
2. Herbert Schildt, "Java the complete reference", McGraw Hill, Osborne, 7th Edition, 2011.
3. T.Budd, "Understanding Object- Oriented Programming with Java", Pearson Education, Updated Edition (New Java 2 Coverage), 1999.

Reference Books:

1. P.J.Dietel and H.M.Dietel , "Java How to program", Prentice Hall, 6th Edition, 2005.
2. P.Radha Krishna , "Object Oriented programming through Java", CRC Press, 1st Edition, 2007.
3. S.Malhotra and S. Choudhary, "Programming in Java", Oxford University Press, 2nd Edition, 2014 .

Web References:

1. http://java.sun.com
2. http://www.oracle.com/technetwork/java/index.html)
3. http://java.sun.com/javase
4. http://www.oracle.com/technetwork/java/javase/overview/index.html
5. http://download.oracle.com/javase/7/docs/api/index.html

List of GE Courses
System Software

OBJECTIVES
- To understand the relationship between system software and machine architecture.
- To know the design and implementation of assemblers
- To know the design and implementation of linkers and loaders.
- To have an understanding of macroprocessors.
- To have an understanding of system software tools.

UNIT I INTRODUCTION
System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming.

UNIT II ASSEMBLERS
Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example -

MASM assembler.

UNIT III LOADERS AND LINKERS
Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features - Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker.

UNIT IV MACRO PROCESSORS
Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro-Implementation example - MASM Macro Processor – ANSI C Macro language.

UNIT V SYSTEM SOFTWARE TOOLS
Text editors - Overview of the Editing Process - User Interface – Editor Structure. - Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.

TEXT BOOK
1. Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2000.

REFERENCES BOOKS
1. D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill, 1999.
2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 1972.

Operating Systems

1.Introduction
Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems , time sharing systems; operating systems for personal computers & workstations, process control & real time systems.

2. Operating System Organization
Processor and user modes, kernels, system calls and system programs.

3. Process Management

System view of the process and resources, process abstraction, process hierarchy, threads, threading

issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter-process communication; deadlocks. Physical and virtual address space; memory allocation strategies –fixed and variable partitions, paging, segmentation, virtual memory.

5. File and I/O Management
Directory structure, file operations, files allocation methods, device management.

6. Protection and Security

Policy mechanism, Authentication, Internal access Authorization.

Recommended Books:
1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.

2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.

3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.

4. W. Stallings, Operating Systems, Internals & Design Principles , 5^{th}India. 2008.Edition, Prentice Hall of

List of AEC Courses

Ethics and Cyber-awareness

Introduction to Cyber law:

Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological

Significance of domain Names, Internet as a tool for global access.

Information Technology Act:

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers

Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

Cyber law and Related Legislation:

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Namesand Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil ProcedureCode, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code,

Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet,Alternative Dispute Resolution , Online Dispute Resolution (ODR).

Electronic Business and legal issues:

Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

Cyber Ethics:

The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.

Reference Books:

1. Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher
2. Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
3. Information Security policy & Implementation Issues, NIIT, PHI
4. Computers, Internet and New Technology Laws, Karnika Seth, Lexis Nexis Butterworths WadhwaNagpur.
5. Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi,
6. Cyber Law, Jonthan Rosenoer, Springer, New York, (1997).
7. The Information Technology Act, 2005: A Handbook, OUP Sudhir Naib,, New York, (2011)
8. Information Technology Act, 2000, S. R. Bhansali,, University Book House Pvt. Ltd., Jaipur (2003).
9. Cyber Crimes and Law Enforcement, Vasu Deva, Commonwealth Publishers, New Delhi, (2003).

Introduction to Business Analytics

Course Objectives:
  1. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
  2. To become familiar with the processes needed to develop, report, and analyze business data.
  3. To learn how to use and apply programming languages to solve business problems

Syllabus :
Unit 1 : Overview of Business Analytics. Visualization/ Data Issues: Organization/sources of data, Importance of data quality, Dealing with missing or incomplete data, Data Classification.

Unit 2 : Introduction to Data Mining : Data Mining Process, Market Basket Analysis, Classification, Clustering and Prediction.

Unit 3 : Introduction to Decision Modeling : Optimization in business problems: marketing mix, capital budgeting, portfolio optimization, Decision Making under Uncertainty : inventory management, capital investment analysis, market share estimation, sensitivity analysis.

Reference Book:
1. R. N. Prasad and Seema Acahrya, Fundamentals of Business analytics, 2nd Edition, Wiley, 2016.
2. U Dinesh Kumar, Business Analytics: The science of Data driven decision making, Wiley, 1st Edition, 2017.
3. Regi Mathew, business Analytics for decision making, 1st edition, Pearson, 2020.

Outcome of the course:

1. Construct data models and prototypes needed to gain stakeholder support or achieve business objectives.
2. Organize big data sets into meaningful structures, incorporating data profiling and quality standards.
3. Incorporate the data analysis framework for optimal performance.
4. Perform a needs assessment and analytical problem framing.