Learning Outcomes based Curriculum Framework (LOCF)

BACHELOR of COMPUTER APPLICATION
(B.C.A)

as a Subject
2022

Choice Based Credit System (CBCS)

PANSKURA BANAMALI COLLEGE
(Autonomous)

Choice Based Credit System (CBCS)

PANSKURA BANAMALI COLLEGE
(Autonomous)

2022

Table of Contents

Sl. No.		Title	Page No.
		Preamble	4
1.	**Introduction**		5
2.	**Learning Outcomes-based approach to Curriculum Planning**		6
	2.1.	**Nature and extent of Bachelor's Degree Programme**	6
	2.2.	**Aims of Bachelor's Degree Programme in BCA**	7
	2.3.	**Key outcomes underpinning curriculum planning and development**	7
3.	**Graduate Attributes in BCA**		7
	3.1.	**Disciplinary knowledge**	7
	3.2.	**Communications skills**	8
	3.3.	**Critical thinking and analytical reasoning**	8
	3.4.	**Problem solving**	8
	3.5.	**Research-related skills**	8
	3.6.	**Information/digital literacy**	8
	3.7.	**Self-directed learning**	8
	3.8.	**Moral and ethical awareness/reasoning**	8
	3.9.	**Lifelong learning**	9
4.	**Qualification descriptors for BCA as a subject**		9
5.	**Programme Learning Outcomes of BCA as a subject**		10
6.	**Structure of BCA**		11
	6.1.	**Course learning outcomes**	11
		6.1.1. Credit distribution for BCA	13
	6.2.	**Contents for each course**	13
		6.2.1. Contents of courses for B.Sc. (Hons) BCA	13
	6.3.	**References for each course**	42
7.	**Teaching-Learning Process**		43
8.	**Assessment Methods**		45
9.	**Keywords**		46

Preamble

The LOCF (Learning Outcomes based Curriculum Framework) committee constituted by Academic Council of Panskura Banamali College(Autonomous) is pleased to submit its report concerning the syllabus in **BACHELOR OF COMPUTER APPLICATION (B.C.A)** as a subject. The committee discussed the framework of syllabi in its meetings and suggests the implementation of these syllabi in the Departments of **B.C.A** in Institutes based on following facts:

1. The learning outcomes of each paper are designed so that these may help learners to understand the main objectives of studying the course.

2. This will enable learners to select elective papers depending on the individual inclinations and contemporary requirements.

3. The objectives of LOCF are to mentally prepare the students to learn **B.C.A** leading to graduate degree with honors in **B.C.A** as a subject.

4. These syllabi in **B.C.A** under CBCS are recommended keeping in view of the wide applications of Computer in science, engineering, social science, business and a host of other areas.

5. The study of the syllabi will enable the students to be equipped with the state of the art of the subject and will empower them to get jobs in technological and engineering fields as well as in business, education and healthcare sectors.

6. The LOCF committee in **B.C.A** has prepared this draft paying suitable attention to objectives and learning outcomes of the papers. These syllabi may be implemented with minor modifications with appropriate justifications keeping in view regional, national and international context and needs.

7. The outcomes of each paper may be modified as per the local requirements.

8. The text books mentioned in references are denotative/demonstrative. The divisions of each paper in units are specified to the context mentioned in courses. These units will help the learners to complete the study of concerned paper in certain periods and prepare them for examinations.

9. The papers are organized considering the credit load in a particular semester. The core papers of general interest are suggested for semesters I to IV. The elective courses and advanced courses are proposed for the B.Sc. (Hons.) students of semesters V & VI and the elective courses for the students of B.Sc. semesters V & VI having **B.C.A** as a subject.

10. The **B.C.A** is a vast subject with immense diversity. Hence it is very difficult for every student to learn each branch of computer, even though each paper has its unique importance.

Under these circumstances, LOCF in **B.C.A** suggests a number of elective papers along with compulsory papers. A student can select elective papers as per her/his needs and interests.

11. The committee expects that the papers may be taught using various Computer program software such as Turbo C/C++ , Visual Basic, VB Dot Net, Python, Mathematica, MATLAB etc. conceptual understanding and to widen up the horizon of students' self-experience.

12. The committee of the LOCF in **B.C.A** expects that the concerned departments/colleges/institutes/universities will encourage their faculty members to include necessary topics in addition to courses suggested by LOCF committee. It is hoped that the needs of all round development in the careers of learners/students will be fulfilled by the recommendations of LOCF in **B.C.A**.

Learning Outcomes-based Curriculum Framework in B.C.A as a subject

1. Introduction

Programme learning outcomes will include subject-specific skills and generic skills, including transferable global skills and competencies. It would also focus on knowledge and skills that prepare students for further study, employment, and citizenship. They help ensure comparability of learning levels and academic standards across colleges/universities and provide a broad picture of the level of competence of graduates.

The quality education in a subject like **B.C.A** is a very challenging task for Higher Education System in India. UGC has already taken an appropriate measure to define the minimum levels of learning for **B.C.A** courses for undergraduate (BCA) and post-graduate(MCA) levels. The quality of higher education in **B.C.A** should be improved in such a manner that young minds are able to compete in this field globally in terms of their knowledge and skills in the globalised era of the date. Also, there is an urgent need of sustained initiatives to be taken by colleges/institutes/universities for outcome-oriented higher education in **B.C.A** so that graduates are enabled to enhance the chances of employability.

Objective of B.C.A program:

To provide a foundation of

- ✓ Computing Principles
- ✓ Programming Language
- ✓ Business practices for effectively using/managing information systems
- ✓ Enterprise software
- ✓ Application software.
- ✓ Higher Study and Research
- ✓ Good Academician
- ✓ Placement into Government / Corporate sector.

Outcomes of B.C.A program:

An ability to apply knowledge and practice of

- ✓ Mathematics,
- ✓ Computer science
- ✓ Management
- ✓ Academic Activity
- ✓ Employable for Government / Corporate sector.

2. Learning Outcomes-based approach to Curriculum Planning

The Bachelor's Degree in **B.C.A** as a subject, is awarded to the students on the basis of knowledge, understanding, skills, attitudes, values and academic achievements sought to be acquired by learners at the end of these programmes. Hence, the learning outcomes of **B.C.A** for these courses are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for knowledge of BCA.

The LOCF in **B.C.A** has designed courses in the light of graduate attributes, description of qualifications, courses and programme learning outcomes. The committee has tried to frame the syllabi of **B.C.A** in such a way that it may lead to all round development and delivery of complete curriculum planning. Hence, it provides specific guidelines to the learners to acquire sufficient knowledge during this programme.

The objectives of LOCF (**B.C.A**) is to prepare the syllabi having standard level of study. It is also aimed at prescribing standard norms for teaching-learning process and**3**examination pattern. Hence, the programme has been chalked out in such manner that there is scope of flexibility and innovation in

i. Modifications of prescribed syllabi.
ii. Teaching-learning methodology.
iii. Assessment technique of students and knowledge levels.
iv. Learning outcomes of courses.
v. Inclusion of new elective courses subject to availability of experts in institutes across the country.

2.1. Nature and extent of Bachelor's Degree Programme

B.C.A is the study of quantity, structure, space and change. It has very broad scope in science, engineering and social sciences. The key areas of study in B.C.A. are:

1. Computer Programming
2. Computer Architecture and Organization,
3. Design and Analysis of Data structure and Algorithm
4. Data Base Management System
5. Operating System
6. Computer Network and Communication and Network Security
7. Compiler Design and Computation
8. Software Engineering and Management

Degree programs in **B.C.A** cover topics which are already mentioned in details under various headings in Section 6. The depth and breadth of study of individual topics depend on the nature and devotion of learners in specific **B.C.A** programmes.

As a part of effort to enhance employability of **B.C.A** graduates, the courses have been designed to include learning experiences, which offer them opportunities in various sectors of human activities. In this context, the experience of the project work in the areas of applications of **B.C.A** has a key role.

2.2. Aims of Bachelor's degree programme in B.C.A

The overall aims of **B.C.A** as a subject are to

- Create deep interest in learning **B.C.A**.

- Develop broad and balanced knowledge and understanding of definitions, concepts, principles and theorems.
- Familiarize the students with suitable tools of mathematical analysis to handle issues and problems in **B.C.A** and related sciences.
- Enhance the ability of learners to apply the knowledge and skills acquired by them during the programme to solve specific theoretical and applied problems in **B.C.A**.
- Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science and its allied areas on multiple disciplines concerned with Computer Science.
- Encourage the students to develop a range of generic skills helpful in employment, internships and social activities.

2.3. Key outcomes underpinning curriculum planning and development

The LOCF in **B.C.A** desires to propose the courses of BCA for **B.C.A** as a subject, based on the expected learning outcomes and academic standards which are necessary for the graduates after completing these programmes. The committee considered and discussed the following factors seriously:

i. Framing of syllabi
ii. Learners attributes
iii. Qualification descriptors
iv. Programme learning outcomes
v. Course learning outcomes
vi. Necessity of having elective courses
vii. Applications of **B.C.A**
viii. Employability in Information Technology(IT), banking, finance and other sectors.

3. Graduate Attributes in B.C.A

The graduate attributes in **B.C.A** are the summation of the expected course learning outcomes mentioned in the beginning of each course. Some of them are stated below.

3.1. Disciplinary knowledge:

Capability of demonstrating comprehensive knowledge of BCA and understanding of one or more disciplines which form a part of an undergraduate programme of study.

3.2. Communications skills:

i. Ability to communicate various concepts of **B.C.A** effectively using examples and their geometrical visualizations.
ii. Ability to use BCA as a precise language of communication in other branches of human knowledge.
iii. Ability to communicate long standing unsolved problems in **B.C.A**.
iv. Ability to show the importance of **B.C.A** as precursor to various scientific developments since the beginning of the civilization.
v. Ability to explain the development of **B.C.A** in the civilizational context and its role as queen of all sciences.

3.3. Critical thinking and analytical reasoning:

i. Ability to employ critical thinking in understanding the concepts in every area of **B.C.A**.
ii. Ability to analyze the results and apply them in various problems appearing in different branches of **B.C.A**.

3.4. Problem solving:

i. Capability to solve problems in computer graphics using concepts of linear algebra.

ii. Capability to solve various models such as growth and decay models, radioactive decay model, drug assimilation, LCR circuits and population models using techniques of differential equations.
iii. Ability to solve linear system of equations, linear programming problems and network flow problems.
iv. Ability to provide new solutions using the domain knowledge of **B.C.A** acquired during this programme.

3.5. Research-related skills:

i. Capability for inquiring about appropriate questions relating to the concepts in various fields of **B.C.A**.
ii. To know about the advances in various branches of **B.C.A**.

3.6. Information/digital literacy:

i. Capability to use appropriate softwares to solve system of equations and differential equations.
ii. Capability to understand and apply the programming concepts of C/C++ to computing investigations and problem solving.

3.7. Self-directed learning:

Ability to work independently and do in-depth study of various notions of **B.C.A**.

3.8. Moral and ethical awareness/reasoning:

Ability to identify unethical behavior such as fabrication, falsification or misrepresentation of data and adopting objective, unbiased and truthful actions in all aspects.

3.9. Lifelong learning:

Ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning.

4. Qualification descriptors for B.C.A as a subject

The qualification descriptor suggests the generic outcomes and attributes to be obtained while obtaining the degree of **B.C.A** as a subject. The qualification descriptors indicate the academic standards on the basis of following factors:

i. Level of knowledge
ii. Understanding
iii. Skills
iv. Competencies and attitudes
v. Values.

These parameters are expected to be attained and demonstrated by the learners after becoming graduates in these programmes. The colleges/institutes/universities should consider the above mentioned parameters at the time of designing, approving, assessing and reviewing academic programmes containing common courses for B.Sc. (Hons) **B.C.A** as a subject. The learning experiences and assessment procedures should be so designed that every graduate with BCA may achieve the programme learning outcomes with equal opportunity irrespective of the class, gender, community and regions. Each graduate in **B.C.A** should be able to:

i. demonstrate fundamental systematic knowledge of BCA and its applications in Computer Science and engineering, science, technology and mathematical sciences. It should also enhance the subject specific knowledge and help in creating jobs in various sectors.

ii. demonstrate educational skills in areas of analysis, geometry, algebra, mechanics, differential equations etc.

iii. apply knowledge, understanding and skills to identify the difficult/unsolved problems in BCA and to collect the required information in possible range of sources and try to analyse and evaluate these problems using appropriate methodologies.

iv. fulfil one's learning requirements in BCA, drawing from a range of contemporary research works and their applications in diverse areas of mathematical sciences.

v. apply one's disciplinary knowledge and skills in BCA in newer domains and uncharted areas.

vi. identify challenging problems in **B.C.A** and obtain well-defined solutions.

vii. exhibit subject-specific transferable knowledge in **B.C.A** relevant to job trends and employment opportunities.

5. Programme Learning Outcomes of B.C.A as a Subject

1. Bachelor's degree in **B.C.A** is the culmination of in-depth knowledge of Computer Programming ,Computer Architecture and Organization, Design and Analysis of Data structure and Algorithm, Data Base Management System, Operating System, Computer Network and Communication and Network Security, Compiler Design and Computation, Software Engineering and Management and several other branches of **B.C.A**. This also leads to study of related areas like computer science and statistics. Thus, this programme helps learners in building a solid foundation for higher studies in **B.C.A**..

2. The skills and knowledge gained has intrinsic beauty, which also leads to proficiency in analytical reasoning. This can be utilized in modeling and solving real life problems.

3. Students undergoing this programme learn to logically question assertions, to recognize patterns and to distinguish between essential and irrelevant aspects of problems. They also share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to learn behave responsibly in a rapidly changing interdependent society.

4. Students completing this programme will be able to present **B.C.A**. clearly and precisely, make vague ideas precise by formulating them in the language of BCA, describe computational ideas from multiple perspectives and explain fundamental concepts of computer to others.

5. Completion of this programme will also enable the learners to join teaching profession in primary and secondary schools.

6. This programme will also help students to enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

6. Structure of B.Sc. B.C.A.

6.1. Course learning outcomes

Course learning outcomes of each course in **B.C.A**. as a subject have been enshrined in the beginning of course contents of each course.

CORE COURSES (14) of B.C.A.

Program outcomes	Programming using C	Digital Electronics	Data Structure	Discrete Mathematics	DBMS	OOP using C++	Operating System	System Programming	OPP using JAVA	Computer Network	Analysis of Algorithm	Computer Organization	Dot Net	Automata and Compiler
Disciplinary knowledge	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Communicating thinking	√	√	√	√	√	√	√		√	√	√	√	√	
Critical thinking	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Analytical solving	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Problem related skills	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Research literacy				√						√		√	√	
Information literacy	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Digital	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Self-directed learning skills learning	√ √ √	√	√ √ √	√	√	√	√ √ √	√	√	√	√	√	√	√ √ √
Professional skills	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Application														
Experiment al learning	√		√	√			√	√	√	√				√
Employability options	√ √	√	√ √	√	√		√ √	√	√ √	√ √			√	√ √

DISCIPLINE SPECIFIC ELECTIVE COURSES (Any Four)

Program	Software Engineering and UML	Android Programming	Webpage Design	Programming Using Python	Profession Values and Ethics	Soft Skill	Entrepreneurship Development	Advance DBMS	Mobile Computing	Wireless Sensor Networking	Linux and Shell Programming	Cloud Computing	Bio-informatics	Artificial Intelligence and Soft Computing	Project/Seminar/Grand Viva
Disciplinary knowledge	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Communicating thinking	√	√			√	√		√	√		√	√		√	
Critical thinking	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Analytical solving	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Problem related skills	√	√	√	√	√	√	√	√	√	√	√		√	√	
Research literacy	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Information literacy			√	√	√				√			√			
Digital learning			√	√	√				√			√			
Self-directed learning	√	√	√	√	√	√		√	√	√	√	√		√	√
Lifelong skills	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Professional skills	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Application															
Experiment al learning			√	√	√	√		√	√		√	√	√		
Employability options				√	√	√		√	√		√	√	√		

BCA

GENERIC PAPER(any 4)

Program outcomes	Linear Algebra	Numerical Computing	Operation Research	Graph Theory
Disciplinary knowledge	√	√	√	√
Communication skills	√	√	√	√
Critical thinking	√	√	√	√
Analytical thinking	√	√	√	√
Problem solving	√	√	√	√
Research related skills	√	√	√	√
Information literacy		√	√	√
Digital literacy	√	√		√
Self-directed learning		√		
Lifelong learning	√	√	√	√
Professional skills	√		√	√
Applicational skills	√	√	√	√
Experimental learning	√	√	√	
Employability options			√	

Skill Enhancement Courses (Any Two)

Program outcomes	Web Technology	Computer Graphics and Multimedia	PHP	HTML	XML	ASP	JAVA Script	Photoshop	Animation	Video Flash	Webpage Design	My Sql Coding	Audio Mixing	Page Maker
Disciplinary knowledge	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Communication skills	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Problem thinking	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Research thinking	√		√		√	√		√	√		√	√	√	√
Information solving	√	√	√		√	√	√	√				√	√	√
Digital related skills			√			√						√	√	√
Self-literacy learning		√	√		√	√	√	√		√		√	√	
literacy learning directed		√	√		√	√	√	√		√		√	√	√
	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lifelong Application	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Professional	√	√	√	√	√	√	√	√	√	√	√	√	√	√
skills Employabilial skills		√	√		√	√	√	√		√		√	√	√
l learning ty options	√	√	√	√	√	√	√	√	√	√	√	√	√	√

6.1.1. Credit distribution for B.C.A.

Sl. No.	Nature of Papers	Total No. of Papers	Credits in Theory+(Tutorial/Practical)	Total Credits
1.	Core Papers	14	06	84
2.	DSE (Discipline Specific Electives) Papers	04	06	24
3.	Generic Electives /Interdisciplinary	04	06	24
4.	Ability Enhancement Papers	02	02+04	06
5.	Skill Enhancement Papers	02	02	04
Total Papers/Credits		**26**	**--**	**142**

6.2. Contents for each course

6.2.1. Contents of courses for BCA

SEMESTER	CORE COURSE (14)	ABILITY ENHANCEMENT COMPULSORY COURSE (AECC) (2)	SKILL ENHANCEMENT COURSE (SEC) (2)	ELECITIVE : DISCIPLINE SPECIFIC (DSE) (4)	ELECTIVE : GENERIC (GE) (4)
I	Introduction to Programming using C Computer Fundamental with Digital Electronics	AECC1			GE-1
II	Data Structure Discrete Mathematics	AECC2			GE-2
III	DBMS Object Oriented using C++ Operating System		SEC – 1		GE - 3
IV	System Programming OOPS Using JAVA Data Communication & Computer Network		SEC - 2		GE - 4
V	Analysis of Algorithm & Graph Algorithm Micro Processor & Computer Organization			DSE - 1 DSE – 2	
VI	. (DOT) NET Theory of Automata and Compiler Design			DSE – 3 DSE – 4	

Core Papers(C): (Credit:06 each) (1period/week for tutorials or 4periods/week of practical)

1. **Introduction to Programming using C**
2. **Computer Fundamental with Digital Electronics**
3. **Data Structure**
4. **Discrete Mathematics**
5. **Data Base Management System (DBMS)**
6. **Object Oriented using C++**
7. **Operating System**
8. **System Programming**
9. **OOPS Using JAVA**
10. **Data Communication & Computer Network**
11. **Analysis of Algorithm & Graph Algorithm**
12. **Micro Processor & Computer Organization**
13. **. (DOT) NET**
14. **Theory of Automata and Compiler Design**

Discipline Specific Elective Papers: (Credit:06 each)–DSE-1, DSE-2,DSE-3,DSE-4.

DSE –1 (any one)

DSE –1 .a. Software Engineering with OOADs using UML
DSE –1 .b. Android Programming
DSE –1 .c. Web page design using PHP/My SQL
DSE –1 .d. Programming using Python

DSE –2 (any one)

DSE –2.a. Tour (IT Based Company, Hub, Park, Institute, Industry, Workshop etc.)
DSE –2.b. Profession Values & Ethics
DSE –2.c. Entrepreneurship Development
DSE –2.d. Soft Skill

DSE –3 (any one)

DSE –3.a. Advance DBMS
DSE –3.b. Mobile Computing
DSE –3.c. Wire Less Sensor Networking
DSE –3.d. Unix/Linux & Shell Programming

DSE –3 Project

DSE –4 (any one)

DSE –4 .a. Cloud Computing
DSE –4.b. Bio-informatics
DSE –4.c. Artificial Intelligence
DSE –4.d. Soft Computing

DSE –4 Seminar/Term paper/Grand Viva

Skill Enhancement Courses (Credit: 02 each): SEC–1,SEC–2

SEC–1

SEC–1.**i. Web Technology & Internetworking [Web Page Design Using HTML]**
SEC–1.**ii. Web Technology & Internetworking [Web Page Design Using XML]**
SEC–1.**iii. Web Technology & Internetworking [Web Page Design Using Java Scripts]**
SEC–1.**iv. Web Technology & Internetworking [Web Page Design Using PHP/My SQL]**

SEC–2

SEC–2.**i. Computer Graphics & Multimedia [Photoshop Design]**
SEC–2.**ii. Computer Graphics & Multimedia [Audio & Video editing]**
SEC–2.**iii. Computer Graphics & Multimedia [Animation designing]**
SEC–2.**iv. Computer Graphics & Multimedia [Page Maker]**

Generic Elective (GE)
Other Discipline (Four papers)–GE1 to GE4

GE1: Linear Algebra (Theory)

GE2: Numerical Computing (Theory)

GE2: Numerical Computing Lab (Tutorial /Lab)

GE3: Operation Research (Theory)

GE4: Graph Theory (Theory)

ABILITY ENHANCEMENT COMPULSORY COURSE (AECC) (2)

Ability Enhancement Compulsory Course (AECC) – I :

English/MIL communications/ Environmental Science

Ability Enhancement Compulsory Course (AECC) – II :

Environmental Science/English/MIL communications

***

Core Course (CC)

Objectives:

The student teachers will be able to:-

- ✓ Provide a strong foundation in fundamentals of computers.
- ✓ Prepare the students with exceptional skills of problem solving, communication and leadership skills.
- ✓ Facilitate overall understanding of the requirements of the subjects.
- ✓ Prepare the students to provide professional solutions to real time problems.

Paper-CC1: Introduction to Programming using C

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- ➢ Understanding a functional hierarchical code organization.
- ➢ Ability to define and manage data structures based on problem subject domain.
- ➢ Ability to work with textual information, characters and strings.
- ➢ Ability to work with arrays of complex objects.
- ➢ Understanding a concept of object thinking within the framework of functional model.
- ➢ Understanding a concept of functional hierarchical code organization.
- ➢ Understanding a defensive programming concept. Ability to handle possible errors during program execution.

UNIT-I: Introduction: -Scope of C Language Distinction and similarities with other HLLs Special features and Application areas .Elements of C :-Character Set, Key Words, Data Types ,Constants and Variables Operators unary, binary, ternary , Operator precedence ,Console Input/Output :-Types of IO , Console IO ,Unformatted console IO: getchar (), Gets(), Puts(),Formatted IO : Scanf(), Printf(),String Handling

UNIT-II: Control Flow: - Statements and blocks, If , Switch, Loops: For, While, Do While, Go to and labels

UNIT-III: Arrays: -Basic Concepts, Memory Representation, One Dimensional Arrays, Two Dimensional Arrays, Three Dimensional Arrays

UNIT-IV: Functions:- Basic concept, Declaration and prototype , Calling Arguments , Call by value and call by reference, Scope rules Recursion, Storage classes types, Library of functions math, string, system

UNIT-V: Pointers:- Basic Concepts ,&, * Operator ,Pointer expression: assignment, arithmetic, comparison ,Dynamic Memory Allocation , Pointer V/S Array , Array of Pointer , Pointer V/S Function

UNIT-VI: Structure, Union and Enumerated Data Types:-Basic Concepts, Declarations and Memory Map, Elements of Structures, Structure V/S Function, Structure V/S Array, Union, Enumerated data Types: Type Def, Enum Self-referential structures

UNIT-VI: File Handling: Types of Files File Organization Opening, Reading, Writing, Closing Text and binary file

Reference Books:

1. C Programming, StephenKochan
2. Programming with C, Schaum's Series
3. C Programming , V. Balaguru Swami
4. Let Us C, YashwantKanetkar
5. Programming in C: A Practical Approach, Ajay Mittal

Paper-CC2: Computer Fundamental with Digital Electronics

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- ➢ Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
- ➢ To understand and examine the structure of various number system and its application in digital design.
- ➢ The ability to understand , analyze and design various combinational and sequential circuits.
- ➢ Ability to identify basic requirements for a design application and propose a cost effective solution.
- ➢ Ability to identify and prevent various hazards and timing problems in a digital design.
- ➢ To develop skill to build and troubleshoot digital circuits.

UNIT-I: Overview- A brief introduction of computer generation. Types of computer (Micro, Mini, Mainframe, Super), Machine language & Assembly language, High level language, Type of Software.
UNIT-II: Computer Basic: Need and application of computers, hardware and software, organization of computer, concept of algorithm and flow charts.
UNIT -III: Data and number representation- binary-complement representation BCD-ASCII, Gray Code, conversion of numbers form one system to the other, 2's Complement representation, binary arithmetic, Code Conversion.

UNIT-IV: Logic gates, basic logic operations, truth tables, Boolean expression, simplification using KMAP, Prime Implicate. Combination circuits, adders, Subtractor, Decoder, encoder, Multiplexer, Sequential circuits, flip-flops, Registers, counter (Async & Sync).
UNIT-V: Memory circuits, ROM, PROM, EPROM and dynamic RAM, Digital Components. Seven segment display.
UNIT-VI: Different types of A/D and D/A conversion techniques , Different Logic families- TTL, ECL, MOS and CMOS, their operation, design and specifications

Reference Books:

1. Raja Raman. V: Fundamentals of computers, PHI
2.Fundamentals of Digital Circuits, Anand Kumar, PHI
3.Digital Electronics, Tokheim, TMH
4.Digital Electronics, S. Rangnekar, ISTE/EXCEL
5.Digital Logic & Computer Design, M. Morris Mano
6.Introduction to Digital Computer Design, An, 5th ed., Rajaraman& Radhakrishnan

Paper-CC3: Data Structure

Course Learning Outcomes:
After course completion the students will have the following learning outcomes:

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

Unit I : Development of Algorithms: Notations & Analysis, storage structures for arrays, Arrays Pointer ,Sparse matrices- Structures & Arrays of structures.
Unit II : Linked list (Single linked list, double linked list, circular linked list), Application of linked list (Polynomial manipulation), Stack & Queue (Implementation of stack as an array and linked list, Application of Stack, Implementation of Queue as an array and linked list,). Infix , prefix and postfix expression and their conversion. Various types of queue. De-queue.
Unit III : Tree, Binary Trees, Binary search trees, General trees, Tree Traversing, Operations on Binary trees, Expressions manipulations, Height Balanced Trees. B Tree, B+ Tree
Unit IV: Graphs, Graphs Representation, Path matrix-BFS, DFS- Bi-connected graphs, shortest path problems.
Unit V: Sorting (Selection, Bubble, Insertion, Merge, Quick), Linear Searching, Binary Searching.
Unit- VI: Hashing, Different problem in Hashing and their solutions.

Reference Books:

1. Michel Townsend, "Discrete Mathematics: Applied Combinatorics and graph theory", The Benjamin/Cummings Publishing Company", California.
2. Kenneth H Rosen. "Discrete Mathematics and Its Applications, Tata McGrahHill Publishing Company, New Delhi.
3. Robin J. Wilson, "Introduction to Graph Theory" Pearson Education Asia, New Delhi.
Data Structure using C – Rajni Jindal – Umesh Publication
5.Data Structure using C – B. BalujaDhanpatrai Publication
6.Classic Data Structures, 2nd ed., Samanta
7.Data Structures Using C and C++, 2nd ed., Langsam, Augenstein& Tenenbaum

Paper-CC4: Discrete Mathematics

Course Learning Outcomes:
After course completion the students will have the following learning outcomes:

- Students completing this course will be able to express a logic sentence in terms of predicates, quantifiers, and logical connectives.
- Students completing this course will be able to apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.
- Students completing this course will be able to use tree and graph algorithms to solve problems.
- Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.

UNIT-I: Set theory. Relations and functions: Set notations and description, subsets, basic set operations. Venndiagrams, laws of set theory, partition of sets, basic definitions of relations and functions, properties of relations; injective, surjective and bijective functions, composition.

UNIT-II: Combinations: Rule of products, permutations, combinations. Algebra of Logic: Propositions and logic operations, truth tables and propositions generated by set, equivalence and implication laws of logic, mathematical system, and propositions over a universe, mathematical induction. Recursion and recurrence: The many faces of recursion, recurrence, relations, and some common recurrence relations, generating functions.

UNIT-III: Algebric Structures: Table of operation, properties of binary operations, semigroup, subsemigroup, free semigroup, product of semigroup, congruence relation, monoid, submonoid, group, subgroup, cyclic group, coset, order of group, order of element, normal subgroup, homomorphisms, Isomorphism, Automorphism, Rings, Types of rings, subrings, Integral domain, Field.

UNIT-IV: Posets, Lattices and Boolean Algebra: Poset, Hasse Diagram, Lattices, sublattics, Boolean Algebra,BooleanExpression, Principal of Duality, K-Map, Simplification using K-Map.

Reference Books:

1. Engineering Mathematics, Vol:1 & Vol:2, Sastry,PHI
2. University Algebra through 600 Solved Problems, N. S. Gopalakrishnan, New Age International
3. Engineering Mathematics, Arumugam, SCITECH
4. Discrete Mathematics and Graph Theory, Satyanarayana & Prasad
5. Discrete Mathematics with Graph Theory, 3rd ed., Goodaire& Parmenter
6. Discrete Mathematics and Graph Theory, 2nd ed., Biswal
7. Discrete Mathematics, Rajendra Akerkar and Rupali Akerkar
8. Discrete Mathematics, Babu Ram

Paper-CC5: Data Base Management System (DBMS)

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- 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.

UNIT-I - Overview of DBMS. Introduction to DBMS, Data, Information and knowledge, Increasing Use of Data as a Corporate Resources, Data Independence, Database, Administrative Roles, DBMS Architecture, Different kind of DBMS Users, Importance of Data Dictionary, Contents of Data Dictionary, Types of Database Languages, Data Models.

UNIT-II - Traditional Database Model Over Relational Database Model. Traditional Model, Hierarchical, Network, Relational Model, Data Definition and Data Manipulation , Constructs in each of the three models, A Comparison of Three Models, Relational Model, Definition of relation and properties of relation model, Concept of Keys (Candidate Keys, Primary Key, Alternate Key, Foreign Key), Relational Algebra, Different Types of Join (Theta Join, Eque Join, Natural Join, Outer Join), Simple and Complex Queries using Relational Algebra.

UNIT- III - Structured Query Languages. Create Simple Queries Using (Where, Like, Group By, Having, Order By), View table Structure, Temporary Tables.

UNIT-IV - Database Design. ANSI/SPARC 3-Level Architecture, Conceptual Model, Logical Model, Physical Model, Entity, Relational Model, ER Diagram, Strong and Weak Entities, Generalization, Specialization and Aggregation, Converting and ER Model to Relation Schema,

UNIT-V: Normalization, Functional Dependencies, Multi-Value Dependencies, Join Dependencies, Normal Forms, Issue of Physical Design, Concepts of Indexed, File Organization for Relational Tables, De- Normalization, Clustering of Tables, Clustering Indexes.

Reference Books:

1. The complete reference-By Coach and loney
2. A Beginners guide- By Abbey and corney
3. Database System-Elmasri and Navathe
4. Database system concepts- Silberschatz Abraham Korth Henry F. Jt. auth. Sudarshan S. Jt. Auth.
5. Database management system oracle SQL and PL/SQL- Das Gupta Pranab Kumar

Paper-CC6: Object Oriented using C++

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- 1 Ability to describe the concepts of object-oriented programming.
- Ability to handle interfaces, class hierarchies and exceptions in programs.
- Ability to construct appropriate diagrams and textual descriptions to communicate the static structure and dynamic behavior of an object oriented solution .
- Ability to design and develop Object Oriented systems

Unit I - Introduction to OOPs and C++ Element. Introduction to OOPs, Features & Advantages of OOPs, Different element of C++ (Tokens, Keywords, Identifiers, Variable, Constant, Operators, Expression, String).

Unit II - Program Control Statements. Sequential Constructs, Decision Making Construct, Iteration / Loop Construct, Arrays, Functions (User defined Function, Inline Function, Function Overloading), User Defined Data Types (Structure, Union and Enumeration).

Unit III - Class, Object, Constructor & Destructor. Class, Modifiers (Private, Public & Protected), Data Member, Member Function, Static Data Member, Static Member Function, Friend Function, Object, Constructor (Default Constructor, Parameterized Constructor and Copy Constructor), Destructor.

Unit IV - Pointer, Polymorphism & Inheritance. Pointer (Pointer to Object, this Pointer, Pointer to Derive Class), Introduction to Polymorphism (Runtime Polymorphism, Compile time Polymorphism), Operator Overloading, Virtual Function, Inheritance (Single Inheritance, Multiple Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Hybrid Inheritance), Virtual Base Class, Abstract Class.

Unit V - File Handling, Exception Handling. Files I/O, Exception Handling (Exception Handling Mechanism, Throwing Mechanism, Catching Mechanism, Re-throwing an Exception).

Reference Books:

1.E. Balaguruswami – Object Oriented programming with C++
2.Kris James – Success with C++
3.David Parsons – Object Oriented programming with C++
4.D. Ravichandran – Programming in C++
5.Dewhurst and Stark – Programming in C++
6.Venugopal, Ravishankar, Rajkumar – Mastering C++

Paper-CC7: Operating System

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- an ability to understand basic concepts about operating system.
- an ability to describe process management ,scheduling and concurrency control mechanisms.
- an ability to analyze memory management and deadlocks.
- an ability to compare various file systems and its operating systems examples.

UNIT-I: Introduction [4L] : Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

UNIT-II: System Structure[3L] : Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

UNIT-III: Process Management : Processes [3L]: Concept of processes, process scheduling, operations on processes, co-operating processes, inter- process communication. Threads [2L]: overview, benefits of threads, user and kernel threads. CPU scheduling [3L]: scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling. Process Synchronization [5L]: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

UNIT-IV: Deadlocks [4L]: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

UNIT-V: Storage Management : Memory Management [5L]: background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging. Virtual Memory [3L]: background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing. File Systems [4L]: file concept, acces s methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

UNIT-VI: I/O Management [4L]: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and nonblocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

UNIT-VII: Disk Management [3L]: disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN) , disk reliability, disk formatting, boot block, bad blocks.

UNIT-VIII: Protection & Security [4L] : Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption. Case study: UNIX.

Reference Books:

1.Milenkovie M., "Operating System : Concept & Design", McGraw Hill.
2.Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.
3.Silbersehatz A, P.B. Galvin and G.Gagne, "Operating System Concepts", Wiley.
4.Dhamdhere: Operating System TMH
5.Stalling, William, "Operating Systems", Maxwell McMillan International Editions, 1992.
6.Dietel H. N., "An Introduction to Operating Systems", Addison Wesley.
7. Systems Programming, Donovan, Tata Mc Graw Hill
8. System Programming, Dhamdhere (IInd Revised Edition), Tata Mc Graw Hill
12. Sen James A. – Analysis & Design of Information Systems
13. Lee-Introductory Systems Analysis and Design
14. Wetherbe James C. Systems Analysis & Design

Paper-CC8: System Programming

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Learn basic concepts of operating systems and system software's.
- Design of operating systems and system software's.
- Learn the functioning of the principal parts of an operating system.

UNIT-I: Introduction to Systems Programming, Introduction to Assembly Language Programming - Introduction to Instruction Formats, Data formats - Role of Base Register, Index Register.
UNIT-II: Introduction to Assembler, databases used in assembler design, Design of Assembler - Single Pass Double Pass. Introduction to Macros, various types of Macros, Design of Macro Processor - Single Pass & Double Pass.
UNIT-III: Introduction to Loaders, functions of a loader, types of Loaders, databases used in Loaders, Design of Loaders - Absolute & DLL.
UNIT-IV: Introduction to compilers: a brief discussion on various phases of compilers. Applications of FSM and grammars in compiler design.
UNIT-V: Introduction to Software Tools, Text editors, Interpreters, Program Generators, Debug Monitors.

Reference Books:

1. Computer Organization – V. Carl Hamacher&Zvonko G. Vransic – McGraw Hill
2. Computer Architecture & Logic Design – Thomas C. Barty - McGraw Hill
3. Computer Organization – J.P. Heys
4. Digital Computer – Morris Mano – Pearson.

Paper-CC9: OOPS Using JAVA

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Ability to describe the concepts of object-oriented programming with Java.
- Ability to handle interfaces, class hierarchies and exceptions in programs.
- Ability to construct appropriate diagrams and textual descriptions to communicate the static structure and dynamic behavior of an object oriented solution .
- Ability to design and develop Object Oriented systems with Java.

UNIT I - Introduction to JAVA. Introduction to Java, Java Virtual Machine, Object Oriented Principle, Object and Classes, Java Keywords, Variable, Data types and Literals in Java, String, Operators and Casting, Control of Flow, (Selection Statements, Iteration Statements),Command Line Argument.
UNIT II - Classes and Inheritances. Introduction to Class and Object, Method, Overloading Method, Constructor, Constructor Overloading, this Keyword, Introduction to Inheritance, Using Super, Multilevel Hierarchy, Abstract class, Using Final.
UNIT III - Package and Interface. Package (Defining Package, Finding Package), Introduction to Interface, Defining, and Implementing of Interface, Predefined Package.
UNIT IV - Exception Handling and Threads. Exception Handling, Type of Exception, Try, Catch, and Finally. Multiple Catch blocks, Nested Try Statements, throw, throws, Thread Model, Multithreading.
UNIT V - Applet, AWT, Input Output Stream. Introduction to Applet, Applet Methods, Introduction to AWT (Working with Windows, Graphic, Text), GUI Components, Using AWT Controls, Layout Managers, and Menus, Event Classes, Event Listener Interface.

Reference Books:

1. Complete Reference (Java 2) – Herbert Schildt - Tata McGraw Hill
2. Java in a nut shell – Flanagan – Orielly Publication
3. Ali Bahrami,"Object–Oriented System Development"Mc Graw Hill.
4. Bruce, Foundations of Object Oriented Languages, PHI
5. Patrick Naughton, Herbert Schildt–"The complete reference+Java2" TMH

Paper-CC10: Data Communication & Computer Network

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Independently understand basic computer network technology.
- Understand and explain Data Communications System and its components.
- Identify the different types of network topologies and protocols.
- 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 a network
- Understand and building the skills of subnetting and routing mechanisms.
- Familiarity with the basic protocols of computer networks, and how they can be usedto assist in network design and implementation.

Unit I : Physical Layer: Introduction to Computer Communication and Network : Network Topologies, Types of Network, OSI Model, Protocol Stack, Network Protocols. Analog Signals & Digital Signals. Data Transmission: Sampling, Transmission Mode. Analog Transmission: Modulation (Analog & Digital Signals). Multiplexing: FDM, WDM & TDM. Transmission Media: Guided Media, Unguided Media (Wireless). Circuit Switching.

Unit II : Data Link Layer: Error detection and correction: - Type of Errors, Detection, Error Correction, Framing. Data Link Control and Protocols: - Flow and Error control, CRC, REC, FEC, Hamming Code, Stop-and Wait ARQ, Go-Back, N ARQ, Selective Repeat ARQ, HDLC. ALOHA, CSMA, CSMA/CD. Multiple Access: Random Access, Controlled Access, Area Network: Ethernet, Wireless LANS: IEEE 802-11, Frame Relay, ATM

Unit-III: Network Layer: Host to Host Delivery: IP Addressing and Routing, Gateway, N/W Layer Protocols: ARP, IPV4, ICMP, IPV6, Transport Layer: Process-to-Process Delivery: UDP, TCP Congestion Control & Quality of Service.

Unit-IV: Application Layer: Client Server Model, Domain Name System (DNS), E-mail (SMTP), File Transfer (FTP) HTTP, WWW.

Reference Books:

1. Raj Kamal, Internet and Web Technology, TMH, New Delhi, 3rd Edition, PHI
2. A.S Godbole & A. Kahate, Web Technologies, TMH, New Delhi
3. Burdman, Collaborative Web Development, Addision Wesley.
4. Sharma & Sharma, Developing E-Commerce Sites, Addision Wesley.
5. Ivan Bayross, Web Technologies Part II, BPB Publications.
6. ShishirGundavarma, CGI Programming on the Word Wide Web, O' Reilly & Associate.
7. Don Box, Essential COM, Addision Wesley.
8. Greg Buczek, ASP Developer's Guide, TMH
9. Data Communication & Networking – Behuouz A. Forouzan, TMH
10. Computer Network – A.S Tanenbaum, Pearson Education
11. Computer Newtworks- kundu – PHI
12. Computer Network – Rajesh – Vikash

Paper-CC11: Analysis of Algorithm & Graph Algorithm

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyze worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
- Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.

UNIT-I: Time and space complexity[2L],Asymptotic Notation [3L] Big-O, omega, theta etc.; finding time complexity of well known algorithms, like- heapsort, search algorithm etc.

UNIT-II: Algorithm Design techniques [2L]Recursion- Definition, Use, Limitations, Examples: Hanoi problem. Tail Recursion.

UNIT-III: Divide and Conquer [3L]. Basic method, use, Examples: Merge sort, Quick Sort, Binary Search.

UNIT-IV: Dynamic Programming [4L]. Basic method, use, Examples: matrix-chain multiplication, All pair shortest paths, single-source shortest path, Travelling Salesman problem.

UNIT-V: Branch and Bound [2L] : Basic method, use, Examples: The 15-puzzle problem.

UNIT-VI: Backtracking [3L], Basic method, use, Examples: Eight queens problem, Graph coloring problem, Hamiltonian problem

UNIT-VII: Greedy Method [4L]. Basic method, use, Examples: Knapsack problem, Job sequencing with deadlines, minimum spanning tree(Prim's and Kruskal's algorithms).

UNIT-VIII: Lower Bound Theory [2L].Bounds on sorting and sorting techniques using partial and total orders.

UNIT-IX: Disjoint Set Manipulation [2L], Set manipulation algorithm like UNION-FIND, union by rank, Path compression.

UNIT-X: Properties of graphs and graph traversal algorithms [3L]: BFS and DFS. Matrix manipulation algorithms [5L]

UNIT-XI: Different types of algorithms and solution of simultaneous equations, DFT & FFT algorithm; integer multiplication schemes Notion of NP-completeness [5L]. P class, NP-hard class, NP-complete class, Circuit Satisfiability problem, Clique Decision Problem. Approximation algorithms [3L]

Reference Books:

1. A.Aho, J.Hopcroft and J.Ullman “The Design and Analysis of algorithms”
2. D.E.Knuth “The Art of Computer Programming”, Vol. I & Vol.2
3. Horowitz Ellis, SahaniSartaz, R. Sanguthevar " Fundamentals of Computer Algorithms".
4. Goodman: Introduction to Design and Analysis Of Algorithms TMH

Paper-CC12: Micro Processor & Computer Organization

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Describe the architecture and organization of microprocessor along with instruction set format.
- Describe modes and functional block diagram of 8086 along with pins and their functions.
- List and describe memory and addressing modes.
- List, describe and use different types of instructions, directives and interrupts
- Develop assembly language programs using various programming tools.

Group A:

UNIT-I: Introduction to microprocessors: Features, Programmers model, external & internal organization.

UNIT-II: 8085 Architecture: 8085 Architecture & organization, Instruction cycles, machine cycles and T-states, address decoding Techniques, minimum system design, Memory interfacing with timing considerations, clock, reset & buffering circuits, 8085 Instruction set: Instruction format, addressing modes, classification of instruction set.,8085 Programming: Assembly language programming:- basic structure, data transfer, arithmetical, logical, transfer of control & Miscellaneous instruction types.

UNIT-III: Stack & subroutines: Stack operations, limitations, subroutine concepts, parameter passing techniques, subroutine design, delay subroutine design & applications, Re-entrant & recursive subroutines, concept of counters and timers.

Group B:

Unit I - Introduction to Hardware. Cycle time of CPU, Register, Accumulator, Arithmetic Logical Unit, System Bus-Introduction, Memory (Hierarchy of memory, features of memory, semiconductor memories).

Unit II - Instruction Format and Addressing Methods. Processor Organization, Register Organization Different Instruction Format, Instruction length, Introduction of Addressing Mode, Different Addressing Modes, Processor Organization, Register Organization.

Unit III - Organization of data and I/O System Interrupt. Organization of Data in Memory, Stack, Input Output Organization, Different I/O techniques, Input /Output Processor, RISC, CISC.

Unit IV - Memory Organization and Peripherals. Memory, Memory Hierarchy, Various Memory Devices, Cache Memory, Virtual Memory, Secondary Memory, Different Input / Output Devices and their function, Associative Memory, DMA.

Unit- V- Control Unit- Control unit and its functions, Microprogram control unit structure, Micro instruction format, horizontal and vertical micro instruction, hardware control unit.

Reference Books:

1. Microprocessor system Lbu&Glbson Computer Interfacing & applications Venugopal, BPB
2. 8085 microprocessor : programming and interfacing-Srinath N K.
3. Microprocessor 8085 : architecture, programming and interfacing-Wadhwa Ajay
4. Microprocessor 8085 and its interfacing-Mathur Sunil5. Microprocessor architecture, programming and applications with 8085/8085A, Wiley eastern Ltd, 1989 by Ramesh S. Gaonkar.

Paper-CC13: DOT(.) NET

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Understanding a functional hierarchical code organization.
- Ability to define and manage data structures based on problem subject domain.
- Ability to work with textual information, characters and strings.
- Ability to work with arrays of complex objects.
- Understanding a concept of object thinking within the framework of functional model.
- Understanding a concept of functional hierarchical code organization.
- Understanding a defensive programming concept. Ability to handle possible errors during program execution.

UNIT-I: An Overview of NET, Defining NET, Web Services, The NET Framework, The Common Language Runtime, CLR Based Languages, The NET Framework Class Library, The NET Compact Framework, NET My Services, The NET Enterprise Servers, A NET Scenario,

UNIT-II: Web Services, Describing Web Services, Access to Internet Applications, B2B Integration, A Web Services Scenario, XML, WSDL, SOAP, UDDI, Future Directions for Web Services.

UNIT-III: The Common Language Runtime, The Common Type System, Introducing the Common Type System, The Common Language Specification, Compiling Managed Code, Microsoft Intermediate Language, Metadata, Manifests, Categorizing Assemblies, Loading Assemblies, Compiling MSIL, Securing Assemblies, Garbage Collection, Application Domains,

UNIT-IV: NET Languages, NET Languages, Overview of the NET Framework, The System Namespace, A Survey of Systems Subordinate, System , System Runtime Serialization, System Xml, The XML Technology Family, What System Xml Provides, System Reflection, System Runtime Remoting, An Overview of the Remoting Process, Choosing a Channel, Creating and Destroying Remote Object, System Enterprise Services, Accessing COM Objects, Accessing Non COM DLLs, Building GUIs Using Windows Forms, Windows Forms Controls.

UNIT-V: ADONET: NET Data Providers, Direct Access to Data, Accessing Data with Data Sets, Creating and Using Data Sets, Accessing and Modifying a Data Set, Using Data Sets with XML Defined Data,

UNIT-VI: ASPNET: System Web UI, How Browser Applications Work, Web Controls, Separating the User Interface, Web Services Servers, Web Services Clients, Options for Web Services Applications, Microsoft Specific Support,

Reference Books:

I Understanding .NET: a tutorial and analysis By David Chappell
I. ASP.NET 2.0 : a developer's notebook, Author :Lee Wei-Meng
II. Beginning ASP.NET 2.0 with C#, Author:Hart Chris
III. C# and the .NET platform, Author: Troelsen Andrew
IV. Core C# and .NET,Author:Perry Stephen C

Paper-CC14: Theory of Automata and Compiler Design

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Graduate should be able to understand the concept of abstract machines and their power to recognize the languages.
- Attainsthe knowledge of language classes & grammars relationship among them with the help of chomsky hierarchy.
- Ability to understand the design of a compiler given features of the languages.
- Ability to implement practical aspects of automata theory.
- Gain knowledge of powerful compiler generation tools.

Group A

UNIT-I: BASIC LANGUAGE & AUTOMATA THEORY: Review of finite automata, regular sets, Context-free grammars & languages, Moore & Mealy state machines, their capabilities & limitations. Deterministic & Non-Deterministic FSM's, Push-down stack &memory machine. (PDM)

UNIT-II: TUNING MACHINES: Recursive languages, Turing acceptors, techniques for Turing machine construction, Church's hypothesis, Turing machines as generators, variations & equivalence of Turing machines.

UNIT-III: UNDECIDABILITY: Universal Turing machines, undecidability of the halting problem, and undecidable problems about context free languages.

UNIT-IV: THE CHOMSKY HIERARCHY: Grammars and their relations to automata, relations between classes of languages, LR (0) andLR (1) grammars, parser construction.

UNIT-V: CLOSURE PROPERTIES OF FAMILIES OF LANGUAGES: Abstract families of languages, language operations.

Group B

UNIT-I: Introduction to compilers, structure of a compiler, phases of compilation, such as Lexical analysis, code generation, code optimization, table management.

UNIT-II: Implementation aspects of programming language constructs such as data elements, Declarations,
binding attributes to names, in built data structures such as arrays, records, sets, strings, expression evaluation, statements of different types, parameter passing (call by reference, value, name), storage management, recursion.

UNIT-III: Design of lexical analyser. Basic parsing techniques such as shift reduce parsing, operator precedence parsing, Top-down parsing, bottom-up parsing. Symbol tables: Contents, data structures, representation of scope. Syntax directed translation.

UNIT-IV: Code generation, type checking, cross compiler.

Reference Books:

1. R.G.Dromey, How to solve it by computer, 2011, 1st edition, Pearson Education.
2. Cormen, Leiserson, Rivest and Stein, “Introduction to Algorithms”, 2009, 3rd Edition, MIT Press.
3. Aho, Hopcroft and ullman, The Design And Analysis of Computer Algorithms, 2009, 4th edition, Pearson Education, New Delhi.
4.R .L . Gupta and V . K Gupta , Financial Accounting , 2012, Sultan Chand and Sons Publishers .
5. Ansulene Prinsloo, Accounting: Foundational Principles of Financial Accounting, 2015, AuRet Publishing.

6. Joanne M. Flood, Interpretation and Application of Generally Accepted Accounting Principles, 2015, Wiley GAAP .
7. Hopcroft JE. and Ullman JD., "Introduction to Automata Theory, Languages & Computation", Narosa.
8. K.L.P Mishra & N. Chandrasekharan – "Theory of Computer Science", PHI
9. Lewis H. R. and Papadimitrou C. H., "Elements of the theory of Computation", P.H.I.
10. Kain, "Theory of Automata & Formal Language", McGraw Hill.
11. Aho, Sethi, Ullman - "Compiler Principles, Techniques and Tools" - Pearson Education.
12. Holub - "Compiler Design in C" - PHI.

Discipline Specific Elective (DSE)

Objectives:
The student teachers will be able to:-

- Demonstrate the knowledge of Computer Science and Computer programming based problem solving skills.
- Ability to link knowledge of Computer Science with other two chosen auxiliary disciplines of study.
- Ability to formulate, to model, to design solutions, procedure and to use different software tools to solve real world problems and evaluate as well.
- The ability to apply the knowledge and understanding to the analysis of a given information handling problem.

Paper- DSE –1**:**

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- an ability to communicate effectively with a range of audiences
- An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- The ability to analyze, design, verify, validate, implement, apply, and maintain software systems
- The ability to appropriately apply discrete mathematics, probability and statistics, and relevant topics in computer science and supporting disciplines to complex software systems
- Understanding a concept of functional hierarchical code organization.
- Understanding a defensive programming concept. Ability to handle possible errors during program execution.

DSE –1 .a. (Theory) Software Engineering with OOADs using UML
Group A
Unit I : Overview of System Analysis & Design , Business System Concept, System Development Life Cycle, Waterfall Model , Spiral Model, Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model. [10L] .
Unit II : System Requirement Specification – DFD, Data Dictionary, ER diagram, Process Organization & Interactions. [5L] System Design – Problem Partitioning, Top-Down And Bottop-Up design ;Decision tree, decision table and structured English; Functional vs. Object- Oriented approach. [5L] Coding & Documentation - Documentation. [4L]
Unit III : Structured Programming, OO Programming, Information Hiding, Reuse, System Testing – Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment . , Validation & Verification Metrics, Monitoring & Control. [8L]

Unit IV : Software Project Management – Project Scheduling , Staffing, Software Configuration Management, Quality Assurance, Project Monitoring. [7L]
CASE TOOLS : Concepts, use and application. [5L]

Group B

UNIT-I: Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Lifecycle.
UNIT-II:Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.
UNIT-III:Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.
UNIT-IV:Basic Behavioral Modeling-I: Interactions, Interaction diagrams.
UNIT-V:Basic Behavioral Modeling-II: Use cases, Use case Diagrams, Activity Diagrams.
UNIT-VI: Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.
UNIT-VII: Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.
UNIT-VIII: Case Study: The Unified Library application

Group C

Unit I - Overview of System Analysis and Design. Introduction to System, Difference between Manual System and Automated System, Types of Systems, System Analyst, System Development Life Cycle and its Phases, Elements of Structured Analysis and Characteristics.
Unit II - Designing of a System. Data Flow Diagrams (DFD), Data Dictionary, Pseudo code, The Process of System Design, Difference between Logical Design and Physical Design, Top-Down Design and Functional Decomposition, Forms-Driven Methodology.
Unit III - File Organization and Data Base Design. The Major Development Activities in Structured Design, Elements of Design, Introduction to File Organization, Data Base Design, Objectives of Data Base Design, The Role of DBA.
Unit IV - System Testing and Implementation. System Testing, Need for System Testing, Testing Strategies, Quality Assurance, Implementation, Evaluation.

Reference Books:

1. 1. Sommerville I: Software Engineering, Addison Wesley
2. 2. Object Oriented & Classical Software Engineering(Fifth Edition),
3. 3. Vans Vlet, Software Engineering, SPD
4. 4. Uma, Essentials of Software Engineering, Jaico
5. 5. Sommerville, Ian – Software Engineering, Pearson Education
6. 6. Benmenachen, Software Quality, Vikas
7. 7. IEEE Standards on Software Engineering.
8. 8. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, PearsonEducation.
9. 9. Pascal Roques: Modeling Software Systems Using UML2, WILEY-DreamtechIndiaPvt. Ltd.
10. 10. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
11. 11. Mark Priestley: Practical Object-Oriented Design with UML,TATAMcGrawHill
12. 12.Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

DSE –1 .b.(Theory) Android Programming

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.
Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.
Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project – Hello Word, run on emulator,
Deploy it on USB-connected Android device.
User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes.
User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners(Combo boxes),Images, Menu, Dialog.
Database: Understanding of SQLite database, connecting with the database.

Reference Books:
1. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.
More Reference
. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html
4. http://docs.oracle.com/javase/tutorial/index.htm (Available in the form of free downloadable ebooks also).
5. http://developer.android.com/guide/components/activities.html
6. http://developer.android.com/guide/components/fundamentals.html
7. http://developer.android.com/guide/components/intents-filters.html.
8. http://developer.android.com/training/multiscreen/screensizes.html
9. http://developer.android.com/guide/topics/ui/controls.html
10. http://developer.android.com/guide/topics/ui/declaring-layout.html
11. http://developer.android.com/training/basics/data-storage/databases.html

DSE –1 .c. (Theory) Web page design using PHP/My SQL

1. Introduction to Web Programming
2. Installation of PHP/MySql and web server
3. Introduction to PHP programming
4. Writing PHP Programs
5. Loops, Control Structure and Arrays
6. PHP functions String functions , Array functions , Mathematical function , Graphics functions, File system function, Date and time function , Miscellaneous Functions ,
7. Error handling
8. Object Oriented Features of PHP
9. File and Directory handling
10. MySql database Configuration of MySqlserver , Starting MySql server , MySql tables ,DisplayingMySql data , Adding and removing user access.
11. Web Servers IIS web Server ,Apache web server

Reference Books:
1. Beginning PHP 4 Databases – Christopher Scollo, Harish Rawat, Dipak Thomas, Sanjay Abraham, Andrew Hill & Jim Hubbard; Wrox Press
2. PHP MySql Website Programming – Chris Bea, Mike Duzzard, Jessy White, Cinis&Dilip Thomas; Wrox Press
3. PHP Black Book – Peter Moulding, Coriolis Group
4. MySql – PHP Database Applications – Jay Greenspan & Brad Bulger; John Wiley & Sons
5. PHP MySql Website Programming: Problem-Design-Solutions – Chris Bea, Mike Duzzard, Jessy White, Cinis&Dilip Thomas; Apress

6. Essential PHP for Web Professionals – Christopher Cosentino; Prentice Hall
7. Sam's Teach Yourself PHP 4 in 24 Hours – Matt Zandstra; SAMS
8. PHP 5.1 For Beginners – Ivan Bayross, O'Reilly, Shroff Publishers & Distributors Pvt. Ltd.

DSE –1 .d.(Theory) Programming using Python

Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.
Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.
Overview of Programming : Structure of a Python Program, Elements of Python
Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)
Creating Python Programs : Input and Output Statements, Control statements(Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments, Errors and Exceptions.
Iteration and Recursion: Conditional execution, Alternative execution, Nested conditionals, The return statement, Recursion, Stack diagrams for recursive functions, Multiple assignment, The while statement, Tables, Two-dimensional tables
Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists
Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries.
Data Structures: Arrays, list, set, stacks and queues.
Searching and Sorting: Linear and Binary Search, Bubble, Selection and Insertion sorting.

Reference Books:

1. P. K. Sinha &PritiSinha , "Computer Fundamentals", BPB Publications, 2007.
2. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.
3. T. Budd, Exploring Python, TMH, 1st Ed, 2011
4. Python Tutorial/Documentation www.python.or
5. Allen Downey, Jeffrey Elkner, Chris Meyers.How to think like a computer scientist learning with Python / 1st Edition,2012 – Freely available online.
6. http://docs.python.org/3/tutorial/index.html
7. http://interactivepython.org/courselib/static/pythonds
8. http://www.ibiblio.org/g2swap/byteofpython/read/

Paper- DSE –2:

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- To develop inter personal skills and be an effective goal oriented team player.
- To develop professionals with idealistic, practical and moral values.
- To develop communication and problem solving skills.
- To re-engineer attitude and understand it s influence on behavior

DSE – 2.a. Tour(Practical/Tutorial)

A departmental tour of not less than 3 days and not more than one week will be conducted with the students. Students should submit a report on that tour which will be examined by a board of examiners to be nominated by the B.O.S. (IT Based Company, Hub, Park, Institute, Industry, Workshop etc.)

DSE – 2.b. (Theory)Profession Values & Ethics

1. Costing :- cost, cost unit, costing, cost sheet, material costing –EOQ , ABC Analysis (6L) (10M)
2. Ratio Analysis- (4l) (8m)
3. Cash Flow &Fund Flow- (4l) (6M)
4. Budgets & Budgetary Control –(4L) (6M)
5. Profession values & Ethics- (4L) (4M)
6. HRM – (4L) (4m)
7. Business Environment –(4L) (2m)
8. Marketing – (4L) (4m)
9. Industrial Hazards-(4L) (4m)
10. B.R.S – (4L) (2m)

Reference Books:

1. 13. Human Resource Management : L. M. PRASAD.
2. 14. Principal Management : L. M. PRASAD.
3. 15. Modern Marketing : R.S.N.PILLAI, BAGAVATHI.
4. 16. Blending the best of the East & West, Dr.Subir Chowdhury, EXCEL
5. 17. Ethics & Mgmt. & Indian Ethos, Ghosh, VIKAS
6. 18. Business Ethics,Pherwani,EPH
7. 19. Ethics,Indian Ethos & Mgmt., Balachandran,Raja,Nair, Shroff Publishers
8. 20. Business Ethics: concept and cases, Velasquez, Pearso

DSE – 2.c. (Theory)Entrepreneurship Development

Unit – 1 Introduction

1.1 Meaning and Importance
1.2 Evolution of term ‘Entrepreneurship’
1.3 Factors influencing entrepreneurship’
1.3.1 Psychological factors
1.3.2 Social factors
1.3.3 Economic factor
1.3.4 Environmental factors
1.4 Characteristics of an entrepreneur
1.5 Entrepreneur and Entrepreneur
1.6 Types of entrepreneur
1.6.1 According to Type of Business
1.6.2 According to Use of Technology
1.6.3 According to Motivation
1.6.4 According to Growth
1.6.5 According to Stages
1.6.6 New generations of entrepreneurship viz. social entrepreneurship,
Edupreneurship, Health entrepreneurship, Tourism entrepreneurship, Women entrepreneurship etc.
1.7 Barriers to entrepreneurship

Unit- 2 Entrepreneurial Motivation
2.1 Motivation
2.2 Maslow's theory
2.3. Herjburg's theory
2.4 McGragor's Theory
2.5 McClelland's Need – Achievement Theory
2.6 Culture & Society
2.7 Values / Ethics
2.8 Risk taking behavior
Unit- 3 Creativity
3.1 Creativity and entrepreneurship
3.2 Steps in Creativity
3.3 Innovation and inventions
3.3.1. Using left brain skills to harvest right brain ideas
3.3.2 Legal Protection of innovation
3.4 Skills of an entrepreneur
3.5 Decision making and Problem Solving (steps indecision making)

Reference :

1. Small scale industries and entrepreneurship, Dr. Vasant Desai, Himalayan Publishing House
2. Management of small scale industries, Dr. Vasant Desai, Himalayan Publishing House
3. Management of small scale industries, J.C. Saboo Megha Biyani, Himalayan Publishing House
4. Dynamics of entrepreneurial development and Management, Dr. Vasant Desai, Himalayan Publishing
5. Entrepreneurship development, Moharanas and Dash C.R., RBSA Publishing, Jaipure
6. Beyond entrepreneurship, Collins and Lazier W, Prentice Hall, New Jersey, 1992
7. Entrepreneurship, Hisrich Peters Sphephard, Tata McGraw Hill
8. Fundamentals of entrepreneurship, S.K. Mohanty, Prentice Hall of India
9. A Guide to Entrepreneurship, David Oates, Jaico Publishing House, Mumbai, Edn 2009

DSE – 2.d. (Theory)Soft Skill

Unit I - **Ethics and integrity**
Importance of ethics in life, Intuitionism vs Consequentialism, Non-consequentialism, Virtue ethics vs situation ethics, Integrity - listen to conscience, Stand up for what is right

Change management
Who moved my cheese?, Tolerance of change and uncertainty, Joining the bandwagon, Adapting change for growth - overcoming inhibition **How to pick up skills faster?** Knowledge vs skill, Skill introspection, Skill acquisition, "10,000 hours rule" and the converse **Habit formation** Know your habits, How habits work? - The scientific approach, How habits work? - The psychological approach, Habits and professional success, "The Habit Loop", Domino effect, Unlearning a bad habit
Analytic and research skills.
Focused and targeted information seeking, How to make Google work for you, Data assimilation
Unit II - **Goal setting**
SMART goals, Action plans, Obstacles -Failure management
Motivation
Rewards and other motivational factors, Maslow's hierarchy of needs, Internal and external motivation **Facilitation** Planning and sequencing, Challenge by choice, Full Value Contract (FVC), Experiential learning cycle, Facilitating the Debrief .

Introspection
Identify your USP, Recognize your strengths and weakness, Nurture strengths, Fixing weakness, Overcoming your complex, Confidence building .
Trust and collaboration
Virtual Team building, Flexibility, Delegating, Shouldering responsibilities
Unit III – **Transactional Analysis**
Introduction**,** Contracting, Ego states**,** Life positions **Brain storming** Individual Brainstorming, Group Brainstorming, Stepladder Technique, Brain writing, Crawford's Slip writing approach, Reverse brainstorming, Star bursting, Charlette procedure, Round robin brainstorming .
Psychometric Analysis
Skill Test, Personality Test
Rebus Puzzles/Problem Solving
More than one answer, Unique ways
Unit IV – **Theatrix**
Motion Picture, Drama, Role Play, Different kinds of expressions **Creative expression** Writing, Graphic Arts, Music, Art and Dance .
Flexibility of thought
The 5'P' framework (Profiling, prioritizing, problem analysis, problem solving, planning) **Adapt to changes(tolerance of change and uncertainty)** Adaptability Curve , Survivor syndrome

Reference Books:

1. Chip Heath, How to Change Things When Change Is Hard (Hardcover**)**,2010,FirstEdition,Crown Business.
2. Karen Kindrachuk, Introspection**,** 2010, 1st Edition.
3. Karen Hough, The Improvisation Edge: Secrets to Building Trust and Radical Collaboration at Work, 2011, Berrett-Koehler Publishers

Paper- DSE –3**:**

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Understand Operating System concepts
- Use System calls and memory management
- Use Unix commands and editors
- Carry out Unix/Linux File management and shell programming in Unix/Linux
- Do Network configuration and security management in Unix/Linux
- Understand and explain common wireless sensor node architectures.
- Be able to carry out simple analysis and planning of wireless sensor networks (WSNs).
- Demonstrate knowledge of MAC protocols developed for WSN.
- Demonstrate knowledge of routing protocols developed for WSN.
- Understand and explain mobile data-centric networking principles.
- Be familiar with WSN standards.

DSE –3 .a. (Theory)Advanced DMBS

UNIT-I: Database Design: Multivalued dependencies, theory of normalisation-4NF, 5NF, 6NF DKNF

UNIT-II: ANSI SQL2: DDL, DML, constraints and assertions, views, database security.
UNIT-III: Transaction processing, concurrency control, Recovery management. Transaction model properties,lock base protocols, Two-phase locking, Live – Lock, Time- Stamp Protocol.
UNIT-IV: Brief introduction to distributed database, temporal database and object-oriented database.
UNIT-V: Embedded SQL & Applications.

Reference Books:
1. Data Base System Concepts, Korth, MH
2. Data Base Management System, RamaKrishnan, MH
3. Data Base Management System, A.K. Pujari, ISTE/EXCEL
4. Data Base Management System, Leon, VIKAS
5. Data Base Management System,V.K.Jain,WileyDreamtech

DSE –3 .b. (Theory) MOBILE COMPUTING

UNIT I: WIRELESS COMMUNICATION FUNDAMENTALS : Introduction – Wireless transmission –Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing –Modulations – Spread spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular WirelessNetworks.
UNIT II: TELECOMMUNICATION NETWORKS :Telecommunication systems – GSM – GPRS – DECT – UMTS – IMT-2000 – Satellite Networks - Basics – Parameters and Configurations – CapacityAllocation – FAMA and DAMA – Broadcast Systems – DAB – DVB.
UNIT III: WIRLESS LAN : Wireless LAN – IEEE 802.11 - Architecture – services – MAC – Physical layer – IEEE 802.11a - 802.11b standards – HIPERLAN – Blue Tooth.
UNIT IV: MOBILE NETWORK LAYER :Mobile IP – Dynamic Host Configuration Protocol - Routing – DSDV – DSR – Alternative Metrics.
UNIT V: TRANSPORT AND APPLICATION LAYERS : Traditional TCP – Classical TCP improvements – WAP, WAP 2.0.

References Books:
1. Jochen Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition, 2003.
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education, 2002.
3. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, PHI/Pearson Education, 2003.
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile

DSE –3 .c. (Theory)Wire Less Sensor Networking

Characteristics Of WSN: Characteristic requirements for WSN - Challenges for WSNs – WSN vs Adhoc Networks - Sensor node architecture – Commercially available sensor nodes –Imote, IRIS, Mica Mote, EYES nodes, BTnodes, TelosB, Sunspot -Physical layer and transceiver design considerations in WSNs, Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations.
Medium Access Control Protocols: Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts - Contentionbased protocols - Schedule-based protocols - SMAC - BMAC - Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol.

Routing And Data Gathering Protocols Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping – Data centric Routing – SPIN – Directed Diffusion – Energy aware routing -

Gradient-based routing - Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS – Location Based Routing – GF, GAF, GEAR, GPSR – Real Time routing Protocols – TEEN, APTEEN, SPEED, RAP - Data aggregation - data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB.

Embedded Operating Systems: Operating Systems for Wireless Sensor Networks – Introduction - Operating System Design Issues - Examples of Operating Systems – TinyOS – Mate – MagnetOS – MANTIS - OSPM - EYES OS – SenOS – EMERALDS – PicOS – Introduction to Tiny OS – NesC – Interfaces and Modules- Configurations and Wiring - Generic Components -Programming in Tiny OS using NesC, Emulator TOSSIM.

Applications Of WSN: WSN

Applications - Home Control - Building Automation - Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation - Habitat Monitoring - Nanoscopic Sensor Applications – Case Study: IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling.

Reference Books:

1.Kazem Sohraby, Daniel Minoli and Taieb Znati, " Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley & Sons, 2007. 2.Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Ltd, 2005.

2.K. Akkaya and M. Younis, "A survey of routing protocols in wireless sensor networks", Elsevier Ad Hoc Network Journal, Vol. 3, no. 3, pp. 325--349 2.Philip Levis, " TinyOS Programming" 3.Anna Ha´c, "Wireless Sensor Network Designs", John Wiley & Sons Ltd,

DSE –3 .d. (Theory) Unix/Linux & Shell Programming

UNIT-I: Organization of UNIX/Linux. User interface, Programmer interface. The environment of UNIX/Linux process System calls. Process control, File related system calls. Process related system calls. Signals programming using system calls. Advanced I/O multiplexing. Memory mapped I/O.

UNIT-II: Interprocess communication: Pipes, shared memory, semaphores, messages. Advanced inter-process communications. Streams, Pipes, Open server.

UNIT – III : Comparative analysis of Unix and Linux.

Reference Books:

1. Your UNIX, the Ultimate Guide, Sumitava Das, TMH
2. Design of UNIX Operating System, Bach, PHI
3. UNIX Programming Environment, Kernigham& Pike, PHI
4. Learning UNIX Operating System, Peek, SPD/O'REILLY
5. Learning the Vi Editor, Lamb, SPD/O'REILLY
6. Essentials Systems Administration, Frisch, SPD/O'REILLY

DSE –3. (Practical/Tutorial)Project

A Group project will be assigned to students under the supervision of internal faculty members. The students will prepare a project report in consultation with the supervisor allotted by the department committee which will be presented before a board of examiners to be nominated by the B.O.S. A Group can be formed with minimum number of Two students and maximum number of Four students. [This must be related with Computer Application using C,C++, Java,. (Dot) Net, Python, PHP/My SQL etc.]

Paper- DSE –4:

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Introducing the fundamental theory and concepts of computational intelligence methods, in particular neural networks, fuzzy systems, genetic algorithms and their applications in the area of machine intelligence.
- This can be summarized as to understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
- To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.
- To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.
- To develop communication and problem solving skills.
- To re-engineer attitude and understand it s influence on behavior

DSE –4 .a. (Theory) Cloud Computing

Computer Networks and Distributed Processing
TOPICS**:**

- Enabling Technologies and System Models for Cloud Computing
- Introduction to Cloud Computing including benefits, challenges, and risks
- Cloud Computing Models including Infrastructure/Platform/Software – as-a-service
- Public cloud, private cloud and hybrid clouds
- Cloud OS
- Cloud Architectures including Federated Clouds
- Scalability, Performance, QoS
- Data centers for Cloud Computing
- Principles of Virtualization platforms
- Security and Privacy issues in the Cloud
- VMWare ESX Memory Management
- Capacity Planning and Disaster Recovery in Cloud Computing

REFERENCES:
Technical papers from major journals and major conferences on computing, networking, cloud computing.

DSE –4 .b. (Theory) Bio-informatics

Unit I Introduction to bioinformatics and data generation What is bioinformatics and its relation with molecular biology. Examples of related tools(FASTA, BLAST, BLAT, RASMOL), databases(GENBANK, Pubmed, PDB) and software(RASMOL,Ligand Explorer). Data generation; Generation of large scale molecular biology data. (Through Genome sequencing, Protein sequencing, Gel electrophoresis, NMR Spectroscopy, X-Ray Diffraction, and microarray). Applications of Bioinformatics.
Unit II Biological Database and its Types Introduction to data types and Source. Population and sample, Classification and Presentation of Data. Quality of data, private and public data sources. General Introduction of Biological Databases; Nucleic acid databases (NCBI, DDBJ, and EMBL). Protein databases (Primary, Composite, and Secondary). Specialized Genome databases: (SGD, TIGR, and ACeDB). Structure databases (CATH, SCOP, and PDBsum)
Unit III Data storage and retrieval and Interoperability Flat files, relational, object oriented databases and controlled vocabularies. File Format (Genbank, DDBJ, FASTA, PDB, SwissProt). Introduction to Metadata and search; Indices, Boolean, Fuzzy, Neighboring search. The challenges of data exchange and integration. Ontologies, interchange languages and standardization efforts. General Introduction to XML, UMLS, CORBA, PYTHON and OMG/LIFESCIENCE.

REFERENCES:

Technical papers from major journals and major conferences on computing, networking, cloud computing.

DSE –4 .c. (Theory) Artificial Intelligence

UNIT – I: Introduction to Neural Networks, Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

UNIT- II: Essentials of Artificial Neural Networks, Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.

UNIT–III: Single Layer Feed Forward Neural Networks, Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model.

UNIT- IV: Multilayer Feed forward Neural Networks Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

UNIT V: Associative Memories, Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function. Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis.

Reference Books:

1. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2001.
2. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TMH,
3. James A Freeman and Davis Skapura, Neural Networks Pearson Education, 2002.
4. Timothy J. Ross, " Fuzzy Logic With Engineering Applications", McGraw-Hill Inc. 1997

DSE –4 .d. (Theory) Soft Computing

UNIT – I: Classical & Fuzzy Sets, Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT II: Fuzzy Logic System Components Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT III: Applications Neural network applications: Process identification, control, fault diagnosis. Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

Reference Books:

1. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2001.
2. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TMH,
3. James A Freeman and Davis Skapura, Neural Networks Pearson Education, 2002.
4. Timothy J. Ross, " Fuzzy Logic With Engineering Applications", McGraw-Hill Inc. 1997

DSE –4 . (Practical/Tutorial)Seminar /Term paper/ Grand Viva

Unit I - Individual SEMINAR topic must be given to Each student by the Department of concern College . EVERY Students have to present the seminar topic before the External Examiner. Note: Every seminar topic should be guided by the concern teacher of college. Student must have to present their seminar before the college teacher and must be evaluated by the teacher and which will be treated as Internal marks.

Unit II - Grand Viva will be conducted in presence of external examiner and will be based on all the subjects throughout the course.

Skill Enhancement Courses (SEC)

Objectives:
The student teachers will be able to:-

- To learn state of the art skills as well as tools to find the solution, interpret the results and make predictions for the future developments.
- To have expertise in current trending courses as well as technologies to meet industry needs.

SEC–1.i. Web Technology & Internetworking [Web Page Design Using HTML]

Course Learning Outcomes:
After course completion the students will have the following learning outcomes:

- Students are able to develop a dynamic webpage by the use of java script and HTML/ DHTML/ASP.
- Students will be able to write a well formed / valid XML document
- Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- Students will be able to write a server side java application called Servlet to catch form data sent from client and store it on database.
- Students will be able to write a server side java application called JSP to catch form data sent from client, process it and store it on database.

UNIT-I Internet and WWW: Introduction to Internet, Web. History and Growth of Internet and WWW. Communicating on the Internet: Internet domain, IP Address, URL, etc.
General Concepts: Web Client and Web Server, Web sites, Web Browsers, Web Addresses and Web Pages, Home Page, Search Engines. HTTP and FTP. Web Services: E-mail, Video Conferencing, Chatting, Social Networking. Information Retrieval, DownLoading and UpLoading. Need, Benefits, Importance and Applications of Internet. Social Effects of Internet.
UNIT-II Principles of Web Design: Key issues to be considered in Web Site Design.
Structure of a Web Page. Static and Dynamic Web Pages. What is A Mark Up Language.
HTML: Introduction to HTML, Elements of HTML. HTML Documents: Structure and Features. Inserting Text, Images, Hyperlinks etc. HTML Tags: Use of different HTML Tags in Web Pages.
HTML Editors & Tools: Use of different HTML Editors and Tool Microsoft Front Page.
SEC–1.ii. Web Technology & Internetworking [Web Page Design Using XML]
Course Learning Outcomes:
After course completion the students will have the following learning outcomes:
a. Students will be able to write a well formed / valid XML document
b. Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
c. Students will be able to write a server side java application called Servlet to catch form data sent from client and store it on database.
d. Students will be able to write a server side java application called JSP to catch form data sent from client, process it and store it on database.

UNIT-I Effective Web Design: XML (eXtensible Markup Language) and CSS (Cascading Style Sheet).
XML: Introduction to XML, What is XML, XML vs. HTML, Advantages of XML, Features of XML, Working with XML, XML Structure, Components of XML-file, Logical Structure of a XML Document, Naming Rules in XML, XML Document Categories: Well-formed Documents and Valid Documents. Validating XML Documents. XML Parser. Viewing the XML document in a Web Browser.
XML Elements: Defining Your Own TAGS in XML, Root Element, Child Elements and their Attributes. Comments in XML, White Space and New Line in XML.
CSS: Introduction to CSS, What is CSS, Advantages of CSS, Features of CSS, Working with CSS. Style Rules, Selectors, Properties, Values. Grouping. Creating a CSS file.
Using a StyleSheet with HTML file.

Using a StyleSheet with XML file.
UNIT-II Computer Ethics, Netiquette, and Web Security: Overview of Security: Definition, Breaches of Security, Intrusion Detection and Protection. Major Issues and Common Threats: Spamming, Computer Viruses, Worms, Trojan Horses, Malware, Spyware, Adware, Virtual Theft, Predators, Phishing, Sweepers, Denial of Services etc. Attackers, Hackers and Crackers. Uses and Misuses of Social Networking Sites.
General Measures: Passwords, Authentication and Encryption. Cryptography: Role of Cryptography. Public/Private Key Encryption, Digital Signatures, Digital Certificates etc.
Firewalls- Advantages and Disadvantages of Firewalls. Awareness of Terms:
Intellectual Property, Copyright, Cyber Crime, Cyber Laws etc.

SEC–1.iii. Web Technology & Internetworking [Web Page Design Using Java Scripts]

Course Learning Outcomes:
After course completion the students will have the following learning outcomes:

- Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- Students will be able to write a server side java application called Servlet to catch form data sent from client and store it on database.
- Students will be able to write a server side java application called JSP to catch form data sent from client, process it and store it on database.

Unit I : Physical Layer: Introduction to Computer Communication and Network : Network Topologies, Types of Network, OSI Model, Protocol Stack, Network Protocols. Analog Signals & Digital Signals. Data Transmission: Sampling, Transmission Mode. Analog Transmission: Modulation (Analog & Digital Signals). Multiplexing: FDM, WDM & TDM. Transmission Media: Guided Media, Unguided Media (Wireless). Circuit Switching.
Unit II : Basics of JavaScript (Data types, Loops, Arrays, Objects, Functions, etc)
Unit III : OOPs concepts in JavaScript , Introduction to Document Object Model(DOM) and Browser Object Model(BOM) in Java

SEC–1.iv. Web Technology & Internetworking [Web Page Design Using PHP/My SQL]

Course Learning Outcomes:
After course completion the students will have the following learning outcomes:

- Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- Students will be able to write a server side java application called Servlet to catch form data sent from client and store it on database.
- Students will be able to write a server side java application called JSP to catch form data sent from client, process it and store it on database.

Unit I : Data Link Layer: Error detection and correction: - Type of Errors, Detection, Error Correction, Framing. Data Link Control and Protocols: - Flow and Error control, CRC, REC, FEC, Hamming Code, Stop-and Wait ARQ, Go-Back, N ARQ, Selective Repeat ARQ, HDLC. ALOHA, CSMA, CSMA/CD. Multiple Access: Random Access, Controlled Access, Area Network: Ethernet, Wireless LANS: IEEE 802-11, Frame Relay, ATM
Unit II: Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator and Expression.
Unit III :Introduction to RDBMS, Connection with MySql Database, Performing basic database operation(DML) (Insert, Delete, Update, Select), Setting query parameter, Executing queryJoin (Cross joins, Inner joins, Outer Joins, Self joins.)

Reference Books:
1. Raj Kamal, Internet and Web Technology, TMH, New Delhi, 3rd Edition, PHI
2. A.S Godbole & A. Kahate, Web Technologies, TMH, New Delhi
3. Burdman, Collaborative Web Development, Addision Wesley.
4. Sharma & Sharma, Developing E-Commerce Sites, Addision Wesley.
5. Ivan Bayross, Web Technologies Part II, BPB Publications.
6. ShishirGundavarma, CGI Programming on the Word Wide Web, O' Reilly & Associate.
7. Don Box, Essential COM, Addision Wesley.
8. Greg Buczek, ASP Developer's Guide, TMH
9. Data Communication & Networking – Behuouz A. Forouzan, TMH

10. Computer Network – A.S Tanenbaum, Pearson Education
11. Computer Newtworks- kundu – PHI
12. Computer Network – Rajesh – Vikash

SEC–2.**i. Computer Graphics & Multimedia [Photoshop Design]**

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Define multimedia to potential clients.
- Identify and describe the function of the general skill sets in the multimedia industry.
- Identify the basic components of a multimedia project.
- Identify the basic hardware and software requirements for multimedia development and playback.

UNIT-I: Development of Computer Graphics: Basic graphics system and standards, Raster scan and random scan, graphics; Continual refresh and storages display, display processors and character generator, Colour display techniques, Frame buffer and bit operations, concepts in raster graphics.
UNIT-II:

1. Point plotting, line & regular figure algorithms
2. Raster scan line & circle drawing algorithms
3. Clipping & Windowing algorithms for points, lines & polygons
4. 2-D / 3-D transformations
5. Simple fractals representation , Demonstrate the properties of the Bezier curves.
6. Filling algorithms , Clip line segments against windows
7. Web document creation using Dreamweaver.
8. Creating Animation using Flash.

SEC–2.**ii. Computer Graphics & Multimedia [Audio & Video editing]**

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Define multimedia to potential clients.
- Identify and describe the function of the general skill sets in the multimedia industry.
- Identify the basic components of a multimedia project.
- Identify the basic hardware and software requirements for multimedia development and playback.

UNIT-I: An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

SEC–2.**iii. Computer Graphics & Multimedia [Animation designing]**

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Define multimedia to potential clients.
- Identify and describe the function of the general skill sets in the multimedia industry.
- Identify the basic components of a multimedia project.
- Identify the basic hardware and software requirements for multimedia development and playback.

UNIT-I: Compression & Decompression – Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval Technologies.

SEC–2.**iv. Computer Graphics & Multimedia [Page Maker]**

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Define multimedia to potential clients.
- Identify and describe the function of the general skill sets in the multimedia industry.
- Identify the basic components of a multimedia project.
- Identify the basic hardware and software requirements for multimedia development and playback.

Unit I: PageMaker Basics Starting PageMaker, about the work area, using the toolbox, working with palettes, viewing pages, working with text and graphics, moving between pages, adding and deleting pages, working with multiple open publications.
Unit II: Constructing a publication Creating and opening publication, naming and saving a publication, closing a publication, setting up pages, changing document setup options, setting up rulers, creating running headers and footers.
Unit III: Drawing tools and text tools Different drawing tools, text tools, character formatting, paragraph formatting, controlling windows and orphans, controlling page breaks, tabs and hyphenation, grid manager, printing a document.
Unit IV: Importing Graphics Placing graphics, sizing and cropping graphics, OLE, Embedding an OLE object

Reference Books:

1. Procedural & Mathematical Elements in Computer Graphics, Rogers, TMH
2. Computer Graphics, Hearn & Baker, PHI
3. Introduction to Computer Graphics, A. Mukherjee, VIKAS
4. Fundamentals of Computer Graphics & Multimedia, Mukherjee, PHI

Generic Elective (GE)

Objectives:
The student teachers will be able to:-

- To understand and apply the fundamental concepts in Linear Algebra, Numerical Computing
- To apply graph theory based tools in solving practical problems in Operation Research , graph theory
- To improve the proof writing skills.

Paper- GE1 : Linear Algebra

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Understand the concepts of vector spaces, subspaces, bases, dimension and their properties.
- Relate matrices and linear transformations, compute eigen values and eigen vectors of linear transformations.
- Learn properties of inner product spaces and determine orthogonality in inner product spaces.
- Realize importance of adjoint of a linear transformation and its canonical form.

Catalog Information: Systems of linear equations and the associated matrix operations, linear transformations, vector spaces,

bases, eigenvectors.

1.1 Systems of Linear Equations: Basic definitions and notations, possible number of solutions of linear equations, elementary row operations, equivalent systems, existence and uniqueness questions.
1.2 Row Reduction and Echelon Forms: Echelon form, reduced echelon form, uniqueness of the reduced echelon form, pivot positions, the row reduction algorithm, solutions of linear systems, parametric description of solution sets, implications for existence, uniqueness, and number of solutions.
1.3 Equations: Vectors in Rn, linear combinations, span.
1.4 The Matrix Equation Ax=b: Existence of solutions, computation of Ax, properties of matrix-vector product Ax.
1.5 Solution Sets of Linear Systems: Homogeneous linear systems, solutions of nonhomogeneous systems.
2.1 Matrix Operations: Sums and scalar multiples, matrix multiplication, properties of matrix multiplication, powers of a matrix, the transpose of a matrix andits properties.
2.2 The Inverse of a Matrix: definition, existence, properties, inverses and the solution of linear systems, elementary matrices, an algorithm for finding the inverse.
2.3 Characterizations of Invertible Matrices: The invertible matrix theorem.
3.1 Introduction to Determinants: cofactors, definition of the determinant in terms of cofactors.
3.2 Properties of Determinants: Row operations, inverses, column operations, determinants and matrix products.
3.3 Cramer's Rule: adjugate or adjoint and its properties, inverse via adjoint.
1.7 Linear Independence: linear independence of a set of vectors, linear independence of matrix columns, sets of one or two vectors, sets of two or more vectors.
4.1 Vector Spaces and Subspaces: Definition, examples, subspaces, a subspace spanned by a set.
4.2 Null Spaces, Column Spaces, and Linear Transformations: The null spaceof a matrix, the column space of a matrix.
4.3 Linear Independent Sets; Bases: Definitions, examples, the spanning settheorem, bases for null spaces and column spaces.
4.4 Coordinate Systems: The unique representation theorem, coordinates in Rn.
4.5 The Dimension of a Vector Space: definitions, examples, proof that all bases of the same vector space have the same number of vecors, subspaces of a finite dimensional space, the dimension of null-space and column space of a matrix.
4.6 Rank: The row space, the rank theorem, applications to systems of equations, rank and the invertible matrix theorem.
4.7 Change of Basis.
5.1 Eigenvectors and Eigen values: Definitions and calculations.
5.2 The Characteristic Equation.
Optional sections: (choose by topic)–Diagonalization , Linear Transformations , Orthogonality and/or Least Squares .

Reference Books:

1. Linear Algebra and Its Applications, MyMathLabs and Student Study Guide bundle, 4th Edition, Lay, Addison-Wesley.

Paper- GE2 **: Numerical Computing**

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Obtain numerical solutions of algebraic and transcendental equations.
- Find numerical solutions of system of linear equations and check the accuracy of the solutions.
- Learn about various interpolating and extrapolating methods.
- Solve initial and boundary value problems in differential equations using numerical methods.
- Apply various numerical methods in real life problems.

UNIT-I: Approximation in numerical computation, Truncation and rounding errors.
UNIT-II: Interpolation : Lagrange's interpolation, forward differences, backword differences . Newton forward and backward formulae for interpolation, errors in polynomial interpolation.

UNIT-III: Numerical Integration: derivation of general formulae for numerical integration using newton's forward difference formula. Trapezoidal rule, Simpson 1/3 rule.
UNIT-IV: Numerical solution of a system of linear equation, Gauss elimination method, Matrix inversion, Gauss-Jacobi method, Gauss Seidel method.
UNIT-V: Algebraic Equation : Bisection method, Regula–Falsi method, Newton Raphson method,
UNIT-VI: Numerical solution of ordinary differential equation : Euler's method, Runga – kutta method,
UNIT-VII: Concept of random variable and probability distributions, discrete random variable and its distributions – Binomial, Poisson, Hyper geometric.
UNIT-VIII: Continuous random variable and its distributions - Uniform, Normal, Exponential, Concept of Sampling distribution and various types of it, Statistical inferences – point estimate, interval estimate, Sample size determination.
UNIT-IX: Principles of Statistical inferences – Testing hypotheses and Inferences concerning means, variances and proportions.

Reference Books:

1. V. Rajaraman, Computer Oriented Numerical Methods - Prentice Hall Publication.
2. S. S. Sastry, Introductory methods of Numerical Analysis - Prentice Hall Publication.
3. Dr. B. S. Grewal : Numerical Methods in Engineering and Science.
4. Statistics For engineers –Richardson, TATA Mchraw Hill.
5. Numerical Mathematical Analysis (By J.B.Scarborough)
6. Numerical Analysis & Algorithms, Pradeep Niyogi, TMH
7. Numerical Mathematical Analysis ,Mathews,PHI
8. C language and Numerical Methods (ByC.Xacier)
9. Numerical Analysis (By S. Ali Mollah)
10. Introductory Numerical Analysis(By Dutta & Jana)
11. Numerical Methods (Problems and Solution) (By Jain ,Iyengar& Jain),New Age International
12. Computer Oriented Numerical Methods, N. Dutta, VIKAS
13. Numerical Methods,Arumugam,Scitech
14. Numerical Methods in Computer Applications, P.U.Wayse.EPH.

Paper- GE3 : Operation Research

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Obtain numerical solutions of algebraic and transcendental equations.
- Find numerical solutions of system of linear equations and check the accuracy of the solutions.
- Learn about various interpolating and extrapolating methods.
- Solve initial and boundary value problems in differential equations using numerical methods.
- Apply various numerical methods in real life problems.

UNIT–I: Basics of operation research (OR) : Characteristics of OR – Necessity or OR in industry – OR and decision making – role of computers in OR. Linear Programming: Formulations and graphical solution of (2 variables) canonical and standard terms of linear programming problem.
UNIT-II: Algebraic solution: simplex methods – charnes method of penalties – two phase simplex method., Duality.
UNIT–III: Transportation Model: Definition – formulation and solution of transportation models – The row minima, column-minima, matrix-minima and vogel's approximation methods. Assignment model:
Definition of assignment model – comparison with transportation model – formulation and solution of assignment model. Integer programming problem.
UNIT-IV: sequencing problem: Processing of n jobs through 2 machines – processing n jobs through 3 machines – processing 2 jobs through m machines.
UNIT–V: Networks – Fulkerson's rule – measure of activity – PERT computation – CPM computation – resource scheduling. Game Theory.

Reference Books:

1. HamdyA.Taha : Operation Research – An introduction 5th edition, PHI., New Delhi–1996.
2. Ackoff, R.L. and Sasieni, M.W: Fundamentals of operation research, John wiley and, sons, New York

3. Charnes A. Cooper W. and HendersenA : introduction to linear programming, john wileyandsons, newyork 1953.
4. Srinath l.s.: PERT and CPM Principles and applications, affiliated east press pvt. Ltd., newyork1973.
5. Kantiswarup, p.k. gupta&manmohan – operation research 1996.
6. S.Kalavathy: Operations Research – Second Edition – Vikas Publishing House Pvt. Ltd., 2002.

Paper- GE4 : Graph Theory

Course Learning Outcomes:

After course completion the students will have the following learning outcomes:

- Appreciate the definition and basics of graphs along with types and their examples.
- Understand the definition of a tree and learn its applications to fundamental circuits.
- Know the applications of graph theory to network flows.
- Understand the notion of planarity and coloring of a graph.
- Relate the graph theory to the real-world problems.

UNIT-I: ***Fundamental Concepts***: what is a Graph-Paths-Cycles-Trails-Vertex Degrees and Counting- Directed Graphs-Trees and Distance-Spanning Trees-Enumeration-Optimization and trees.

UNIT-II: ***Matchings And Connectivity*** : Matchings and Covers-Algorithms and applications of matching-Matchings in General graphs-Cuts and Connectivity-k-connected graphs-Network flow problems.

UNIT-III: ***Coloring And Planar Graphs***: Vertex coloring and upper bounds-Structure of k chromatic Graphs-Enumerative Aspects-Embeddings and Euler's formula-Characterization of Planar graphs- Parameters of Planarity-Edges and Cycles-Line Graphs and edge-coloring-Hamiltonian Cycles- Planarity-coloring and cycles.

UNIT – IV :***Introduction***: Definition of linear graph, self loop, Parallel edges, simple graph, multi graph, Pseudo graph, directed graph, Application of graph, Finite and Infinite graph, Incidence and degree, Indegree and outdegree of directed graph and their relation, Isolated vertex, Pendant vertex and Null graph.
Walk, Path & Circuit: Isomorphic Graph, Subgraph (Edge and Vertex disjoint), Walk path circuit and their differences, Connected & Disconnected Graph, Components, Operation On Graphs (Union, Intersection, Ring sum, Decomposition, Deletion of edge and vertex, Fusion, Euler Graph, Arbitrarily Traceable Graph, Hamiltonian paths andcircuit, Complete graph, Bipartite graph, complete bipartite graph.
Tree: Definition of tree, Distance, Eccentricity, Center, Radius and diameter, rooted tree, Binary tree and its properties, Spanning tree, Breadth First Search and Depth First Search, Minimum spanning tree, Algorithm for finding Minimum Spanning Tree (Prim's and Kruskal).
Shortest Path Problem: Dijkstra Algorithm, Traveling Salesman Problem, Floyd and Warshall algorithm.
Searching : BFS, DFS
Planar Graph: Euler formula, Kuratowski's theorem.
Cut Set & Cut Vertices: Cut set and its properties, All Cut-sets in a graph, Fundamental circuit and Cut set, Connectivity (Edge & Vertex), Separability.
Representation of Graph: Adjacency matrix and adjacency list, Incidence matrix, Path matrix, Circuit matrix, their relative advantage & disadvantages.

Reference Books:

1. Michel Townsend, "Discrete Mathematics: Applied Combinatorics and graph theory", The Benjamin/Cummings Publishing Company", California.
2. Kenneth H Rosen. "Discrete Mathematics and Its Applications, Tata McGrahHill Publishing Company, New Delhi

6.3. References for each course

References for each course are given at the end of course contents of each course.

7. Teaching-Learning Process

The teaching-learning process should be aimed at systematic exposition of basic concepts so as to acquire knowledge of BCA in a canonical manner. In this context, applications of BCA and linkage with the theory constitute a vital aspect of the teaching-learning process. The course offers many modes of learning and assessment. Students have great freedom of choice of subjects which they can study. The various components of teaching-learning process are summarized in the following heads.

1. **Lectures:** The most common method of imparting knowledge is through lectures. There are diverse modes of delivering lectures such as through blackboard, power point presentation and other technology aided means. A judicious mix of these means is a key aspect of teaching-learning process.

2. Tutorials: Assimilating mathematical ideas, deepening understanding, and gaining mastery of new concepts all take time, commitment, and intelligent effort. To reinforce learning, to monitor progress, and to provide a regular pattern of study, tutorials are essential requirements. During these tutorials, difficulties faced by the students in understanding the lectures, are dealt with. Tutorials are also aimed at solving problems associated with the concepts discussed during the lectures.

3. **Practicals:** To give a geometrical visualisation and obtaining numerical solutions of mathematical problems, various Computer Algebra Systems (CAS) are used in practical sessions. These sessions provide vital insights into mathematical concepts and draw learner's attention towards limitations of numerical computations. During practicals, mathematical models arising in real life problems can also be simulated.

4. Options System: LOCF in BCA provides great flexibility both in terms of variety of courses and range of references in each course. In fifth and sixth semesters students can opt for elective courses from a wide range of pure and applied courses, depending on their interests and requirements.

5. **Field based learning:** Students may enhance their knowledge through field based learning while understanding the practical importance of BCA especially in industries.

6. **Prescribed textbooks:** A large number of books are included in the list of references of each course for enrichment and enhancement of knowledge.

7. **E-learning resources:** Learner may also access electronic resources and educational websites for better understanding and updating the concepts.

8. **Self-study materials:** Self-study material provided by the teachers/instructors is an integral part of learning BCA. It helps in bridging the gaps in the classroom teaching. It also provides scope for teachers to give additional information beyond classroom learning.

9. **Open-ended projects:** Home assignments at regular intervals and project work involving applications of theory are necessary to assimilate basic concepts of BCA. Hence, it is incumbent on the part of a learner to complete open-ended projects assigned by the teacher.

10. **Internships:** The teaching-learning process needs to be further supported by other activities devoted to subject-specific and interdisciplinary skills, summer and winter internships in BCA. During these internships it is expected that a learner will interact with experts and write a report on a topic provided to the learner.

11. **Institute visits:** Institute visit by a learner is also a part of learning process. During such visits a learner has access to knowledge by attending academic activities such as seminars, colloquia, library consultation and discussion with faculty members. These activities provide guidance and direction for further study.

12. **Industrial visits:** Industrial visits offer an opportunity to observe real time applications of mathematical concepts. These visits also give an opportunity to realise the power of mathematical ideas and their translation in problem solving.

13. **Training programmes:** Training programmes such as BCA Training and Talent Search (MTTS) program, organised by various agencies/institutes like National Board for Higher BCA, also provide an opportunity to learn various dimensions of BCA.

105

8. Assessment Methods

A range of assessment methods which are appropriate to test the understanding of various concepts of BCA will be used. Priority will be given to formative assessment. Various learning outcomes will be assessed using time-bound examinations, series of open and closed book tests with uniform distribution over time, problem solving, home assignments, individual and group project reports, seminar presentations, viva-voce examination, participation in

mathematical quizzes/competitions at local, regional, national and international levels and participations in internship programs. For various courses in BCA, the following assessment methods shall be adopted:

i. Announced/unannounced quizzes
ii. Scheduled/unscheduled tests
iii. Problem solving sessions aligned with classroom lectures
iv. Practical assignments
v. Regular chamber consultation with faculty members
vi. Periodic tests, mid semester examination and semester end comprehensive examination
vii. Seminar presentations
viii. Computer skill test and computer simulation of concepts learnt
ix. Awareness tests of historical development of mathematical ideas
x. Awareness tests of recent advances in BCA
xi. Awareness tests of various national/international prizes in BCA including Fields Medal, Abel prize, Rolf Nevanlinna Prize, Srinivasa Ramanujan Medal etc. and the work of recipients of these prizes
xii. Awareness test of applications of BCA in other branches of science, technology and other disciplines.

9. Keywords

LOCF, CBCS, Course Learning Outcomes, Employability, Simulation, Graduate Attributes Communication Skills, Critical Thinking, Descriptors.