BHARATHIDASAN UNIVERSITY   **TIRUCHIRAPPALLI - 620 024.**

B.Sc. COMPUTER SCIENCE

CHOICE BASED CREDIT SYSTEM –

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(Applicable to the candidates admitted from the academic year 2022-2023 onwards)

(NAAN MUDHALVAN SCHEME was implemented from 2nd to 6th Semester)

Sem.	Part	Course	Title	Ins. Hrs	Credits	Exam Hours	Marks Int.	Marks Ext.	Total
I	I	Language Course – I Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course - I		6	3	3	25	75	100
	III	Core Course – I (CC)	Programming in C and Data Structures	5	5	3	25	75	100
		Core Practical – I (CP)	Programming in C Lab	4	4	3	40	60	100
		First Allied Course – I (AC)		4	4	3	25	75	100
		First Allied Course – II (AC)		3	-	-	-	-	-
	IV	Value Education		2	2	3	25	75	100
		TOTAL		**30**	**21**	**-**	**-**	**-**	**600**
II	I	Language Course - II Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course - II		4	3	3	25	75	100
	III	Core Course – II (CC)	Programming in Java	5	5	3	25	75	100
		Core Practical – II (CP)	Programming in Java Lab	4	4	3	40	60	100
		First Allied Course – II (AC)		3	2	3	25	75	100
		First Allied Course – III (AC)		4	4	3	25	75	100
		Add on Course – I ##	Professional English – I	6*	4	3	25	75	100
	IV	Environmental Studies		2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NMS) @@	Language Proficiency for Employability - Effective English	2	2	3	25	75	100
		TOTAL		**30**	**29**	**-**	**-**	**-**	**900**

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III	I	Language Course – III Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course - III		6	3	3	25	75	100
	III	Core Course – III (CC)	Programming in Python	5	5	3	25	75	100
		Core Practical - III (CP)	Programming in Python Lab	4	4	3	40	60	100
		Second Allied Course – I (AC)		4	4	3	25	75	100
		Second Allied Practical (AP)		3	-	-	-	-	-
		Add on Course – II ##	Professional English - II	6*	4	3	25	75	100
	IV	Non-Major Elective - I @ Those who choose Tamil in Part I can choose a non-major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level or b) Special Tamil if Tamil language was studied up to 10th & 12th std.	Fundamentals of Information Technology	2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NMS) @@	Programming Essentials for Employability – Fundamentals of Coding and cloud	-	2	3	25	75	100
		TOTAL		**30**	**27**	**-**	**-**	**-**	**800**
IV	I	Language Course –IV Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course – IV		6	3	3	25	75	100
	III	Core Course - IV (CC)	Database Management Systems	5	5	3	25	75	100
		Core Practical - IV (CP)	Database Management Systems Lab	4	4	3	40	60	100
		Second Allied Practical (AP)		3	2	3	40	60	100
		Second Allied Course – II (AC)		4	4	3	25	75	100
	IV	Non-Major Elective II @ Those who choose Tamil in Part I can choose a non-major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level or b) Special Tamil if Tamil language was studied up to 10th & 12th std.	Working Principles of Internet	2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NMS) @@	Computational Skills for employability – Oracle Cloud Architecture	-	2	3	25	75	100
		TOTAL		**30**	**25**	**-**	**-**	**-**	**800**

V	III	Core Course - V (CC)	Fundamentals of Algorithms	5	5	3	25	75	100
		Core Course – VI (CC)	Computer Networks	5	5	3	25	75	100
		Core Course – VII (CC)	Digital Electronics and Microprocessor	5	5	3	25	75	100
		Core Practical -V (CP)	Digital Electronics and Microprocessor Lab	4	4	3	40	60	100
		Major Based Elective – I (Any one)	1. Artificial Intelligence and Expert Systems 2. Computer Graphics	5	4	3	25	75	100
	IV	Skill Based Elective I	Web Technology	4	2	3	25	75	100
		Soft Skills Development		2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NMS) @@	Cloud & IT Essentials for Employability – Generative AI	-	2	3	25	75	100
		TOTAL		**30**	**29**	**-**	**-**	**-**	**800**
VI	III	Core Course - VIII (CC)	Operating Systems	6	5	3	25	75	100
		Core Course - IX (CC)	Programming in PHP	6	5	3	25	75	100
		Core Practical – VI (CP)	Programming in PHP Lab	4	4	3	40	60	100
		Major Based Elective - II (Any one)	1. Software Engineering 2. Big Data Analytics	5	4	3	25	75	100
		Project		4	3	-	40	60	100
	IV	Skill Based Elective – II	Mobile Application Development	4	2	3	25	75	100
	V	Gender Studies		1	1	3	25	75	100
		Extension Activities **		-	1	-	-	-	-
	VI	Naan Mudhalvan Scheme (NMS) @@		-	2	3	25	75	100
		TOTAL		**30**	**27**	**-**	**-**	**-**	**800**
		GRAND TOTAL		**180**	**158**	**-**	**-**	**-**	**4700**

List of Allied Courses

First Allied Course   **Second Allied Course**

Mathematics   Applied Physics

$ For those who studied Tamil upto 10th +2 (Regular Stream).

+ Syllabus for other Languages should be on par with Tamil at degree level.

\# Those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part- I should study special Tamil in Part – IV.

\#\# The Professional English – Four Streams Course is offered in the 2nd and 3rd Semester (only for 2022-2023 Batch) in all UG Courses. It will be taught apart from the Existing hours of teaching / additional hours of teaching (1 hour /day) as a 4 credit paper as an add on course on par with Major Paper and completion of the paper is must to continue his / her studies further. (As per G.O. No. 76, Higher Education (K2) Department dated: 18.07.2020).

* The Extra 6 hrs / cycle as per the G.O. 76/2020 will be utilized for the Add on Professional English Course.

@ NCC Course is one of the Choices in Non-Major Elective Course. Only the NCC cadets are eligible to choose this course. However, NCC Course is not a Compulsory Course for the NCC Cadets.

** Extension Activities shall be outside instruction hours.

@@ Naan Mudhalvan Scheme.

SUMMARY OF CURRICULUM STRUCTURE OF UG PROGRAMMES

Sl. No.	Part	Types of the Courses	No. of Courses	No. of Credits	Marks
1.	I	Language Courses	4	12	400
2.	II	English Courses	4	12	400
3.		Core Courses	9	45	900
4.		Core Practical	6	24	600
5.		Allied Courses I & II	4	16	400
6.	III	Allied Practical	2	4	200
7.		Major Based Elective Courses	2	8	200
8.		Add –on Course (Professional English I & II)	2	8	200
9.		Project	1	3	100
10.		Non-Major Elective Courses	2	4	200
11.		Skill Based Elective Courses	2	4	200
12.	IV	Soft Skills Development	1	2	100
13.		Value Education	1	2	100
14.		Environmental Studies	1	2	100
15.		Gender Studies	1	1	100
16.	V	Extension Activities	1	1	---
17.	VI	Naan Mudhalvan Scheme	5	10	500
		Total	**48**	**158**	**4700**

PROGRAMME OUTCOMES:

- Graduates will be able to comprehend the basic concepts learnt and apply in real life situations with analytical skills.
- Graduates with acquired skills and enhanced knowledge will be employable / become entrepreneurs or will pursue higher Education.
- Graduates with acquired knowledge of modern software tools will be able to contribute effectively as software engineers.
- Graduates will be able to comprehend the related concepts to Computer Science with Allied papers
- Graduates will be imbibed with ethical values and social concerns to ensure peaceful society.

PROGRAMME SPECIFIC OUTCOMES:

- Acquired the required knowledge in the Hardware and Software aspects of Computer Science domain and the art of programming.
- Understood the development methodologies of software systems and the ability to analyze design and develop computer applications for real life problems.
- Gained knowledge and skills to collaborate and communicate with peers in IT / ITES industries
- The ability to understand, adjust and adapt with the dynamic technical environment for the growth of IT industry.
- The capacity to transfer the skills gained, to provide innovative and novel solutions by maintaining ethical norms for the betterment of humane society.

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First Year   **CORE COURSE I**   **Semester I**
PROGRAMMING IN C AND
DATA STRUCTURES
Code: **(Theory)**   **Credit: 5**

COURSE OBJECTIVES:

* To know about the basics of C Programming, Control and Looping Structures and programming with it.
* To understand Arrays, Pointers and String Processing in C language
* To know about the basic concepts in Data Structures.

UNIT - I:

Basic of C: History of C and its importance – Structure of a C program – Data Types – Constants and Variables – Operators and Expressions – Order of Precedence, Evaluating of Arithmetic Expressions – Type Conversion- Decision Statements: if, if-else, and nested if statements.

UNIT - II:

Loops Structures: For Loop, While, Do-while loop – Arrays: - One Dimensional Array, Two-dimensional Arrays, Character Arrays and Strings – Functions: Function with arrays - Function with decision and looping statements - Recursion.

UNIT - III:

Pointers: Introduction – Pointer Expressions – Chain of Pointers – Pointers and Arrays – Array of Pointers – Pointers as function arguments – Functions returning Pointers – Pointers to Functions – Function pointer – Structures - declaration, initialization, Array of Structures – Pointer to structures, Structures and functions – Typed of Enumerated data types, Unions.

UNIT - IV:

Strings Processing, Standard string library functions – Files: introduction and files functions – Writing and reading in Text mode – Simple application: Display the contents of a file. Write data to a file. Append data to an existing file – File IO– Reading and writing structures.

UNIT - V:

Stack: LIFO concept, Stack operations, Array implementation of stack – Queue: FIFO concept, Queue operations, Array implementation of queue – Singly Linked List: concepts, operations – Doubly Linked List: concepts,

operations – Trees: General trees, Binary trees.

UNIT – VI   CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, New Delhi, Seventh Edition, 2016.
2. E.Horowitz, S.Sahni and Susan Anderson Freed, "Fundamental Data Structures in C", 2ed, Orient BlackSwan Publisher, 2009.
3. Byron S. Gottfried, "Programming with C", Schaum's Outline Series, Tata- McGraw Hill Edition, New Delhi, 1991.
4. E. Karthikeyan, "A Textbook on C Fundamentals, Data Structures and Problem Solving", Prentice-Hall of India Private Limited, New Delhi, 2008.
5. Yashavant Kanetkar, "Let us C", BPB Publications, Tenth Edition, New Delhi, 2010.
6. Szuhay, Jeff, and Szuhay, Jeff, "Learn C Programming: A Beginner's Guide to Learning C Programming the Easy and Disciplined Way", Packt Publishing, 2020.
7. Jena, Sisir Kumar, and Jena, Sisir Kumar, "C Programming: Learn to Code", CRC Press, 2021.
8. https://www.tutorialspoint.com/cprogramming/index.htm
9. https://www.w3schools.in/data-structures/intro

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

*   Summarize the basic knowledge to develop C programs
*   Manipulate Looping, arrays and functions
*   Apply and write programs for solving real world problems
*   Create open, read, manipulate, write and close files.
*   Understand the basic concepts in data structures.

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COURSE OBJECTIVES:

- To understand the programming fundamentals of C language.
- To impart writing skill of C programming and data structures for a list of problems.
- To impart hands-on training for writing a C program using computers.

1. Write a Program
   (i) To convert temperature from degree Centigrade to Fahrenheit,
   (ii) Find whether given number is Even or Odd,
   (iii) Find the greatest of Three numbers.
2. Write a Program to display Monday to Sunday using switch statement
3. Write a Program to display first Ten Natural Numbers and their sum.
4. Write a Program to perform Multiplication of Two Matrices.
5. Write a Program
   (i) To find the maximum number in an Array using pointer.
   (ii) To reverse a number using pointer.
   (iii) To add two numbers using pointer.
6. Write a Program to solve Quadratic Equation using functions.
7. Write a Program to find factorial of a number using Recursion.
8. Write a Program to demonstrate Call by Value and Call by Reference.
9. Write a Program to create a file containing Student Details.
10. Write a program to implement a stack using singly linked list, Implement Queue using Linked List.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Relate the use of language constructs to solve simple programs
- Develop programs for various concepts in C language
- Understand and trace the execution of the list of programs
- Understand the usage of file handling in C programming
- Solve data problems related to data structures.

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First Year **CORE COURSE II** **Semester II**
PROGRAMMING IN JAVA
Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To acquire the programming skills with java.
- To implement the object-oriented concepts with java language
- To learn the art of GUI programming with Applet.

UNIT - I:

Foundation, Essentials, Control Statement and Classes & Objects, Stage of Java – origin of Java – challenges - features - Object-Oriented Programming; Java Essentials: Elements - API - variables - primitive data types – String Class - operators –combined assignment operators - conversion – scope – comments - keyboard input; Control Statements: if, if-else, nested if & if-else-if statements – logical operators – comparison – conditional operator – switch – increment and decrement – while, do-while & for loops – nested loops – break and continue; Classes and Objects: classes and objects -modifiers - passing arguments– constructors - package & import - static class members –method overloading– constructor overloading –returning objects – this variable – recursion – nested & inner classes – abstract classes & methods.

UNIT - II:

Arrays, String Handling, Inheritance, Interface and Packages, Introduction – processing array – passing arrays – returning arrays – String arrays – two Dimensional Arrays - Arrays with Three or More Dimensions; String Handling: String class – concatenation – comparison – substring – methods – other methods–String Buffer, String Builder & String Tokenizer classes; Inheritance: basics – inheriting and overriding superclass methods – calling superclass constructor – polymorphism – inherit from different classes – abstract classes – final Class; Interfaces: Basics – multiple Interfaces – multiple inheritance using interface – multilevel interface – Packages – Create and access packages in Net Beans IDE – static Import and package class – access specifiers.

UNIT - III:

Exception Handling, I/O and File Handling and Multithreading, Introduction - try and catch block - multiple catch block - nested try - finally Block – throw Statement – exception propagation – throw Clause - custom exception – built-in exception; Multithreading: Introduction – threads – thread creation – life cycle – joining a thread – scheduler &priority – synchronization – inter-thread communication – thread control – thread Pool – thread group – daemon thread; Files and I\O Streams: file Class – streams – byte streams – filtered byte streams – Random Access File class – character streams.

UNIT - IV:

Applet and GUI Part I, Fundamentals – applet class – life cycle – steps for applet program – passing values through parameters – graphics – event handling; GUI I:GUI – creating windows – dialog boxes – layout managers – AWT component classes – Swing component classes – applications of AWT

controls.

UNIT - V:

GUI Part II and Java Database Connectivity, Event handling – AWT components – AWT graphics classes – Swing controls – application using Swing and AWT; Java Database Connectivity: types of drivers – JDBC architecture – JDBC classes &interfaces – steps in JDBC applications – creating a new Database and table with JDBC.

UNIT – VI   CURRENT CONTOURS (For continuous internal assessment only)

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. S. Sagayaraj, R. Denis, P. Karthik & D. Gajalakshmi, "Constructive Java Programming",Universities Press, 2021.
2. E. Balagurusamy, "Programming with JAVA", Tata McGraw Hill, New Delhi, 2019.
3. C. Muthu, "Programming with JAVA", Vijay Nicole Imprints Private Limited, Chennai, Second Edition, 2011.
4. Bruce Eckel, Chuck Allison, "Thinking in Java", Prentice Hall Publications, 2006
5. Malina Pronto, "Java: How To Learn Java Programming: How To Improve Your Java Coding In 2020/2021: 5 Programming Languages To Learn For Beginners In Tech", Independently Published, 2020.
6. Nick Samoylov, "Learn Java 12 Programming: A Step-by-step Guide to Learning Essential Concepts in Java", Packt Publishing, 2019.
7. https://www.javatpoint.com/java-tutorial

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand the concept of OOP as well as the purpose and usage principles ofinheritance, polymorphism, encapsulation and method overloading.
- Identify members of a class and to implement them
- Create Java application programs using sound OOP practices (e.g., interfaces andAPIs) and proper program structuring (e.g., by using access control identifies, andcreate user define package for specific task,(reusability concepts) error exception handling)
- Develop programs using the Java standard class library.
- Develop software using Java programming language, (using applet, AWT controls,and JDBC).

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First Year   **CORE PRACTICAL II**   **Semester II**
                              PROGRAMMING IN JAVA LAB
Code: (Practical)   **Credit: 4**

COURSE OBJECTIVES:

- To understand the basics of JAVA programs and their execution.
- To learn concepts like inheritance, packages and interfaces.
- To understand the life cycle of the applets, database connectivity and their functionality.

1. Write a program to sort the given numbers using arrays.
2. Write a program to implement the FIND and REPLACE operations in the given text.
3. Write a program to implement a calculator to perform basic arithmetic Operations, doing with constructers
4. Write a program to find the student's percentage and grade using command line arguments.
5. Write a program to draw circle or triangle or square using polymorphism and inheritance.
6. Implement multiple inheritance concepts in java using interface, you can choose your own example of a company or education institution or a general concept which requires the use of interface to solve a particular problem.
7. Write a program to create threads and perform operations like start, stop, suspend, resume
8. Write a program to develop an applet to play multiple audio clips using multithreading.
9. Write a program to retrieve employee data from a file
10. Write a program to retrieve student data from a Database

Course Outcomes:

Upon successful completion of this course the students would be able to:

- Develop java programs to understand the OOP concepts.
- Write java programs for classes and objects.
- Develop simple programs with multiple threads.
- Write java programs using Applets.
- Develop java programs to connect databases and files.

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Second Year **CORE COURSE III** **Semester III**
PROGRAMMING IN PYTHON
Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To develop programs using functions and pass arguments in Python.
- To write programs using loops and decision statements in Python.
- To design and program Python applications.

UNIT - I:

Introduction to Python: Features of Python - How to Run Python - Identifiers - Reserved Keywords - Variables - Comments in Python - Indentation in Python - Multi-Line Statements - Multiple Statement Group (Suite) - Quotes in Python - Input, Output and Import Functions - Operators. Data Types and Operations: Numbers – Strings – List – Tuple – Set – Dictionary – Data type conversion.

UNIT - II:

Flow Control: Decision Making – Loops – Nested Loops – Types of Loops. Functions: Function Definition – Function Calling - Function Arguments - Recursive Functions - Function with more than one return value.

Unit - III:

Modules and Packages: Built-in Modules - Creating Modules - import Statement - Locating Modules - Namespaces and Scope - The dir() function - The reload() function - Packages in Python - Date and Time Modules. File Handling- Directories in Python.

UNIT - IV:

Object-Oriented Programming: Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes- Destructors in Python – Encapsulation - Data Hiding – Inheritance - Method Overriding- Polymorphism.

UNIT - V:

Exception Handling: Built-in Exceptions-Handling Exceptions- Exception with Arguments - Raising Exception - User-defined Exception - Assertions in Python. Regular Expressions: The match() function - The search() function - Search and Replace - Regular Expression Modifiers: Option Flags-Regular Expression Patterns- Character Classes-Special Character Classes - Repetition Cases -

findall() method - compile() method.

UNIT – VI   CURRENT CONTOURS (For continuous internal assessment only):

An Introduction to Interactive Programming in Python - Study on Julia – an high level language approach.

REFERENCES:

1. Jeeva Jose and P. Sojan Lal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Book Publishing Co, 2016.
2. Mark Summerfield. ― Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.
3. Martin C. Brown, ―PYTHON: The Complete Reference‖, McGraw-Hill, 2001
4. Wesley J. Chun, "Core Python Programming", Prentice Hall Publication, 2006.
5. Timothy A Budd, "Exploring Python", Tata McGraw Hill, New Delhi, 2011
6. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly Media, 2016.
7. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O Reilly Publishers, 2016
8. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python ―Revised and updated for Python 3.2, Network Theory Ltd., 2011.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To recall and understand the features of python programming language
- To illustrate various programming mechanism used in python
- To apply various language construct to write simple programs in python
- To examine the application of object oriented concept in python
- To distinguish the various constructs used in python.

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COURSE OBJECTIVES:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- To represent compound data using Python lists, tuples, and dictionaries.

1. Flow controls, Functions and String Manipulation
2. Operations on Tuples and Lists
3. Operation on sets
4. Operations on Dictionary
5. Simple OOP– Constructors – create a class for representing a car
6. Method Overloading – create classes for vehicle and Bus and demonstrate method overloading
7. Files – Reading and Writing – perform the basic operation of reading and writing with student file
8. Regular Expressions
9. Modules
10. Packages
11. Exception Handling

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Write simple programs using control structures, functions and strings
- Develop programs using tuples, lists, sets and dictionary
- Write simple programs using Constructors, Method overloading and inheritance
- Develop programs using files and regular expressions
- Write simple programs using packages and exception handling

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Second Year	NON MAJOR ELECTIVE I	Semester III

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Code	(Theory)	Credit: 2

COURSE OBJECTIVES:

- To familiarize the students with the world of IT and IT-enabled services.
- To provide an in-depth knowledge about internet and internet tools.
- To enable the students to understand about Computer Security

UNIT - I:

Introduction to Computers - Generation of Computers - Classification of Digital Computer - Anatomy of Digital Computer.

UNIT-II:

CPU and Memory - Secondary Story Devices - Input Devices - Output Devices.

UNIT-III:

Introduction to Computer Software - Programming Language - Operating Systems - Introduction to Database Management System.

UNIT - IV:

Computer Networks - WWW and Internet - Email - Web Design

UNIT - V:

Computers at Home, Education, Entertainment, Science, Medicine and Engineering - Introduction to Computer Security - Computer Viruses, Bombs, Worms.

UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Alexis Leon and Mathews Leon, Fundamentals of Information Technology, Vikas Publishing House Pvt. Ltd, 2009
2. Fundamentals of Computers and Information Technology, M.N Doja,2005
3. Ramesh Bangia,"Computer Fundamentals and Information Technology", Laxmi Publications Pvt Limited, 2008.
4. Bharihoke, "Fundamentals of Information Technology", Excel Books, 2009.
5. Ralph Stair, George Reynolds, "Fundamentals of Information Systems" Cengage Learning, 2015.

6. Shun-Ping Chen, "Fundamentals of Information and Communication Technologies", Cambridge Scholars Publisher, 2020.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand basic concepts and terminologies in IT and IT-enabled services.
- Understanding personal computers and their operations.
- Understand about operating systems and database management
- Comprehend about WWW, internet, email and web design concepts
- Respond to computer security issues.

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Second Year   **CORE COURSE IV**   **Semester IV**

DATABASE MANAGEMENT SYSTEMS

Code   **(Theory)**   **Credit: 5**

COURSE OBJECTIVES:

- To impart the basic database concepts, applications, data models, schemas and instances.
- To familiarize Entity Relationship model for a database.
- To Demonstrate the use of constraints and relational algebra operations.

UNIT - I:

Introduction: Database-System Applications- Purpose of Database Systems - View of Data -Database Languages - Relational Databases - Database Design -Data Storage and Querying Transaction Management -Data Mining and Analysis - Database Architecture - Database Users and Administrators - History of Database Systems.

UNIT - II:

Relational Model: Structure of Relational Databases -Database Schema - Keys – Schema Diagrams - Relational Query Languages - Relational Operations Fundamental Relational-Algebra Operations Additional Relational-Algebra Operations- Extended Relational-Algebra Operations - Null Values - Modification of the Database.

UNIT - III:

SQL Overview of the SQL Query - Language - SQL Data Definition - Basic Structure of SQL Queries - Additional Basic Operations - Set Operations - Null Values Aggregate Functions - Nested Subqueries - Modification of the Database -Join Expressions - Views - Transactions - Integrity Constraints - SQL Data Types and Schemas – Authorization.

UNIT - IV:

Relational Languages: The Tuple Relational Calculus - The Domain Relational Calculus Database Design and the E-R Model: Overview of the Design Process - The Entity-Relationship Model - Reduction to Relational Schemas - Entity-Relationship Design Issues - Extended E-R Features - Alternative Notations for Modeling Data - Other Aspects of Database Design

UNIT - V:

Relational Database Design: Features of Good Relational Designs - Atomic Domains and First Normal Form - Decomposition Using Functional Dependencies - Functional-Dependency Theory - Decomposition Using Functional Dependencies - Decomposition Using Multivalued Dependencies-More Normal Forms - Database-Design Process

UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Database System Concepts, Sixth edition, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill-2010.

2. Jagdish Chandra Patni, Hitesh Kumar Sharma, Ravi Tomar, Avita Katal., "Database Management System: An Evolutionary Approach", CRC Press, 2022.
3. Abraham Silberschatz, Hendry F. Korth, S Sudharshan," Database System Concepts", 6th Edition, McGraw Hill International, 2019.
4. Blokdyk, Gerardus, and Blokdyk, Gerardus, "RDBMS Relational Database Management System a Complete Guide", 2020 Edition, Emereo Pty Limited, 2019.
5. Wilfried Lemahieu, Seppevanden Broucke, Bart Baesens, "Principles of Database Management: The Practical Guide to Storing, Managing and Analyzing Big and Small Data", Cambridge University Press, 2018.
6. C.J. Date, "An Introduction to Database Systems" Addison Wesley, 2000.
7. https://tutorialspoint.dev/computer-science/dbms

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand the basic concepts of Database Systems
- Know about SQL queries to interact with Database
- Design a Database using ER Modelling
- Apply normalization on database design to eliminate anomalies
- Analyze database transactions and to control them by applying ACID properties.

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COURSE OBJECTIVES:

- To understand the basic concepts and the applications of database systems using MYSQL.
- To create and perform basic operation with MYSQL.
- To interact with MYSQL by using nested queries, set of aggregate operations and views.

1. Create a table and perform the following basic mysql operations
   a. Set the primary key
   b. Alter the structure of the table
   c. Insert values
   d. Delete values based on constraints
   e. Display values using various forms of select clause
   f. Drop the table

2. Develop mysql queries to implement the following set operations
   a. Union
   b. Union all
   c. Intersect
   d. Intersect all

3. Develop mysql queries to implement the following aggregate functions
   a. Sum
   b. Count
   c. Average
   d. Maximum
   e. Minimum
   f. Group by clause & having clause

4. Develop mysql queries to implement following join operations
   a. Natural join
   b. Inner join
   c. Outer join-left outer, right outer, full outer
   d. Using join conditions

5. Develop mysql queries to implement nested subqueries
   a. Set membership (int, not int)
   b. Set comparison (some, all)
   c. Empty relation (exists, not exists)
   d. Check for existence of Duplicate tuples(unique, not unique)

6. Develop mysql queries to create a views and expand it.

7. Develop mysql queries to implement
   a. String operations using %

b. String operations using '_'
c. Sort the element using asc,desc
[*create necessary reletions with requires attribute]

8. Consider the following database for a banking enterprise
BRANCH(branch-name:string, branch-city:string, assets:real)
ACCOUNT(accno:int, branch-name:string, balance:real)
DEPOSITOR(customer-name:string, accno:int)
CUSTOMER(customer-name:string, customer-street:string, customercity: string)
LOAN(loan-number:int, branch-name:string, amount:real)
BORROWER(customer-name:string, loan-number:int)
    i.   Create the above tables by properly specifying the primary keys and the
    ii.   foreign keys
    iii. Enter at least five tuples for each relation
    iv.   Find all the customers who have at least two accounts at the Main Branch.
    v.   Find all the customers who have an account at all the branches located
    vi.   In a specific city.
    vii. Demonstrate how you delete all account tuples at every branch located in a specific city. Generate suitable reports.
    viii. Create a suitable front end for querying and displaying the results.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

• Write queries to manipulate data.
• Demonstrate the aggregate functions and set operations.
• Apply the join operations.
• Know about usage of nested sub queries.
• Understand the method to create views.

*****

COURSE OBJECTIVES:

- To teach the basics of the World Wide Web
- To understand the fundamentals of the Internet and the usage
- To know the components of Multimedia on the internet

UNIT - I:

What is Internet? The Internet's underlying Architecture

UNIT - II:

Connecting to the Internet – Communicating on the Internet

UNIT - III:

How the World Wide Web works. Common Internet tools

UNIT - IV:

Multimedia on the Internet – Intranet and shopping on the Internet

UNIT - V:

Safeguarding the Internet

UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Preston Gralla, "How the Internet Works", Pearson Education, Eighth Edition, 2006.
2. C.Xavier, Fundamentals of Internet and Emerging Technologies, New Age International Private Limited; First Edition ,2021
3. Alexis Leon, Internet for Everyone, S. Chand (G/L) & Company Ltd; Second Edition 2012.
4. Andrea C. Nakaya,"Internet and Social Media Addiction", Reference Point Press,2015.
5. Richard Fox, Wei Hao,"Internet Infrastructure: Networking, Web Services, and Cloud Computing", CRC Press, 2017.
6. Douglas E. Comer,"The Internet Book: Everything You Need to Know about Computer Networking and How the Internet Works", CRC Press, 2018.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand the evolution of the Internet.
- Know the basic knowledge of the web
- Comprehend the protocols and standards used throughoutthe Internet.
- Discuss a variety of Internet and WWW applications and related technologies.
- Evaluate the opportunities and threats created by interconnecting computers via the Internet.

Third Year   **CORE COURSE V**   **Semester V**

FUNDAMENTALS OF ALGORITHMS

Code   **(Theory)**   **Credit: 5**

COURSE OBJECTIVES:

- To study the fundamentals of algorithms
- To understand trees, traversals and about shortest path.
- To know about the different algorithms related to sorting, optimality and backtracking

UNIT - I:

Introduction – Algorithm Specification, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Performance Measurement, Randomized algorithms.

UNIT - II:

Trees – Binary tree representations – Tree Traversal – Threaded Binary Trees – Binary Tree Representation of Trees – Graphs and Representations – Traversals, Connected Components and Spanning Trees – Shortest Paths and Transitive closure – Activity Networks – Topological Sort and Critical Paths.

UNIT - III:

Algorithms – Priority Queues - Heaps – Heap Sort – Merge Sort – Quick Sort – Binary Search – Finding the Maximum and Minimum.

UNIT - IV:

Greedy Method: The General Method – Optimal Storage on Tapes – Knapsack Problem – Job Sequencing with Deadlines – Optimal Merge Patterns.

UNIT - V:

Back tracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring.

UNIT VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Ellis Horowiz, SartajSahni, "Fundamentals of Data Structure",Galgotia Publications, 2008.
2. Ellis Horowiz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms", University Press, 2008.
3. Seymour Lipschutz, "Data Structures",TataMcgraw Hill, Schaum's Outline Series, 2014.

4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
5. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms
6. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
7. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms",MIT Press, 2022.
8. https://www.tutorialspoint.com/data_structures_algorithms/algorithms_basics.htm
9. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Know the basic concepts of algorithms
- Understand trees and shortest path algorithms.
- Compare and contrast different sorting algorithms
- Comprehend greedy and optimality algorithms.
- Appreciate the backtracking concept and its different algorithms.

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Third Year   **CORE COURSE VI**   **Semester V**
                                COMPUTER NETWORKS
Code   **(Theory)**   **Credit: 5**

COURSE OBJECTIVES:

- To describe the general principles of Computer Networks.
- To describe how the different layers in a computer network work
- To know about Wired LAN: IEEE Standards and Satellite networks.

UNIT - I:

Data Communication – Networks – The Internet – Protocols and Standards – OSI Model-Layers in OSI Model - TCP/IP Protocol Suite – Addressing.

UNIT - II:

Analog and Digital – Digital Signals – Transmission Impairment – Performance – Multiplexing – Guided Media – Unguided Media. Switching: Circuit Switched Networks – Datagram Networks – Virtual Circuit Networks

UNIT -III:

Data Link Layer: Error Detection and Correction -Introduction – Block Coding: Error detection, Error correction – Data Link Control: Framing – Flow and Error Control – Protocols – Noiseless Channels – Noisy channels – HDLC – Point to Point Protocol.

UNIT - IV:

Wired LAN: IEEE Standards – Standard Ethernet. Wireless LAN: IEEE 802.11 – Bluetooth. Connecting LANs: Connecting Devices – Virtual LANs. Wireless WAN: Cellular Telephony – Satellite Networks. Network Layer-Logical Addressing: IPv4 Addresses – IPv6 Addresses.

UNIT - V:

Transport Layer: Process to Process Delivery – User Datagram Protocol - TCP. Application Layer: Domain Name Space – DNS in the Internet – Electronic Mail – File Transfer. WWW: Architecture – HTTP.

UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Behrouz A. Forouzan, "Data Communications and Networking", McGraw-Hill Companies, New York, 5th Edition, 2017.

2. William Stallings "Data and computer communications", Prentice Hall of India, 7th Edition, 2004.
3. Andrew S Tanenbaum, "Computer Networks", Prentice Hall of India, New Delhi, 2013.
4. Dr M. P. Vani, "Data Communication and Computer Network", Notion Press, 2019.

5. Hazim Gaber, "Understanding Computer Networks 2020", Independently Published, 2020.
6. Grigorios N. Beligiannis, Ram Palanisamy, S. Smys, Álvaro Rocha, "Computer Networks and Inventive Communication Technologies", Springer, 2021.
7. https://www.guru99.com/data-communication-computer-network-tutorial.html

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Recall the basic concepts of computer networks
- Summarize the technical specifications of various layers of the OSI model in a computer network
- Identify the appropriate protocols and standards for computer networks
- Classify technical factors of cellular networks and satellite communication
- Know about the different functionalities of an application layer.

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Third Year   **CORE COURSE VII**   **Semester V**

DIGITAL ELECTRONICS AND MICROPROCESSOR

Code   **(Theory)**   **Credit: 5**

COURSE OBJECTIVES:

- To impart knowledge about the basics of Digital Systems
- To focus on the study of Boolean algebra, Combinational circuits.
- To impart knowledge about basic parts and functions of microprocessor and to have an understanding of the Registers, Interrupts, Interfaces, Buses, Pins, Instructions of 8085 microprocessor

UNIT - I:

Digital Systems and Binary Numbers - Digital Systems - Binary Numbers - Number Base Conversions - Octal and Hexadecimal Numbers - Complements of Numbers. Signed Binary Numbers - Binary Codes - Binary Storage and Registers - Binary Logic

UNIT - II:

Boolean Algebra and Logic Gates - Introduction - Basic Definitions - Axiomatic Definition of Boolean Algebra - Basic Theorems and Properties of Boolean Algebra. Boolean Functions - Canonical and Standard Forms - Other Logic Operations - Digital Logic Gates - Integrated Circuits.

UNIT - III:

Combinational Logic - Introduction - Combinational Circuits - Analysis of Combinational Circuits - Design Procedure - Binary Adder - Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoders - Encoders - Multiplexers - HDL Models of Combinational Circuits.

UNIT - IV:

Evolution of Microprocessor – Single chip Microcomputer – Microprocessor Applications –Buses- Memory Addressing capacity and CPU – Microcomputers – Processor Architecture – Intel 8085 – Instruction cycle – Timing Diagram.

UNIT - V:

Instruction Set of Intel 8085 – Instruction and Data Format – Address Modes – Status Flags – Intel 8085 instruction - Programming Microprocessor – Assembly language – Assembler.

UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. M. Morris R. Mano, Michael D. Ciletti. Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog, 6th Edition, 2018
2. Badri Ram, "Fundamentals of Microprocessors and Microcomputers", Dhanpat Rai Publications, 2012.
3. Dhanasekharan Natarajan, "Fundamentals of Digital Electronics", Springer International Publishing, 2020
4. Dr. S Salivahanan,"Analog and Digital Electronic", McGraw-Hill Education, 2019.
5. Soumitra Kumar Mandal, "Digital Electronics", McGraw-Hill Education, 2018.
6. A. Anand Kumar, "Fundamentals of Digital Circuits", Prentice Hall India Pvt. Limited, 2016.
7. Senthil Kumar Saravanan, Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press, 2010.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand about various number systems
- Know about Boolean Algebra and Logic Gates
- Draw and explain Combinational circuits
- Explain the Evolution of Microprocessors
- Use the Instruction Set of Intel 8085 in simple programs.

*****

Third Year   **CORE PRACTICAL V**   **Semester V**
DIGITAL ELECTRONICS AND MICROPROCESSOR
LAB
Code   **(Practical)**   **Credit: 4**

COURSE OBJECTIVES:

- To have hands-on experience with digital electronics concepts.
- To experiment the design of basic logic circuits, combinational and sequential circuits
- To write ALP and to execute them with a microprocessor kit.

A. Digital Electronics Experiments

1. Verification of Logic gates
2. Construction of half and full adder
3. K-Map
4. Shift register
5. Up Down Counters

B. Microprocessor Experiments

1. Eight Bit Addition and Subtraction
2. Sum of series
3. Data transfer
4. Maximum of N Numbers
5. Decimal to Hexadecimal

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Verify the logic gate and the working of Adder and subtractors
- Construct and study the function of Shift registers
- Understand the working of Up Down Counters
- To write simple ALPs and execute them
- To manipulate an array with ALP.

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COURSE OBJECTIVES:

- To study about the basic concepts in Artificial intelligence and reasoning
- To know about knowledge representation and its subsequent inference
- To study the concept of expert systems

UNIT - I:

Problems and Search : Searching strategies- Uninformed Search- breadth first search, depth first search, uniform cost search, depth limited search, iterative deepening search, bidirectional search - Informed Search- Best first search ,Greedy Best first search , A* search – Constraint satisfaction problem , Local searching strategies.

UNIT - II:

Reasoning: Symbolic Reasoning Under Uncertainty- Statistical Reasoning - Weak Slot-And-Filler-Structure - Semantic nets – Frames- Strong Slot-And-Filler Structure-Conceptual Dependency-Scripts- CYC.

UNIT - III:

Knowledge Representation: Knowledge Representation - Knowledge representation issues - Using predicate logic - Representing Knowledge Using Rules. Syntactic-Semantic of Representation – Logic & slot and filler - Game Playing – Minimal search- Alpha beta cutoffs –Iterative deepening planning – component of planning system – Goal stack planning.

UNIT - IV:

Natural Language Processing**:** Natural Language Processing –Syntactic processing, semantic analysis-Parallel and Distributed AI-Psychological modeling-parallelism and distributed in reasoning systems – Learning Connectionist Models – Hopfield networks, neural networks.

UNIT - V:

Expert Systems: Common Sense –qualitative physics, common sense ontologies-memory organization -Expert systems –Expert system shells- explanation – Knowledge acquisition -Perception and Action – Real time search- robot architecture.

UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester

Concerned

REFERENCES:

1. Elaine Rich, Kevin Knight, "Artificial Intelligence", 3/e, Tata McGraw Hill, 2017.
2. Russell , " Artificial intelligence :A modern Approach , Pearson Education ,3rd edition,2013
3. I. Gupta, G. Nagpal, "Artificial Intelligence and Expert Systems", Mercury Learning & Information, 2020.
4. C.S. Krishnamoorthy, S. Rajeev, "Artificial Intelligence and Expert Systems for Engineers", CRC Press, 2018.
5. V. Daniel Hunt, "Artificial Intelligence & Expert Systems Sourcebook, Springer US, 2012.
6. Artificial Intelligence and Expert system by V.Daniel hunt, Springer press, 2011.
7. Nilsson N.J., "Principles of Artificial Intelligence", Morgan Kaufmann.1998.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand the history of artificial intelligence (AI) and its foundations.
- Describe the modern view of AI as the study of agents that receive percepts from the Environment and perform actions.
- Demonstrate awareness of informed search and exploration methods.
- Create knowledge of decision making and learning methods
- Recall the concepts of expert systems.

*****

Third Year	**MAJOR BASED ELECTIVE I**	Semester V
	2) COMPUTER GRAPHICS	
Code	**(Theory)**	Credit: 4

COURSE OBJECTIVES:

* To understand the basic objectives and scope of computer graphics.
* To identify computer graphics applications and common graphics APIs.
* To know the basic structures of 2D and 3D graphics systems.

UNIT - I:

Overview of Computer Graphics System: Video Display Devices – Raster Scan Systems – Random – Scan Systems - Graphics Monitors and Workstations – Input Devices – Hardcopy Devices – Graphics Software.

UNIT - II:

Output Primitives: Line Drawing Algorithms – Loading the Frame Buffer – Line Function – Circle – Generating Algorithms. Attributes of Output Primitives: Line Attributes – Curve Attributes – Color and Grayscale levels– Area fill Attributes – Character Attributes – Bundled Attributes – Inquiry Functions.

UNIT - III:

2D Geometric Transformations: Basic Transformation – Matrix Representations – Composite Transformations – Window to View port Co-Ordinate Transformations. Clipping: Point Clipping – Line Clipping – Cohen-Sutherland Line Clipping – Liang Barsky Line Clipping – Polygon Clipping – Sutherland – Hodgman Polygon Clipping – Curve Clipping – Text Clipping.

UNIT - IV:

Graphical User Interfaces and Interactive Input Methods: The User Dialogue – Input of Graphical Data – Input Functions – Interactive Picture Construction Techniques. Three Dimensional Concepts: 3D-Display Methods – #Three Dimensional Graphics Packages.

UNIT - V:

3D Geometric and Modelling Transformations: Translation – Scaling – Rotation – Other Transformations. Visible Surface Detection Methods: Classification of Visible Surface Detection Algorithm –Blackface Detection – Depth-Buffer Method – A-Buffer Method – Scan-Line Method –Applications of Computer Graphics.

UNIT VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Donald Hearn M. Pauline Baker, Computer Graphics C Version, Pearson Education, 2014.
2. Alexey Boreskov, Evgeniy Shikin, "Computer Graphics From Pixels to Programmable Graphics Hardware", CRC Press, 2013.
3. Donald Hearn M. Pauline Baker, "Computer Graphics C Version", Pearson Education, 2014.
4. Branislav Sobota, "Computer Graphics and Imaging", Intech Open Publication, 2019.
5. Dr. Deepali A. Godse, Atul P. Godse, "Computer Graphics", UNICORN Publishing Group, 2020.
6. Gabriel Gambetta, "Computer Graphics from Scratch A Programmer's Introduction to 3D Rendering", No Starch Press, 2021.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

• Understand the basics of Computer Graphics, Different Graphics Systems and Applications of Computer Graphics.
• Learn Algorithms for Scan Conversion and filling of Basic Objects and their Comparative Analysis.
• Use of Geometric Transformations on Graphical Objects and their Application in Composite form.
• Apply 2D Geometric Transformations
• Use 3D Geometric and Modelling Transformations.

*****

Third Year	SKILL BASED ELECTIVE I	Semester V
	WEB TECHNOLOGY	
Code	(Theory)	Credit: 2

COURSE OBJECTIVES:

- To understand the basic concepts related to HTML, JavaScript and VB script.
- To familiarize various concepts associated with Dynamic webpages
- To know about data representation with XML and XSL.

UNIT - I:

HTML: Introduction – SGML – Outline of an HTML Document – Head Section – Body Section – HTML Forms.

UNIT - II:

Java Script: Introduction – Language Elements – Objects of Java Script – Other Objects – Arrays.

UNIT - III:

VB Script: Introduction – Embedding VBScript Code in an HTML Document – Comments – Variables – Operators – Procedures – Conditional Statements – Looping Constructs – Object and VB Script – Cookies.

UNIT - IV:

Dynamic HTML (DHTML): Introduction – Cascading Style Sheets (CSS) – DHTML Document Object Model and Collections – Event Handling.

UNIT - V:

Extensible Mark-Up Language (XML): Introduction – HTML vs XML – Syntax of the XML Document – XML Attributes – XML Validation – XML DTD – The Building Blocks of XML Documents – DTD Elements – DTD Attributes – DTD Entities – DTD Validation – XSL – XSL Transformation.

UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. N.P. Gopalan and J. Akilandeswari, Web Technology – A Developer's Perspective, Prentice Hall of India Private Ltd, New Delhi, Second Edition, 2016.
2. C.Xavier, Web Technology and Design, NEW AGE; First edition, 2018
3. Steven M. Schafer, "HTML, XHTML, and CSS Bible", Wiley Publication, 2011

4. Keith Grant, "CSS in Depth", Manning Publication, 2018.
5. William Alvin Newton, Steven Webber, "Computer Programming JavaScript, Python, HTML, SQL, CSS", Independently Published, 2019.
6. Hasanraza ANSARI, "Learn VBScript", Independently Published, 2021.
7. https://www.geeksforgeeks.org/web-technology/

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand and apply the webpage concepts.
- Develop static and dynamic web pages
- Understand the feature of JavaScript and VB Script
- Develop knowledge about XML fundamentals and usage of XML technology.
- Understand about the web design with XSL and data validation with DTD.

*****

Third Year	**CORE COURSE VIII**	**Semester VI**
	OPERATING SYSTEMS	
Code	**(Theory)**	**Credit: 5**

COURSE OBJECTIVES:

- To understand the basics of Operating systems and their working
- To Learn and understand operating system services and methods
- To understand the different types of devices connected with Operating systems.

UNIT - I:

Introduction - What Is an Operating System-Operating System Software -A Brief History of Machine Hardware -Types of Operating Systems - Brief History of Operating System Development-Object-Oriented Design

UNIT - II:

Early Systems: Single-User Contiguous Scheme -Fixed Partitions-Dynamic Partitions-Best-Fit versus First-Fit Allocation -Deallocation - Relocatable Dynamic Partitions. Virtual Memory: Paged Memory Allocation-Demand Paging-Page Replacement Policies and Concepts -Segmented Memory Allocation-Segmented/Demand Paged Memory Allocation - Virtual Memory-Cache Memory

UNIT - III:

Overview-About Multi-Core Technologies-Job Scheduling Versus Process Scheduling-Process Scheduler-Process Scheduling Policies-Process Scheduling Algorithms –A Word About Interrupts-Deadlock-Seven Cases of Deadlock -Conditions for Deadlock- Modeling Deadlock-Strategies for Handling Deadlocks –Starvation- Concurrent Processes: What Is Parallel Processing-Evolution of Multiprocessors- Introduction to Multi-Core Processors-Typical Multiprocessing Configurations--Process Synchronization Software.

UNIT - IV:

Types of Devices-Sequential Access Storage Media-Direct Access Storage Devices-Magnetic Disk Drive Access Times- Components of the I/O Subsystem- Communication among Devices-Management of I/O Requests

UNIT - V:

The File Manager -Interacting with the File Manager -File Organization – Physical Storage Allocation -Access Methods-Levels in a File Management System – Access Control Verification Module

UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Ann McIver Mc Hoes, Ida M. Flynn, "Understanding Operating Systems", Course Technology, Cengage Learning, 2011.
2. Greg Tomsho,"Guide to Operating Systems", Cengage Learning, 2020.

3. Cesar Herrera, Darrell Hajek, Flor Narciso, "Principles of Operating Systems", Amazon Digital Services LLC - KDP Print US, 2020.
4. Cesar Herrera, Darrell Hajek,"Principles of Operating Systems", Independently Published, 2019.
5. Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau,"Operating Systems: Three Easy Pieces", Create Space Independent Publishing Platform, 2018.
6. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", Wiley Publisher, 2018.
7. https://www.guru99.com/os-tutorial.html

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Recall the basic principles and importance of the operating system in a computer
- Illustrate the objectives and functions of the operating system components
- Identify the various operating system techniques
- Analyse the issues and challenges of the operating system and security mechanisms
- Evaluate the functions and features of file management in operating systems

*****

Third Year   **CORE COURSE IX**   **Semester VI**
                              PROGRAMMING IN PHP
Code   **(Theory)**   **Credit: 5**

COURSE OBJECTIVES:

- To understand the basics of PHP and Ajax
- To know about various constructs available in PHP
- To understand and implement the AJAX based dynamic client-server interaction

UNIT - I:

Essentials of PHP - Operators and Flow Control - Strings and Arrays.

UNIT - II:

Creating Functions - Reading Data in Web Pages - PHP Browser – Handling Power.

UNIT - III:

Object-Oriented Programming –Advanced Object-Oriented Programming

UNIT - IV:

File Handling –Working with Databases – Sessions, Cookies, and FTP

UNIT - V:

Ajax – Advanced Ajax – Drawing Images on the Server.

UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Steven Holzner, The PHP Complete Reference, McGraw Hill Education, 2007.
2. Vikram Vaswani, PHP: A Beginner's Guide, McGraw Hill Education, 2008.
3. Don Gosselin, Diana Kokoska, Robert Easterbrooks, "PHP Programming with MySQL", Course Technology, 2010.
4. Kevin Tatroe, Peter MacIntyre, Rasmus Lerdorf, " Programming PHP: Creating Dynamic Web Pages", O'Reilly Media, 2013.
5. Alan Forbes, "The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL, Create Space Independent Publishing Platform, 2015.
6. Antonio Lopez, "Learning PHP 7, Packt Publishing, 2016.
7. https://www.guru99.com/php-tutorials.html

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand the fundamental knowledge of developing web applications with PHP.
- Illustrate the advanced concepts like strings, arrays and functions
- Design Web based applications.
- Analyze and solve various database tasks using PHP.
- Develop AJAX based applications.

*****

COURSE OBJECTIVES:

- To acquire the programming experience in PHP
- To apply variables, strings, and constants to a PHP a script and test it with a program.
- To design an authentication web page in PHP with MySQL.

1. Write a program to find the factorial of a number.
2. Write a program using Conditional Statements need a number N and check whether it is divisible by M
3. Write a program to find the maximum value in a given multi-dimensional array.
4. Write a program to find the GCD of two numbers using user-defined functions.
5. Design a simple web page to generate multiplication table for a given number.
6. Design a web page that should compute one's age on a given date.
7. Write a program to download a file from the server.
8. Write a program to store the current date and time in a COOKIE and display the 'Last Visited' date and time on the web page.
9. Write a program to store page views count in SESSION, to increment the count on each refresh and to show the count on web page.
10. Write a program to design a simple calculator.
11. Design an authentication web page in PHP with MySQL to check username and password.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Learn PHP programming on handling strings and arrays.
- Design web pages for different applications with MYSQL
- Handle files, sessions and cookies by downloading a file from the server,
- Develop real-time applications.
- Gain experience in drawing images using Ajax.

*****

COURSE OBJECTIVES:

- To impart knowledge in the life cycle of software engineering
- To learn about Requirements Analysis Modeling, Basic Issues in Software Design and Software coding
- To acquire exposure in Web Engineering

UNIT - I:

Introduction: Introduction to Software Engineering - Software Process – Software Process Models - Software Model - Requirements Engineering Principles: Requirements Engineering - Importance of Requirements - Types of Requirements - Steps involved in Requirements Engineering.

UNIT - II:

Requirements Analysis Modeling: Analysis Modeling Approaches - Structured Analysis - Object Oriented Analysis - Design and Architectural Engineering : Design Process and Concepts - Basic Issues in Software Design - Characteristics of Good Design - Software Design and Software Engineering - Function Oriented System vs Object Oriented System - Modularity, Cohesion, Coupling, Layering - Real Time Software Design - Design Models - Design Documentation.

UNIT - III:

Object Oriented Concepts: Fundamental Parts of Object Oriented Approach – Data Hiding and Class Hierarchy Creation - Relationships - Role of UML in OO Design -Design Patterns - Frameworks - Object Oriented Analysis - Object Oriented Design - User Interface Design : Concepts of User Interface - Elements of User Interface -Designing the User Interface - User Interface Evaluation - Golden Rules of User Interface Design - User Interface Models - Usability

UNIT - IV:

Software Coding - Introduction to Software Measurement and Metrics – Software Configuration - Project Management Introduction - Introduction to Software Testing - Software Maintenance

UNIT - V:

Web Engineering : Introduction to Web - General Web Characteristics – Web Application Categories - Working of Web Application - Advantages and Drawbacks of Web Applications - Web Engineering - Emerging Trends in Software Engineering – Web 2.0 - Rapid Delivery - Open Source Software Development - Security Engineering - Service Oriented Software Engineering - Web Service -

Software as a Service – Service Oriented Architecture - Cloud Computing - Aspect Oriented Software Development - Test Driven Development - Social Computing

UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Chandramouli Subramanian, Saikat Dutt Chandramouli Seetharaman, B.G. Geetha, Software Engineering, Pearson Publications, 2015.
2. Software Engineering, Jibitesh Mishra, Pearson Education, 2011.
3. Ian Sommerville,"Software Engineering", Pearson, 2011.
4. Rod Stephens, "Beginning Software Engineering", Wiley, 2015.
5. Ashfaque Ahmed, Bhanu Prasad,"Foundations of Software Engineering", CRC Press, 2016.
6. Titus Winters, Tom Manshreck, Hyrum Wright, "Software Engineering at Google", O'Reilly Media, 2020.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Recall the various techniques of software process models.
- Understand the requirements for a software project.
- Develop frameworks for software projects.
- Apply the knowledge, techniques, and skills in the development of a software product.
- Make use of web engineering concepts for software development.

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Third Year　　　　　　　**MAJOR BASED ELECTIVE II**　　　　　**Semester VI**
　　　　　　　　　　　　　　　　2) BIG DATA ANALYTICS
Code　　　　　　　　　　　　　　**(Theory)**　　　　　　　　　**Credit: 4**

COURSE OBJECTIVES:

- To explore the fundamental concepts of big data analytics.
- To understand the concepts of Enterprise Technologies and Big Data Business Intelligence.
- To acquire knowledge about Big Data Storage.

UNIT - I:

Introduction: Concepts and Terminology – Big Data Characteristics – Different Types of Data –case study Background – Business goals and Obstacles – Business Motivations and Drivers for Big Data Adoption-Marketplace Dynamic – Business Architecture- Business Process Management.

UNIT - II:

Big data Adoption and Planning Considerations: Organization Prerequisites – Data Procurement – Privacy – Security – Provenance – Limited Real-time Support – Distinct Performance Challenges – Distinct Governance Requirements – Distinct Methodology – Big Data Analytics – Data Identification – Data Acquisition and Filtering – Data Extraction – Data validation and cleansing – Data Aggregation and Representation.

UNIT - III:

Enterprise Technologies and Big Data Business Intelligence: Online Transaction and Processing (OLTP) – Online Analytical Processing (OLAP) – Extract Transform Load (ETL) – Data Warehouses – Data Marts.

UNIT - IV:

Big Data Processing Concepts: Introduction – Parallel Data Processing – Distributed Data Processing – Hadoop – Processing Workloads – Cluster – Processing in Batch Mode – Map – Combine – Partition – Shuffle and Sort.

UNIT - V:

Big Data Storage Technology: On-Disk Storage Devices – NoSQL Database – In-Memory Storage Device – Big Data Analytics Techniques – Quantitative Analysis – Qualitative Analysis – Data Mining – Statistical Analysis – A/B Testing – Correlation-Regression – Machine Learning.

UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Paul Buhler, Wajid Khattak and Thomas Erl, "Big Data Fundamentals: Concepts, Drivers & Techniques", Prentice Hall Publications, 1st Edition, January 2016.
2. Dr. A.V.K. Shanthi, Dr. Praveen Kumar Misra, Dr. Bramah Hazela, Dr. Saptarshi Gupta, published a book "Big Data Analytics- Discovering, Analysying, Visualizing and Presenting Data", by Scientific International Publishing House.
3. Soraya Sedkaoui,"Data Analytics and Big Data", Wiley, 2018.
4. DT Editorial Services, "Big Data (Hadoop 2, Map Reduce, Hive, YARN, Pig, R and Data Visualization) Black Book", 1st Edition, Dreamtech Press, 2016.
5. Soumendra Mohanty, Madhu Jagadeesh, and Harsha Srivatsa, "Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics", Apress Media, 2013.
6. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilly Media, 2012.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

• Recall the basics of Big Data and its applications
• Know about OLTP,OLAP and ETL,
• Apply the cutting-edge tools and technologies to analyze Big Data
• Analyse various big data tools and techniques
• Evaluate various storage and analytical techniques.

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Third Year　　　　　　　　　　**PROJECT**　　　　　　　　**Semester-VI**

Code:　　　　　　　　　　　　　　　　　　　　　　　　　**Credit: 3**

      The candidate shall be required to take up a Project Work by group or individual and submit it at the end of the final year. The Head of the Department shall assign the Guide who, in turn, will suggest the Project Work to the students in the beginning of the final year. A copy of the Project Report will be submitted to the University through the Head of the Department on or before the date fixed by the University.

      The Project will be evaluated by an internal and an external examiner nominated by the University. The candidate concerned will have to defend his/her Project through a Viva-voce.

ASSESSMENT/EVALUATION/VIVA VOCE:

1. PROJECT REPORT EVALUATION (Both Internal & External)

   I. Plan of the Project　　　　　　　　　　　- 20 marks

  II. Execution of the Plan/collection of　　　- 45 marks
      Data / Organisation of Materials /
      Hypothesis, Testing etc. and
      presentation of the report.

 III. Individual initiative　　　　　　　　　　- 15 marks

2. Viva-Voce / Internal & External　　　　　- 20 marks

      TOTAL　　　　　　　　　　　　**- 100 marks**

PASSING MINIMUM:

	Vivo-Voce 20 Marks	**Dissertation 80 Marks**
Project	40% out of 20 Marks (i.e. 8 Marks)	40% out of 80 marks (i.e. 32 marks)

      A candidate who gets less than 40% in the Project must resubmit the Project Report. Such candidates need to defend the resubmitted Project at the Viva-voce within a month. A maximum of 2 chances will be given to the candidate.

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Third Year　　　　　**SKILL BASED ELECTIVE II**　　　　　**Semester VI**
MOBILE APPLICATION DEVELOPMENT
Code　　　　　　　　　　　　**(Theory)**　　　　　　　　**Credit: 2**

COURSE OBJECTIVES:

- To gain a basic knowledge of Android application development
- To understand about user Interfaces for the Android platform.
- To familiarize of the Android Studio development tool.

UNIT - I:

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, building you First Android application, Understanding Anatomy of Android Application, Android Manifest file

UNIT - II:

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions

UNIT - III:

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation

UNIT - IV:
Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UNIT - V:

Using Common Android APIs: Using Android Data and Storage APIs, managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

UNIT - VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2011.
2. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd,2010
3. Mark L Murphy, "Beginning Android3", Apress Publications, 2011.
4. Bill Phillips, Chris Stewart, Kristin Marsicano, Brian Gardner, "Android Programming", Big Nerd Ranch, 2019.
5. Barry Burd, John Paul Mueller, "Android Application Development All in one for Dummies",Wiley Publications, 2020.

6. NamrataBandekar, Darryl Bayliss, Fuad Kamal, "Android Apprentice (Fourth Edition) Beginning Android Development with Kotlin", R R BOWKER LLC, 2021.
7. https://www.javatpoint.com/android-tutorial

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Identify various concepts of mobile application programming in Android platform
- Implement the business logic in an app with java
- Understand Android User Interface Design with XML
- Know about Common Android APIs
- Deploy applications to the Android marketplace for distribution.

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