



BACHELOR COMPUTER APPLICATIONS

CHOICE BASED CREDIT SYSTEM –

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

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

Sem.	Part	Course	Title	Ins. Hrs.	Credits	Exam Hours	Marks		Total
							Int.	Ext.	
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		6	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	3	25	75	100	
TOTAL				30	29	-	-	-	900

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 Course – II (AC)		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 upto 10 th & 12 th std.	Fundamentals of Information Technology	2	2	3	25	75	100	
	TOTAL				30	25	-	-	-	700
	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 Course – II (AC)		3	2	3	25	75	100	
		Second Allied Course – III (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 upto 10 th & 12 th std.	Working Principles of Internet	2	2	3	25	75	100	
VI		Naan Mudhalvan Scheme (NMS) @@	Digital Skills for Employability	-	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)	Web Technology	5	5	3	25	75	100
		Core Practical -V (CP)	Web Technology Lab	4	4	3	40	60	100
		Major Based Elective – I (Any one)	1. Multimedia Technologies 2. Data Mining and Warehousing	5	4	3	25	75	100
	IV	Skill Based Elective I	Mobile Application Development	4	2	3	25	75	100
		Soft Skills Development		2	2	3	25	75	100
TOTAL				30	27	-	-	-	700
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 Project Management 2. E-Commerce Technologies	5	4	3	25	75	100
		Project		4	3	-	20	80	100
	IV	Skill Based Elective – II	Internet of Things	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	-	-	-
GRAND TOTAL				180	154	-	-	-	4500

List of Allied Courses

First Allied Course

Mathematics

Second Allied Course

Accounting and Organizational Behaviour

- \$ 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.	III	Core Courses	9	45	900
4.		Core Practical	6	24	600
5.		Allied Courses (1 st & 2 nd)	6	20	600
6.		Major Based Elective Courses	2	8	200
7.		Add -on Course (Professional English I & II)	2	8	200
8.		Project	1	3	100
9.	IV	Non-Major Elective Courses	2	4	200
10.		Skill Based Elective Courses	2	4	200
11.		Soft Skills Development	1	2	100
12.		Value Education	1	2	100
13.		Environmental Studies	1	2	100
14.	V	Gender Studies	1	1	100
15.		Extension Activities	1	1	---
16.	VI	Naan Mudhalvan Scheme	3	6	300
Total			46	154	4500

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 imbued with ethical values and social concerns to ensure peaceful society.

PROGRAMME SPECIFIC OUTCOMES:

After completing the Bachelor of Computer Applications Programme, the graduates would have

- Understand and analyze the fundamental knowledge in the domain of computer applications.
- Enhance the logical and analytical thinking to understand the computational systems.
- Ability to comprehend the structure, development methodologies of software systems and to design the software solutions.
- Explore the developing areas in the sphere of computer applications and to enrich themselves to be skilful to meet the diverse expectations of the industry.
- Equip them to be competent to provide optimal and ethical solutions to the technological challenges laid by the professional societies

First Year

**CORE COURSE I
PROGRAMMING IN C AND DATA
STRUCTURES**

Semester I

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 – Typedef, 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 – 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 Black Swan 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.

First Year

**CORE PRACTICAL I
PROGRAMMING IN C LAB
(Practical)**

Semester I

Code

Credit: 4

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.

First Year

**CORE COURSE II
PROGRAMMING IN JAVA
(Theory)**

Semester II

Code

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 NetBeans 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 of inheritance, 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 and APIs) and proper program structuring (e.g., by using access control identifies, and create 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)

First Year

**CORE PRACTICAL II
PROGRAMMING IN JAVA LAB
(Practical)**

Semester II

Code

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 constructors
 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.

Second Year

**CORE COURSE III
PROGRAMMING IN PYTHON
(Theory)**

Semester III

Code

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 highlevel 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.

Second Year

**CORE PRACTICAL III
PROGRAMMING IN PYTHON LAB
(Practical)**

Semester III

Code

Credit: 4

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.

Second Year

**NON-MAJOR ELECTIVE I
FUNDAMENTALS OF INFORMATION
TECHNOLOGY**

Semester III

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 Storage 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.

Second Year

CORE COURSE IV
DATABASE MANAGEMENT SYSTEMS
(Theory)

Semester IV

Code

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.

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 relations 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 foreign keys
- ii. Enter at least five tuples for each relation
- iii. Find all the customers who have at least two accounts at the Main branch.
- iv. Find all the customers who have an account at all the branches located in a specific city.
- v. Demonstrate how you delete all account tuples at every branch located in a specific city.
- vi. Generate suitable reports.
- vii. 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 subqueries
- Understand the method to create views

Second Year

**NON-MAJOR ELECTIVE II
WORKING PRINCIPLES OF INTERNET
(Theory)**

Semester IV

Code

Credit: 2

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 throughout the 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
FUNDAMENTALS OF ALGORITHMS
(Theory)**

Semester V

Code

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 Horowitz, Sartaj Sahni, "Fundamentals of Data Structure", Galgotia Publications, 2008.

2. Ellis Horowitz, 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.

Third Year

**CORE COURSE VI
COMPUTER NETWORKS
(Theory)**

Semester V

Code

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.

Third Year

**CORE COURSE VII
WEB TECHNOLOGY
(Theory)**

Semester V

Code

Credit: 5

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.

COURSE OBJECTIVES:

- To teach the basics involved in publishing content on the World Wide Web.
 - To design and implement static and dynamic website
 - To understand, analyze and create XML documents and XML Schema.
1. Design the following static web pages required for an online book store web site.
 - a. HOME PAGE: The static home page must contain three frames.
 - b. LOGIN PAGE
 - c. CATALOGUE PAGE: The catalogue page should contain the Details of all the books available in the web site in a table.
 - d. REGISTRATION PAGE
 2. Write JavaScript to validate the following fields of the Registration page.
 - a. First Name (Name should contains alphabets and the length should not be less than 6 characters).
 - b. Password (Password should not be less than 6 characters length).
 - c. E-mail id (should not contain any invalid and must follow the
 - d. Standard pattern name@domain.com)
 - e. Mobile Number (Phone number should contain 10 digits only).
 - f. Last Name and Address (should not be Empty).
 3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
 4. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
 5. To convert the static web pages online library into dynamic web pages using servlets and cookies.
 6. Write a java script program to test the first character of a string is uppercase or not
 7. Write a program to find the Fibonacci series for n series using VB-Script
 8. Write a program to display Date & Time using VB-Script.
 9. Write a program to convert the string to lowercase using VB-Script.

10. Create a well-formed XML document to represent ten students' information, store it as XML file and display the document in a browser.

COURSE OUTCOMES:

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

- Develop web pages using HTML, DHTML and Cascading Styles sheets
- Develop a dynamic web pages using JavaScript (client side programming).
- Develop an interactive web applications using VB Script
- Build and consume web services.
- Develop a Program using XML

Third Year

**MAJOR BASED ELECTIVE I
1) MULTIMEDIA TECHNOLOGIES
(Theory)**

Semester V

Code

Credit: 4

COURSE OBJECTIVES:

- To learn the creation of interactive media using industry-standard authoring tools.
- To impart knowledge on the integration of text, images, animation, audio, and video into Web-based applications
- To study on the deployment of multimedia applications.

UNIT - I:

INTRODUCTION TO MULTIMEDIA: Introduction to making Multimedia-Multimedia Skills and training- Text: Using text in Multimedia-Computer and Text- Font Editing and Design Tools- Hypermedia and Hypertext

UNIT - II:

MULTIMEDIA FILE HANDLING: Sound – Images – Animation – Video

UNIT - III:

DIGITAL VIDEO AND IMAGE COMPRESSION: Evaluating a compression system – Redundancy and Visibility-Video compression techniques- Standardization of an algorithm – The JPEG image compression standard-ITU –T Standards – MPEG motion video compression standard-DVI Technology.

UNIT - IV:

HARDWARE, SOFTWARE AND MULTIMEDIA AUTHORING TOOLS: Multimedia Hardware: Macintosh and Windows production Platforms-Hardware Peripherals: Memory and Storage Devices, Input Devices, Output Devices, Communication Devices .Basic Software Tools

UNIT - V:

MULTIMEDIA AND INTERNET: Internetworking –connections –Internet services – Tools for WWW – Designing WWW.

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

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Tay Vaughan, Multimedia: Making It Work, 7th Edition, Tata Mc-Graw Hill., 2008.

2. John F. Koegel Buford, Multimedia Systems, Pearson edition, 2003.
3. Ranjan Parekh, Principles of Multimedia, TMH, 2006.
4. Ralf Steinmetz and Klara Nahrstedt, Multimedia: Computing, Communication and applications, Pearson Edition, 2001.
5. Syed, Mahbubur Rahman, Multimedia Technologies: Concepts, Methodologies, Tools, and Applications, Information Science Reference, 2008.
6. Banerji, Multimedia Technologies, McGraw-Hill Education (India) Pvt Limited, 2010.
7. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia. Germany, Springer International Publishing, 2014.

COURSE OUTCOMES:

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

- Apply the knowledge of the basic fundamental components of Multimedia
- Apply the animation effects for basic multimedia formats
- Identify compression and applying the video settings
- Explain hardware components and software tool devices
- Design and create webpages for different applications.

Third Year

MAJOR BASED ELECTIVE I
2) DATA MINING AND WAREHOUSING
(Theory)

Semester V

Code

Credit: 4

COURSE OBJECTIVES:

- To introduce the concept of data mining as an important tool for enterprise data management and cutting edge technology for building competitive advantage.
- To enable students to effectively identify sources of data and process it for data mining
- To make students well versed in all data mining algorithms and methods of evaluation

UNIT - I:

Basic Data Mining Tasks – Data Mining Versus Knowledge Discovery in Data Bases – Data Mining Issues – Data Mining Matrices – Social Implications of Data Mining – Data Mining from Data Base Perspective.

UNIT - II:

Data Mining Techniques – a Statistical Perspective on data mining – Similarity Measures – Decision Trees – Neural Networks – Genetic Algorithms.

UNIT - III:

Classification: Introduction – Statistical – Based Algorithms – Distance Based Algorithms – Decision Tree – Based Algorithms – Neural Network Based Algorithms – Rule Based Algorithms – Combining Techniques. Clustering: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms. Partitioned Algorithms.

UNIT - IV:

Data Warehousing: An introduction - characteristic of a data warehouse - datamats - other aspects of data mart. Online analytical processing: introduction - OLTP& OLAP systems - data modeling - star schema for multidimensional view - data modeling - multifact star schema or snow flake schema - OLAP TOOLS - state of the market - OLAP TOOLS and the internet

UNIT - V:

Developing a data WAREHOUSE: Why and how to build a data ware house architectural strategies and organization issues-design consideration- data content-metadata distribution of data - tools for data warehousing - performance consideration-crucial decision in designing a data warehouse. Applications of data warehousing and data mining in government: Introduction -National data warehouses- other areas for data warehousing and data mining

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

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Margaret H. Dunham, Data Mining Introductory and Advanced Topics, Pearson Education – 2003.
2. Arun K. Pujari, “Data Mining Techniques”, Universities Press, 2010.
3. Jiawei Han & Micheline Kamber, “ Data mining Concepts & Techniques”, Academic press, 2001
4. Alex Berson, Stephen J. Smith, “data warehousing, data mining, & OLAP”, TMCH, 2001.
5. Margaret H. Dunham, “Data mining introductory and advanced topics”, Pearson education, 2003
6. Arun K. Pujari, “Techniques”, Universities Press (India) Pvt. Ltd., 2003.
7. C.S.R. Prabhu, “Data warehousing concepts, techniques, products and an application”, PHI, Second Edition, 2008
8. <https://www.javatpoint.com/data-mining>
9. <https://www.javatpoint.com/data-warehouse>

COURSE OUTCOMES:

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

- Identify data mining tools and techniques in building intelligent machines.
- Analyze various data mining algorithms to be applied in real time applications.
- Demonstrate the data mining algorithms in combinatorial optimization problems.
- Illustrate the mining techniques like association, classification and clustering on transactional databases.
- Perform exploratory analysis of the data to be used for mining

Third Year

**SKILL BASED ELECTIVE I
MOBILE APPLICATION DEVELOPMENT
(Theory)**

Semester V

Code

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.

Third Year

**CORE COURSE VIII
OPERATING SYSTEMS
(Theory)**

Semester VI

Code

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
PROGRAMMING IN PHP
(Theory)**

Semester VI

Code

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.

Third Year

**CORE PRACTICAL VI
PROGRAMMING IN PHP LAB
(Practical)**

Semester VI

Code

Credit: 4

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.

Third Year

MAJOR BASED ELECTIVE II
1) SOFTWARE PROJECT MANAGEMENT
(Theory)

Semester VI

Code

Credit: 4

COURSE OBJECTIVES:

- To understand the fundamental principles of Software Project management
- To be familiar with the different methods and techniques used for project management.
- To understand the software project failure reasons and mitigation techniques.

UNIT - I:

Introduction –Software Engineering Technology – Software process – Software process models – The prototyping. Requirement Engineering - System modeling – Requirements analysis and elicitation for software - software prototyping – data dictionary – elements of analysis model – data modeling – functional modeling and information flow.

UNIT - II:

The system design process – software design and software engineering – The design process – Design principles – Design concepts – Effective modular design – Design heuristics for effective modularity - User interface Design

UNIT - III:

Software testing techniques – Software testing fundamentals – White box testing – Basis path testing – Control structure testing – Black box testing. Software testing strategies – A strategic approach to s/w testing – Validation testing – System testing – The Art of debugging

UNIT - IV:

Software Configuration Management – Definitions and terminology – processes and activities .Software Quality assurance – definitions –quality control and assurance – Organization of Structures – Risk Management – Risk Identification, quantification Monitoring – Mitigation. Project initiation – Project Planning and tracking–organizational processes – assigning resources – project tracking – project closure

UNIT - V:

Software requirements gathering – steps to be followed – skills sets required – challenges. Estimation: Three phases of estimation. Design and Development phases – reusability, Technology choices, Standards, Portability user interface – testability – diagnosis ability – Maintainability – Install ability-The Effect of Internet on Project Management

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

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Roger S. Pressman: Software Engineering, Tata McGraw Hill Publication Company Pvt. Ltd., V Edition. Year
2. Gopaldaswamy Ramesh, "Managing Globle Software Projects" Tata McGraw Hill Publishing Company Ltd, New Delhi, 2002.
3. Watts S Humbhrey: A Discipline for Software Engineering, Pearson education Publ., 2001.
4. Bob Hughes and Mike Cotterell "Software Project Management"2nd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002
5. Pressman, Roger S., and Maxim, Bruce R.,Software Engineering: A Practitioner's Approach. Singapore, McGraw-Hill Education, 2015.
6. Hodges, Jason Lee. Software Engineering from Scratch: A Comprehensive Introduction Using Scala, Apress, 2019.
7. Rath, Amiya Kumar, and Mohapatra, Hitesh, Fundamentals of Software Engineering: Designed to Provide an Insight Into the Software Engineering Concepts,BPB PUBN, 2020.
8. <https://www.javatpoint.com/software-project-management>

COURSE OUTCOMES:

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

- Identify the different project contexts and suggest an appropriate management strategy.
- Understand why and how that failure probability can be reduced effectively
- Determine an appropriate project management approach through an evaluation of the business context and scope of the project
- Practice the successful software development with professional ethics. Identify and describe the key phases of project management.
- Demonstrate through application, knowledge of the key project management skills, such as product and work break-down structure, schedule, governance including progress reporting, risk and quality management.

Third Year

MAJOR BASED ELECTIVE II
2) E-COMMERCE TECHNOLOGIES
(Theory)

Semester VI

Code

Credit: 4

COURSE OBJECTIVES:

- To study ecommerce concepts with case studies.
- To learn about data interchange features and electronic payment facilities.
- To study cyber attacks and the mitigation techniques.

UNIT - I:

E-Commerce–Electronic Commerce – E-Commerce types – E-Commerce and world at the large – E Commerce Case studies: Intel, Amazon

UNIT - II:

Electronic Mail – The X, 400 Messages handling system – Internet addresses – Multipurpose Internet mail Extension – X.500 Directory Services – E-Mail User agent.

UNIT - III:

EDI– Costs and benefits – Components of EDI Systems – EDI implementation issues – EDIFACT – EDIFACT Message Structure.

UNIT - IV:

Cyber Security – Cyber Attacks – Hacking – SSL – Authentication and assurance of DATA integrity – Cryptographic based solution – Digital Signatures – VPN.

UNIT - V:

Electronic Payment Systems – Payment gateway – internet banking – the SET protocol – E-Cash – E-Cheque – Elements of electronics payments

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

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Kamalesh. Kbalaji, Debjani Nag –E-Commerce – The Cutting Edge of Business 2nd Edition, Tata McGraw Hill. Year.
2. Whinston, Andrew B., and Kalakota, Ravi, Frontiers of Electronic Commerce, DIANE Publishing Company, 1999.
3. S. Jaiswal, E-Commerce : Doing Business through internet, Galgotia Publication, 2001
4. Rajaraman V, Essentials of E-Commerce Technology, PHI Learning, 2009.

5. Qin, Zheng, Introduction to E-commerce, Tsinghua University Press, 2009.
6. Manzoor, Amir, E-commerce: An Introduction. Germany, Lambert Academic Publishing, 2010.
7. https://www.tutorialspoint.com/e_commerce/index.htm#:~:text=E%2DCommerce%20or%20Electronics%20Commerce,medium%20such%20as%20the%20Internet

COURSE OUTCOMES:

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

- Know the E-Commerce process
- Describe an example of system architecture for an e-Business system
- Use and appreciate elements of web design.
- Identify and explain fundamental web site tools including design tools, programming tools, and data processing tools.
- Identify the major electronic payment issues and solutions

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

III. Individual initiative - 15 marks

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

TOTAL - 100 marks**PASSING MINIMUM:**

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

Third Year

**SKILL BASED ELECTIVE II
INTERNET OF THINGS
(Theory)**

Semester VI

Code

Credit: 2

COURSE OBJECTIVES:

- To learn the concepts of IoT and its protocols.
- To learn how to analyse the data in IoT.
- To study IoT& Security infrastructure for popular applications.

UNIT - I:

INTRODUCTION - Definition & characteristics of IoT - physical design of IoT - logical design of IoT - IoT enabling Technologies - IoT levels & Deployment templates. Domain specific IoT : Home Automation - cities - Environment - Energy - retail - logistics - Agriculture - Industry Health and life style.

UNIT - II:

IOT and M2M - Deference between Iot and M2M - SDN and NFV for lot - IoT systems management - SNMP - YANG – NETOPEER.

UNIT - III:

IOT SPECIFICATION IoT platforms design Methodology - purpose and specification - process specification - Domain model specification - Information model specification - Service specification - IoT level specification - functional view specification - operational view specification - Device and component Integrators - Application Development.

UNIT - IV:

LOGICAL DESIGN USING PYTHON Logical design using python - Installing python - type conversions - control flow - functions - modules - File handling - classes. IoT physical devices and End points, building blocks of IoT device - Raspberry Pi - Linux on Raspberry Pi - Raspberry Pi interfaces.

UNIT - V:

IOT AND CLOUD COMPUTING IoT physical servers & cloud computing - WAMP - Xively cloud for IoT - python Web application frame work - Amazon web services for IoT.

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

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, Internet of Things - A hands on Approach, Universities Press.2015.
2. Samuel Greengard, The Internet of Things MIT Press, 2015.
3. BK Tripathy, J Anuradha, Internet of Things (IoT): Technologies, Applications, Challenges and Solutions,CRC Press, 2017.
4. Srinivasa K.G., Siddesh G.M. Hanumantha Raju R, Internet of Things, Cengage Learning India pvt. Ltd 2018
5. Jamil Y. Khan, Mehmet R. Yuce, Internet of Things (IoT): Systems and Applications, Jenny Stanford Publishing, 2019.
6. Kumar, Sudhir, Fundamentals of Internet of Things, CRC Press, 2021.
7. [https://www.tutorialspoint.com/internet_of_things/index.htm#:~:text=IoT%20\(Internet%20of%20Things\)%20is,to%20any%20industry%20or%20system.](https://www.tutorialspoint.com/internet_of_things/index.htm#:~:text=IoT%20(Internet%20of%20Things)%20is,to%20any%20industry%20or%20system.)

COURSE OUTCOMES:

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

- Understand the fundamentals of Internet of Things.
- Know the basics of communication protocols and the designing principles of Web connectivity
- Gain the knowledge of Internet connectivity principles
- Design and develop smart city in IoT
- Analyse and evaluate the data received through sensors in IoT.
