BHARATHIDASAN UNIVERSITY TIRUCHIRAPPALLI-620 024.

B.Sc. INFORMATION TECHNOLOGY

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		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		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**

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)	Database Management Systems	5	5	3	25	75	100
		Core Practical - III (CP)	Database Management Systems Lab	4	4	3	40	60	100
		Second Allied Course – I (AC)		4	4	3	25	75	100
		Second Allied Practical – II (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 upto 10^{th} & 12^{th} 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)	ASP Dot Net	5	5	3	25	75	100
		Core Practical - IV (CP)	ASP Dot Net Lab	4	4	3	40	60	100
		Second Allied Practical – II (AP)		3	2	3	40	60	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 Basic Tamil if Tamil language was not studied in school level **or** 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) @@	Computational Skills for employability – Oracle Cloud Architecture	-	2	3	25	75	100
	TOTAL			**30**	**25**	**-**	**-**	**-**	**800**

V	III	Core Course - V (CC)	Principles of Information Technology	5	5	3	25	75	100
		Core Course – VI (CC)	Operating System	5	5	3	25	75	100
		Core Course – VII (CC)	Software Engineering	5	5	3	25	75	100
		Core Practical -V (CP)	Linux Lab	4	4	3	40	60	100
		Major Based Elective – I (Any one)	Internet of Things / Multimedia System	5	4	3	25	75	100
	IV	Skill Based Elective I	Programming in Python	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)	Computer Networks	6	5	3	25	75	100
		Core Course - IX (CC)	Mean Stack Webapp Development	6	5	3	25	75	100
		Core Practical – VI (CP)	Mean Stack Webapp Lab	4	4	3	40	60	100
		Major Based Elective – II (Any one)	Cyber Security / Cloud Computing	5	4	3	25	75	100
		Project		4	3	-	20	80	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) @@	Google Cloud Computing	-	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.	III	Core Courses	9	45	900
4.		Core Practical	6	24	600
5.		Allied Courses I & II	4	16	400
6.		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.	IV	Non-Major Elective Courses	2	4	200
11.		Skill Based Elective Courses	2	4	200
12.		Soft Skills Development	1	2	100
13.		Value Education	1	2	100
14.		Environmental Studies	1	2	100
15.	V	Gender Studies	1	1	100
16.		Extension Activities	1	1	--
17.	VI	Naan Mudhalvan Scheme	5	10	500
	Total		**48**	**158**	**4700**

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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:

- After completing the B.Sc. Information Technology Programme, the graduates would have
- 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 capability to transfer, with the skills gained, to provide innovative and novel solutions by maintaining ethical norms for the betterment of human society.

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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 – 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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First Year **CORE PRACTICAL I** **Semester I**

PROGRAMMING IN C LAB

Code: **(Practical)** **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 ofproblems.
- 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 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).

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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**

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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Second Year	**CORE PRACTICAL III**	**Semester III**
	DATABASE MANAGEMENT SYSTEMS LAB	
Code	**(Practical)**	**Credit: 4**

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 sub-queries

   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 view 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 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 SQL 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

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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 ASP DOT NET**	**Semester IV**
Code	**(Theory)**	**Credit: 5**

COURSE OBJECTIVES:

- To enable the students to learn about ASP.NET to develop web forms
- To develop the skills to do session tracking and management.
- To learn and create web services and the role of ADO in developing applications.

UNIT - I:

Introduction to ASP – Active Server Pages Model – ASP File – the process of serving an Active Server Page – Using Scripting Languages – Setting the Primary Scripting Language – Including other files – Understanding objects.

UNIT - II:

Understanding components – Working with users – working with HTML forms – retrieving form data – using text boxes and text areas.

UNIT - III:

Cookies – working with cookies – applications of cookies – addressing the drawbacks of using cookies – using cookies in ASP applications. Working with connections and data sources – creating connections with OLEdb and ODBC – connecting to Microsoft SQL server – connecting to a Microsoft access database.

UNIT - IV:

About the connection object – executing a SQL statement with the connection object – understanding session and connection pooling – working with record sets – retrieving a record set – record set cursor and locking types – understanding ADO cursors – paging through a record set

UNIT-V:

Working with the command object – creating stored procedures – executing stored procedures with the connection object – executing stored procedures with the command object – retrieving parameter information.

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

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Practical ASP – Ivan Bayross, BPB Publications, 2000

2. Scot Johnson, Using Active Server Pages, Prentice Hall of India Private Limited 2001.
3. Jones, A. Russell. Mastering Active Server Pages 3, SYBEX, 2000.
4. Dino Esposito, Programming ASP.NET Core, PHI Learning Pvt. Ltd., Microsoft Press, 2019
5. Ragupathi, Mugilan T. S. Learning ASP.NET Core MVC Programming, Packt Publishing, 2016.
6. Andreas Helland, Vincent Maverick Durano, Jeffrey Chilberto, Ed Price, ASP.NET Core 5 for Beginners, Packt Publishing, 2020.
7. Lock, Andrew, ASP.NET Core in Action, Manning, 2021.

COURSE OUTCOMES:

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

- Acquire fundamentals of ASP.Net.
- Understand the concepts of Components in ASP.Net.
- Know about Cookies and Database Connectivity.
- Write Applications using Connection Objects.
- Implement the Concepts of Command Objects.

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Second Year	**CORE COURSE IV**	**Semester IV**
	ASP DOT NET LAB	
Code	**(Practical)**	**Credit: 4**

COURSE OBJECTIVES:

- To understand the fundamentals of ASP.Net.
- To write simple programs using Components and Command Objects.
- To design and Implement database connectivity using ADO.NET in window based applications and Web-based applications.

1. Create an ASP file to display the message “Have a Good Weekend” if it is a Saturday otherwise “Hang in there, the week will get better”.
2. Write a program to get the name and favorite ice cream flavor. Respond with the price of the corresponding ice cream.
3. Create a login form, to expire, if the user does not type the password within 100 seconds.
4. Create an advertisement for a bookshop using Ad Rotator component.
5. Create a course registration form with name, address and list of available course. Reply with the corresponding course fees on selection of a single course or a collection of courses.
6. Write a program to manipulate cookies with the information between HTTP sessions such as
   i. Last Date visited
   ii. Last Time visited
   iii. Number of visits
7. Create a student database and manipulate the records using the connection object in ASP.
8. Create an employee database and manipulate the records using command object in ASP.

COURSE OUTCOMES:

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

- Acquire skills in fundamentals of ASP.Net programming.
- Develop simple programs using Components.
- Know the art of programming using HTTP Sessions
- Use cookies in ASP applications.
- Write programs using Connection and Command objects.

*****

Second Year **NON-MAJOR ELECTIVE II** **Semester IV**

WORKING PRINCIPLES OF INTERNET

Code **(Theory)** **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** | **Semester V**

PRINCIPLES OF INFORMATION TECHNOLOGY

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

COURSE OBJECTIVES:

- To learn the basics of Information Technology
- To understand the fundamentals of Internet Connections and Web Page designing using HTML.
- To acquire Knowledge on Multimedia and the Internet.

UNIT - I:

Internet: The wired world of the internet – Information travels across the internet – TCP/IP – Understanding internet addresses and domains – Anatomy of web connections – Internet file types. Internet's Underlying Architecture: Domain name system – Routers – The internet's client/server architecture.

UNIT - II:

Connecting to the internet: Connecting your computer – Connecting to the internet from online services – ISDN – The internet/television connection – Network computers – DSL (Digital Subscriber Line). Communicating on the internet: E-mail – Usenet and newsgroups – Internet chat and instant messaging – Making phone calls on the internet.

UNIT - III:

World Wide Web: Web pages – Web browsers – Markup Languages – Hypertext – Image maps and interactive forms – Web host servers – Websites with databases. Common Internet Tools: Gophers – Telnet – FTP and downloading files – Searching the internet.

UNIT-IV:

Multimedia on the Internet: Audio on the internet – Video on the internet – Intranet and shopping on the internet.

UNIT - V:

Safeguarding the internet: Firewalls – Viruses – Digital certificates.

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”, 10th Edition, Que Publishers, 2014.
1. Raj Kamal, “Internet and Web Technologies”, Tata McGraw Hill, 2002. 2. C Xavier, “World Wide Web design with HTML”, Tata Mc-Graw Hill, 2008.
2. Bergkvist, Lorraine N., and Austin, Kathleen M.. Principles of Information Technology, Goodheart-Willcox Company, 2015.
3. Stair, Ralph, and Reynolds, George, Fundamentals of Information Systems, Cengage Learning, 2015.
4. Principles of Information Technology - Texas. United Kingdom, Pearson Education, 2016.
5. Rajaraman, V, Introduction to Information Technology, PHI Learning Pvt. Ltd., 2018.

COURSE OUTCOMES:

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

- Understand the terms related to Information Technology
- Know the usage of E-Mail and ISDN
- Acquire the concepts of Markup Languages and Common Internet Tools
- Develop Knowledge about Multimedia on the internet
- Recall the concepts of firewalls and viruses.

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Third Year	CORE COURSE VI	Semester V
	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

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Third Year	CORE COURSE VII SOFTWARE ENGINEERING	Semester V
Code	(Theory)	Credit: 5

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.

*****

Third Year	**CORE PRACTICAL V LINUX LAB**	**Semester V**
Code	**(Practical)**	**Credit: 4**

COURSE OBJECTIVES:

- To understand the basic commands of Linux operating system.
- To enable the students to write simple shell programs using Linux utilities, pipes and filters.
- To relate the various commands used by Linux shell which makes the users interact with each other.

1. Check whether the given number is prime or not.
2. Find the biggest of given two numbers.
3. Write a program to check the given number is odd or even.
4. Write a program to generate Fibonacci Series.
5. Write a program to prepare electric bill for domestic consumers. For first 100 units - Rs.0.75/ unit For next 100 units - Rs.1.50/unit Above 200 units - Rs.3.00/unit.
   Prepare the bill for the following format:
   Customer No. ----------
   Customer Name ----------
   Pre.Reading ----------
   Cur.Reading ----------
   Units Consumed ----------
   Charge ----------
   Signature
6. Write a program to display the result PASS or FAIL using the information given below:
   Student Name, Student Reg. No., Mark1, Mark2, Mark3, Mark4. The minimum pass for each subject is 50.
7. Write a program to prepare a Payroll with Basic Pay, DA, Allowances, PF and Gross Pay.
8. Using Case Statement, write a program to check the files ending with vowels.
9. Write a single program to sort the names and numbers in alphabetical, ascending and descending order.
10. Write a menu driven program to print Bio-data for five persons.

COURSE OUTCOMES:

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

- Acquire skills in fundamentals of Linux and Shell Programming.
- Use Linux utilities to perform File processing, Directory handling, User Management and display system configuration
- Apply skills in the working environment of Linux
- Apply and change the ownership and file permissions using advance UNIX commands.
- Know the advanced tools of LINUX write programs using Connection and Command objects.

Third Year **MAJOR BASED ELECTIVE I** **Semester V**

1) INTERNET OF THINGS

Code **(Theory)** **Credit: 4**

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.

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.

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

COURSE OBJECTIVES:

- To describe the fundamental concepts of multimedia.
- To understand the basics of digital video and audio
- To have better knowledge on animation

UNIT - I:

Multimedia Definition - Use Of Multimedia - Delivering Multimedia - Text: About Fonts and Faces - Using Text in Multimedia - Computers and Text - Font Editing and Design Tools - Hypermedia and Hypertext.

UNIT - II:

Images: Plan Approach - Organize Tools - Configure Computer Workspace - Making Still Images - Color - Image File Formats. Sound: The Power of Sound - Digital Audio - Midi Audio - Midi vs. Digital Audio - Multimedia System Sounds - Audio File Formats -Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project.

UNIT - III:

Animation: The Power of Motion - Principles of Animation - Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays - Digital Video Containers - Obtaining Video Clips - Shooting and Editing Video.

UNIT - IV:

Making Multimedia: The Stage of Multimedia Project - The Intangible Needs - The Hardware Needs - The Software Needs - An Authoring Systems Needs- Multimedia Production Team.

UNIT - V:

Planning and Costing: The Process of Making Multimedia - Scheduling - Estimating - RFPs and Bid Proposals. Designing and Producing - Content and Talent: Acquiring Content - Ownership of Content Created for Project - Acquiring Talent.

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", 8th Edition, Osborne/McGraw-Hill, 2001.
2. Atul Puri, Tsuhan Chen, Multimedia Systems, Standards, and Networks, Taylor & Francis, 2000.
3. Rahman, Syed Mahbubur, Interactive Multimedia Systems, IRM Press, 2002.
4. Medioni, Gerard, and Havaldar, Parag. Multimedia Systems: Algorithms, Standards, and Industry Practices, Cengage Learning, 2009.
5. Borko Furht, Multimedia Systems and Techniques, Springer US, 2012.
6. Nahrstedt, Klara, and Steinmetz, Ralf, Multimedia Systems, Springer Berlin Heidelberg, 2013.

COURSE OUTCOMES:

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

- Identify the basics of multimedia and multimedia system architecture.
- Understand different multimedia components.
- Explain file formats for different multimedia components.
- Describe various multimedia communication techniques.
- Create animated applications

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Third Year	SKILL BASED ELECTIVE I PROGRAMMING IN PYTHON	Semester V
Code	(Theory)	Credit: 2

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.

*****

Third Year	CORE COURSE VIII COMPUTER NETWORKS	Semester VI
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 IX	Semester VI
	MEAN STACK WEBAPP DEVELOPMENT	
Code	(Theory)	Credit: 5

COURSE OBJECTIVES:

- To create, and analyze the data with MongoDB.
- To provide knowledge on creating MEAN Project
- To provide the basics of angularJS

UNIT - I:

Introducing Full Stack Development: Brief History of Web Development – Towards Full Stack Development – Benefits of Full Stack Development –MEAN Stack – Node.js: The Web Server/Platform – Express: The Framework – MongoDB: The Database – Angular JS: The Front End Framework. Designing a MEAN Stack Architecture: Common MEAN Stack Architecture – Designing a Flexible MEAN Architecture

UNIT - II:

Creating and Setting up MEAN Project: Creating an Express Project – Modifying Express for MVC – Import Bootstrap for Responsive Layouts. Static Site with Node and Express: Defining Routes in Express – Building Basic Controllers – Creating Some Views – Adding Rest of Views – Take Data out of Views and Make Smarter

UNIT - III:

Data Model with MongoDB: Connecting Express Application to MongoDB using Mongoose – Model the Data – Simple Mongoose Schema – MongoDB Shell to create MongoDB Database Writing REST API: Expose MongoDB database to Application: Setting up API in Express – GET Methods: Reading Data from Mongo DB – POST Methods: Adding Data to MongoDB. PUT Methods: Updating Data in MongoDB. DELETE Method: Deleting Data from MongoDB

UNIT - IV:

Consuming a REST API: Call API from Express – List of Data from an API – Getting Single Document from API – Adding Data to Database via API. Adding Angular Component to an Express Application: Getting and Running Angular – Displaying and Filtering the Homepage List – Getting Data from API – Ensuring Forms work as Expected

UNIT - V:

Single Page Application with Angular: Groundwork for an Angular SPA – Switch from Express Routing to Angular Routing – Adding First Views, Controllers and Services. Building SPA with Angular: Full SPA – Adding Additional Pages and dynamically injecting HTML – Complex Views and Routing Parameters – Angular UI Components to create Modal Popup

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

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Simon Holmes, "Getting MEAN with Mongo, Express, Angular, and Node, Manning Publications, 2016.
2. Jeff Dickey, "Write Modern Web Apps with the MEAN Stack: Mongo, Express, AngularJS,
3. and Node.js", Peachpit Press, 2015.
4. Brad Dayley, Brendan Dayley, "Node.js, MongoDB and Angular Web Development",
5. Addison Wesley, 2017.
6. Amos Q. Haviv, Adrian Mejia,"Web Application Development with MEAN ", Kindle, June 15, 2017.

COURSE OUTCOMES:

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

- Understand the fundamentals of Full Stack Development and MEAN Stack Architecture
- Create and Setup a MEAN Project with Node and Express
- Build a Data Model with Mongo DB using REST API
- Demonstrate how to consume REST API
- Ability to develop applications using AngularJS

*****

Third Year	CORE PRACTICAL VI MEAN STACK WEBAPP LAB	Semester VI
Code	(Practical)	Credit: 4

COURSE OBJECTIVES:

- To provide complete knowledge of web application development
- To learn the UI interface design aspects with AngularJS and the serverside development with MongoDB, Express.js, and Node.js
- To develop a simple web app and deploy frontend and backend together

JavaScript

1. Document Object Model
2. JavaScript Frameworks – jQuery, AngularJS, BootStrap

Angular JS

3. Directives, Expressions, Controllers and Filters
4. AngularJS Modules and Forms

Node JS

5. CallBacks, Events, Global Objects
6. Buffers, Streams and File System

Express

7. Express Framework
8. RESTFul API

MongoDB

9. Data Modeling – Create Database, Drop Database
10. CRUD Operations
11. Document Querying and Functions

Project

12. Simple Web Application connecting component of MEAN Stack

COURSE OUTCOMES:

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

- Execute Programs based on DOM and JavaScript Frameworks
- Execute programs using basic functionality available in AngularJS and NodeJS
- Demonstrate how to consume REST API using Express
- Perform basic data access operations in MongoDB
- Ability to develop simple web application connecting all the components of MEAN Stack

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Third Year	**MAJOR BASED ELECTIVE II 1) CYBER SECURITY**	**Semester VI**
Code	**(Theory)**	**Credit: 4**

COURSE OBJECTIVES:

- To understand the fundamental concepts of Cyber Security
- To understand various types of cyber-attacks and cyber-crimes
- To familiarize concept of various cyber laws, cyber forensics and Privacy issues.

UNIT - I:

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II:

Cyberspace and the Law & Cyber Forensics**:** Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics

UNIT - III:

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

UNIT - IV:

Understanding Computer Forensics: Introduction - Historical Background of Cyberforensics - · Digital Forensics Science - The Need for Computer Forensics - Cyberforensics and Digital Evidence - Forensics Analysis of E-Mail - Digital Forensics Life Cycle - Chain of Custody Concept - Network Forensics - Approaching a Computer Forensics Investigation - Setting up a Computer Forensics Laboratory: Understanding the Requirements - Computer Forensics and Steganography - Relevance of the OSI 7 Layer Model to Computer Forensics - Forensics and Social Networking Sites: The Security/Privacy Threats - Computer Forensics from Compliance Perspective - Challenges in Computer Forensics - Special Tools and Techniques - Forensics Auditing - Antiforensics

UNIT - V:

Forensics of Hand-Held Devices: Introduction - Understanding Cell Phone Working Characteristics - Hand-Held Devices and Digital Forensics - Toolkits for Hand-Held Device Forensics - Forensics of iPods and Digital Music Devices - An Illustration on Real Life Use of Forensics - Techno-Legal Challenges with Evidence from Hand-Held Devices - Organizational Guidelines on Cell Phone Forensics

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

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Nina Godbole and Sunit Belpure, Cyber Security understanding Cybercrimes, Computer Forensics and legal perspectives, Wiley, 2011
2. Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer, Marcus H. Sachs, Jeffrey, Cyber Security Policy Guide book, Wiley, 2012.
3. James Graham, Richard Howard and Ryan Otson, Cyber Security Essentials, CRC Press, 2013.
4. James Graham, Rick Howard, Ryan Olson, Cyber Security Essentials, CRC Press, 2016.
5. Mayank Bhushan, Rajkumar S Rathore, Aatif Jamshed,Fundamentals of Cyber Security. India, BPB Publications, 2017.
6. Anand Shinde, Introduction to Cyber Security: Guide to the World of Cyber Security, Notion Press, 2021.

COURSE OUTCOMES:

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

- Understand the basics of cyber security and cybercrime.
- Understand and analyse cyber-attacks, types of cybercrimes, cyber laws
- Know about cyber scrine in Mobile and Wireless Devices
- Know the basics of Computer Forensics
- Understand about Forensics of Hand-Held Devices.

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Third Year **MAJOR BASED ELECTIVE II** **Semester VI**

2) CLOUD COMPUTING

Code **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To describe the concepts in Cloud Computing and its Security
- To explain the cloud modeling and design
- To explore the virtualization and cloud

UNIT - I:

Cloud Computing Foundation: Introduction to Cloud Computing – Move to Cloud Computing – Types of Cloud – Working of Cloud Computing

UNIT - II:

Cloud Computing Architecture: Cloud Computing Technology – Cloud Architecture – Cloud Modeling and Design - Virtualization: Foundation – Grid, Cloud and Virtualization – Virtualization and Cloud Computing

UNIT - III:

Data Storage and Cloud Computing: Data Storage – Cloud Storage – Cloud Storage from LANs to WANs – Cloud Computing Services: Cloud Services – Cloud Computing at Work

UNIT - IV:

Cloud Computing and Security: Risks in Cloud Computing – Data Security in Cloud – Cloud Security Services – Cloud Computing Tools: Tools and Technologies for Cloud – Cloud Mashaps – Apache Hadoop – Cloud Tools

UNIT - V:

Cloud Applications – Moving Applications to the Cloud – Google Cloud Applications – Amazon Cloud Services – Cloud Applications

UNIT - VI Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. A. Srinivasan and J.Suresh, "Cloud Computing – A Practical Approach for Learning and Implementation", Pearson India Publications, 2014. **(Unit 1:** Chapter1, Chapter2, Chapter3, Chapter4**; Unit 2:** Chapter5, Chapter6, Chapter7, Chapter8, Chapter9, Chapter10; **Unit 3:** Chapter11, Chapter12, Chapter13, Chapter14, Chapter16, Chapter17; **Unit 4:** Chapter18,

Chapter19, Chapter20, Chapter24, Chapter25, Chapter26,Chapter27; **Unit 5:** Chapter28, Chapter30, Chapter31, Chapter32)
2. Rajkumar Buyya, James Broberg, Andrzej, "Cloud Computing: Principles and Paradigms", Wiley India Publications, 2011.
3. Anthony T.Velte , Toby J. Velte Robert Elsenpeter, "Cloud computing a practical approach", TATA McGraw- Hill , New Delhi – 2010
4. Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online" - Que 2008
5. Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, "Cloud computing for dummies", Wiley Publishing, Inc, 2010
6. Comer, Douglas, The Cloud Computing Book: The Future of Computing Explained, CRC Press, 2021.

COURSE OUTCOMES:

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

- Describe various types of cloud
- Identify the cloud computing basics and its architecture
- Implement data storage and security
- Explore various cloud applications
- Describe various cloud services.

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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 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:

	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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