THANTHAI PERIYAR GOVERNMENT ARTS AND SCIENCE COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI-23.
COURSE PATTERN FOR UG - COMPUTER SCIENCE - 2023-2024 ONWARDS

Sl. No.	PART	COURSE	Sub-Code	Page No.	COURSE TITLE	Hrs.	Credits	CIA	Semester Exam	Total
					I SEMESTER					
1	P - I	TAMIL	I		LT-I : TAMIL - I	6	3	25	75	100
2	P - II	ENGLISH	I		LE-I : ENGLISH - I	6	3	25	75	100
3		CORE	I		C-I : Programming in C	6	5	25	75	100
	P - III	CORE	II*-P		C-II : C and Java Programming Lab	2	-	-	-	-
4		First Alli.	I	GE - I	Generic Elective - I : Mathematics - 1 (OR)	4	4	25	75	100
		First Alli.	II*-P		Generic Elective - II : Mathematics - 2 (OR)	2	-	-	-	-
5	P - IV	SBE	I		PCSEC: Foundation Course in Computer Science	2	2	25	75	100
6		VE			VE : Value Education	2	2	25	75	100
					TOTAL	30	19	150	450	600
					II SEMESTER					
7	P - I	TAMIL	II		LT-II : TAMIL - II	6	3	25	75	100
8	P - II	ENGLISH	II		LE-II : ENGLISH - II	4	3	25	75	100
9		CORE	II-P		C-II : C and Java Programming Lab	4	4	40	60	100
10	P - III	CORE	III		C-III : Programming in Java	5	5	25	75	100
11		First Alli.	II-P	GE - II	Generic Elective - II : Mathematics - 2 (OR)	3	3	40	60	100
12		First Alli.	III	GE - III	Generic Elective - III : Mathematics - 3 (OR)	4	4	25	75	100
13	P - IV	ES			ES : Environmental Science	2	2	25	75	100
14		NMSDC*	I	AECC - I	NMSDC-I :	2	2	25	75	100
					TOTAL	30	26	230	570	800
					III SEMESTER					
15	P - I	TAMIL	III		LT-III : TAMIL - III	6	3	25	75	100
16	P - II	ENGLISH	III		LE-III : ENGLISH - III	6	3	25	75	100
17		CORE	IV		C-IV : Database System Concepts	4	4	25	75	100
		CORE	V*-P		C-V : SQL and Fundamental of Python Programming Lab	2	-	-	-	-
18	P - III	ME	I	C-VI	C-VI : (A) Digital Electronics and Computer Organization (OR) (B) Digital Computer Fundamentals	4	4	25	75	100
19		Sec. Alli.	I	GE - IV	Generic Elective - IV : Physics - 1 (or)	4	4	25	75	100
		Sec. Alli.	II*-P	DSE-I	Discipline Specific Elective - I : Physics - 2 (or)	2	-	-	-	-
20	P - IV	NME	I		Non Major Elective - I : (A) Fundamentals of Information Technology (OR) (B) Fundamentals of Problem Solving Techniques	2	2	25	75	100
					TOTAL	30	20	150	450	600
					IV SEMESTER					
21	P - I	TAMIL	IV		LT-IV : TAMIL - IV	6	3	25	75	100
22	P - II	ENGLISH	IV		LE-IV : ENGLISH - IV	6	3	25	75	100
23		CORE	V-P		C-V : SQL and Fundamental of Python Programming Lab	4	4	40	60	100
24	P - III	CORE	VII		C-VII : Fundamentals of Python Programming	5	5	25	75	100
25		Sec. Alli.	II-P	DSE-I	Discipline Specific Elective - I : Physics - 2 (OR)	3	3	40	60	100
26		Sec. Alli.	III	DSE-II	Discipline Specific Elective - II : Physics - 3 (OR)	4	3	25	75	100
27	P - IV	NMSDC*	II	AECC - II	NMSDC-II :	2	2	25	75	100
					TOTAL	30	23	205	495	700
					V SEMESTER					
28		CORE	VIII		C-VIII : Data Structures and Algorithms	5	5	25	75	100
29		CORE	IX		C-IX : Software Engineering	5	5	25	75	100
30	P - III	CORE	X		C-X : Advanced Python Programming	6	5	25	75	100
31		CORE	XI-P		C-XI : Advanced Python Programming Lab	5	5	40	60	100
32		ME	II	DSE-III	Discipline Specific Elective - III : (A) Discrete Mathematics (OR) (B) Introduction to Data Science	5	3	25	75	100
33	P - IV	NME	II	NME	Non Major Elective - II : (A) Fundamentals of Web Designing (OR) (B) Documentation and Spreadsheet	2	2	25	75	100
34		SSD		SSD	SSD : Soft Skill Development	2	2	25	75	100
35	P - V	EA			EA : Extension Activity	-	1	25	75	100
					TOTAL	30	28	215	585	800
					VI SEMESTER					
36		CORE	XII		C-XII : Operating Systems	6	6	25	75	100
37		CORE	XIII		C-XIII : Computer Networks	6	5	25	75	100
38		CORE	XIIV		C-XIV : Fundamentals of Microprocessors	5	5	25	75	100
39	P - III	CORE	XV-P		C-XV : Digital Electronics and Microprocessor Lab	6	5	40	60	100
40		ME	III	DSE-IV	Discipline Specific Elective - IV : (A) Computer Graphics (OR) (B) Multimedia Systems	5	3	25	75	100
41		NMSDC*	III	AECC - III	NMSDC-III :	2	2	25	75	100
					TOTAL	30	26	165	435	600
42		*Optional			Extra/Additional :					100
					GRAND TOTAL	180	142	1115	2985	4200

B.Sc.	Part: III - Subject Code:		Core: I		Semester	I
Computer Science	**PROGRAMMING IN C**		Int.	25	Hours	6
			Ext.	75	Credit	5

Objective : To impart the features and syntax of C programming language and to train the students to write good programs in C.

Outcome : Structured Programming approach with fundamental programming features is learned.

Unit 1 History of C and importance of C – Structure of a C – Execution of Program.

Character set – C tokens – Keywords and Identifiers – Constants – Variables – Data types – Declaration of Variables – Declaration of storage class – Assigning values to variables – Defining symbolic constants – Const and volatile variable.

Operators and Expression: Arithmetic, Relational, Logical, Assignment, Increment and Decrement – Conditional, Bitwise and Special operators.

Arithmetic expressions – Evaluation – Precedence of arithmetic operators – Type conversions – Operator precedence and associativity.

Unit 2 I/O Statements: stdio: scanf, printf – Built-in functions: Introduction – getchar and putchar – math: sqrt, pow, sin, cos, tan, ceil, floor, abs, log, log10 and sgn ctype: clrscr, getch and putch – Formatted input and output.

Control structures: if – if else – Nested if – switch statement – Conditional operator – go to statement.

Looping structures: Introduction – while – do ... while – for statements – Jumps in loops.

Unit 3 Arrays: Introduction – One and two dimensional arrays: Declaration and initialization.

Character arrays: Declaration and initialization – Reading & writing of strings – String manipulations using built-in functions: strcat, strchr, strcmp, strcpy, strlen, strrev, strset, strupr and strlwr – Enumerated data type.

Unit 4 Functions: User defined functions – Need, Elements, Definition, Return values, Function calls, Function declaration – Call by Value and Call by Reference – Categories of functions: No arguments and no return values, Arguments but no return values, arguments with return values, no arguments but return value, multiple return values – Recursion – Scope of variables.

Pointers: Understanding pointers, Address operator, Declarations and Initialization, Accessing through pointers – Pointers and strings – Pointers and functions.

Unit 5 Structure and Union: Defining structure, Declaring structure variables, Accessing members, Operations on individual members, Structure initialization, Arrays of structures – Unions.

File Management: Introduction, Defining and opening file, Closing a file – Input / Output operations on Sequential files – Random Access files – Pre-processor: Introduction and Macros.

Text Book:

1. Programming in C, 7th Edition, Balagurusamy, E, Tata McGraw Hill Publishing Company, New Delhi, 2016.

Reference Book:

1. Programming with C, Ravichandran, New Age International Company, New Delhi, 2009.

B.Sc.	Part: III - Subject Code:			Core: II-P	Semester	I/II
Computer Science	**C AND JAVA PROGRAMMING LAB**	Int.	40		Hours	2/4
		Ext.	60		Credit	-/4

Objective : C: To train the structured programming of C with fundamental programs and to programme the elementary structures using C.

JAVA: Able to develop application programs using Structured approach as well as Object Oriented Programming approach using Java.

Outcome : C: C language structures like arrays, strings functions, pointers, structures and unions and also working with files are learned.

JAVA: Knowledge in interfaces and packages, implements in java.lang, java.util, and java.awt (AWT Components) are learned.

C PROGRAMMING LAB (I SEMESTER)

1   Simple Expression Evaluation.

2   Solving Quadratic Equations using IF and Switch Statements.

3   Problems using looping structures.

4   Problems using single dimensional array.

5   Matrix Manipulation.

6   String Manipulation and Enumerated data.

7   Simple Programs using User Defined Functions.

8   Problems working with pointers.

9   Problems using Structures and Unions.

10   Working with Sequential file and Random Access File.

11   Problems using pre-processor directives.

JAVA PROGRAMMING LAB (II SEMESTER)

1 Objects and classes.

2 Constructors.

3 Method Overloading and Method Overriding.

4 Inheritance.

5 Interfaces and packages.

5 Exception handling.

6 String and String Buffer Class.

7 String manipulations

8 Usage of AWT Components with layouts.

Reference Books:

1. Programming in C, 7th Edition, E. Balagurusamy, Tata McGraw Hill Publishing Company, New Delhi, 2016.

2. Programming with C, Ravichandran, New Age International Company, New Delhi, 2009.

3. Java: The Complete Reference, 7th Edition, Herbert Schildt, Tata McGraw Hill, New Delhi, 2010.

4. Programming with Java – A Primer, E. Balagurusamy, Tata McGraw Hill, 3e

Note: Practical examination will be conducted at the end of Semester II

Practical Question Paper pattern for the Part III: (Maximum 60 Marks)

One or Two Questions from C Due Weightage to be granted on question's robustness

One or Two Questions from Java Due Weightage to be granted on question's robustness

B.Sc.	Part: IV - Subject Code:		SBE: I		Semester	I
Computer Science	**PCSEC: FOUNDATION COURSE IN COMPUTER SCIENCE**	Int.	25		Hours	2
		Ext.	75		Credit	2

Objective : To impart the fundamental knowledge in Computer, features and programming aids.

Outcome : Learned the Computer Science basics and prerequisites for programming such as Algorithm, Procedure and Flowchart writings.

Unit 1 Introduction to Computers: Evolution of Computers – Generation of Computers – Classification of Computers: Analog, Digital and Hybrid Computers.

Classification of Computer: Super, Mainframe, Maxi, Personal Computers and Terminals – Characteristics of Computers – Block diagram of a Digital Computer – Example Hardwares.

Unit 2 Introduction to Number system: Decimal, Binary, Octal, and Hexadecimal – Floating Point numbers: Mantissa and Exponential format.

Introduction to types of Programming Language: Structured, OOPs, Event Driven Programming, Query Processing, and Scripting – Example Languages.

Unit 3 Classification of Software: Introduction – Types: Application software, System Software – Example Softwares.

Structured Programming: Algorithms, Procedures, and Flow Charts: Symbols and concepts.

Examples using (Algorithm and/or Procedure and/or Flowchart): Simple Interest (Arithmetic), Degree, Radian and Gradient Conversion.

Unit 4 Examples using (Algorithm and/or Procedure and/or Flowchart): Prime Numbers (if – else), Biggest three numbers (nested – if), Sum of N numbers (Single for loop) – Matrix addition (nested for loop), Ascending order (for & if).

Unit 5 Examples using (Algorithm and/or Procedure and/or Flowchart): Quadratic Equation (Roots of a Quadratic Equation), Block: While loop, Do - while – Switch - case – Sine series computation (Value of Sin x),

Text Book:

1. Fundamentals of Computers, 2nd Edition, Rajaraman, V, Prentice Hall India Limited.

Reference Book:

1. Introduction to Information Technology, 2nd Edition, Turban, Rainer and Potter, Willey Student, New Delhi, 2012.

B.Sc.	Part: III - Subject Code:	Core: III	Semester	II
Computer Science	**PROGRAMMING IN JAVA**	Int.	25	Hours	5
		Ext.	75	Credit	5

Objective : To introduce the concepts of OOPS, to familiarize the features of Java that supports platform independency, implementing interfaces and exception handling, creating GUI using AWT and understand and implementation of event handling.

Outcome : Gains knowledge on OOP concepts, java primaries, arrays, classes and objects. Knowledge on packages, exceptions and applet programs, use of built-in basic packages java.lang, java.util and programs on I/O streams are acquired.

Understands the AWT components and Layouts and developing small GUI programs.

Unit 1 Introduction: Review of Object Oriented concepts – History of Java - Java buzzwords – JVM architecture – Data types – Variables – Scope and life time of variables – arrays – operators – control statements – type conversion and casting – simple java programs – constructors – methods – Static block – Static Data – Static Method String and String Buffer Classes.

Unit 2 Inheritance: Basic concepts – Types of inheritance – Member access rules – Usage of this and Super key word – Method Overloading – Method overriding – Abstract classes – Dynamic method dispatch – Usage of final keyword. Packages: Definition – Access Protection – Importing Packages.

Unit 3 Interfaces: Definition – Implementation – Extending Interfaces – Exception Handling: try – catch – throw – throws – finally – Built-in exceptions – Creating own Exception classes.

Unit 4 AWT Controls: The AWT class hierarchy – user interface components – Labels – Button – Text Components – Check Box – Check Box Group – Choice – List Box – Panels – Scroll Pane – Menu – Scroll Bar. Working with Frame class – Colour – Fonts and layout managers.

Unit 5 Event Handling: Events – Event sources – Event Listeners – Event Delegation Model (EDM) – Handling Mouse and Keyboard Events – Adapter classes – Inner classes.

Text Books:

1. Java: The Complete Reference, 7th Edition, Herbert Schildt, Tata McGraw Hill, New Delhi, 2010.

2. Core Java 2 Volume I – Fundamentals, Gary Cornell, Addison Wesley, 1999.

Reference Books:

1. Head First Java, O'Rielly Publications

2. Introduction to Java Programming, 7th Edition, Y. Daniel Liang, Pearson Education India, 2010.

B.Sc.	Part: III - Subject Code:		Core: IV	Semester	III
Computer Science	**DATABASE SYSTEM CONCEPTS**	Int.	25	Hours	4
		Ext.	75	Credit	4

Objective : To understand the concepts and organization of a general database and relational database and also SQL and PL/SQL.

Outcome : Database and its architecture, data models, Relational algebra and calculus, Functional Dependency and Decomposition are learned with normalization procedures.

SQL queries, constraints, sub queries, Join, Set and Views and also simple programs on PL/SQL are learned.

Unit 1 Introduction to database systems: Basic concepts and definitions – data dictionary – database – Database system – Database Administrator – Database Approach – Database system environment – advantages and disadvantages of DBMS.

Database system architecture: Introduction – Schemas, Sub-schemas, and Instances – Three level ANSI – SPARC Database Architecture – Data independence – Structure, Components and Functions of DBMS

Unit 2 Data models: Hierarchical, Network, Relational and entity relationship data models.

Relational algebra and calculus: Structure of relational database – Relational algebra – Relational Calculus.

Functional dependency and decomposition: Functional Dependency Diagram and examples – Full functional dependency – Axioms for functional dependencies – Decomposition.

Unit	3	Normalization: Normal Forms – First, Second and Third Normal form – Boyce/Codd Normal form – Multi-valued dependencies and Fourth Normal form – Join dependencies and Fifth Normal form.
Unit	4	Manipulation in database management systems: Table – Data types – Create Table – Creating a Table from a Table – Insertion of data into tables – Viewing Data in Table Inserting data into a table – Delete – Update – Modifying the Structure of tables – Renaming – Destroy – Examining objects created by a user – Computation on Table Data – Dual table – Functions – Group functions – Scalar functions.
Unit	5	Data constraints: Types – Column level – Primary key – Foreign key – Null value – Unique – Check – Constraints in Alter table – Dropping constraints in Alter table – Default – Grouping Data from Table – Manipulating Date – Sub-Queries – Join: using Union, Intersect and Minus – Create views.

PL/SQL: Introduction – PL/SQL Block – PL/SQL execution environment – Simple programs using PL/SQL. |

Text Books:

1. Database Systems Concepts, Designs and Application Second Edition, Shio Kumar Singh, Pearson Education

    UNIT 1: Chapter 1 (1. 2 to 1. 5, 1. 7, 1. 8. 4 to 1. 8. 6)

    Chapter 2 (2. 1 to 2. 4, 2. 6)

    UNIT 2: Chapter 2 (2. 7. 4 to 2. 7. 6), Chapter 4 (4. 3 to 4. 5)

    Chapter 9 (9. 2. 1 to 9. 2. 3, 9. 3)

    UNIT 3: Chapter 10 (10. 1 to 10. 6)

2. SQL, PL/SQL – The Programming Language of SQL, Second Revised Edition, Ivan Bayross, BPB Publications, New Delhi, 1999.

    UNIT 4, 5: Chapter 2, 3, 4 (only views) and 6

Reference Books:

1. An Introduction to Database Systems, Seventh Edition, C. J. Date, Pearson Education, 2002.

2. Fundamentals of Database systems, Elmasri & Navathe, Addison & Wesley, New Delhi.

B.Sc.	Part: III - Subject Code:		Core: V-P		Semester	III/IV
Computer Science	**SQL AND FUNDAMENTALS OF PYTHON PROGRAMMING LAB**		Int.	40	Hours	2/4
			Ext.	60	Credit	-/4

Objective : SQL: To learn the DDL and DML SQL statements on tables with some features of relational database query processing concepts.

PYTHON: Acquire programming skills in core Python to develop simple programs, programs to define data structures and its operations, Towers of Hanoi and Menu construction.

Outcome : SQL: Learned SQL query as well as simple programs in PL/SQL.

PYTHON: Problem solving approaches, basic programming constructs, various computing strategies for Python-based solutions to real world problems, data structures such as lists, tuples, sets and dictionaries processing and file operations are learned.

SQL LAB (III SEMESTER)

1   Data Definition Language: Create, Alter, Drop, Rename, Truncate.

2   Data Manipulation Language: Insert, Update, Delete, Select.

3   SQL SELECT Statement: Selecting All Columns, Selecting Specific Columns, Column Alias, Concatenation Operator, Arithmetic Operators, Comparison Conditions, Logical Conditions, ORDER BY Clause.

4   Constraints: Not Null, Unique Key, Primary Key, Foreign Key, Check, usage of Alter – Enabling & Disabling constraints – Dropping a Constraint.

5   Dual table creation – Character Functions and Number Functions.

6   Aggregate Functions – Group By and Having Clause.

7   Set operations.

8 Joins: Equijoins – USING and On clause, Non – Equijoin, Self Joins, Left Outer Joins, Right Outer Joins, Full Outer Joins, Cross Joins, Natural Join.

9 Creation of Views.

10 Simple Programs using PL/SQL.

FUNDAMENTALS OF PYTHON PROGRAMMING LAB (IV SEMESTER)

1 Conversion of temperature from Fahrenheit to Celsius and vice versa.

2 Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the five subjects are to be input by user. Assign grades according to the following criteria:

  Grade A: Percentage >=80

  Grade B: Percentage >=70 and 80

  Grade C: Percentage >=60 and <70

  Grade D: Percentage >=40 and <60

  Grade E: Percentage < 40

3 Programs to find the area of rectangle, square, circle and triangle by accepting suitable input values from user.

4 Prime numbers generation.

5 Factorial of the given number using recursive function.

6 Count the number of even and odd numbers from array of N elements.

7 Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input : tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output : 3)

8 Reverse a string word by word

9 Create a Savings Account class that behaves just like a Bank Account, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint: use Inheritance).

10   Program to construct the following pattern, using a nested loop

<pre>
        *
       **
      ***
     ****
    *****
     ****
      ***
       **
        *
</pre>

11   Simple programs for Parameter passing, Call-by-value, Call-by-reference and default arguments and returning values from the functions.

12   Read a file content and copy only the contents at odd lines into a new file.

13   Program for Towers of Hanoi using recursion.

14   Create a menu driven Python program with a dictionary for words and their meanings.

Reference Books:

1. SQL, PL/SQL – The Programming Language of SQL, Second Revised Edition, Ivan Bayross, BPB Publications, New Delhi, 1999.

2. Introduction to Computer Science using Python - A computational Problem solving Focus, Charles Dierbach, Wiley India Edition, 2015.

Note: Practical examination will be conducted at the end of Semester IV

Practical Question Paper pattern for the Part III: (Maximum 60 Marks)

One or Two Questions from SQL   Due Weightage to be granted on question's robustness

One or Two Questions from Python   Due Weightage to be granted on question's robustness

B.Sc.	Part: III - Subject Code:	ME-I: Core: VI-A		Semester	III
Computer Science	**MAJOR ELECTIVE – I:** **DIGITAL ELECTRONICS AND COMPUTER ORGANIZATION**	Int.	25	Hours	4
		Ext.	75	Credit	4

Objective : To understand the basic concepts of number systems, Boolean algebra, Gates and other related topics and to realize the building blocks of a digital computer system.

Outcome : Provisioning knowledge over fundamental concepts in Digital Electronics, computer hardware and digital logic.

Unit 1 Number Systems: Decimal, Binary, Octal & Hexadecimal numbers – Number conversions. Signed Binary Number – Binary Arithmetic – Codes: Classification of Codes – Tables for BCD 8421, 2421, XS3, and Gray Codes.

Unit 2 Boolean Algebra and Logic Gates: Fundamental concepts – Boolean Constants and Variables – Logic gates – Truth Tables – Types of Gates – Basic Laws of Boolean algebra – Boolean Theorems – De Morgan's theorems – Boolean Expression for Logic Circuits – Implementing Circuits from Boolean Expressions – Standard Representation for Logical Functions – Minterm and Maxterm – Simplification of Boolean expressions using Laws and Theorems.

Unit 3 Karnaugh's Map Representation and Simplification up to four variables for SOP and POS – SOP and POS with Don't Care Condition.

Combinational Logic Circuits: Design Procedure – Adders: Half Adder, Full Adder – Subtractor: Half Subtractor, Full Subtractor.

Multiplexer: Concept and 4: 1 multiplexer – Demultiplexer: Concept and 1: 4 demultiplexer.

Unit	4	Sequential Logic Circuits: Introduction – Basic Flip – Flops: Clocked SR, JK, Type D and Type T – Characteristics of Flip – Flop.

Unit   4   Sequential Logic Circuits: Introduction – Basic Flip – Flops: Clocked SR, JK, Type D and Type T – Characteristics of Flip – Flop.

Shift Registers – Binary Counters – Encoder – Decoder.

Memory: Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory.

Unit   5   Cache Memory – Virtual Memory – Properties of Memory.

Computer Architecture: Instruction Formats – Data Transfer and Manipulation Instructions and data – Addressing modes.

Text Books:

1. Digital Electronics, G. K. Kharate, Oxford University Press, 2010.

   (For UNITS: 1, 2, 3 and 4 (Properties of Memory only)).

2. Computer System Architecture, M. Morris Mano, PHI, New Delhi, 1999.

   (For UNITS: 4 and 5).

Reference Book:

1. Digital Computer Fundamentals, Second Edition, Thomas C. Bartee, McGraw Hill International Publications, 1986.

B.Sc.	Part: III - Subject Code:	ME-I: Core: VI-B		Semester	III
Computer Science	**MAJOR ELECTIVE – I:** **DIGITAL COMPUTER FUNDAMENTALS**	Int.	25	Hours	4
		Ext.	75	Credit	4

Objective : To understand the basic concepts of Logic gates, Boolean algebra, Combinational Circuits and sequential circuits

Outcome : Provisioning knowledge over fundamental concepts in Digital Computers logic gates, number systems and Counter designs.

Unit 1 Number Systems and Codes: Number System –Base Conversion – Binary Codes – Code Conversion. Digital Logic: Logic Gates – Truth Tables – Universal Gates.

Unit 2 Boolean Algebra: Laws and Theorems – SOP, POS Methods – Simplification of Boolean Functions – Using Theorems, K-Map, Prime–Implicant Method – Binary Arithmetic: Binary Addition – Subtraction – Various Representations of Binary Numbers – Arithmetic Building Blocks – Adder – Subtractor.

Unit 3 Combinational Logic: Multiplexers – Demultiplexers – Decoders – Encoders – Code Converters – Parity Generators and Checkers.

Unit 4 Sequential Logic: RS, JK, D, and T Flip-Flops – Master-Slave Flip-Flops. Registers: Shift Registers – Types of Shift Registers.

Unit 5 Counters: Asynchronous and Synchronous Counters – Ripple, Mod, Up-Down Counters– Ring Counters. Memory: Basic Terms and Ideas –Types of ROMs – Types of RAMs.

Text Book:

1. Digital Computer Design, V. Rajaraman and T. Radhakrishnan, Prentice Hall of India, 2001

Reference Books:

1. Digital Principles and Applications, 5th Edition, D.P. Leach and A.P. Malvino, TMH, 2002.

2. Digital Logic and Computer Design, M. Moris Mano, PHI, 2001.

3. Digital Computer Fundamentals, 6th Edition, T.C. Bartee, Tata McGraw Hill, 1991.

B.Sc.	Part: IV - Subject Code:		NME: I-A		Semester	IV
Computer Science	**NON-MAJOR ELECTIVE – I:** **FUNDAMENTALS OF INFORMATION TECHNOLOGY**		Int.	25	Hours	2
			Ext.	75	Credit	2

Objective : To explore the concepts of information Technology and communication via computers.

Outcome : Acquired knowledge on the recent trends on computer and communication networks.

Unit 1 Introduction to Computers: Introduction – Importance of computers – Characteristics of computers.

Unit 2 Classification of digital computers – Anatomy of digital Computers.

Unit 3 Input devices – Output devices – Programming Languages – Operating Systems.

Unit 4 Computer Networks: Types of Networks – Network topology.

Unit 5 Internet and World Wide Web.

Text Book:

1. Fundamentals of Information Technology, Alexis Leon & Mathews. S.Chand (G/L) & Company Ltd., 2008

Reference Book:

1. Using Information Technology – A Practical introduction to computers and communications, 3rd Edition, Stacey Sawyer, Brian K Williams, Sarah E Hutchinson, TMH, 1999.

B.Sc.	Part: IV - Subject Code:		NME: I-B	Semester	IV
Computer Science	**NON-MAJOR ELECTIVE – I:** **FUNDAMENTALS OF PROBLEM SOLVING TECHNIQUES**	Int.	25	Hours	2
		Ext.	75	Credit	2

Objective : To explore the importance of algorithms and programs and to know the basic problem solving strategies

Outcome : Acquired knowledge on systematic approach to solve computer problems using algorithms and application of text manipulation

Unit 1 Introduction: Notion of algorithms and programs – Requirements for solving problems by computer – The problem-solving aspect: Problem definition phase, Getting started on a problem.

Unit 2 The use of specific examples, Similarities among problems, Working backwards from the solution – General problem-solving strategies – Problem solving using top-down design – Implementation of algorithms – The concept of Recursion.

Unit 3 Computing the prime factors of an integer – Generation of pseudo-random numbers – Raising a number to a large power.

Unit 4 Fundamental Algorithms: Exchanging the values of two variables – Counting – Summation of a set of numbers – Factorial computation – Fibonacci Series generation – Reversing the digits of an integer.

Unit 5 Text Processing: Text line length adjustment – Left and right justification of text – Keyword searching in text – Text line editing.

Text Book:

1. How to Solve it by Computer, R. G. Dromey, Pearson India, 2007.

Reference Books:

1. The Stanford Mathematics Problem Book: With Hints and Solutions, George Polya, Jeremy Kilpatrick, Dover Publications, 2009 (Kindle Edition 2013).

2. Problem Solving with Computers, 1st edition, Greg W. Scragg, Jones & Bartlett, 1996.

B.Sc.	Part: III - Subject Code:	Core: VII	Semester	IV
Computer Science	**FUNDAMENTALS OF PYTHON PROGRAMMING**	Int. 25	Hours	5
		Ext. 75	Credit	5

Objective : Learn and understand the core syntax and semantics of Python programming language, strings manipulations and functions definition, process of structuring the data using lists, dictionaries, and sets, concept of modularity and reusability, creation of objects and perform operations on text files.

Outcome : Develop and execute simple python program, conditional and looping structures, representing the data as list, set, and dictionaries, Decomposing program into functions and read / write operations on text files.

Unit 1 Introduction: The essence of computational problem solving – Limits of computational problem solving – Computer algorithms – Computer Hardware and Software – The process of computational problem solving – Python programming language – Literals – Variables and Identifiers.

Unit 2 Operators – Expressions and Data types, Input / Output Control Structures – Boolean Expressions – Selection Control – If Statement – Indentation – Multi-way Selection – Iterative Control – While Statement – Infinite loops – Definite vs. Indefinite Loops – Boolean Flag.

Unit 3 Python Data Structures: String, List, Set and Dictionary manipulations – Building Blocks of Python programs – Understanding and using ranges.

Unit 4 Functions: Program Routines – Defining Functions – More on Functions: Calling Value and returning functions – Calling Non-Value and returning functions – Parameter Passing – Keyword Arguments – Default Arguments – Variable Scope – Recursion: Recursive functions.

Unit 5 Text Files: Opening, Reading and Writing text files – Object Oriented Programming using Python: Encapsulation – Inheritance – Polymorphism.

Text Books:

1. Introduction to Computer Science using Python - A computational Problem solving Focus, Charles Dierbach, Wiley India Edition, 2015.

2. Core Python Applications Programming, 3rd Edition, Wesley J. Chun, Pearson Education, 2016

Reference Books:

1. Learning Python Powerful Object Oriented Programming, 5th Edition, Mark Lutz, O'reilly Media.2018

2. Exploring Python, 1st Edition, Timothy A. Budd, Tata McGraw Hill Education Private Limited 2011.

3. Python Programming: An Introduction to Computer Science, 2nd Edition, John Zelle, Course Technology Cengage Learning Publications, 2013, ISBN 978- 1590282410.

4. Python Programming for Absolute Beginners, Michel Dawson, Third Edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-1435455009

Web resource

https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

B.Sc.	Part: III - Subject Code:		Core: VIII		Semester	V
Computer Science	**DATA STRUCTURES AND ALGORITHMS**		Int.	25	Hours	5
			Ext.	75	Credit	5

Objective : To impart the knowledge of fundamental data structures and basic algorithm design methods.

Outcome : Appreciate different types of data structures; choose appropriate design methods to write algorithms to solve real life problems are learned.

Unit 1 Data Structures: Definition – Elementary data organization – Data structure operations. Arrays: Linear arrays – Representation of linear array in memory – Array operations, Multidimensional arrays, Parallel arrays, and Sparse matrix. Strings: String operations – Pattern matching algorithms. Linked Lists: Array vs. linked list – Representation of linked lists in memory – Operations in a linked list – Doubly linked list.

Unit 2 Stack: Primitive operation on stack – Algorithms for PUSH and POP – Representation of Stack as Linked list and array – Stacks applications: Polish notation – Evaluation of Arithmetic expressions – Queues: Primitive operations on the queues – Priority queue – Representation of Queues as Linked list and array – Applications of queue.

Unit 3 Trees: Basic terminologies, Binary trees, Tree representations using Array & Linked list – Basic operations on Binary trees – Traversal of Binary trees: In-order, Pre-order & Post-order – Applications of Binary tree traversals.

Unit 4 Algorithm: Characteristics – Basic steps – Algorithms complexity and time-space trade-offs – Algorithmic notations.

Algorithm design methods: Sub-goals – Hill climbing – Working backward – Heuristics – Backtrack programming – Recursion.

Unit 5 Sorting and searching: Introduction – Sorting: Bubble sort, Insertion sort, Selection sort, Merge sort, Quick sort – Radix sort.

Searching: Linear search and Binary search.

Text Books:

1. Data Structures, Seymour Lipschutz, Tata McGraw Hill Publishing Company Limited, Schaum's Outlines, New Delhi.

   UNIT: 1, 2, 3 and 5

   UNIT: 4: Chapters: 1. 5 and 2. 3

2. Introduction to the Design and Analysis of Algorithms, Goodman, S. E and S. T. Hedetniemi, McGraw Hill, International edition, 1988.

   UNIT: 4: Chapters: 1. 3, 3. 1, 3. 2, 3. 3, 3. 4

Reference Books:

1. An Introduction to Data Structures with Applications, Tremblay, J. P. and Paul G. Sorenson, McGraw Hill International Student Edition, New York.
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Addison Wesley, New Delhi, 1987.

B.Sc.	Part: III - Subject Code:			Core: IX		Semester	V
Computer Science	**SOFTWARE ENGINEERING**		Int.	25	Hours		5
			Ext.	75	Credit		5

Objective : To introduce the main concepts of Software Engineering and the various phases involved in Software Development.

Outcome : To work as a member in a development team to develop and deliver a high quality-end software products and know the basis for software development lifecycle.

Unit 1 Introduction to software engineering: Definitions – Size factors – Quality and productivity factors – Planning a software project: Problem definition – Developing a solution strategy – Planning the development process – Team structure and Project structure.

Unit 2 Software cost estimation: Software cost factors – Software cost estimation techniques.

Software requirements definition: Software requirements specification – Formal specification techniques.

Unit 3 Software design: Fundamental design concepts – Modules and modularization criteria – Design notations – Structured coding techniques – Coding style – Documentation and guidelines.

Unit 4 Verification and validation techniques: Quality assurance – Walkthroughs and Inspection – Static analysis – Unit testing and Debugging – System testing.

Unit 5 Software Maintenance: Enhancing maintainability during development – Managerial aspects of software maintenance – Configuration management – Source code metrics.

Text Book:

1. Software engineering concepts, Richard Fairley, Tata McGraw – Hill International Editions, New Delhi, 2007 (Reprint).

   UNIT – 1   : Chapters : 1. 1, 1. 2, 1. 3, 2. 1, 2. 2, 2. 3, 2. 4

   UNIT – 2   : Chapters : 3. 1, 3. 2, 4. 1, 4. 2

   UNIT – 3   : Chapters : 5. 1, 5. 2, 5. 3, 6. 1, 6. 2, 6. 4

   UNIT – 4   : Chapters : 8. 1, 8. 2, 8. 3, 8. 4, 8. 5, 8. 6

   UNIT – 5   : Chapters : 9. 1, 9. 2, 9. 3, 9. 4

Reference Book:

1. Software Engineering – A Practitioner's Approach, Roger S. Pressman, 7th Edition, McGraw Hill Educational Edition, Indian Reprint, Delhi, 2017.

B.Sc.	Part: III - Subject Code:		Core: X		Semester	V
Computer Science	**ADVANCED PYTHON PROGRAMMING**	Int.	25	Hours		6
		Ext.	75	Credit		5

Objective : Introduces the advanced concepts, core syntax and semantics, database connectivity and perform various operations on database, use of different packages, concurrency and parallelism, and web services.

Outcome : Develop and execute simple Turtle Graphics program, various operations on files, application of Python packages in the programs, Creation of threading and parallelism, and understand the web services.

Unit 1 Interactive and Non-Interactive Graphics – Pixels – Buffering – Python and Computer Graphics – Python Turtle Graphics Introduction – Turtle attributes – Modular Design: Modules – Top-Down Design – Turtle graphics Library – 3D Graphics Library.

Unit 2 Working with files: Reading and Writing data files – File Operations – Directories – Working with CSV and EXCEL files. Database Programming: Connecting a database, Creating Tables, INSERT, UPDATE, DELETE and READ operations, Transaction Control, Disconnecting a database

Unit 3 Introduction to Numpy: Creation of vectors and matrices – Matrix manipulations

Introduction to Pandas: Data structures – Series and DataFrame – Data wrangling – Loading a dataset into a dataframe – Selecting Columns and Rows from a dataframe – Adding and Deleting data in a dataframe.

Unit 4 Exception Handling – Introduction to Concurrency and Parallelism – Threading: Introductions – Threads versus processes – Creating a Thread – Thread Class – Passing Arguments –Timers.

Unit 5 Network Programming: Introduction to socket and web services – IPv4 versus IPv6 – Sockets in Python: Introduction – Setting up a connection – Implementing the client and server application – Web services in python: Web frame works, Flask, Hello world in Flask.

Text Books:

1. Advanced Guide to Python3 Programming, John Hunt, Springer.

   UNIT – 1   : Chapters : 2 & 3

   UNIT – 2   : Chapters : 18 (P.No.:215–244), 20 (P.No.:241–246),

                           21 (P.No.:249–254)

   UNIT – 4   : Chapters : 29 (P.No.:337–344), 30 (P.No.:347–358)

   UNIT – 5   : Chapters : 38 (P.No.:471–479), 39 (P.No.:457–469),

                           40 (P.No.:471–479)

2. Introduction to Computer Science using Python - A computational Problem solving Focus, Charles Dierbach, Wiley India, 2015.

3. Core Python Applications Programming, Wesley J. Chun, 3rd Edition, Pearson Education, 2016

Reference Books:

1. Learning Python Powerful Object Oriented Programming, 5th Edition, Mark Lutz, O'reilly Media 2018.

2. Exploring Python, 1st Edition, Timothy A. Budd, Tata McGraw Hill Education Private Limited 2011.

3. Python Programming: An Introduction to Computer Science, 2nd Edition, John Zelle, Course Technology Cengage Learning Publications, 2013, ISBN 978- 1590282410

4. Python Programming for Absolute Beginners, 3rd Edition, Michel Dawson, Course Technology Cengage Learning Publications, 2013, ISBN 978-1435455009.

Web resource

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B.Sc.	Part: III - Subject Code:		Core: XI-P	Semester	V
Computer Science	**ADVANCED PYTHON PROGRAMMING LAB**	Int.	40	Hours	5
		Ext.	60	Credit	5

Objective : Acquire programming skills in advanced Python concepts, Object-oriented programming, read and write data from different files, database applications development, and data analysis methods.

Outcome : Learned the advanced programming concepts of Python, turtle graphics based programs, exception handling and regular expression, Web services and data analysis methods.

ADVANCED PYTHON PROGRAMMING LAB

1   Turtle window with specific size.

2   Draw an octagon on the Turtle Graphics screen

3   Program to implement concepts of OOP

        a) Types of Methods

        b) Inheritance

        c) Polymorphism

        d) Abstract methods and classes

        e) Interface

4   Implementation of file operations.

5   Read the content and write only the odd lines into a new file.

6   Read a CSV dataset and perform EDA

7   Read a EXCEL dataset and display

       a. Histogram b. Bar chart c. Boxplot d. Scatter plot

8   Databases operations

     a) Connecting to database.

     b) Creating and dropping tables.

     c) Inserting and updating into tables.

9   Demonstrate different types of exception handling.

10   Simple Client-Server applications

11   Linear Regression.

12   Logistic Regression.

Reference Books:

1. Advanced Guide to Python3 Programming, John Hunt, Springer

2. Introduction to Computer Science using Python - A computational Problem solving Focus, Charles Dierbach, Wiley India, 2015.

3. Core Python Applications Programming, Wesley J. Chun, 3rd Edition, Pearson Education, 2016

Note: Practical Question Paper pattern for the Part III: (Maximum 60 Marks)

B.Sc.	Part: III - Subject Code:	ME-II: DSE-III-A		Semester	V
Computer Science	**MAJOR ELECTIVE – II:** **DISCIPLINE SPECIFIC ELECTIVE – III:** **DISCRETE MATHEMATICS**	Int.	25	Hours	5
		Ext.	75	Credit	3

Objective   :   To impart basic features of Logic, Boolean Algebra and the concepts of Graph Theory with matrix representations.

Outcomes   :   Basic concepts of Mathematical logics and Tautology, illustrative for Functions, Identities and Cartesian product are learned.

                  Graphs, Operations on graphs, Trees and Fundamental circuits, Adjacency graphs, Fundamental cut-sets and Fundamental circuits are learned.

Unit   1   Relations: Cartesian product of two sets – Relations – Representation of relation – Operations on relations – Equivalence relations.

                Functions: Functions and operators – one-to-one – onto functions – Special type of functions.

Unit   2   Mathematical Logic: Logical statement of Proposition – Types of Propositions – Propositional Calculus – Negation of a Proposition – Disjunction – Conjunction – Tautologies and Contradictions – Logical Equivalence – Algebra of Propositions – Conditional Propositions – Converse, Inverse and Contra positive Propositions – Negation of a Conditional Proposition – Biconditional Propositions – Arguments.

Unit   3   Graph Theory: Introduction – Definition – Applications of graphs – Finite and Infinite graphs – Incidence and Degree – Isolated vertex, Pendant vertex and Null graph – Paths and Circuits: Isomorphism – Subgraphs – walk, path, and circuit – connected, disconnected graphs – components – Euler graphs – Operations on graphs – More on Euler graphs – Hamiltonian paths and circuits.

Unit	4	Trees and Fundamental Circuits: Trees – Some properties of trees – Pendant vertices in a tree – Distance and centre in a tree – Rooted and binary trees – Spanning trees – Fundamental circuits – Finding all spanning trees of a graph – Cut-sets – Some properties of a cut-set – All cut-sets in a graph – Fundamental Circuits and cut-sets.

Unit	5	Matrix representation of graphs: Incidence matrix – Submatrices of Incidence matrix A(G) – Circuit matrix – Fundamental Circuit matrix and Rank of Circuit matrix – An Application to a Switching Network – Cut-set matrix – Relationships among incidence matrix (A_f,) fundamental circuit matrix (B_f) and fundamental cut-set matrix (C_f) – Path matrix – Adjacency matrix.

Text Books:

1. Discrete Mathematics, Dr. N. Sridharan, N. Chandrasekaran, The National Publishing Company, 2000.

    UNIT – 1: Pages 2. 1 – 2. 28, 3. 1 – 3. 10

2. Discrete Mathematics, 3rd Edition, Vatssa, B. S., Wishwar Prakashan, A Division of Wiley Eastern Ltd., (1988), New Delhi – 110 002.

    UNIT – 2: Section 1. 1 – 1. 18

3. Graph theory with application to Engineering and Computer Science, Narsingh Deo, Prentice Hall of India, New Delhi (1993)

    UNIT – 3: Pages 1 – 9, 14 – 17, 19 – 34

    UNIT – 4: Pages 39 – 52, 55 – 75.

    UNIT – 5: Pages 137 – 162

Reference Books:

1. Modern Algebra, Arumugan and A. T. Issac, New Gamma Publication (1992), New Gamma Publication, 1992.
2. Discrete Mathematics, M. K. Venkataraman, The National Publishing Company, 2004.

B.Sc.	Part: III - Subject Code:	ME-II: DSE-III-B		Semester	V
Computer Science	**MAJOR ELECTIVE – II:** **DISCIPLINE SPECIFIC ELECTIVE – III:** **INTRODUCTION TO DATA SCIENCE**	Int.	25	Hours	5
		Ext.	75	Credit	3

Objective : To provide basic knowledge about data, analysis, supervised and unsupervised modelling and Non-relational data representation

Outcomes : Acquired knowledge on data science, modelling of data process and NoSQL

Unit 1 Introduction: Benefits and uses – Facets of data – Data science process – Big data ecosystem and data science.

Unit 2 The Data science process: Overview – Research goals – Retrieving data – Transformation – Exploratory Data Analysis – Model building.

Unit 3 Algorithms: Machine learning algorithms – Modelling process – Types – Supervised – Unsupervised – Semi-supervised.

Unit 4 Introduction to Hadoop: Hadoop framework – Spark – Replacing MapReduce – NoSQL – ACID – CAP – BASE – types.

Unit 5 Case Study: Prediction of Disease – Setting research goals – Data retrieval – preparation – exploration – Disease profiling – presentation and automation.

Text Book:

1. Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications, 2016.

Reference Books:

1. The Art of Data Science, Roger Peng, lulu.com 2016.
2. Getting Started with Data Science – Making Sense of Data with Analytics, Murtaza Haider, IBM press, E-book.
3. Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, Davy Cielen, Arno D.B. Meysman, Mohamed Ali, Dreamtech Press 2016.
4. Numsense! Data Science for the Layman: No Math Added, 1st Edition, Annalyn Ng, Kenneth Soo, 2017.
5. Doing Data Science Straight Talk from the Frontline, Cathy O'Neil, Rachel Schutt, O'Reilly Media 2013.
6. Data Science for Dummies, 2nd Edition, Lillian Pierson, 2017.

B.Sc.	Part: IV - Subject Code:		NME: II-A		Semester	V
Computer Science	**NON-MAJOR ELECTIVE – II:** **FUNDAMENTALS OF WEB DESIGNING**	Int.	25	Hours	2	
		Ext.	75	Credit	2	

Objective : To introduce the basic concepts of HTML and to design web pages using few tags.

Outcome : Familiarity with website and its components and design a static web pages.

Unit 1 Introduction to Internet – Email – HTML: Introduction – Designing a Home page – HTML Document – Anchor Tag – Hyperlinks.

Unit 2 Head and Body sections – Header section – Title – Links – Colourful pages and Examples.

Unit 3 Design of Body section – Heading – Alignment – Horizontal rule – Paragraph – Tabs – Images and Pictures.

Unit 4 Ordered and Unordered Lists: List – Unordered lists – Headings in list – Ordered lists – Nested lists.

Unit 5 Table Handling: Tables – Width of the table and cells – Row span and Column span – Colouring cells – Frames and Frameset.

Text Book:

1. World Wide Web design with HTML, C. Xavier, Tata McGraw Hill, New Delhi, 2000.

Reference Book:

1. Web enabled commercial application development using HTML, DHTML, Java script, Perl CGI, 2nd revised edition, Ivan Bayross, BPB publishing, 2002.

B.Sc.	Part: IV - Subject Code:		NME: II-B		Semester	V
Computer Science	**NON-MAJOR ELECTIVE – II:** **DOCUMENTATION AND SPREADSHEET**	Int.	25		Hours	2
		Ext.	75		Credit	2

Objective : To make the students to understand the operation of Word processing and Spread sheet.

Outcome : Explored the features of word processing through Word and built-in features like Charts and advanced techniques of Spread sheets.

Unit 1 Introduction to Documentation – Opening, Saving and Printing Document – Tool Bars – Editing: Clip-board, Delete, Cut – Copy – Paste – Undo/ Redo operations – Document Views – Ruler & Gridlines – Zoom.

Unit 2 Common Formatting Functions: Font Properties – Alignment – High-lighting text – Bullets and Numbering – Indentation – Formatting Paragraph – Find & Replace.

Unit 3 Insertion: Blank Page & Page Break, Picture, ClipArt, WordArt and Special symbols.

Table: Inserting Rows and Columns – Merging – Cell Alignments – Auto fit – Table Borders.

Page Layout: Orientation – Margins: Top, Left, Gutter – Header & Footer – Review: Spelling & Grammar.

Unit 4 Introduction to Spreadsheet – Spread sheet terminologies – Opening, Saving and Closing Workbook – Entering Data in Spreadsheet – Copying the Data – Formatting the Data – Editing the Worksheet – Calculation in a worksheet – Functions, Formulae and Copying formulae.

Unit 5 Built-in functions in Excel: Date & Time, Text, Mathematical and Statistics Functions – Charts: Types and formatting charts.

Text Books:

1. Word for Dummies, Dan Gookin, Wiley, 2016.

2. Excel for Dummies, Gerg Harvey, John Wiley & Sons, 2016

3. Step - by - Step in Excel 2010, Joyce Cox, Joan Lambert and Curtisfrye, PHI Publications, New Delhi.

Reference Books:

1. Word, Excel, and PowerPoint – Just for Beginners, Dorothy House, Outskirts Press, 2015.

2. Mastering MS Office, Bittu Kumar, V& S Publishers, 2017

B.Sc.	Part: III - Subject Code:		Core: XII	Semester	VI
Computer Science	**OPERATING SYSTEMS**	Int.	25	Hours	6
		Ext.	75	Credit	6

Objective   :   To gain fundamental concepts of an Operating System and its working principles to manage its resources

Outcome   :   Principles of operating systems and its architectures, the process life cycle, comprehend the scheduling algorithms and study the deadlock mechanisms are learned.

Exploring the various techniques of allocating memory to processes memory, categorize the file access methods; identify the directory and disk structures and protection mechanisms, Compare and contrasting the principles of protection, access control and user authentication techniques in security domain are studied.

Unit   1   Operating Systems: Computer-system organization – Computer – system architecture – Operating System structure – Operating System operations – Process management – Memory management – Storage management – Protection and Security.

Unit   2   Process concept: Process scheduling – Operations on Processes – Inter process communication – CPU Scheduling – Basic concepts – Scheduling criteria – Scheduling algorithms.

Deadlocks: System model – Deadlock characterization – Methods for handling deadlocks.

Unit   3   Main memory: Swapping – Contiguous memory allocation – Segmentation – Paging – Structure of the Page Table – Virtual memory: Demand paging.

Unit   4   File concept – Access methods – Directory and Disk structure – File System – Mounting file – File sharing.

Unit 5 Protection: Goals of Protection – Principles of protection – Domain of protection – Access matrix – Implementation of the Access matrix – Access control.

Security: Security problem – Cryptography as a security tool – User authentication.

Text Book:

1. Operating Systems Concepts, 9th Edition, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Wiley Publications, 2013.

    UNIT – 1:   Chapter 1 (Sec. 1. 2 – 1. 9)

    UNIT – 2:   Chapter 3 (Sec. 3. 1 – 3. 4)

                        Chapter 6 (Sec. 6. 1 – 6. 3)

                        Chapter 7 (Sec. 7. 1 – 7. 3)

    UNIT – 3:   Chapter 8 (Sec: 8. 2 – 8. 6)

                        Chapter 9 (Sec. 9. 2)

    UNIT – 4:   Chapter 11(Sec. 11. 1 – 11. 6)

    UNIT – 5 :   Chapter 14 (Sec. 14. 1 – 14. 6)

                        Chapter 15 (Sec. 15. 1, 15. 4, 15. 5)

Reference Books:

1. Operating Systems, 2nd Edition, William Stallings, PHI, 2001.
2. Operating Systems – Internals and Design Principles, 8th Edition, William Stallings, Pearson Publications, 2014.
3. Modern Operating Systems, 4th Edition, Andrew S. Tanenbaum, Pearson Publications, 2014.

B.Sc.	Part: III - Subject Code:		Core: XIII	Semester	VI
Computer Science	**COMPUTER NETWORKS**	Int.	25	Hours	6
		Ext.	75	Credit	5

Objective : To study the concepts of computer networking, networking models and its layered architecture with different protocols.

Outcome : Gains valuable skills in computer networks (switching, routing and knowledge on protocol), system and network administration, computer and network security.

Unit 1 Basic Concepts: Line configuration – Topology – Transmission modes – Categories of networks – The OSI model – Layered architecture – Functions of the layers.

Unit 2 Signals: Analog and Digital data – Analog and Digital signals – Periodic and Aperiodic signals – Analog signals – Digital signals – Error detection & Correction: Types of Errors – Detection – VRC, LRC – CRC – Checksum – Error Correction.

Unit 3 Data Link Layer Protocols: Asynchronous protocols – Synchronous protocols – Character Oriented protocols – Bit Oriented protocols – Switching: Circuit switching – Packet switching – Message switching.

Unit 4 Networking and Internetworking Devices: Repeaters – Bridges – Routers – Gateways – Routing algorithms – Distance Vector routing – Link State routing.

Unit 5 TCP/IP Protocol Suite: Overview – Network layer – Addressing – Subnetting – Transport layer – TCP & UDP – Application layer: BOOTP – DHCP – DNS – Telnet – FTP – TFTP – SMTP – SNMP – HTTP.

Text Book:

1. Data Communications and Networking, 2nd Edition, Behrouz A Forouzan, TMH.

Reference Book:

1. Computer Networks, Andrew S. Tanenbaum, Computer Networks, PHI

B.Sc.	Part: III - Subject Code:		Core: XIV		Semester	VI
Computer Science	**FUNDAMENTALS OF MICROPROCESSORS**		Int.	25	Hours	5
			Ext.	75	Credit	5

Objective : To impart an in depth knowledge of the architecture and programming of the 8-bit microprocessor 8085 and interfacing of the peripherals.

Outcome : Ability to develop assembly language programming and understand the need for different interfacing devices is learned.

Unit 1 Evolution of microprocessors – Single chip microcomputers – Microprocessors applications – Programming Digital computers – Buses – Memory addressing capacity of CPU – Microcomputers – Processor architecture – Intel 8085 – Instruction cycle – Timing diagram.

Unit 2 Instruction set of Intel 8085 – Instruction and data formats – Addressing modes – Status flags – Intel 8085 instructions – Programming of microprocessors.

Unit 3 Assembly language – Assemblers – Stacks and subroutines – MACRO – Assembly language programming – Simple examples – Addition and Subtraction of binary and decimal numbers – Complement – Shift – Masking – Finding the largest and smallest numbers in an array.

Unit 4 Arranging a series of numbers – Sum of a series of numbers – Multiplication – Division – Multi byte addition and Subtraction.

Peripheral devices and interfacing – Address space partitioning – Memory and I/O devices – I/O ports.

Unit 5 Programmable peripheral interface – Programmable counter/interval timer – Microprocessor applications – Delay subroutines – Delay subroutine using Register pair – Interfacing of 7 segment displays – Microprocessor based traffic control.

Text Book:

1. Fundamental of Microprocessors and Microcomputers, 4th Revised Edition, Badri Ram, 1993.

Reference Book:

1. Microprocessor Architecture, programming and applications with the 8085/8080A, Ramesh, S. Gaonkar, Wiley Eastern, 1990.

B.Sc.	Part: III - Subject Code:		Core: XV-P	Semester	VI
Computer Science	**DIGITAL ELECTRONICS AND MICROPROCESSOR LAB**	Int.	40	Hours	6
		Ext.	60	Credit	5

Objective : To study the functions of Basic gates and Arithmetic operations using ICs and to programme pseudo codes on 8 – bit microprocessor 8085 in the form of assembly language programs.

Outcome : Gains the skills in developing assembly language programs and knowledge on digital electronics.

DIGITAL ELECTRONICS LAB

1   Study of Basic Gates AND, OR, NOT.

2   Study of Logic Gates NAND, NOR, XOR.

3   Universal properties of NAND & NOR gates.

4   Proving De Morgan's Laws.

5   Simplification of Boolean Expression using Laws and Construction of Logic circuit using NAND and NOR logic gates.

6   Half Adder and the Full Adder circuits.

7   Half Subtractor and Full Subtractor circuits.

8   Karnaugh's Map Reduction Method.

MICROPROCESSOR LAB

1   Add, Subtract, Multiply and Divide 8-Bit numbers.

2   Add and subtract two 8-bit BCD numbers.

3   Perform 16-bit addition of hexadecimal numbers.

4   Find the Smallest and Largest elements from the given list.

5   Perform Multi-byte Addition and Subtraction.

6   Perform Block movement.

7   Complement

8   Shift and Masking

9   Sorting a list of numbers in ascending order.

10   Perform multiplication by successive addition.

11   Perform division by successive Subtraction.

Reference Books:

1. Digital Electronics, G. K. Kharate, Oxford University Press, 2010.

2. Digital Computer Fundamentals, Second Edition, Thomas C. Bartee, McGraw Hill International Publications, 1986.

3. Fundamental of Microprocessors and Microcomputers, 4th Revised Edition, Badri Ram, 1993.

Practical Question Paper pattern for the Part III: (Maximum 60 Marks)

One or Two Questions from Digital Electronics	Due Weightage to be granted on question's robustness
One or Two Questions from Microprocessor	Due Weightage to be granted on question's robustness

B.Sc.	Part: III - Subject Code:		ME-III: DSE-IV-A		Semester	VI
Computer Science	**MAJOR ELECTIVE – III:** **DISCIPLINE SPECIFIC ELECTIVE – IV:** **COMPUTER GRAPHICS**	Int.	25		Hours	5
		Ext.	75		Credit	3

Objective : To offer knowledge on basics to graphical techniques, raster graphics, two and three dimensional transformations.

Outcome : Applications of graphics, graphics displays, primitive algorithms to draw graphical objects, clipping concepts and picture construction techniques are lush fruited.

Unit 1 Computer Aided Design – Presentation Graphics – Computer Art – Entertainment – Education and Training – Visualization Image Processing – Graphical User Interface – Video Display Devices – Raster Scan Systems – Random Scan Systems.

Unit 2 Graphics Monitors and Workstations – Input Devices – Hard Copy Devices – Graphics Software.

Output primitives: Point and Lines – Line Drawing Algorithms – Circle Generating Algorithms: Properties of circles, Midpoint circle algorithm concept.

Unit 3 Attributes of Output Primitives: Line Attributes – Curve Attributes – Colour and Gray Scale levels – Area Fill Attributes – Character Attributes – Inquiry Functions.

Two Dimensional Transformations: Basic Transformation – Matrix Representations.

Unit 4 Composite Transformations – Other Transformations.

The Viewing Pipeline – Window – to – Viewport Coordinate Transformation.

Clipping Operations – Point Clipping – Line Clipping: Cohen – Sutherland Line clipping algorithm.

Polygon clipping: Sutherland-Hodgeman polygon clipping algorithm – Text Clipping – Exterior Clipping.

Unit 5 The User Dialogue – Logical Classification of Input Devices: Locator Devices – Stroke Devices – String Devices – Valuator Devices – Choice Devices – Pick Devices – Interactive Picture Construction Techniques.

Three Dimensional Concepts: Three Dimensional Cartesian Coordinate Systems – Three dimensional Display methods – Three Dimensional Graphics Packages – Three Dimensional Transformations: Translation, Scaling, Reflections and Shears.

Text Book:

1. Computer Graphics, Donald Hearn and M. Pauline Baker, PHI, New Delhi.

Reference Books:

1. Principles of Interactive Computer Graphics, William M. Newman and Robert F. Sproul, TMH, New Delhi.

2. Interactive Computer Graphics Data Structures Algorithms and Languages, Giloi W. K., PHI.

B.Sc.	Part: III - Subject Code:	ME-III: DSE-IV-B		Semester	VI
Computer Science	**MAJOR ELECTIVE – III:** **DISCIPLINE SPECIFIC ELECTIVE – IV:** **MULTIMEDIA SYSTEMS**	Int.	25	Hours	5
		Ext.	75	Credit	3

Objective : To understand the standards available for different audio, video and text applications and application of multimedia authoring systems.

Outcome : Commercial applications of Text, Image, Audio and Video representations, manipulation and processing techniques are lush fruited.

Unit 1 Multimedia Definition – Use of Multimedia – Delivering Multimedia – Text: About Fonts and Faces – Using Text in Multimedia – Computers and Text – Hypermedia and Hypertext.

Unit 2 Images: Plan Approach – Organize Tools – Configure Computer Workspace – Making Still Images – Colour – Image File Formats.

Sound: The Power of Sound – Digital Audio – Midi Audio – Midi vs. Digital Audio – Audio File Formats – Vaughan's Law of Multimedia Minimums – Adding Sound to Multimedia Project.

Unit 3 Animation: The Power of Motion – Principles of Animation – Animation by Computer.

Video: Using Video – Working with Video and Displays – Digital Video Containers – Obtaining Video Clips.

Unit 4 Making Multimedia: The Stage of Multimedia Project – The Intangible Needs – The Hardware Needs – The Software Needs – Authoring Systems Needs – Multimedia Production Team.

Unit 5 Planning and Costing: The Process of Making Multimedia – Designing and Producing – Content and Talent: Acquiring Content – Ownership of Content Created for Project.

Text Book:

1. Multimedia: Making It Work, 8th Edition, Tay Vaughan, Osborne McGraw– Hill, 2001.

Reference Book:

1. Multimedia Computing, Communication & Applications, Ralf Steinmetz & Klara Nahrstedt, Pearson Education, 2012.