**SRI RAMAKRISHNA MISSION VIDYALAYA COLLEGE OF ARTS AND SCIENCE**

**(AUTONOMOUS) COIMBATORE – 641 020**

For candidates admitted from academic year **2020-2021** onwards under New CBCS.

# Department of Information Technology

## Programme Objectives

1. Developing graduates to identify understand the problem and use appropriate problem solving techniques.
2. Graduates of the programme will continue to develop and update their knowledge and skills throughout their career.
3. Graduates of this programme will establish as effective professional by acquiring technological concepts and skills to meet the industry needs and can pursue higher education.
4. Developing graduates with good communication skills to promote ideas, goals and personality skills to work in a team and undertake leadership roles when appropriate.
5. Make positive contributions to the community by applying skills, abilities and ethics culture learned.

## Programme Outcomes

1. Ability to apply the knowledge of mathematics and science to develop real time systems
2. Ability to design and conduct experiments / practical's
3. An ability to function on multidisciplinary teams
4. An ability to communicate effectively and engage in lifelong learning.
5. Student recognize the need for continuing professional development, ethical, legal, social issues and responsibilities

## Programme Specific Outcome:

1. Students are able to apply the fundamental concepts and methodologies of computer system.
2. The student understands the programming skill on their own to solve the real world problems.
3. Students use appropriate system design notations and apply system design engineering process and technologies in order to design, plan and implement software system.
4. The programme enhances students' knowledge to establish themselves as successful entrepreneurs.

## B.Sc. Information Technology – 2021-2022

### SEMESTER – I

| S.NO | COURSE CODE | PART | COURSE TITLE | HRS / WK | CREDITS | EXAM HRS | MAX MARKS | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOT |
| 1 | 20UGC1TA1/ 1HI1 | I | Tamil – I Amutha Tamil / Hindi – I | 6 | 3 | 2 | 50 | 50 | 100 |
| 2 | 20UGC1EN1 | II | English – I | 6 | 3 | 2 | 50 | 50 | 100 |
| 3 | 20UIT1C01 | III | Core : Programming in C | 5 | 4 | 2 | 50 | 50 | 100 |
| 4 | 20UIT1C02 | III | Core : PC Software | 2 | 2 | - | 50 | - | 50 |
| 5 | 20UIT1AL1 | III | Allied : Mathematics – I | 6 | 5 | 2 | 50 | 50 | 100 |
| 6 | 20UIT1CP1 | III | Core Practical : Programming in C | 5 | 3 | 2 | 50 | 50 | 100 |
| **TOTAL** | | | | **30** | **20** | | **300** | **250** | **550** |

### SEMESTER – II

| S.NO | COURSE CODE | PART | COURSE TITLE | HRS / WR | CREDITS | EXAM HRS | MAX MARKS | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOT |
| 1 | 20UGC2TA2/ 2HI2 | I | Tamil – II Kappiya Tamil / Hindi – II | 6 | 3 | 2 | 50 | 50 | 100 |
| 2 | 20UGC2EN2 | II | English – II | 6 | 3 | 2 | 50 | 50 | 100 |
| 3 | 20UIT2C03 | III | Core : Object Oriented Programming with C++ | 5 | 4 | 2 | 50 | 50 | 100 |
| 4 | 20UIT2C04 | III | Core : IT Essentials | 2 | 2 | - | 50 | | 50 |
| 5 | 20UIT2AL2 | III | Allied : Allied Mathematics – II | 6 | 5 | 2 | 50 | 50 | 100 |
| 6 | 20UIT2CP2 | III | Core Practical : Object Oriented Programming with C++ | 5 | 3 | 2 | 50 | 50 | 100 |
| 7 | 20UGC2ENS | IV | Environmental Studies | | 2 | 1 | - | 50 | 50 |
| **TOTAL** | | | | **30** | **22** | | **300** | **300** | **600** |

## SEMESTER – III

| S.NO | COURSE CODE | PART | COURSE TITLE | HRS / WK | CREDITS | EXAMS HRS | MAX MARKS | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOT |
| 1 | 20UIT3C05 | III | Core : Java Programming | 5 | 4 | 2 | 50 | 50 | 100 |
| 2 | 20UIT3C06 | III | Core : Data and File Structures | 5 | 4 | 2 | 50 | 50 | 100 |
| 3 | 20UIT3C07 | III | Core : Digital Computer Fundamentals | 4 | 4 | 2 | 50 | 50 | 100 |
| 4 | 20UIT3AL3 | III | Allied : Operations Research | 6 | 5 | 2 | 50 | 50 | 100 |
| 5 | 20UIT3CP3 | III | Core Practical : Java Programming | 4 | 3 | 2 | 50 | 50 | 100 |
| 6 | 20UIT3CP4 | III | Core Practical : Data Structure using C++ | 4 | 3 | 2 | 50 | 50 | 100 |
| 7 | 20UIT3NM1/ 20UGC3TB1 | IV | Non Major Elective : Grammar and Communication / Basic Tamil-I | 2 | 2 | 2 | - | 50 | 50 |
| **TOTAL** | | | | **30** | **25** | | **300** | **350** | **650** |

## SEMESTER – IV

| S.NO | COURSE CODE | PART | COURSE TITLE | HRS / WK | CREDITS | EXAMS HRS | MAX MARKS | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOT |
| 1 | 20UIT4C08 | III | Core : Visual Programming | 6 | 5 | 2 | 50 | 50 | 100 |
| 2 | 20UIT4C09 | III | Core : Relational Database Management System | 5 | 4 | 2 | 50 | 50 | 100 |
| 3 | 20UIT4C10 | III | Core : Advanced Networking | 6 | 4 | 2 | 50 | 50 | 100 |
| 4 | 20UIT4AL4 | III | Allied : Financial Accounting | 6 | 5 | 2 | 50 | 50 | 100 |
| 5 | 20UIT4CP5 | III | Core Practical : Visual Programming and RDBMS | 5 | 3 | 2 | 50 | 50 | 100 |
| 6 | * 20UGC4TB2 | IV | Non Major Elective : Basic Tamil-II | 2 | 2 | 2 | - | 50 | 50 |
| 7 | 20UGC4VAE | IV | Value Education | | 2 | 1 | - | 50 | 50 |
| 8 | 20UGC4 NSS/SPO/YRC | V | Extension Activities : NSS/SPORTS/YRC | | 1 | 1 | - | 50 | 50 |
| **TOTAL** | | | | **30** | **26** | | **250** | **400** | **650** |

## SEMESTER – V

| S.NO | COURSE CODE | PART | COURSE TITLE | HRS /WK | CREDITS | EXAMS HRS | MAX MARKS | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOT |
| 1 | 20UIT5C11 | III | Core : Python Programming | 5 | 4 | 2 | 50 | 50 | 100 |
| 2 | 20UIT5C12 | III | Core : Web Technology | 4 | 4 | 2 | 50 | 50 | 100 |
| 3 | 20UIT5C13 | III | Core : Operating System | 5 | 4 | 2 | 50 | 50 | 100 |
| 4 | 20UIT5C14 | III | Core : Data Mining and Warehousing | 4 | 4 | 2 | 50 | 50 | 100 |
| 5 | @ | III | Elective : Group I @ | 4 | 4 | 2 | 50 | 50 | 100 |
| 6 | 20UIT5CP6 | III | Core Practical : Python Programming Lab | 4 | 3 | 2 | 50 | 50 | 100 |
| 7 | 20UIT5CP7 | III | Core Practical : Web Technology | 4 | 3 | 2 | 50 | 50 | 100 |
| **TOTAL** | | | | **30** | **26** | | **350** | **350** | **700** |

## SEMESTER – VI

| S.NO | COURSE CODE | PART | COURSE TITLE | HRS /WK | CREDITS | EXAMS HRS | MAX MARKS | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOT |
| 1 | 20UIT6C15 | III | Core : Mobile Application Development | 6 | 5 | 2 | 50 | 50 | 100 |
| 2 | 20UIT6C16 | III | Core : Software Engineering | 6 | 5 | 2 | 50 | 50 | 100 |
| 3 | @ | III | Elective : Group II@ | 6 | 5 | 2 | 50 | 50 | 100 |
| 4 | 20UIT6CP8 | III | Core Practical : Mobile Application Development | 6 | 3 | 2 | 50 | 50 | 100 |
| 5 | 20UIT6CPR | III | Core : Project Work | 6 | 5 | - | 50 | 50 | 100 |
| **TOTAL** | | | | **30** | **23** | | **250** | **250** | **500** |

*** List of Non Major Elective(NME): II**

| Course Code | Course Title |
|---|---|
| 20UCM4NM2 | NME : General Commercial Knowledge |
| 20UCC4NM2 | NME : Consumer Rights |
| 20UPA4NM2 | NME : Entrepreneurship |
| 20USC4NM2 | NME : Web Programming Lab (HTML & CSS) |
| 20UCA4NM2 | NME : Data Science and Big data analytics Lab |
| 20UMS4NM2 | NME : Quantitative Methods for Competitive Examinations |

**@ List of Elective Courses**

| Course code | Course Title |
|---|---|
| **Group I** | |
| **20UIT5EA1** | Elective : Artificial Intelligence and Expert System |
| **20UIT5EB1** | Elective : Cloud Computing |
| **20UIT5EC1** | Elective : Client/Server Technology |
| **20UIT5ED1** | **Elective : Fundamentals of Cyber Security** |
| **20UIT5EE1** | Elective : Geographical Information System |
| **Group II** | |
| **20UIT6EA2** | Elective : Software Testing |
| **20UIT6EB2** | Elective : Embedded Systems |
| **20UIT6EC2** | Elective : Compiler Design |
| **20UIT6ED2** | **Elective : Multimedia and its applications** |
| **20UIT6EE2** | Elective : Computer Graphics |

| Part | Course Types | Number of Courses | Credits | Marks |
|---|---|---|---|---|
| **I** | Tamil | 2 | 6 | 200 |
| **II** | English | 2 | 6 | 200 |
| **III** | Core | 25 | 92 | 2400 |
| | Allied | 4 | 20 | 400 |
| | Elective (Group) | 2 | 9 | 200 |
| **IV** | Non Major Elective | 2 | 4 | 100 |
| | Environmental studies | 1 | 2 | 50 |
| | Value education | 1 | 2 | 50 |
| **V** | NSS/NCC/Sports | 1 | 1 | 50 |
| | **TOTAL** | 40 | **142** | **3650** |

**Programme : B.Sc Information Technology**

**Course Title : Core : Programming in C** **Course Code : 20UIT1C01**

**Year : I** **Semester : I**

**Hour/Week : 5** **Credits : 4**

**COURSE OBJECTIVES:**

1. To make the students aware of the basic concepts of C.
2. To make them understand the benefits and applications of C.
3. Understand the concept of a program in a high-level language being translated by a compiler into machine language program and then executed.
4. To develop the program writing and logical thinking skills.
5. To apply the features of the general programming.

**COURSE OUTCOMES:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Know the logics of solving the problems | K1 |
| **CO2** | Understand the concepts of C programming | K2 |
| **CO3** | Analyze and discover bugs in the program | K4 |
| **CO4** | Develop an application using memory management functions. | K3 |
| **CO5** | Analyze the concepts and develop programs to solve real-time problems | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PS04** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | M | S | L | | S | S | M | L |
| **CO2** | S | S | M | S | M | | S | S | L | L |
| **CO3** | S | S | M | S | M | | S | S | M | L |
| **CO4** | S | S | M | S | M | | S | S | M | M |
| **CO5** | S | S | M | S | M | | S | S | M | M |

**S- Strong; M-Medium; L-Low**

**Unit I (15 Hrs)**

Overview of C – Introduction-Character set –C Tokens Keywords & identifiers - Constant – Variables - Data types- Declaration of Variables- Assigning values to variables* - Defining Symbolic Constants- Operators: Arithmetic, Relational Logical, Assignment, Conditional Bitwise, Special, Increment and Decrement operators-Arithmetic Expressions-Evaluation of expression- Procedure of arithmetic operators-Type conversion in expression- operator precedence & associatively – mathematical functions-**Reading & writing a character – formatted input and output.** Page No: 1-20, 22-36, 38-44, 51-103

**Unit II (15 Hrs)**

Decision making and Branching – Decision making with IF Statement-simple IF Statement-The IF ELSE statement -Nesting of IF—ELSE statement- Decision Making and Looping-The WHILE statement. Array : The o n e Dimensional- two dimensional arrays- Character String Handling- Declaring and initializing string variables- Reading strings from technical-writing strings to screen Arithmetic operation on character-**putting strings together-comparison of two strings- string handling functions- table of Strings.*** Page No: 110-122, 145-168, 180-183, 197- 198, 218-239.

**Unit III (15 Hrs)**

User defined functions –need for user Defined functions- A multi-function program – The form of c functions –Return values and their types - Calling a function- Category of functions-No Arguments and no Return values- Arguments but no return values-Arguments with return values-Handling of non-integer functions nesting of functions- Recursion-functions with arrays- **The scope and lifetime of variables of Variables in functions – ANSI C function.*** Page No : 247-288

**Unit IV (15 Hrs)**

Structure definition- Giving values to members –Structures initialization-Comparison of Structure variables-Arrays of Structures- Arrays with in Structures- Structures within structures – Structures and functions- **unions- Size of structures- Bit fields***.

Pointers- Understanding pointers-Accessing the Address of a Variable – Declaring and initializing pointers- Accessing a variable through its pointers- pointers expressions pointer increments and scale factor-pointers and arrays – **pointers and character strings-** pointers and functions-**pointers and structures***. Page No: 301-324, 333-362.

**Unit V (15 Hrs)**

File management in C- Defining and opening a file- closing file - I/O operations on files- Error handling during I/O operations -Random Access to files- Command line arguments and **file parameters –The Preprocessor***. Page No: 370-389

***Self-Study**

**BOOKS FOR STUDY:**


1. Balagurusamy.E, *"Programming in ANSI C"*, McGraw Hill, Seventh Edition, 2017.
2. Kamthane, *"Programming in C*", Kindle Edition, November 2019.


**BOOKS FOR REFERENCE:**


1. Yashavant Kanetkar, *"Let us C"*, BPB Publications, 13th Edition, 2014.
2. Byron Gottfried, *"Programming with C"*, Tata McGraw Hill, Third Edition, 2013.
3. Mullesh Cooper, *"Spirit of C"*, Tata McGraw Hill, 28th impression, 2006.


**E-RESOURCES:**

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.unf.edu/~wkloster/2220/ppts/cprogramming_tutorial.pdf

**Programme : B.Sc Information Technology**

**Course Title : Core : PC Software** **Course Code : 20UIT2C02**

**Year : I** **Semester : I**

**Hour/Week : 2** **Credits : 2**

**COURSE OBJECTIVES:**

1. To understand about the basic computer skills and internet.
2. To gain knowledge on documentation
3. To attain knowledge on Spreadsheet
4. To develop the presentation Skills.

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Understanding the concepts of Basic Computer Skills, Internet | K1 |
| **CO2** | Ability to perform documentation skills | K2 & K3 |
| **CO3** | Acquiring and Develop knowledge in Spreadsheet and Presentation Skills | K2 & K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | M | M | M | M | L | | M | L | M | M |
| **CO2** | L | M | M | M | L | | S | M | L | M |
| **CO3** | S | M | M | M | L | | M | M | M | M |

**S- Strong; M-Medium; L-Low**

**Unit I**

**Basic Computer Skills:** Identifying Major Computer Components – How Computers Work – Turning on the computer and logging on – The keyboard and mouse – Operating systems and standard components of a PC system.

**Internet:** Definition of the internet – The evaluation of the internet – Internet addresses – Advantages and disadvantages of internet – **Search Engine: Searching – Creating and sending mail.**

**Unit II**

**Microsoft Word:** Introduction – Getting familiar with Microsoft word for windows – Office button – Quick access toolbar – Title bar – Ribbon – Ruler – Text area – The vertical and horizontal scroll bars – Status bar – Understanding document views – Click – Understanding nonprinting characters – Type, Backspace and Delete – Save a file and close word – More basic features – Create auto text – Use spell check – Find and replace – Changing the font and font size – Formatting paragraphs and working with styles – **Changing line spacing – Indent and align paragraphs – Adding bullets and numbers, adding page numbers** - setting page layouts and printing documents.

**Unit III**

**Microsoft Excel:** Entering text and numbers – Worksheets – The formula and status bar – Move around a worksheet – Entering excel formulas and formatting data – Merge and centre align – Alignment – Advanced calculations –cell addressing – Keyboard shortcuts – Move to a new worksheet – Creating excel functions, filling cells and printing – **Page Layout, Creating Headers and footers – Creating Charts in excel.**

**Microsoft PowerPoint:** The PowerPoint window – Slides, Placeholders and Notes – Status bar, tabs, view buttons and more – Normal view, Slide sorter view, Slide show – Create a title slide – Create new slides – Apply a theme – Animations, **Transitions, Spell check, Outline tab, Slides tab, Sorter view,** and printing.

**BOOKS FOR STUDY**


1 . Joe Habraken, *"Office 2016 In Depth"*, Que Publishing, First Edition, 2015.
2. Prof. Satish Jain, *"Computer Course Windows 10 with MS Office 2016"*, BPB Publications, 2018


**BOOKS FOR REFERENCE**


1. PeterWeverka, *"Office 2016 All in one for Dummies"*, John Wiley & Sons Inc, 2016
2 . Joan Lambert, Curtis Frye, *"Microsoft Office 2016 Step by Step"*, Microsoft Press , 2015


**E-RESOURCES**

1. https://edu.gcfglobal.org/en/topics/office2016/
2. https://www.tutorialspoint.com

| | | | |
|---|---|---|---|
| **Programme** | **: B.Sc Information Technology** | | |
| **Course Title** | **: Core Practical : Programming in C** | **Course Code** | **: 20UIT1CP1** |
| **Year** | **: I** | **Semester** | **: I** |
| **Hour/Week** | **: 5** | **Credits** | **: 3** |

**COURSE OBJECTIVE:**

1. To develop simple programs using C for solving mathematical problems.
2. To develop programs using concepts of C.
3. To develop programs, identify the suitable problem solving technique
4. To develop the program writing and logical thinking skills
5. To develop programs using C to solve real-time problems.

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Recall the mathematical functions while creating a program | K1 |
| **CO2** | Understand the fundamental programming concepts | K2 |
| **CO3** | Illustrate the programming technique to analyze software problems | K3 |
| **CO4** | Apply the concepts to find solution for the problems | K3 |
| **CO5** | Design and develop the simple application. | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PS04** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | M | M | | S | M | M | L |
| **CO2** | S | S | M | S | M | | S | M | M | L |
| **CO3** | S | S | M | S | M | | S | M | M | L |
| **CO4** | S | S | M | M | M | | S | M | M | L |
| **CO5** | S | S | L | M | M | | S | M | M | L |

**S- Strong; M-Medium; L-Low**

## LST OF PRACTICALS

1. Write a program for quadratic equation to find different types of values and roots.
2. Write a program to find prime numbers, and the structure is given below (1000).
3. Write a program to find maximum and minimum number for the given set of numbers.
4. Write a program for two-dimensional matrix addition.
5. Write a program to find a factorial of given number.
6. Write a program to find Fibonacci series for given range of numbers.
7. Write a program to find the day for given date.
8. Write a program to convert integer into words form range 1 to100.
9. Write a program to find Armstrong no for 1 to 1000.
10. Write a program Conversion of decimal to binary.
11. Write a program Conversion of binary to decimal.
12. Write a program Find ncr value using function.
13. Write a program to calculate biggest among n numbers using function.
14. Write a program for String manipulations (user defined functions for strcmp, strcat, strlen, strcpy ).
15. Write a program to check given string is palindrome or not, without using string reverse function.
16. Write a program to sort a given set of numbers in ascending order.
17. Write a program to sort given set of strings using pointers.
18. Write a program to merge the files given.
19. Write a program to read one file & write it into another using command line arguments.
20. Write a program to print student's result information (reg. no., name, etc)

**Programme : B.Sc Information Technology**

**Course Title : Core : Object Oriented Programming with C++** **Course Code : 20UIT2C03**

**Year : I** **Semester : II**

**Hour/Week : 5** **Credits : 4**

## COURSE OBJECTIVES

1. To learn the basic concepts of OOPS.
2. To develop programs in C++using the concepts of OOPS.
3. To understand pointers and strings
4. To understand file concepts
5. To develop programs for error handling and generic programs

## COURSE OUTCOMES

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Understand the OOPS concepts. | K2 |
| **CO2** | Learn data types and control structures in C++ | K1 |
| **CO3** | Demonstrate the Reusability by applying the types of Inheritance and know Polymorphism | K3 |
| **CO4** | Demonstrate the use of pointers in virtual functions. | K3 |
| **CO5** | Analyze the features of C++ including templates, exceptions and file handling. | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | M | M | S | | S | S | M | L |
| **CO2** | S | S | M | M | L | | S | S | M | L |
| **CO3** | S | S | L | M | M | | S | S | M | L |
| **CO4** | S | S | L | M | M | | M | S | L | L |
| **CO5** | S | S | M | L | L | | M | S | S | L |

**S – Strong; M – Medium; L – Low**

**UNIT I (15 Hrs)**

Principles of object oriented programming: Basic concepts–Benefits– Applications of C++ - Structure of C++ program – Basic data types – **User Defined Data Types: derived data types*** - Declarations of variables – Operators in C++ - Manipulators-Type cast operator – conversions – Operator overloading – Control Structures. Pages:(7-69)

**UNIT II (15 Hrs)**

Functions: Function prototyping - call by reference – return by reference – inline functions-default arguments – Function overloading. Classes and objects: Specifying a class – Defining member functions – Arrays within a class – **memory allocation for objects*** – Arrays of object – objects as function arguments – Constructors – Parameterized constructor – Copy constructor – **Dynamic constructor*** – Destructors. Pages:(79-164)

**UNIT III (15 Hrs)**

Operator overloading & type conversion: Defining operator overloading– Overloading unary operators – **Overloading Binary operators*** - Type conversions.

Inheritance: Defining derived class – Single inheritance – Multilevel inheritance- Multiple inheritance – Hierarchical inheritance – Hybrid inheritance – **Constructors in derived class**.* Pages:(177-241)

**UNIT IV (15 Hrs)**

Pointers, Virtual functions and Polymorphism: Pointers to Objects – this Pointer – Virtual Functions – **Pure virtual functions.***

Files: Opening and Closing a file – Detecting End-of- File – **File pointers and their manipulations***- Command-Line Arguments. Pages:(253-353)

**UNIT V (15 Hrs)**

Templates: Class templates – Function templates – Overloading of template function – **Member function templates.***

Exception Handling: Basics – Exception handling mechanism – Throwing mechanism – Catching mechanism – **Specifying exceptions.*** Pages:(360-394)

***SelfStudy**

**BOOKS FOR STUDY:**


1. E. Balagurusamy, Object Oriented Programming with C++,Tata McGraw Hill Education Private Limited, 8th Edition,N.Delhi, 2020.
2. Yashavant Kanetkar, Let us C++, BPB Publications, 17th Edition, 2020.


**BOOKS FOR REFERENCE:**


1. Robert Lafore, Object Oriented Programming in C++,Pearson Education,4th Edition, 2020.
2. Herbert Schildt, The Complete Reference : C++, Tata McGraw Hill Education Private Limited, 4th Edition, 2017.


**E-RESOURCES:**

1. https://www3.ntu.edu.sg/home/ehchua/programming/cpp/cp3_OOP.html
2. https://www.udemy.com/course/c-programming-oops-concepts/?
3. https://www.geeksforgeeks.org/object-oriented-programming-in-cpp/

**Programme : B.Sc Information Technology**

**Course Title : Core : IT Essentials** **Course Code : 20UIT2C04**

**Year : I** **Semester : II**

**Hour/Week : 2** **Credits : 2**

**COURSE OBJECTIVES:**

1. To understand the computer components and operating system installation.
2. To understand the importance of Device manager and software installation.
3. To Acquire knowledge of network oriented configuration and improve system performance

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Understanding the concepts of Computer components and OS Installation | K1 & K2 |
| **CO2** | Understanding the functionalities importance of Device manager and software installation | K2 & K3 |
| **CO3** | Acquiring knowledge on network configuration. | K3 & K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | M | M | M | M | M | | S | S | M | S |
| **CO2** | M | M | L | M | M | | M | M | M | M |
| **CO3** | M | M | L | M | L | | S | L | M | S |

**S- Strong; M-Medium; L-Low**

**UNIT – I**

Introduction: Input Device – Output Device – Storage Device – Adapters and expansion cards –connectors- Computer Front View –Rear View – Inside View- Computer Assembling – **Computer Bootup sequence*** - OS Installation: Windows Installation – Linux Installation - **Driver Installation***

**UNIT - II**

Device Manager –Disk Management – Computer Service Configuration – Sharing files & folders - printer configuration- Software Installation: TC- Wamp Server – IIS- Office – Open shot – OBS Studio - **Google Meet** – **Google Class room*** – Any Desk – Skype – Remote Desktop Connection -etc.,

**UNIT- III**

Network Configuration – Wired Network – Wireless Network – **Hotspot*** – Firewall configuration. Troubleshooting: User account- Remove viruses and malware - Uninstall unnecessary programs **- Adjust windows visual effects***

***Self-Study**

**BOOKS FOR STUDY:**


1. Ajit Mittal, Ajay Rana, *"Mastering PC Hardware & Networking"*, 1st Edition, Khanna Publishers, 2014
2. Ramesh Bangia, *"Learning PC Hardware"*, Khanna Publishers, 2nd Edition, 2011.


**BOOKS FOR REFERENCE:**


1. Kaveh Pahlavan and P. Krishnamoorty, *"Networking Fundamentals: Wide, Local and Personal Area Communications"*, Wiley publications, 2nd Edition, 2009.
2. Ron Gilster, *"PC Hardware : A Beginner's Guide"*, Tata McGraw-Hill Publishing, Thirteenth Reprint, 2008.


**E-RESOURCES**

1. http://www.cisco.netacad.com
2. https://computer.howstuffworks.com

**Programme : B.Sc Information Technology**

**Course Title : Core Practical : Object Oriented Programming with C++**

**Course Code : 20UIT2CP2**

**Year : I**

**Semester : II**

**Hour/Week : 5**

**Credits : 3**

## COURSE OBJECTIVES

1. To develop simple programs using C++for solving mathematical problems.
2. To develop C++ programs by using OOPS concepts.
3. To develop C++ programs for generic programing
4. To develop C++ programs to solve real world problems.
5. To Design and Create new applications by interconnecting many classes and reuse the code.

## COURSE OUTCOME

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Learn and Apply control Structure for mathematical problems. | K1 & K3 |
| **CO2** | Develop programs using OOP concepts. | K3 |
| **CO3** | Develop programs using file handling techniques | K3 |
| **CO4** | Develop programs to solve real-time problems. | K3 |
| **C05** | Analyze the design reusable applications. | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PS04** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | M | M | M | | S | M | M | M |
| **CO2** | S | S | M | S | M | | S | M | M | M |
| **CO3** | S | M | M | S | M | | S | M | M | L |
| **CO4** | S | M | S | S | L | | S | M | M | L |
| **CO5** | S | M | M | M | L | | S | M | M | L |

**S – Strong; M – Medium; L – Low**

## LIST OF PRACTICALS

1. Write a C++ program to read an integer and reverse it. Having reversed it check whether it is prime or not.
2. Write a C++ program to find the Largest and smallest value in 'n' numbers.
3. Write a C++ program to count the number of characters, words and lines in a given sentence without using string functions.
4. Write a C++ program to sort the given set of strings.
5. Write a C++ program to implement Constructors and Destructors in factorial of 'n' numbers.
6. Write a C++ program to implement Copy Constructor.
7. Write a C++ program to implement unary operator overloading.
8. Write a C++ program to implement Binary Operator (+) Overloading for the addition of Complex numbers.
9. Write a C++ program to implement Single inheritance for Employee details.
10. Write a C++ program to implement Multiple Inheritance for Student details.
11. Write a C++ program to implement Friend function for alumni details.
12. Write a C++ program to implement pure virtual function for customer details.
13. Write a C++ program on accessing the Data Members using "this" pointer.
14. Write a C++ program to create a binary file "mark.dat" file and store student name, roll no and marks in three subjects using structure.
15. Write a C++ program to create the data file "empinfo.dat"
16. Write a C++ program to find maximum number of given two number using template function.
17. Write a C++ program to create two different types of objects using class template.

**Programme : B.Sc Information Technology**

**Course Title : Core : Java Programming** **Course Code : 20UIT3C05**

**Year : II** **Semester : III**

**Hour/Week : 5** **Credits : 4**

**COURSE OBJECTIVES:**

1. To make aware of the basic concept of core java.
2. To understand the concept of Multithread Program and String Handling.
3. To understand the concept of File handling and Network Programming.
4. To provide knowledge on advanced features like Applet, Event Handling and Swing.
5. To understand the concept of database connectivity with JDBC Components.

**COURSE OUTCOMES:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Learn and Understand the concepts of Core Java. | K1 & K2 |
| **CO2** | Identify the logic behind process handling by using threads | K2 |
| **CO3** | Identify the logic behind Network Programming. | K2 |
| **CO4** | Develop the Window based application using Applet, Event Handling and Swing. | K3 |
| **CO5** | Analyze the JDBC concept to solve real-time problems. | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | M | M | M | | S | S | M | M |
| **CO2** | S | S | L | M | M | | S | S | M | M |
| **CO3** | S | S | L | M | M | | S | S | M | M |
| **CO4** | S | S | M | M | M | | S | S | S | M |
| **CO5** | S | S | M | M | M | | S | S | S | S |

**S-Strong; M-medium; L-low**

**Unit I (12 Hrs)**

**Introduction to java- Introduction to Classes*** - Inheritance Concepts- Packages and Interfaces: Packages – Access protection Importing packages – interfaces. Exception Handling: Fundamentals – Exception types – Using Try and Catch – nested Try – statements – throw, throws, finally. (Page No: 129-246)

**Unit II (12 Hrs)**

Multithreaded programming: Thread model – Creating a thread, creating multiple threads – Using Alive0 and join 0 – synchronization – Inter threaded communication. String Handling: String constructors – string operations – character extraction – **string comparison – searching – modification – string buffer** *. (Page No: 273-297,347-376)

**Unit III (12 Hrs)**

I/O: File – Stream classes – Byte streams – character streams – **serialization*** – Networking: Basics – TCP/IP client sockets – inet Address – URL – **Datagrams***. (Page No: 588-620)

**Unit IV (12 Hrs)**

Applet: Basics – Architecture – Passing parameters to Applets – Skeleton – Simple Applet – Event handling: Event model –Event class –Event listener interface. **- Using AWT Controls, Layout Managers, and Menus** * (Page No: 628-644)

**Unit V (12 Hrs)**

JDBC Architecture-Common JDBC Components **-CONNECTIONS:** Import JDBC Packages-Register JDBC Driver--Database URL Formulation-Create Connection Object-Closing JDBC Connections-**The Statement Objects-The Prepared Statement Objects***

***Self-study**

**BOOK FOR STUDY:**

1. Herbert Schildt, *"Java: The Complete Reference"*, McGraw Hill, Eleventh Edition, 2018.

**BOOKS FOR REFERENCE:**

1. E.Balagurusamy, *"Programming with Java – A Primer"*, McGraw-Hill Publication, Fifth Edition, 2017.
2. Harley Hahn, *"The internet computer reference"*, TATA McGraw Hill, Second Edition, 2016.

**E-RESOURCES:**

1. https://www.javatpoint.com/java-tutorial
2. https://www.w3schools.com/java/java_intro.asp
3. https://docs.oracle.com/javase/tutorial/
4. https://www.learnjavaonline.org/
5. https://javabeginnerstutorial.com/core-java-tutorial/

**Programme : B.Sc Information Technology**

**Course Title : Core : Data File Structures** **Course Code : 20UIT3C06**

**Year : II** **Semester : III**

**Hour/Week : 5** **Credits : 4**

**COURSE OBJECTIVES:**

1. To understand the linear and non-linear data structures available in solving problems
2. To know about the sorting and searching techniques and its efficiencies
3. To get a clear idea about the various algorithm design techniques
4. Using the data structures and algorithms in real time applications
5. Able to analyze the efficiency of algorithm

**COURSE OUTCOMES:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Acquire knowledge about algorithms and concepts of linear and non linear | K1 |
| **CO2** | Apply stack, queue and linked list in real world problem | K2 |
| **CO3** | Have knowledge of tree and graphs concepts | K2 |
| **CO4** | Apply various searching and sorting techniques | K3 |
| **CO5** | Analyze the various algorithms to implement in real time application. | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | L | M | M | | S | S | M | M |
| **CO2** | S | S | L | M | M | | S | S | M | M |
| **CO3** | S | S | L | M | S | | S | S | M | M |
| **CO4** | S | S | L | M | M | | S | S | M | M |
| **CO5** | S | S | L | M | M | | S | S | S | M |

**S – Strong; M – Medium; L – Low**

**Unit-I :-**

**Algorithm specification* (25-32)-Performance Analysis* (38-61)**. Arrays: Array as an ADT Polynomial ADT- Polynomial Representation–Polynomial Addition –Sparse Matrices-Representation of Arrays **(84-112)**. Stacks and Queues: Stacks ADT- Queues ADT. **(134-147).**

**Unit-II:-**

Linked lists: Singly Linked Lists and Chains-Representing Chains in C++ **(170-183)**-Circular Lists-Available Space List-Linked Stacks and Queues-Polynomials-**Equivalence Classes* (194-215)**-Doubly Linked List-**Generalized Lists* (224-240)**.

**Unit-III:-**

Trees: Introduction-Binary Trees-Binary Tree Traversal and Tree Iterators **(243-269)** – **Threaded Binary Trees* (274-277)**. Graphs: Graphs ADT-Elementary Graph Operation: Depth First Search-Breath First Search-Connected Components-Spanning Trees- Bi-connected - Components –Minimum Cost Spanning Tree-**Shortest Path and Transitive Closure* (324-372)**.

**Unit-IV:-**

Internal Sorting: Insertion Sort –Quick Sort **(399-405)**-Merge Sort-Heap Sort **(407-416)**.External Sorting: Introduction- k way Merging Buffer Handling for Parallel Operation-**Run Generation-Optimal Merging of Runs* (438-457)**.

**Unit-V:-**

Hashing: Introduction-Static Hashing: Hash Table-Hash Function **(458-463)**-Dynamic Hashing **(477-482)**-Efficient Binary Search Trees: Optimal Binary Search Tree- **AVL Trees* (553-577)**. **Multi-way Search Tree* (606-635)**.

***Self-Study**

**BOOK FOR STUDY:**


1. Dinesh P. Mehta , Sartaj Sahni, *"Handbook of Data Structures and Applications"*, Chapman and Hall/CRC, Second Edition, 2018.
2. Mark Allen Weiss, *"Data Structures and Algorithm Analysis in C++"*, Pearson Education, Fourth Edition, 2014


**BOOKS FOR REFERENCE:**


1. Adam Drozdek, *"Data Structure and Algorithm in C++"*, Cengage, Fourth edition, 2013.
2. Ellis Horowitz and Sartaj Sahni, *"Fundamentals of Data Structures in C++"*, Universities Press, Second Edition, Reprint 2008.
3. Yashwant Kanetkar, *"Data Structures through C"*, BPB publication, 2nd edition, 2003.


**E-RESOURCES:**

1. https://www.javatpoint.com/data-structure-tutorial.
2. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
3. https://www.programiz.com/dsa
4. https://www.youtube.com/watch?v=RBSGKlAvoiM

**Programme : B.Sc IT**

**Course Title : Core : Digital Computer Fundamentals** **Course Code : 20UIT3C07**

**Year : II** **Semester : III**

**Hour/Week : 4** **Credits : 4**

**COURSE OBJECTIVE:**

1. To study the number system and Codes
2. To learn combinational and sequential circuits
3. To know the data processing circuits
4. To learn the fundamentals of computer and peripherals
5. To understand the concept of Architecture of Computer

**COURSE OUTCOMES:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Learn and understand various number system and codes | K1 & K2 |
| **CO2** | Understand Boolean laws and rules to simplify expressions | K2 |
| **CO3** | Experiment combinational and sequential circuits | K3 |
| **CO4** | Identify and illustrate basic organization of computer | K2 |
| **CO5** | Illustrate the memory concepts, I/O devices and peripherals | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | L | M | M | | S | S | M | L | M |
| **CO2** | S | M | L | M | M | | S | M | M | M | M |
| **CO3** | S | M | L | M | M | | S | M | M | M | M |
| **CO4** | S | M | L | M | M | | S | M | M | L | M |
| **CO5** | M | S | L | M | S | | L | S | M | M | M |

**S – Strong; M – Medium; L – Low**

**Unit – I (12 Hrs)**

Number Systems and Codes: **Binary number systems*** – **Binary to decimal conversion*** – **Decimal to Binary conversion*** – Octal Numbers – Hexadecimal Numbers – 1's & 2's complement representation - 1's & 2's complement arithmetic - ASCII Codes – BCD – Excess-3 Code – Gray Code.(176-199)

**Unit – II (12 Hrs)**

Combinational Logic Circuits : Boolean Laws and Theorems – Sum of Product method – Truth table to Karnaugh Map - Pairs, Quads and Octets – Karnaugh simplifications – **Don't-care Conditions – Product of sums methods - Product of sums simplifications*** (77-106). Arithmetic Building Blocks: Arithmetic building blocks – Adder – Subtracter – Full Adder (218-235).

**Unit –III (12 Hrs)**

Data Processing Circuits: Multiplexer – Demultiplexer – **Decoder – Encoder*** – (123-133 , 135-136, 144-145) Flip Flops: RS , Edge triggered RS Flip Flop, Edge triggered D, **JK ,JK Master Slave Flip Flop*** – Shift Registers – Asynchronous Counters - Synchronous Counters (274-278, 282-292, 310-325, 340-341, 348-353).

**Unit – IV (12 Hrs)**

Programming the Basic Computer: Introduction - Machine language – Assembly languages: rules of the languages - translation to binary (173 – 183). Central processing Unit: Introduction - General Register Organizations – Control word - Examples of Micro operations - Stack organization - Instruction Formats – Addressing modes - **Data Transfer and Manipulation - Program Control***. (241 - 282).

**Unit – V (12 Hrs)**

Input-Output Organization: Peripheral devices- Input-Output Interface - Asynchronous data transfer - Modes of Transfer - Priority Interrupt - Direct Memory Access (DMA) – Input-Output Processor (IOP). (381 - 429). Memory Organization: Memory Hierarchy – **Main memory - Auxiliary memory - Associative memory - Cache memory - Virtual memory***. (381 - 476).

***Self-Study**

**BOOK FOR STUDY:**

1. C Thomas Bartee, "*Digital Computer Fundamentals",* McGraw-Hill, Fourth Edition, 2016.
2. Donald P. Leach, Albert Paul Malvino and Goutam saha, *"Digital Principles and Applications"*, Tata McGraw-Hill Publishing, Eight Edition, Reprint 2010. (Units I, II, III)
3. M. Morris Mano, *"Computer System Architecture"*, Pearson Education, Third Edition, Reprint 2017. (Unit IV, V)

**BOOKS FOR REFERENCE:**

1. Thomas C. Bartee, *"Digital Computer Fundamentals"*, Tata McGraw-Hill Publishing Company Limited, Sixth Edition, Reprint 2011.
2. John P. Hayes, *"Computer Architecture and Organization",* McGraw Hill, International Edition, Third Edition, Reprint 2010.

**E-RESOURCES:**

1. https://www.javatpoint.com/digital-computers
2. https://upscfever.com/upsc-fever/en/gatecse/en-gatecse-chp159.html

**Programme : B.Sc IT**

**Course Title : Allied : Operation Research** **Course Code : 20UIT3AL3**

**Year : II** **Semester : III**

**Hour/Week : 6** **Credits : 5**

**COURSE OBJECTIVES**

1. To understand the concepts of Linear Programming Problems.
2. To study and understand the concept of transportation and Assignment problems.
3. To use the knowledge of Inventory, Analyze to solve Replacement problems and real world problems.

**COURSE OUTCOMES**

On the successful completion of the course, students will be able to

| | | |
|---|---|---|
| **CO1** | Remembering the formulation of Business Problems. | K1 |
| **CO2** | understanding the methods of problem solving | K2 |
| **CO3** | Applying the mathematical calculations in Industrial Problems. | K3 |
| **CO4** | Analyzing mathematical methods and applications. | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | M | L | M | M | L | | L | L | L | L | L |
| **CO2** | M | M | M | L | L | | M | M | L | L | L |
| **CO3** | M | M | M | M | L | | L | L | L | L | L |
| **CO4** | M | M | M | M | L | | L | L | L | L | L |

**S- Strong; M-Medium; L-Low**

**UNIT I** **(16 Hours)**

Linear Programming Problem: Introduction – Mathematical formulation of L.P.P. - Graphical solution method – Simplex method – Method of penalties/ Big-M method – Two phase method. (Chapter 2,3& 4, Page No. 39 - 113)

**UNIT II** **(14 Hours)**

Transportation problem: Introduction - finding initial basic feasible solution – moving towards optimality – the transportation algorithm. (Chapter 10, Page No. 247-281)

Assignment problem: Method for solving an assignment problem –Variation of assignment problem – Traveling salesman problem – degeneracy. (Chapter 11, Page No. 295-324)

**UNIT III** **(16 Hours)**

Queueing theory: Introduction - Queueing system – Characteristics of the Queueing system – Operating characteristics of a Queueing system - Classification of queues – Poisson queues- (M/M/1) : (∞/FIFO) , (M/M/1) : (N/FIFO) , (M/M/C) : (∞/FIFO) , (M/M/C) : (N/FIFO).(Chapter 21, Page No. 589-621)

**UNIT IV** **(16 Hours)**

Inventory: Introduction – Inventory control– Cost associated with inventories – Economic lot size problem – Problems of EOQ with shortage allowed – Purchase inventory problem with price breaks. (Chapter 19, Page No. 507-538)

Replacement problem: replacement of items that deteriorates with time – replacement of items that fail completely. (Chapter 18, Page No. 477-494)

**UNIT V** **(13 Hours)**

Networking scheduling by PERT/CPM: Introduction – Basic concepts - Critical path method – pert calculations – pert algorithm – construction of network – critical path analysis - statistical considerations in PERT . (Chapter 25, Page No. 763-784)

**BOOK FOR STUDY**

1. Kanti Swarup, P.K. Gupta, Man Mohan, Operations Research, Sultan Chand & Sons, 2007, Thirteen Edition.

**BOOKS FOR REFERENCE**

1. Prof V.Sundaresan, K.S. Ganapathy Subramanian, K.Ganesan, Resource Management
2. Techniques, A.R.Publications, 2004, Second Edition. Handy A.Taha, Operations
3. Research,CollierMacmillan,Third Edition.

**E-RESOURCES:**

1. https://roughan.info/notes/oorii/06tutorials.html
2. https://nptel.ac.in/courses/110/106/110106062/

**Programme : B.Sc Information Technology**

**Course Title : Core Practical : Java Programming** **Course Code : 20UIT3CP3**

**Year : II** **Semester : III**

**Hour/Week : 4** **Credits : 3**

**COURSE OBJECTIVES**

1. To develop simple programs using Classes and object, Inheritance, packages, String handling and file handling.
2. To develop program for handling Process using Multithreading.
3. To develop network programs using concepts of Java.
4. To develop Window based application using Event Handling.
5. To develop programs using to solve real-time problems.

**COURSE OUTCOMES:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Understand the fundamental programming concepts | K1 |
| **CO2** | Make use of process handling method by multithreading while developing a program. | K2 |
| **CO3** | Identify the suitable problem-solving technique to develop a Network programs able to solve network related problems. | K2 & K3 |
| **CO4** | Develop the Window based application using Applet, Event Handling and Swing. | K3 |
| **CO5** | Analyze the concept to solve real-time problems. | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | L | M | M | | S | S | S | M |
| **CO2** | S | S | L | M | M | | S | M | M | L |
| **CO3** | S | S | L | M | M | | S | M | M | L |
| **CO4** | S | S | M | M | M | | S | S | M | M |
| **CO5** | S | S | M | M | M | | S | S | S | S |

**S – Strong; M – Medium; L – Low**

## LIST OF PRACTICALS

1. Write a java program to display student information using class and object.
2. Write a java program to find factorial number using constructor
3. Write a java program to find prime number using constructor overloading
4. Write a java program to find the Armstrong using overriding
5. Write a Java program to get your name, age, class from one package and also get your college name address from other package in some other directory. To import these to packages into one main method.
6. Write a java program to find area of circle using multiple inheritance
7. Write a java program to display the employee details using interface
8. Write a any five string operations using java string handling
9. Write a java program to find any exception using exception handling method
10. Write a java program to display the student information using database
11. Write a java program adding two numbers using applet
12. Write a java program action listener event using applet
13. Write a java program to display the domain name using inet address
14. Write a Java application program to create the table then adding and deleting the records to and from that table by JDBC.
15. Write a Java application program to create the table then adding, modifying the records to that table by JDBC.

**Programme : B.Sc Information Technology**

**Course Title : Core Practical : Data Structure using C++** **Course Code : 20UIT3CP4**

**Year : II** **Semester : III**

**Hour/Week : 4** **Credits : 3**

**COURSE OBJECTIVES:**

1. To understand the linear and non-linear data structures available in solving problems.
2. To know about the sorting and searching techniques and its efficiencies.
3. To get a clear idea about the various algorithm design techniques.
4. Using the data structures and algorithms in real time applications.
5. Able to analyse the efficiency of algorithm.

**COURSE OUTCOMES:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Understand the concept of building algorithms and Programs | K2 |
| **CO2** | Apply the concept of Stack , Queue and Linked list to solve real world problems | K3 |
| **CO3** | Analysis the working of Non-linear data structure such as tree and graphs | K4 |
| **CO4** | Implement the correct searching and sorting techniques for real time application | K3 |
| **CO5** | Analyze the concept of Indexing and Hashing Techniques | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | L | M | M | | S | S | M | M |
| **CO2** | S | S | L | M | M | | S | S | S | M |
| **CO3** | S | S | L | M | S | | S | S | S | M |
| **CO4** | S | S | L | M | M | | S | S | S | M |
| **CO5** | S | S | L | M | M | | S | S | S | M |

**S – Strong; M – Medium; L – Low**

# LIST OF PRACTICALS

1. Write a C++ program to implement a stack.
2. Write a C++ program to convert an Infix Notation to Postfix Notation.
3. Write a C++ program to implement an Evaluate of expression.
4. Write a C++ program to implement a stack using Linked List
5. Write a C++ program to implement a Queue.
6. Write a C++ program to implement a circular queue.
7. Write a C++ program to implement a Queue using Linked List
8. Write a C++ program to construct a Binary Tree Traversal.
9. Write a C++ program to implement a Depth First Search
10. Write a C++ program to implement a Breath First Search.
11. Write a C++ program to implement a Warshall's Algorithm.
12. Write a C++ program to implement a Dijkstra's Algorithm.
13. Write a C++ program to implement an Insertion Sort.
14. Write a C++ program to implement a Merge Sort.
15. Write a C++ program to implement a Heap Sort.

**Programme : B.Sc Information Technology**

**Course Title : Core : Visual Programming** **Course Code : 20UIT4C08**

**Year : II** **Semester : IV**

**Hour/Week : 6** **Credits : 5**

**COURSE OBJECTIVES:**

1. To understand basic concepts of C sharp Console Applications
2. To understand the Working Environment of C Sharp Windows Applications and its controls, tools, and Components for develop the new c sharp windows application
3. To understand basic concepts of ADO.Net and its Applications
4. To understanding the Database Connectivity and Report Generation using C sharp .net
5. To Understand the Working Environment of ASP.Net and Basic Programs.

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Understand to work with the basic c sharp console Program to Create Console Applications | K2 |
| **CO2** | Apply to make familiar to develop c sharp windows application | K3 |
| **CO3** | Apply to work with ADO.net and its Application | K3 |
| **CO4** | Analyze to have knowledge of Database Connectivity and Report Generation using C Sharp. | K4 |
| **CO5** | Analyze to working with ASP.net and its Basic Programs. | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | L | M | M | L | M | | L | M | M | M |
| **CO2** | M | S | M | M | M | | M | M | S | S |
| **CO3** | S | S | M | S | M | | M | S | S | S |
| **CO4** | S | S | S | S | M | | M | S | M | S |
| **CO5** | M | M | M | S | S | | M | M | M | S |

**S-Strong; M-Medium; L-Low**

**Unit I**

**Console Application :** Introduction to C# **(1-5)** – Understanding .Net: The C# Environment **(11-16)** – Overview of C# **(18-21)** – Adding Comments – Command Line Arguments **(21-25)** Literals, Variables and Data Types**(34-49)** – Operators and Expressions**(55-73)** - Decision Making and Branching **(80-96)** – Decision Making and Looping**(102-118)** – Methods in C# **(125-137)** – Handling Arrays **(145-160)** – **Manipulating Strings (168-181)** – Classes and Objects **(212- 233)**.

**Unit II**

**Graphical User Interfaces with Windows Forms: Part I :** Introduction – Windows Forms – Event Handling **(399-409)** – Control Properties and Layout – Labels, TextBoxes and Buttons – GroupBoxes and Panels – CheckBoxes and RadioButtons – PictureBoxes – **Tooltips – NumericUpDown Control*** – Mouse-Event Handling – Keyboard- **Event Handling* (410-440)**

**Unit III**

**Graphical User Interfaces with Windows Forms: Part 2:** Introduction – Menus – MonthCalendar Control – DateTimePicker Control – LinkLabel Control – ListBox Control – CheckedListBox Control **(441-465)** – ComboBox Control – TreeView Control – ListView Control – TabControl – Multiple Document Interface (MDI) Windows – **Visual Inheritance* (466-501)**

**Unit- IV**

**Data Access with .NET :** ADO.NET Overview**(685-687)** – Using Database Connections**(688-692)** – Fast Data Access: The Data Reader – Managing Data and Relationships: The DataSet Class **(701-714)** – Populating a DataSet – Persisting DataSet Changes – Working with ADO.NET **(721-733)** – **The DataGrid Control (735-749) – Data Binding*** – Visual Studio.Net and Data Access **(750- 769)**

**Unit V**

**ASP.Net :** Web forms – Buttons, Text boxes, Labels, Literals, Place holders, Check boxes, Radio buttons, Tables, Panels, Images, Image buttons, List boxes, Drop down lists, **Hyperlinks and link buttons, HTML controls.*(643-646, 677-706, 711-738, 781-820)**

***Self-Study**

**BOOKS FOR STUDY:**


1. Ian Griffiths, *"Programming C# 8.0 Build Cloud Web and Desktop Applications"*, O'Reilly, Revised edition, 2020.
2. E.Balagurusamy, "*Programming in C#"*, Tata McGraw-Hill, 3rd Edition, 2017.
3. Paul Deitel and Harvey Deitel, "*C# 2010 for Programmers"*, Pearson, 4th Edition, 2017.
4. Simon Robinson, Christian Nagel, Karli Watson, Jay Glynn, "*Professional C#"*, Wrox Publisher, 3rd Edition, 2017.
5. Steven Holzner, *"Visual Basic.NET Black Book"*, Dream Tech Publisher, Platinum Edition, 2016.


**BOOKS FOR REFERENCE:**


1. Herbert Schildt, *"C# 4.0 Complete References"*, Tata McGraw-Hill, First Edition, 2015.
2. Geetanjali Arora ,Balasubramaniam Aiswamy ,and Nitin Pandey, *"Microsoft C# Professional Projects"*, Prentice Hall of India Private Limited, 2012.


**E-RESOURCES:**

1. https://www.tutorialsteacher.com/csharp/csharp-tutorials
2. https://dotnettutorials.net/course/csharp-dot-net-tutorials/

**Programme : B.Sc Information Technology**

**Course Title : Core : Relational Database Management** **Course Code : 20UIT4C09**

**Year : II** **Semester : IV**

**Hour/Week : 5** **Credits : 4**

**COURSE OBJECTIVE:**

1. Learn and practice data modelling using the entity relationship and modelling database designs
2. Understand the use of structured query language and learn SQL syntax
3. Apply normalization techniques to normalize the database.
4. Understand the needs of database processing and learn techniques for controlling consequences of concurrent data access.

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | The Learner will be able to describe data models and schemas in DBMS | K1 |
| **CO2** | To Understand the Features of database management systems and Relational database | K2 |
| **CO3** | To use SQL-Standard Language of Relational databases | K3 |
| **CO4** | To understand the functional dependencies and design of the database | K2 |
| **CO5** | To understand the concept of transaction and query processing | K2 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | L | M | M | L | M | | M | M | S | M |
| **CO2** | M | M | M | S | S | | M | S | M | M |
| **CO3** | S | S | M | S | S | | M | S | S | M |
| **CO4** | L | M | M | M | S | | M | M | M | M |
| **CO5** | S | S | M | S | S | | M | S | S | S |

**S- Strong; M-Medium; L-Low**

**Unit I**

Introduction to Database Systems: – Database System Applications, Purpose of Database Systems – View of Data – Data Models – Database Languages – Relational Databases, Database Design (Chapter 1, Page No.:1 - 19) **Entity-Relationship Model :- Basic Concepts – Constraints – Keys – E-R Design Issues – Weak Entity Sets– Extended E-R Features*** (Chapter 6, Page No.:204 - 226)

**Unit II**

Relational Model: – Structure of Relational Databases – The Fundamental Relational Algebra Operations – Additional Relational-Algebra Operations – Extended Relational-Algebra Operations – Null Values – **Modification of the Database*** (Chapter 2, Page No.: 37 – 70)

**Unit III**

**Basic SQL:** Introduction - SQL Data Definition - Basic Structure of SQL Queries - Additional Basic Operations - Set Operations - Null Values - Aggregate Functions - **Nested Subqueries - Modification of the Database.*** (Page No: 57 - 104)

**Intermediate SQL:** Join Expressions - Views - Transactions - Integrity Constraints - **SQL Data Types and Schemas*** – Authorization. (Page No: 113 – 150)

**Unit IV**

**Advanced SQL:** Accessing SQL from a Programming Language - **Functions and Procedures*** - Triggers - Recursive Queries - Advanced Aggregation Features – OLAP (Page No: 157 - 209)

**Unit V (12 hrs)**

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 – Database-Design Process*** (Chapter 7, Page No.: 263 - 302)

***Self-Study**

**BOOKS FOR STUDY:**


1. Dusan Petkovic, *"Microsoft SQL Server 2019: A Beginner's Guide"*, McGraw-Hill Education, Seventh Edition , 2020.
2. A.Silberschatz, H.Korth and S.Sudarsan, *"Database System Concepts*", 6th Edition, TATA McGraw Hill Inc., 2017.


**BOOKS FOR REFERENCE:**


1. Bipin.C.Desai, *"An Introduction to Database System"*, West Publishing Company, 2015.
2. C.J.Date, *"An Introduction to Database Systems"*, Addition– Wesley, 8th Edition, 2016.


**E-RESOURCES:**

1. http://spoken-tutorial.org/
2. https://myacademy.oracle.com

| | | | |
|---|---|---|---|
| **Programme** | **: B.Sc Information Technology** | | |
| **Course Title** | **: Core : Advanced Networking** | **Course Code** | **: 20UIT4C10** |
| **Year** | **: II** | **Semester** | **: IV** |
| **Hour/Week** | **: 6** | **Credits** | **: 4** |

**COURSE OBJECTIVES:**

1. To make aware about the structure, functions, components, and models of the computer networks.
2. Describe the importance of IP addressing and design, calculate, and apply subnet masks and addresses to fulfil given requirements in IPv4 and IPv6 networks
3. Compare the different types of routing protocols and metrics
4. To understand design a scalable hierarchical network, Configure and troubleshooting, VLAN and inter-VLAN routing
5. To Acquire knowledge of various protocol STP, LACP, PAgP and Access Control List

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | To understand the concepts of functions, components, and models of the computer networks | K1 & K2 |
| **CO2** | Understanding the concepts of IP addressing and sub netting calculation | K2 |
| **CO3** | Analyze the different types of routing protocols and metrics | K4 |
| **CO4** | Analyze the functionalities of VLAN and inter-VLAN routing | K4 |
| **CO5** | Apply Packet Tracer tool to implement advanced Networking Concept | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | M | S | L | M | M | | S | M | L | M |
| **CO2** | S | S | L | M | M | | S | M | L | M |
| **CO3** | S | S | L | M | M | | S | M | M | M |
| **CO4** | S | S | L | M | M | | S | M | M | M |
| **CO5** | S | S | L | M | M | | S | M | M | M |

**S – Strong; M – Medium; L – Low**

**Unit – I (15 Hrs)**

**Introduction: The use of computer networks - Network architectures -Components of the Network - Types of Networks - Transmission Media: Classification of transmission media*** -Overview of TCP / IP & OSI: benefits of a Layered Model – TCP/IP Model – OSI Model – Comparing the TCP/IP & OSI Model- Application layer Services and Protocols Function- Transport Layer Protocols: TCP and UDP – Port Addressing.

**Unit – II (15 Hrs)**

OSI Network Layer: Process and Protocols –address management - Types of Address in IPv4 -NAT - Public and Private Address –ISP -Overview of IPv6 – Subnet Mask – Subnetting - OSI Data link layer: Service - Data Link Sublayers - **Ethernet Frame Size and Fields - MAC Address Structure***

**Unit III (15 Hrs)**

**Routing :** Static Routing- Configuring Static routes - Modifying Static Routes - Summarizing Routes - **Configuring a Summary Route and Troubleshooting*** -Dynamic routing : purpose - advantage - Metric -Types -RIP configuration -EIGRP configuration- EIGRP Tuning -Single Area OSPF configuration - Multi Area OSPF configuration - **OSPF Tuning***

**Unit IV (15 Hrs)**

Introduction : LAN Design - VTP: purpose- configuration -VLAN: types - benefits - Configuration -Inter-VLAN: features- types - traditional -router on a stick - **Using multilayer switch***

**Unit V (15 Hrs)**

STP: Uses - configuration - Ether channel: Advantage- LACP configuration -PAgP Configuration - **ACL: Purpose - types -Standard ACL Configuration - Extended ACL configuration***

***Self-Study**

**BOOK FOR STUDY:**

1. Todd Lammle, *"CCNA Routing and Switching Complete Study Guide"*, 2nd Edition - John Wiley & Sons, 2016

**BOOKS FOR REFERENCE:**

1. Cisco Systems, Inc., "*CCNA 1 and 2 Companion Guide"*, Cisco Press, Third Edition, 2013.
2. Cisco Systems, Inc.,*"CCNA 3 and 4 Companion Guide"*, Cisco Press, Third Edition, 2013.
3. Andrew S Tanenbaum, *"Computer Networks"*, Prentice Hall of India, 3rd Edition, 2016.

**E-RESOURCE:**

1. https://www.netacad.com/group/resources/ccna-rs-scaling/6.0
2. https://www.netacad.com/group/resources/ccna-rs-connect/6.0

**Programme : B.Sc Information Technology**

**Course Title : Core : Financial Accounting** **Course Code : 20UIT4AL4**

**Year : II** **Semester : IV**

**Hour/Week : 6** **Credits : 5**

**COURSE OBJECTIVES:**

1. To acquire the knowledge for preparation of Trial Balance.
2. To provide a strong foundation in fundamental accounting concepts, various elements of financial statements and relevant accounting standards.
3. To understand the problem-solving techniques in subsidiary books.
4. To Explain the basic concepts and processes in determination of cost of products and services
5. To provide the fundamental knowledge and techniques in Management Accounting.

**COURSE OUTCOMES:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Relate accounting concepts and reproduce financial statements | K1 |
| **CO2** | Familiarize the students with the steps involved and understand the relationship between Profit & Loss Account and Balance Sheet. | K2 |
| **CO3** | Demonstrate knowledge of each step in the various subsidiary books of accounting | K1 & K2 |
| **CO4** | Understand and explain the conceptual framework of Cost Accounting | K1 & K2 |
| **CO5** | Prepare budgets and demonstrate budget control techniques | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | S | M | M | | M | S | S | M | S |
| **CO2** | S | M | S | S | M | | M | S | S | M | S |
| **CO3** | M | S | M | S | S | | S | M | M | S | M |
| **CO4** | M | S | S | M | S | | S | S | M | S | S |
| **CO5** | S | S | M | S | M | | S | S | M | S | S |

**S-Strong; M-Medium; L-Low**

**Unit – I**

Book Keeping – Accounting Principles and Concepts – Double entry system – Rules of Accounts – Journal, Ledger and Trial Balance. (PG NO:1-7, 16-20, 27-37, 43-71)

**Unit – II**

Final Accounts: Trading account, Profit and Loss Account and Balance Sheet with adjustments. (PG NO: 205-282)

**Unit – III**

Preparation of Subsidiary books – Purchase book – Sales book – Cash Book (Single Column, Double Column, Triple Column).

**Unit – IV**

Cost Accounting – Elements of Cost – Methods of Costing – Difference between cost and management accounting – Preparation of cost sheet. (PG NO: I.1 – I.19, I.26 – I.55)

**Unit – V**

**Budgeting and budgetary control – Types of Budgets – Preparation of Various Budgets – Advantages of Budgeting and Budgetary Control. (Problem only flexible budget, Production budget, cash budget).*** (PG NO: C.1 – C.67)

***Self-study.**

**BOOKS FOR STUDY:**


1. S.P.Jain & K.L.Narang, *Advanced Accountancy*, Kalyani Publisher, 22nd Edition, Reprint 2019. (Unit I, II & III).
2. S.P.Jain & K.L.Narang, *Cost Accounting* – Kalyani Publisher, 18th Edition, Reprint 2015 (Unit IV).
3. R.S.N.Pillai and Bhagavathi, *Management Accounting* – S Chand & Co Ltd Publisher, 2010 (Unit V).

**BOOKS FOR REFERENCE:**


1. T.S.Grewal, *Introduction to Accountancy*, S. Chand Publisher: (1 January 2016)
2. R.S.N. Pillai & Bagavathi, *Cost Accounting* S. Chand Publisher, Seventh edition (1 January 2015).
3. N.P. Srinivasan, *Management Accounting*, New Age International Publishers; First Edition 1 January 2018).


**E-RESOURCES:**

1. https://qrgo.page.link/8U1xz
2. https://www.youtube.com/watch?v=4N0Dmzhi3Tw
3. https://www.youtube.com/watch?v=XvxsVUNaoUc
4. https://www.youtube.com/watch?v=FlisUOIwOnw
5. https://www.youtube.com/watch?v=wRRM0EWGBYU

**Programme : B.Sc Information Technology**

**Course Title : Core : Visual Programming and RDBMS** **Course Code : 20UIT4CP5**

**Year : II** **Semester : IV**

**Hour/Week : 5** **Credits : 3**

**COURSE OBJECTIVES:**

1. To understand concepts of Arrays and Strings functions in c sharp console application
2. To understanding about ADO.Net using Database Connectivity Programs with windows application
3. Manipulate the data using SQL command for business operation.
4. Construct the SQL structure using logical operator and various built-in function.
5. Understand the needs of database processing and learn techniques for controlling consequences of concurrent data access

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Ability to have knowledge about Array and String Function in c sharp console | K1 |
| **CO2** | Understand about ADO.Net using Database Connectivity Programs with windows application | K2 |
| **CO3** | Able to manipulate data as per business requirement by using various logical operator and built-in function. | K2 |
| **CO4** | The learner can construct join query and sub query as per need. | K3 |
| **CO5** | Apply and relate the concept of transaction, concurrency control and recovery in database. | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | M | M | M | L | M | | L | M | M | M |
| **CO2** | S | S | M | S | M | | M | S | S | S |
| **CO3** | L | M | M | M | M | | L | L | M | M |
| **CO4** | M | M | M | M | S | | M | S | S | S |
| **CO5** | M | M | M | S | S | | M | M | M | S |

**S-Strong; M-Medium; L-Low**

**Visual Programming Lab**
**LIST OF PRACTICALS**

1. Write a C# Console Program to perform command line argument.
2. Write a C# Console Program to perform simple calculator.
3. Write a C# Console Program to perform string functions.
4. Write a C# Console Program to jagged array.
5. Write a program to create a MS Windows Notepad Application with Menus and ToolBar
6. Write a program to create a MS Windows Word Pad Application
7. Write a program to a Sample Inventory Application for a Hostel Store with Transactions
8. Write a program to a Sample Application for Student Progress Card

**RDBMS Lab**

1. Write a program to Simple queries with DDL & DML Commands using SQL.
2. Write a program to Comparison (relational) operator and Logical operator using SQL.
3. Write a program to the Set operations and sorting and grouping operator using SQL.
4. Write a program to the built-in functions i) Count Function ii) Character Function using SQL.
5. Write a program to the built-in functions i) Number Function ii) Date function using SQL.
6. Write a program to create a student table contains reg-no, stud-name, class, subjects to perform an Aggregate operations using SQL.
7. Write a program to create of a Database and writing SQL queries to retrieve information from the database.
8. Write a program to Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions
9. Write a program to creating an Employee Database to set various constraints
10. Write a program to creation of database triggers and Functions.

| | | | |
|---|---|---|---|
| **Programme** | **: B.Sc Information Technology** | | |
| **Course Title** | **: Core : Python Programming** | **Course Code** | **: 20UIT5C11** |
| **Year** | **: III** | **Semester** | **: V** |
| **Hour/Week** | **: 5** | **Credits** | **: 4** |

**COURSE OBJECTIVES**

1. To make aware of the basic concepts of Python and packages.
2. To impart knowledge on designing Graphical user Interfaces in Python.
3. To create awareness in Problem solving and programming capability.
4. To introduce about the various packages effects in python.
5. To provide skills on real time datasets using python packages.

**COURSE OUTCOMES**

After learning the course, the students will be able to

| | | |
|---|---|---|
| **CO1** | Have a sound knowledge on the methodologies and essentials of Python programming. | K1 |
| **CO2** | Understand the basic concepts of python modules and packages. | K2 |
| **CO3** | Gain awareness in creating simple predictions using Python. | K1 |
| **CO4** | Know about the various interpretations in python. | K2 |
| **CO5** | Apply the skills of real time datasets with python packages | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | M | M | S | | S | S | M | S |
| **CO2** | S | S | M | M | S | | S | S | M | S |
| **CO3** | S | S | S | M | S | | S | S | S | S |
| **CO4** | S | S | S | S | S | | M | M | S | S |
| **CO5** | S | S | S | S | S | | S | S | S | S |

**S - Strong; M - Medium; L - Low**

**Unit – I**

**Shell or Notebook:** Launching - Launching the Jupiter Notebook - Help and Documentation in IPython - Exploring Modules with Tab Completion - Keyboard Shortcuts in the IPython Shell - IPython Magic Commands.

**Launching the Ipython Shell.***

**Unit – II**

**NumPy:** Introduction to NumPy – The Basics of NumPy arrays–Computation on NumPy Arrays–Aggregations: Min. Max, and Everything in Between – Computation on Arrays.

**Various Computational Operations using Array Representations.***

**Unit – III**

**Pandas:** Introduction to pandas - Data manipulation with pandas–Operating on null values, hierarchical indexing – Combining Datasets – Aggregation and Grouping.

**Manipulation of datas with combined datasets using Pandas.***

**Unit – IV**

**Matplotlib:** Introduction to Matplotlib– Visualization with Matplotlib – Simple line plots – scatter plots – visualizing errors – Histograms, binnings and density – Customizing plots – Multiple sub plots – Text annotation.

**Customizing the plots with multiple sub plote.***

**Unit – V**

**Sci-kit Learn:** Introduction to Scikit Learn: Data representation – Hyper parameters &Validation: Selecting the best model – Learning Curves. – Correlation - Linear Regression: Simple Linear Regression – Basis function regression – Regularization.

**Data Representation using various Regression algorithms.***

***Self-study**

**BOOKS FOR STUDY:**


1. Jake VanderPlas, "*Python for Data Science Hand Book"*, O'Reilly, 1st Edition, 2016.
2. Ashok Namdev Kamthane, "*Programming and Problem Solving with Python"*, Mc Graw Hill Education. First Edition, 2018.


**BOOKS FOR REFERENCE:**


1. William McKinney, "*Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython"*, Shroff/O'Reilly, 2nd Edition, 2017.
2. Prateek Gupta, *"Data Science with Jupiter: Master Data Science skills with easy-to-follow Python examples"*, BPB Publications, 1st Edition, 2019.


**E-RESOURCES:**

1. https://www.javatpoint.com/python-tutorial
2. https://www.tutorialspoint.com/python/index.htm
3. https://www.python.org/

**Programme : B.Sc Information Technology**

**Course Title : Core : Web Technology** **Course Code : 20UIT5C12**

**Year : III** **Semester : V**

**Hour/Week : 4** **Credits : 4**

**COURSE OBJECTIVE:**

1. Learn and practice HTML5 web design for constructing webpage's.
2. Understand and apply CSS and Bootstrap CSS in the webpage's.
3. Understand about Server Sided Scripting language in PHP & MySql.
4. Understand the needs of Java Script in web programming.
5. Understand the needs of AJAX script in web programming languages in PHP.

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Ability to design web page using HTML5. | K1 |
| **CO2** | Understanding the Features of CSS and Bootstrap CSS and how to apply this in the web page. | K2 |
| **CO3** | Understanding the concept of Server Side Scripting language PHP and MySql. Ability to write code in PHP and save the data into the MySql database Table. | K2 |
| **CO4** | Understand the concept of Java Script in web programming. | K2 |
| **CO5** | Ability to understand the functional dependencies of AJAX in PHP | K2 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | L | M | M | S | S | | L | M | M | M |
| **CO2** | S | S | L | M | M | | L | M | L | M |
| **CO3** | M | S | M | S | S | | M | S | S | S |
| **CO4** | L | M | M | M | M | | L | M | M | M |
| **CO5** | M | M | M | S | S | | M | M | M | M |

**S- Strong; M-Medium; L-Low**

**Unit I**

**Overview of HTML5 – HTML5 and its Essentials – Exploring New Features of HTML5 – Fundamentals of HTML (1-59) – Working with Text (77-94) – Organizing Text in HTML (113-117) – Working with Links and URLs (129-135) – Creating Tables (145-151) – Working with Forms (189-205) – Working with Multimedia (245-252)***.

**Unit II**

Overview of CSS – Exploring CSS Selectors – Inserting CSS in an HTML Document (465-476) – Background and Color Gradients in CSS (487-504) – Fonts and Text Styles (521-530) – Creating Boxes and Columns Using CSS (545-566) – Displaying, Positioning and Floating an Element (597-603)

Bootstrap Overview – Bootstrap Environment Setup – Bootstrap Grid System – Bootstrap CSS Overview – Bootstrap Typography – Bootstrap Tables – Bootstrap Forms – Bootstrap Images – Bootstrap Dropdowns – Bootstrap Navigation Elements – Bootstrap Jumpotron – Bootstrap Alerts.

**Unit III**

Introducing PHP (1-18) – Using Variables and Operators (21-45) – Controlling program flow (49-82) – Working with cookies, sessions and headers (293 – 308).Working with arrays (85-118) – Using functions and classes (121-148) – Working with files and directories (159-180) – Working with databases and SQL (185-246)

**Unit IV**

JavaScript Introduction – Comments – Variables – Operators – Control Statements – Functions – Events – Arrays – Number – Strings – Date – Math – Forms and Validations.

**Unit V**

Getting started with Ajax (433-435) – Writing Ajax (435) – Creating and Opening XMLHttpRequest object (436-440) – Handling & Starting the Downloaded data (441-447) – Ajax with Some PHP (448) – Passing Data to the Server with GET & POST (449-455).

***Self-Study**

**BOOKS FOR STUDY**


1. Robin Nixon, Learning PHP, MySQL & JavaScript with JQuery, CSS & HTML5, 5th Edition, O'Reilly, 2018.
2. VikramVaswani, A Beginner's Guide PHP,1st Edition, Tata McGraw Hill, 2018.
3. Steven Holzner, PHP Complete Reference, Tata McGraw Hill Edition, 2018.


**BOOK FOR REFERENCE**


1. Kogent Learning Solutions Inc., *"HTML5 Black Book Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and JQuery"*, Dreamtech Press, First Edition, 2016


**E-RESOURSES**

1. http://spoken-tutorial.org/
2. http://tutorialspoint.com – Bootstrap Tutorial
3. https://www.w3schools.com/html/
4. https://www.w3schools.com/js/default.asp
5. https://www.w3schools.com/js/js_ajax_intro.asp

**Programme : B.Sc Information Technology**

**Course Title : Core : Operating System** **Course Code : 20UIT5C13**

**Year : III** **Semester : V**

**Hour/Week : 5** **Credits : 4**

**COURSE OBJECTIVES:**

1. To be aware of the evolution and fundamental principles of operating system, processes and their communication
2. To understand the process management and Process scheduling algorithms.
3. To understand the memory management page replacement algorithms.
4. To know about file management and the distributed file system concepts in operating systems
5. To be aware of components of operating system of WINDOWS 2000 and WINDOWS XP with relevant case study.

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Know, how process scheduling algorithms works | K1 |
| **CO2** | Understand the concepts of Operating System and its components. | K2 |
| **CO3** | Apply the various paging, demand paging and page replacement Concept | K3 |
| **CO4** | Apply the various file system can be implemented and Disk Structures Concept | K3 |
| **CO5** | Analyze the features of WINDOWS 2000 and WINDOWS XP Operating System. | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | L | M | M | | S | M | M | L |
| **CO2** | S | S | L | M | M | | S | M | M | L |
| **CO3** | S | S | L | M | M | | S | M | M | L |
| **CO4** | S | S | L | M | M | | S | M | M | L |
| **CO5** | S | S | L | M | M | | S | M | M | L |

**S – Strong; M – Medium; L – Low**

**Unit I**

INTRODUCTION: What is an Operating System?-Mainframe Systems-Desktop Systems-Multiprocessor Systems-Distributed Systems-Clustered System-Real-Time Systems-Handheld Systems. Operating-System Structures:-System Components-Operating-System Services-System Calls-System Programs-System Structure-Virtual Machines.(Pages 3-19,55-80)

**Unit II**

PROCESS MANAGEMENT: Process Concept-Process Scheduling-Operations on Processes-Cooperating Processes -Inter process Communication. CPU Scheduling:-Basic Concepts-Scheduling Criteria- Scheduling Algorithms-Multiple- Processor Scheduling-Real-Time Scheduling. Deadlocks:-System Model-Deadlock Characterization-Methods for Handling Deadlocks-Deadlock Prevention- Deadlock Avoidance- Deadlock Detection-Recovery from Deadlock. (Pages 95 – 109, 151-170, 243 - 264)

**Unit III**

STORAGE MANAGEMENT: Memory Management:-Background-Swapping- Contiguous Memory Allocation-Paging-Segmentation- Segmentation with Paging. Virtual Memory:-Background-Demand Paging-Process Creation-Page Replacement-Allocation of Frames-Thrashing. (Pages 273-309, 317 – 348)

**Unit IV**

File-System Implementation:-File-System Structure- File-System Implementation- Directory Implementation-Allocation Methods-Free-Space Management. Mass-Storage Structure:-Disk Structure-Disk Management-Swap-Space Management-RAID Structure-Disk Attachment-Stable-Storage Implementation-Tertiary-Storage Structure. (Pages 411 – 430, 491 – 516).

**Unit V**

**The Linux System: Linux History- Design Principles- Kernel Modules- Process Management- Scheduling- Memory Management- File Systems- Input and Output- Interposes Communication- Network Structure- Security(Pages:405-445)** *

**Windows 7: History- Design Principles- System Components- Terminal Services and Fast User Switching- File System- Networking- Programmer Interface (Pages:853-898)***

***Self-Study**

**BOOK FOR STUDY:**

1. Abraham Silberschatz, Peter B. Galvin, Gerg Gagne, *"Operating System Concepts"*, John Wiley & Sons,, Tenth edition, 2018.

**BOOK FOR REFERENCE:**

1. Abraham Silberschatz, Peter B. Galvin, Gerg Gagne, *"Operating System Concepts"*, Wiley India Edition, Ninth edition, 2015.
2. Stuart E. Madnick, John J.Donovan, *"Operating Systems"*, Tata McGraw Hill, third edition, 2016.

**E-RESOURCES:**

1. https://www.javatpoint.com/os-tutorial
2. https://www.tutorialspoint.com/operating_system/index.htm
3. https://www.studytonight.com/operating-system/

**Programme : B.Sc Information Technology**

**Course Title : Core : Data Mining and Warehousing** **Course Code : 20UIT5C14**

**Year : II** **Semester : IV**

**Hour/Week : 4** **Credits : 4**

**COURSE OBJECTIVES:**

1. To expose the students to the concepts of Data ware housing Architecture and Implementation.
2. To learn to use association rule mining for handling large data.
3. To understand the concept of classification for the retrieval purposes.
4. To know the clustering techniques in details for better organization and retrieval of data.
5. To provide skills on complex data in real world objects.

**COURSE OUTCOMES:**

After learning the course, the students will be able to

| | | |
|---|---|---|
| **CO1** | Understand the basic concepts of Data mining | K2 |
| **CO2** | Apply the association rules for mining the data | K3 |
| **CO3** | Design and deploy appropriate classification techniques | K3 |
| **CO4** | Cluster the high dimensional data for better organization of the data | K3 |
| **CO5** | Evaluate various mining techniques on complex data objects | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | M | M | S | | S | S | M | S |
| **CO2** | S | S | M | M | S | | S | S | M | S |
| **CO3** | S | S | S | M | S | | S | S | S | M |
| **CO4** | S | S | M | S | S | | S | M | M | M |
| **CO5** | S | S | S | S | S | | S | M | S | S |

**S - Strong; M - Medium; L - Low**

**Unit I**

Expanding universe of data – production factor – computer systems that can learn – data mining – data mining versus query tools – data mining in marketing – practical application. (Chapter: 1, Page No.:1-10). Learning – Self Learning Computer Systems – machine learning and the methodology of science – concept learning. (Chapter: 2, Page No.:11-22)

**Learning the practical applications in data mining using machine learning.***

**Unit II**

Data warehouse – need- designing decision support systems – integration with data mining- Client/Server and data warehousing–multi-processing machines – cost justification. (Chapter: 3, Page No.:25-36). **Multi-processing machines in cost justifications**.*

**Unit III**

Knowledge discovery process – data selection – cleaning – enrichment – coding – data mining – preliminary analysis of the data set using traditional query tools – visualization techniques – likelihood and distance – OLAP tools – K-nearest neighbor – Decision trees – Association rules – Neural networks – Genetic algorithms – Reporting. (Chapter: 4, Page No.:37-78)

**Visualization techniques with various algorithms.***

**Unit IV**

Different forms of knowledge – Getting started – Data Selection – Cleaning – Enrichment – Coding – Data mining - Reporting – KDD environment – Ten golden rules. (Chapter: 5, Page No.:79-93)

**Different forms of knowledge used in KDD environment.***

**Unit V**

Customer Profiling – Predicting bid behavior of pilots – Discovering foreign key Relationships-Results. (Chapter: 6, Page No.:95-110) Learning as compression of data sets – The information content of message – Noise and redundancy – significance of noise – Fuzzy databases – The traditional theory of the relational database – from relations to tables – from keys to statistical development Dependencies – Denormalization – Data Mining Primitives. (Chapter: 7, Page No.:111-126)

**Customer profiling with the prediction of data sets learning behavior.***

***Self-study**

**BOOKS FOR STUDY:**


1. Peter Adrians and DOLF Zantinge, *"Data Mining"*, Addition Wesley, Fourth Edition, 2016, (All Units).
2. Jiawei Han,Micheline Kamber,Jian Pei, *"Data Mining concepts and techniques"*, MK Publishers, Third Edition, 2016


**BOOKS FOR REFERENCE:**


1. K.P.Soman, Shyam Divakar, V.Ajay, *"Insight into Data Mining (Theory and Practice)"*, Prentice Hall of India, Second Edition, 2016.
2. Ian H.Witten, Eibe Frank, Mark A.Hall, Christopher J.Pal, *" Data Mining Practical Machine Learning Tools and Techniques"*, MK Publishers, Fourth Edition.


**E-RESOURCES:**

1. https://www.javatpoint.com/data-mining
2. https://en.wikipedia.org/wiki/Data_mining

| | | | |
|---|---|---|---|
| **Programme** | **: B.Sc Information Technology** | | |
| **Course Title** | **: Core Practical : Python Programming Lab** | **Course Code** | **: 20UIT5CP6** |
| **Year** | **: III** | **Semester** | **: V** |
| **Hour/Week** | **: 4** | **Credits** | **: 3** |

## COURSE OBJECTIVES

To develop simple programs using Python and packages.

To develop python programs to solve mathematical and statistical problems

To develop visualization techniques using packages.

To develop the various packages effects in python.

To develop skills on real time datasets using python packages.

## COURSE OUTCOMES

After learning the course, the students will be able to

| | | |
|---|---|---|
| CO1 | Understand the essentials of Python programming | K2 |
| CO2 | know basic programs using python modules and packages | K1 |
| CO3 | Interpret algorithm and visualize the results with real time datasets | K3 |
| CO4 | Able to create database and connect. | K3 |
| CO5 | Apply the skills of real time datasets with python packages | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | S | M | M | | S | S | M | S |
| **CO2** | S | S | M | M | S | | S | S | M | S |
| **CO3** | S | M | M | S | S | | S | S | S | S |
| **CO4** | S | S | M | M | M | | S | M | S | S |
| **CO5** | S | M | S | S | S | | S | S | S | S |

**S - Strong; M - Medium; L - Low**

## LIST OF PROGRAMS

1. Write a Python Program using Expressions, conditionals, loops, list, dictionary, and strings.
2. Write a Python Program using Functions: scope, parameter passing
3. Write a Python Program using Data objects, pass arrays to functions, return values
4. Write a Python Program using Functions using libraries: mathematical, and string functions.
5. Write a Python Program for File handling: open and close a file, read, write, and append to a file, standard input, output, and error streams, relative and absolute paths.
6. Write a Python Program using Python libraries: create and import Python libraries
7. Write a Python Program using Recursion: simple algorithms with recursion: factorial, Fibonacci numbers;
8. Write a Python Program using Recursion on arrays: binary search
9. Write a Python Program using Pandas: Importing package and Arrays
10. Write a Python Program using Data visualization Pyplot: line chart, pie chart, and bar chart.

**Programme : B.Sc Information Technology**

**Course Title : Core Practical : Web Technology** **Course Code : 20UIT5CP7**

**Year : III** **Semester : V**

**Hour/Week : 4** **Credits : 3**

## COURSE OBJECTIVE

1. To develop simple HTML5 programs for developing web design.
2. To develop simple CSS and Bootstrap CSS in the webpage's.
3. To develop Server Sided Scripting language in PHP & MySql.
4. To develop and use JavaScript in HTML forms for validation.
5. To develop and use AJAX script in web programming languages in PHP.

## COURSE OUTCOME

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Ability to design web page using HTML5. | K3 |
| **CO2** | Understanding the Features of CSS and Bootstrap CSS and how to apply this in the web page. | K2 |
| **CO3** | Apply the concept of Server Side Scripting language PHP and MySql. | K3 |
| **CO4** | Understand the JavaScript basics and apply the validation in HTML forms. | K2 |
| **CO5** | Ability to understand the functional dependencies of AJAX in PHP. | K2 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | L | M | M | S | S | | L | M | M | M |
| **CO2** | S | S | L | M | M | | L | M | L | M |
| **CO3** | M | S | M | S | S | | M | S | S | S |
| **CO4** | L | M | M | M | M | | L | M | M | M |
| **CO5** | M | M | M | S | S | | M | M | M | M |

**S- Strong; M-Medium; L-Low**

## LIST OF PRACTICALS

1. Write a HTML5 Program to create student information form with following details (Reg No, Student Name,Date of Birth,Age,Course)
2. Write a HTML with Bootstrap program to create employee information form with following details (EmpNo , Employee Name , Employee Age, Designation , Department)
3. Write a JavaScript validation for employee information form with following details (EmpNo , Employee Name , Employee Age, Designation , Department)
4. Write a HTML with Bootstrap program to create your college website as responsive website by using Bootstrap nav, Bootstrap Jumpotron, …. etc.
5. Write a PHP program to read and print a file character by character, until the end of file reached.
6. Write a PHP Program for string function to convert lower case, upper case, string length, string compare string reverse, and string shuffle.
7. Write a PHP Program to connect MySql and save the following data into the respective MySql table. (Student Name , Student Reg No , Age , Department )
8. Write a PHP Program to connect MySql and view contents of the previous program saved details.
9. Write a PHP Program to connect MySql and view contents and made delete operation in it.
10. Write a PHP Program to connect MySql and view contents and made edit operation in it.
11. Write a PHP Program with MySql to develop one small application in online job portal.
12. Write a PHP Program with MySql to develop online exam.
13. Write a PHP Program with MySql to develop an alumni registration form with image uploading.
14. Write a Program using PHP, AJAX and MySql create your class profile using add, view, edit and delete modes with image and music file uploading.

| | | | |
|---|---|---|---|
| **Programme** | **: B.Sc Information Technology** | | |
| **Course Title** | **: Core : Mobile Application Development** | **Course Code** | **: 20UIT6C15** |
| **Year** | **: III** | **Semester** | **: VI** |
| **Hour/Week** | **: 6** | **Credits** | **: 5** |

**COURSE OBJECTIVES:**

1. To understand the components and structure of mobile application development frameworks for Android mobiles.
2. To understand how to work with various mobile application development frameworks.
3. To learn the basic and important design concepts and issues of development of mobile applications.
4. To understand the capabilities and limitations of mobile devices.
5. To learn about the Android platform and get to understand the application lifecycle.

**COURSE OUTCOMES:**

After learning the course, the students will be able to

| | | |
|---|---|---|
| **CO1** | Understand the existing state of mobile app development via researching existing apps, meeting with industry professionals, and formulating new ideas. | K2 |
| **CO2** | Understand the limitations and features of developing for mobile devices. | K2 |
| **CO3** | Create a complete Mobile app with a significant programming component, involving the sensors and hardware features of the phone. | K3 |
| **CO4** | Understand features of the app marketplace by offering the app for download. | K2 |
| **CO5** | Develop GUI applications, use built-in widgets and components, work with the database to store data locally, and much more. | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | M | M | S | | S | S | M | S |
| **CO2** | S | S | M | M | S | | S | S | M | S |
| **CO3** | S | S | S | M | S | | S | S | S | S |
| **CO4** | S | S | S | S | S | | M | M | S | S |
| **CO5** | S | S | S | S | S | | S | S | S | S |

**S-Strong; M-Medium; L-Low**

**Unit – I**

**Introducing Android:** Before we get started – Advantages of android – Preparing SDK tools to download – Android development IDE – Java, XML and how android works – Android application framework – Screen layout design – User Interface Design – Graphics and animation Design – Interactivity – Content providers – Intent and intent filters. (Pg No: 1-19).

***Introducing the basics in android application techeniques.****

**Unit – II**

Setting up your android development environment – Installing Java, Eclipse and Android – Setting up AVDs and Smart Phone – Understanding Java SE and the Dalvik Virtual Machine – The directory structure of an android project – Leveraging android XML – Using your android application resources – The AndroidManifest.xml file – Creating your first android application.(PgNo:21-85).

***Launching the android development environment.****

**Unit – III**

Android application components – **Android Intent Objects:** Messaging for Components – **Android Manifest XML:** Declaring Your Components – Android View Hierarchies – Defining Screen Layouts: Using XML. (Pg No: 115-160)

***The various components used in android intent objects.****

**Unit – IV**

**UI Design:** Buttons, Menus and Dialogs – Using Android UI Elements (Widgets) – Adding an Image Button to Your Layout – Adding a Text View Widget to Your Layout – Adding an Image – Using Menus in Android – Creating the Menu Structure with XML – Defining Menu Item Strings – Inflating the Menu Structure via Java – Running the Application in the Android Emulator – Making the Menu Work – Adding Dialogs – Using Custom Dialog Subclasses – Displaying an Alert Dialog. (Pg No: 163-207)

***Using Android UI elements.****

**Unit - V**

**Adding Interactivity: Handling UI Events** – An Overview of UI Events in Android – HandlineonClick Events – **Android Touchscreen Events:** onTouch – **Android Right-click Equivalent:** onLongClick – **Key Event Listeners:** onKeyUp and onKeyDown – **Context Menus in Android:** onCreateContextMenu. (Pg No: 235-266)

**Understanding Content Providers:** An Overview of Android Content Providers – Defining a Content Provider – Working with a Database.

***Adding the interactive UI events by different content providers.****

***Self-study**

**BOOKS FOR STUDY:**


1. Wallace Jackson, "*Android Apps for Absolute Beginners*, APress, 2nd Edition, 2016.
2. Ian F.Darwin, *"Android Cookbook"*, O'Reilly, 2nd Edition, 2015


**BOOKS FOR REFERENCE:**


1. Shawn Van Every, *"Pro Android Media: Developing Graphics, Music, Video, and Rich Media Apps for Smartphones and Tablets",* 3rd Edition 2016.
2. Dawn Griffiths and David Griffiths, "*Head First Android Development"*, SPD Publications, 2nd Edition, 2017


**E-RESOURCES:**

1. https://www.android.com/intl/en_in/
2. https://www.tutorialspoint.com/android/index.htm

**Programme : B.Sc Information Technology**

**Course Title : Core : Software Engineering** **Course Code : 20UIT6C16**

**Year : III** **Semester : VI**

**Hour/Week : 6** **Credits : 5**

**COURSE OBJECTIVES:**

1. To remember the methods and technologies involved in building complex software.
2. To provide an insight into the processes of software development
3. To understand and practice the various fields such as analysis, design, development, testing of Software Engineering.
4. To develop skills to construct software of high quality with high reliability
5. To apply metrics and testing techniques to evaluate the software.

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Learn the concepts of process of Software Development. | K1 |
| **CO2** | Understanding model of high level designs in the software projects. | K2 |
| **CO3** | Develop a metrics for performing product measurements in individual software processes. | K3 |
| **CO4** | Implement the methods and techniques to develop a small project. | K3 |
| **CO5** | Analyze the strategies of testing works with various methods. | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | M | M | M | | S | S | S | M |
| **CO2** | S | S | M | M | M | | S | S | M | M |
| **CO3** | S | S | M | M | M | | M | S | S | M |
| **CO4** | S | S | M | M | M | | S | S | S | M |
| **CO5** | S | S | M | M | M | | S | S | S | M |

**S – Strong; M – Medium; L – Low**

**Unit I**

Introduction to Software Engineering: The Evolving Role of software – Software- the Changing Nature of software – **Legacy Software C1*** (33-45) – Process Models: prescriptive Models, The waterfall Model, Incremental Process Models, Evolutionary Process Models- **Specialized Process Models – Unified Process C3*** (78-99)

**Unit II**

Requirements Engineering: Requirements Engineering Tasks – Initiating the Requirements Engineering Process – Eliciting Requirements – Developing Use cases – **Building the Analysis Model – Negotiating Requirements – Validating Requirements C7*** (176-203)

**Unit III**

Design Engineering: Design Process and Design Quality – Design Concepts – The Design Model C9 (261-279) – Data design C10 (289 -290) – Architectural Design C10 (298-303) – **Mapping Data Flow into Software Architecture C10*** (307 – 320)

**Unit IV**

Testing Tactics: Software Testing Fundamentals – Black box and White box Testing – White box Testing – **Basis path Testing – Control Structure Testing*** – Black box Testing. C14 (421-441).

Testing for Webapps: Content Testing – User Interface Testing – Component Level Testing – Navigation Testing – Configuration Testing – Security testing **- Performance Testing C20*** (601-621)

**Unit V**

RISK MANAGEMENT: Software Risks – Risk Identification – Risk Projection – Risk Refinement – Risk Mitigation, Monitoring, and Management C25 (728-739).

QUALITY MANAGEMENT: Quality Concepts – Software Quality Assurance – Software Reviews – **Formal Technical Reviews - Formal Approaches to SQA C26 (745-759) – Software Reliability C26*** (762-764).

***Self-study**

**BOOKS FOR STUDY:**


1. Roger S.Pressman and Bruce R. Maxim, *"Software Engineering: A practitioner's Approach"*, McGraw-Hill Education, 8th edition, 2014.
2. Furrer and Frank.J, *"Future-Proof Software Systems"*, Springer, 2nd Edition , 2019


**BOOKS FOR REFERENCE:**


2.Richard fairly, *"Software Engineering concepts"*, McGraw-Hill Education, Indian Edition, 2017.

3.Nicole Forsgren, Jez Humble, Gene Kim, *"The Science of Lean Software and Devops: Building and Scaling High Performing Technology Organizations"*, IT Revolution Press, 2nd Edition, 2018


**E-RESOURCE:**

1. https://www.tutorialspoint.com/software_engineering/index.htm
2. https://www.javatpoint.com/software-engineering-tutorial
3. https://www.geeksforgeeks.org/software-engineering/

**Programme** : **B.Sc Information Technology**

**Course Title** : **Core Practical : Mobile Application Development** **Course Code** : **20UIT6CP8**

**Year** : **III** **Semester** : **VI**

**Hour/Week** : **6** **Credits** : **3**

## COURSE OBJECTIVES

1. To understand how to work with various mobile application development frameworks.
2. To learn the basic and important design concepts and issues of development of mobile applications.
3. These include Graphic Design, Animation, Audio and Video, and Design for learning, web design and development.
4. To develop the capabilities and limitations of mobile devices.
5. To learn about the multimedia platform and get to understand the designing concepts.

## COURSE OUTCOMES

After learning the course, the students will be able to

| | | |
|---|---|---|
| **CO1** | Understand the limitations and features of developing for mobile devices. | K1 |
| **CO2** | Create a complete Mobile app with a significant programming component, involving the sensors and hardware features of the phone. | K3 |
| **CO3** | Utilize several Flash tools and tactics, and utilize the timeline and Motion tween affects to produce animation. | K3 |
| **CO4** | It is built and designed to meet the demands of today's working designer to create ads or collateral for print or for the web. | K2 |
| **CO5** | Apply the various platform and get to understand the animation techniques. | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | S | M | M | | S | S | M | S |
| **CO2** | S | S | M | M | S | | S | M | M | S |
| **CO3** | S | M | M | S | S | | S | S | S | S |
| **CO4** | S | S | M | M | M | | M | M | S | M |
| **CO5** | S | S | S | S | S | | S | S | S | S |

**S-Strong; M-Medium; L-Low**

## List of Practical's

### Mobile Application Development

1. Write the steps for installation and configuration of android in Windows OS.
2. Write a program to demonstrate usage of two textbox (EditText), Label (Textview) and Button widgets in android and perform addition of two numbers.
3. Write a program and demonstrate the graphical layout orientation.
4. Write a program and fetch the IMEI number of your mobile phone.
5. Write a program to demonstrate usage of DateTimePicker with Toast (MessageBox).
6. Write a program to demonstrate usage of List Box, Combo Box, and Snippers with Toast (MessageBox).
7. Write a program, create and send notification message in your mobile phone.
8. Write a program to demonstrate usage of Textarea, Checkbox, and Radio Button with Toast (MessageBox).
9. Write a program and calculate the simple interest and compound interest using its API controls.
10. Write a program and create phone call activity using android.
11. Write a program for sending SMS using android.
12. Write a simple program to demonstrate the contact manager using Contacts Contract API (Insert, Delete, Edit, and View).
13. Write a simple program to demonstrate connecting with SQLite Database.
14. Write a program and save student information with SQLite Database.
15. Write a program and view student information from SQLite Database.

### Multimedia and its Applications

**GIMP**

1. Create an invitation design using Gimp.
2. Create a layer animation using Gimp.
3. Apply the filter effect in image using Gimp.
4. Create a web index page using Gimp.
5. Create a logo design by Gimp.

**2D PENCIL**

1. Create natural scenery using 2D pencil.
2. How to create a glossy button using 2D pencil?
3. Apply the filter effect in image or font using 2D pencil
4. Create a Text animation using 2D pencil.
5. Create a movie clip animation using 2D pencil.

**INKSPACE**

1. Create a logo design using Inkscape?
2. Create a banner design using Inkscape?
3. Create a corporate ID card design using Inkscape?
4. Create a wedding Card design using Inkscape?
5. Create a 3D Text effect using Inkscape?

| | | | |
|---|---|---|---|
| Programme | : B.Sc Information Technology | | |
| Course Title | : Core : Project Work | Course Code | : 20UIT6CPR |
| Year | : III | Semester | : VI |
| Hour/Week | : 6 | Credits | : 5 |

**COURSE OBJECTIVES**

Enable the Students to

1. Understand the importance of experimental analysis, scientific approach in solving problems of information Technology.
2. Educate and train the students on how to design the system and develop the system and prepare the reports.

**COURSE OUTCOMES**

After learning the course, the students will be able to

| | | |
|---|---|---|
| **CO1** | Identify a problem and select suitable software for implementation | K3 & K 4 |
| **CO2** | Apply the problem-solving skill to solve the problem | K3 & K 4 |
| **CO3** | Able to analyze and interpret the data to arrive at the expected results | K3 & K 4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | M | S | M | S | S | S | S |
| **CO2** | S | S | M | S | M | S | S | S | S |
| **CO3** | S | S | M | S | M | S | S | S | S |

**S-Strong; M-Medium; L-Low**

The Final Year Students are assigned to the project Supervisor and they are asked to submit an individual project report at the end semester. The Broader areas of the project are website creation, order processing, Billing Software, Multimedia, Artificial Intelligence, and Machine Learning based projects.

The student has to approach the nearby companies to get approval from the company to undergo his project work for the period of 8 to 9 months.

The students have to submit the project Completion Letter from the organization.

The project work done by the student is periodically reviewed.

**Programme : B.Sc Information Technology**

**Course Title : Elective : Artificial Intelligence and Expert System** **Course Code : 20UIT5EA1**

**Year : III** **Semester : V**

**Hour/Week : 4** **Credits : 4**

**COURSE OBJECTIVES:**

1. Gain a historical perspective of AI and its foundations.
2. Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
3. Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4. Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool.
5. Experiment with a machine learning model for simulation and analysis.

**COURSE OUTCOMES**

After learning the course, the students will be able to

| | | |
|---|---|---|
| **CO1** | Describe the modern view of AI as the study of agents that receive precepts from the Environment and perform actions. | K1 |
| **CO2** | Demonstrate awareness of informed search and exploration methods. | K2 |
| **CO3** | Explain about AI techniques for knowledge representation, planning and uncertainty Management. | K3 |
| **CO4** | Develop knowledge of decision making and learning methods. | K4 |
| **CO5** | Describe the use of AI to solve English Communication problems. | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | M | M | S | | S | S | M | S |
| **CO2** | S | S | M | M | S | | S | S | M | S |
| **CO3** | S | S | S | M | S | | S | S | S | S |
| **CO4** | S | S | S | S | S | | M | M | S | S |
| **CO5** | S | S | S | S | S | | S | S | S | S |

**S - Strong; M - Medium; L - Low**

**UNIT I**

Introduction-Definition of AI,TASK Domain-underlying Assumption, Criteria for Success, State Space, Production Systems, problem characteristics, production system characters.

**Introducing the domain knowledge in AI.***

**UNIT II**

Heuristic searches Techniques-Generate and test, Hill-Climbing, Best-First search, Problem Production, Constraint satisfaction, Means-end Analysis.

**Technologies related to Constraint Satisfaction is being measured.***

**UNIT III**

Knowledge Representation-approaches and issue-Methods-Production Rules, Semantic nets, Frames & Scripts.

**Knowledge representation and approaches using various methods.***

**UNIT IV**

Expert systems-definition, architecture, characteristics, Advantages & Disadvantages. Development stages of an expert systems-characteristics of problem chosen for Expert system development-application areas of Expert system.

**Advantages of an Expert Systems and its architectures.***

**UNIT V**

Study of Expert System (Overview, facilities, interfacing process, certainly factor calculations)-MYCIN, PROSPECTOR, XCON/R1.

**Study and Analysis of the Expert Systems.***

***Self-study**

**BOOKS FOR STUDY:**


1. Elline rich & Kevin knight, *Artificial Intelligence*, Tata Mc Graw Hill, 2015.
2. Donald A.Watermann, *"A Guide to Expert Systems"*, Addison Wesley. 2016
3. Philip C. Jackson, *"Introduction to Artificial Intelligence"*, Dover Publications, First Edition, 2016.

**BOOKS FOR REFERENCE:**


1. Dr.Dheeraj Mehrotra, *"Basics of Artificial Intelligence and Machine Learning"*, Notion Press, First Edition, 2021.
2. Prachi Joshi, *"Artificial Intelligence: Building Intelligent Systems*", Prentice Hall India Learning Private Limited, First Edition, 2015.


**E-RESOURCES:**

1. https://www.tutorialspoint.cossm/artificial_intelligence/index.htm
2. https://www.mygreatlearning.com/blog/artificial-intelligence-tutorial/

| | | | |
|---|---|---|---|
| **Programme** | **: B.Sc IT** | | |
| **Course Title** | **: Elective : Cloud Computing** | **Course Code** | **: 20UIT5EB1** |
| **Year** | **: III** | **Semester** | **: V** |
| **Hour/Week** | **: 4** | **Credits** | **: 4** |

**COURSE OBJECTIVES:**

1. To understand basics and key concepts of cloud computing.
2. To understand the classification of different cloud computing services.
3. To understand cloud network model and architecture to use in open source software.
4. To make practice of interconnecting the cloud computing environments.
5. To learn the security challenges and implement secure SDLC.

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Able to define cloud computing and memorize the different cloud service and deployment models. | K1 |
| **CO2** | Use and Examine different cloud computing services | K3 |
| **CO3** | Identify the architecture and infrastructure of cloud computing, including SaaS, Private cloud, hybrid cloud, etc. | K2 |
| **CO4** | Able to connect with two or more service providers for the purpose of load balancing traffic and accommodating spikes in demand. | K3 |
| **CO5** | Able to analyze and find the solution for security issues. | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | L | L | M | M | M | | M | L | M | M |
| **CO2** | M | M | L | M | M | | M | M | L | M |
| **CO3** | M | S | M | M | M | | S | S | M | M |
| **CO4** | S | S | M | M | M | | L | M | M | S |
| **CO5** | M | M | L | M | M | | L | M | M | M |

**S-Strong; M-Medium; L-Low**

**Unit – I**

Introduction to Cloud – Emergence of Cloud Computing – Types of cloud- Cloud-Based Service Offerings – Grid Computing or Cloud Computing – Benefits of using a Cloud Model —Key Characteristics – Cloud Models – Challenges for the Cloud. (Page no. xxiv - xxxviii)

**Unit – II**

Web Services from the Cloud: Communication-as-a-Service(CaaS) –Advantages of CaaS– Infrastructure-as-a-Service(IaaS)–Monitoring-as-a-Service(MaaS) – Platform-as-a-Service(PaaS) – Software-as-a-Service(SaaS) - SaaS Implementation Issues-characteristics – Benefits.(Page no.29-54)

**Unit – III**

Building Cloud Networks: Evolution from the MSP Model to Cloud Computing and Software-as-a-Service –Cloud Data Center (CDC) – Collaboration – Service-Oriented Architectures as a step toward Cloud Computing- Basic Approach to a Data Center-Based SOA –Role of Open Source Software in Data Centers.(Page no.57-77).

**Unit –IV**

Federation in the cloud-Levels of Federation-Federated services and Applications-Protecting and controlling federation- Future of Federation- Presence in the cloud- privacy and its relation to cloud-based Information system.(Page no.129-151).

**Unit – V**

Security in the Cloud: Cloud Security Challenges- Software-as-a- service security- Third party risk management-Security Architecture Design- Secure software Development Life Cycle- Data security-Application security- Virtual Machine Security.(Page no.153-181

**BOOK FOR STUDY:**


1. Irena Bojanova, *"Encyclopedia of Cloud Computing"*, Wiley, 2016.
2. John W.Rittinhhouse, James F.Ransome, *"Cloud Computing Implementation, management and security"*, CRC Press, 2016.

**BOOK FOR REFERENCE:**

1. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, *"Cloud Computing A Practical Approach"*, Tata McGraw Hill, Fourth Edition, Reprint 2011.

**E-Resource:**

1. https://www.javatpoint.com/cloud-computing-tutorial
2. https://www.tutorialspoint.com/cloud_computing/index.htm

**Programme** : **B.Sc IT**

**Course Title** : **Elective : Client/Server Technology** **Course Code** : **20UIT5EC1**

**Year** : **III** **Semester** : **V**

**Hour/Week** : **4** **Credits** : **4**

## COURSE OBJECTIVES

1. Understand the strategic potential of distributed computing systems for business processes.
2. Understand the role of the transaction processing, object-oriented, and Internet-based technologies in distributed enterprise computing and make decisions about how and when to apply them.
3. Understand the factors that contribute to the performance of client/server systems and incorporate this understanding in the design of client/server systems.
4. Understand the many issues, tradeoffs, and decision points in developing, integration, and managing distributed applications.

## COURSE OUTCOMES:

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Devise popular servers with two tier scenarios. | K1 |
| **CO2** | Understand the concept of middleware, and communication protocols. | K2 |
| **CO3** | Understand the different component of N Tier and Three Tier application. | K2 |
| **CO4** | Understand the underlying concepts in client server development using common access databases | K2 |
| **CO5** | Compare various application deployment mechanisms and the use of digital certificates. | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | L | L | M | M | M | | L | M | L | L |
| **CO2** | M | M | M | L | M | | S | M | M | M |
| **CO3** | M | M | M | M | S | | S | S | M | M |
| **CO4** | S | M | M | M | M | | M | M | S | S |
| **CO5** | L | L | L | M | M | | M | S | S | M |

**S- Strong; M-Medium; L-Low**

**UNIT I**

Introduction: Client/server computing era-File Server-database server-transaction server-Groupware server-object server-web server.(Page no.7-15).Client/server building blocks:-Intergalactic client/server - **2-tier-client/server building blocks***.(Page no.20-32).

**UNIT II**

Operating Systems:-Anatomy of a Server program-**base service-extended service-scalability***.(Page no.57-65).Clients:-Clients anatomy-non-GUI client's-GUI clients-OOUI Clients-GUI versus OOUI-OOUI's on steroids.(Page no.66-74).

**UNIT III**

NOS:-NOS middleware-extending the local OS's reach-Global directory services-distributed time services-Distributed security(Page no.99-112).RPC:-**Peer-to-Peer communications-sockets-names-pipes***-RPC-MOM middleware-MOM versus RPC.(Page no.115-130).

**UNIT IV**

SQL databases servers:-Fundamentals of SQL & Relational Databases-ISO Standards-Stored procedure triggers and rules.(Page no.150-170).**Data Warehousing:-OLTP-data warehouse- Data Mining-TP monitors***(Page no.200-234,276-282)

**UNIT V**

Client/server Group ware:-Group Ware-components of Group ware(Page no.319-352).**Client server with distributed objects:-Distributed objects to components***-CORBA OMG's object management architecture client/server and the Internet(Page no.379-426).

***Self-Study**

**BOOK FOR STUDY:**

1. RobertOrali Dan Harkey and Jeri Edwards, *"The Essential Client/Server Survival Guide*", Galgotia Publications Pvt.Ltd., Second edition,2016.

**BOOK FOR REFERENCE:**

1. Murugan & Shymala, Client/Server Computing, Margham Publications, 2016.

**E-RESOURCE:**

1. https://www.tutorialspoint.com/Client-Server-Computing

| | | | |
|---|---|---|---|
| **Programme** | **: B.Sc IT** | | |
| **Course Title** | **: Elective : Fundamentals of Cyber Security** | **Course Code** | **: 20UIT5ED1** |
| **Year** | **: III** | **Semester** | **: VI** |
| **Hour/Week** | **: 4** | **Credits** | **: 4** |

**COURSE OBJECTIVES:**

1. To gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
2. To understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.
3. To be able to examine secure software development practices.
4. To understand principles of web security.
5. To be able to incorporate approaches for incident analysis and response.

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Understand the knowledge about Information Systems | K1 |
| **CO2** | Initiate about Information Security and Application Security | K2 |
| **CO3** | Ability to understand about Security Threats and Secure Information System | K2 |
| **CO4** | Assess cyber security risk management policies in order to adequately protect critical information and assets | K3 |
| **CO5** | Analyse the Information Security Standards | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | L | S | M | | S | M | S | L |
| **CO2** | S | M | L | S | M | | S | M | S | L |
| **CO3** | S | M | L | S | S | | S | M | S | L |
| **CO4** | S | M | L | S | S | | S | M | S | M |
| **CO5** | S | M | L | S | S | | S | M | S | M |

**S – Strong; M – Medium; L – Low**

**Unit I: Introduction to Information Systems**

Introduction – Modelling the business process – Information System components – Information System Categories – Individuals in the information system – **Development of information Systems***.

**Unit II : Information Security and Application Security**

Introduction – Threats to Information System - **Information Assurance*** - Cyber Security risk analysis. Introduction – **Data Security consideration*** – Security Technology – Intrusion Detection – Access Control.

**Unit III : Security Threats and Secure Information System**

Introduction to Security Threats – Network and Service Attack - Security threats to E-Commerce. Introduction – Developing Secure Information System – Key elements – Information System Development Life Cycle – Application Security – **Information Security Governance and Risk Management – Risk Management*** – Security Architecture and Design

**Unit IV : Security Issues and Policies**

Introduction – Data Storage and Downloadable Device – Physical Security of IT Assets – CCTV and IDS – Security Policies.

Introduction – Why do we need Security Policies? – Security Policy Development – Email **Security Policies – Policy Review Process – Corporate Policy*** – Sample Template of Cyber Security Policy

**Unit V: Information Security Standards**

Introduction – ISO – IT ACT 2000 – Copyright – Patent - Intellectual Property Rights – Cyber laws in India – **Software Licensing – Semi Conductor Law and Patent Law – Chip Act Right and Exceptions*.**

***Self-Study**

**Book for Study:**

1. Mayank Bhushan, Rajukumar Singh Rathore and Aatif Jamshed, *"Fundamentals of Cyber Security"*, BPB Publications, First Edition, 2017.

**Book for Reference:**

1. Haq Kamar, *"What is Cyber Security"*, Britannica Educational Publishing, First Edition, 2017.

## E-Resources:

1. http://whatis.techtarget.com/definition/cybersecurity
2. https://www.csoonline.com/article/3242690/data-protection/what-is-cyber-security-how-to-build-a-cyber-security-strategy.html
3. https://www.acs.org.au/content/dam/acs/acs-publications/ACS_Cybersecurity_Guide.pdf
4. https://www.youtube.com/user/GoogleCyberSecurity

**Programme : B.Sc Information Technology**

**Course Title : Elective : Geographical Information System** **Course Code : 20UIT5EE1**

**Year : III** **Semester : V**

**Hour/Week : 4** **Credits : 4**

## COURSE OBJECTIVES

1. Have a basic, practical understanding of GIS concepts, techniques and real world applications.
2. Have an understanding of the technical language of GIS.
3. Know how GIS is utilized in the larger context of business needs and IT strategies.
4. Understand the basic concepts of geography necessary to efficiently and accurately use GIS technology.
5. Understand basic GIS data concepts.

## COURSE OUTCOMES

After learning the course, the students will be able to

| | | |
|---|---|---|
| **CO1** | Comprehend fundamental concepts and practices of Geographic Information Systems (GIS) and advances in Geospatial Information Science and Technology (GIS&T). | K1 |
| **CO2** | Apply basic graphic and data visualization concepts such as color theory, symbolization, and use of white space. | K3 |
| **CO3** | Demonstrate organizational skills in file and database management. | K3 |
| **CO4** | Give examples of interdisciplinary applications of Geospatial Information Science and Technology. | K4 |
| **CO5** | Apply GIS analysis to address geospatial problems and/or research questions. | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | M | M | S | | S | S | M | S |
| **CO2** | S | S | M | M | S | | S | S | M | S |
| **CO3** | S | S | S | M | S | | S | S | S | S |
| **CO4** | S | S | S | S | S | | M | M | S | S |
| **CO5** | S | S | S | S | S | | S | S | S | S |

**S - Strong; M - Medium; L - Low**

**Unit I**

Introduction – Defining GIS – Component of GIS – Spatial Data – Maps and their influence on the characteristic of spatial data – Thematic characteristic of spatial data – Other sources of spatial data.

**Introducing the GIS components in various fields.***

**Unit II**

Spatial data Modelling – Entity definition – Spatial data model – Spatial data structures – Modelling surfaces – Modelling networks – Building computer worlds – Modelling the third dimension – Modelling the fourth dimension.

**Spatial Data Structures were used in building computer modeling in third dimension.***

**Unit III**

Introduction – Database data models – Creating a database – GIS database applications – developments in databases – Methods of data input – Data editing – Towards an integrated database.

**Introducing the Database data models in GIS.***

**Unit IV**

Measurements in GIS – lengths perimeters and areas – Queries – Reclassification – Buffering and neighborhood functions – Integrating data map overlay – spatial interpolation – Analysis of surfaces – Network analysis.

**The measurements in GIS with perimeters and areas.***

**Unit V**

Analytical modeling in GIS – Process Models – Modeling physical and environmental process – Modelling human process – modeling the decision making process – Problems with using GIS to model spatial process – Maps as output – Non-cartographic output – GIS and spatial decision support.

**Analytical modeling in GIS.***

***Self-study**

**BOOKS FOR STUDY:**

1. Ian Heywood, Sarah Cornelius, *An introduction to GIS*, Pearson Education, 2017.
2. Kang-Tsung Chang, *Introduction to Geographical Information Systems*, Mc Graw Hill, 9th Edition, 2016

**BOOKS FOR REFERENCE:**

1. Paul A.Longley, Michael F.Goodchild, *Geographical Information System*, Abridged, 2nd Edition, 2015
2. Monika Kannan, Mehtab Singh, *Geographical Information System and Crime Mapping*, CRC Press, 2017

**E-RESOURCES:**

1. http://www.drew.edu/esss-department/about-us/tutorials/
2. https://ocw.mit.edu/resources/res-str-001-geographic-information-system-gis-tutorial-january-iap-2016/

**Programme** : **B.Sc Information Technology**

**Course Title** : **Elective : Software Testing** **Course Code** : **20UIT6EA2**

**Year** : **III** **Semester** : **VI**

**Hour/Week** : **6** **Credits** : **5**

**COURSE OBJECTIVES:**

1. To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
2. To discuss various software testing issues and solutions in software unit test, integration, regression, and system testing.
3. To learn how to planning a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
4. To expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.
5. To understand software test automation problems and solutions.

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Familiarize the principles in software testing, implement and manage various test processes in a project | K1 |
| **CO2** | Understand the importance of performance testing | K2 |
| **CO3** | Understand the needs of software test automation and purpose of existing tools | K2 |
| **CO4** | Describe the structure of test plan, test case design and to generate a testing Report | K3 |
| **CO5** | Analyse Testing applications using different automated testing tools | K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | L | M | M | | S | S | S | M |
| **CO2** | S | S | L | M | M | | S | S | S | M |
| **CO3** | S | S | L | M | M | | S | S | S | M |
| **CO4** | S | S | L | M | M | | S | S | S | M |
| **CO5** | S | S | L | M | M | | S | S | S | M |

**S – Strong; M – Medium; L – Low**

**Unit I**

Introduction: Software Testing Process: Psychology of Testing – verification and validation – Cost of Quality – Characteristics of Test Engineers – Levels Of Testing – Testing Approaches – Types of Testing – Test Plan – Criteria of Completion of Testing.(69 – 93) **Software Quality Assurance : Metrics in Software Development - Quality Standards – (CMM I) Capability Maturity Model Integration for Software Engineering*** (43 – 55)

**Unit II**

Building a Software Testing Environment: - Minimizing Risks – Writing A policy for software Testing – Economics of Testing - Building a Structured Approach to testing (37 - 55) Building a Software Testing Process: **Software Testing Guidelines – Customizing the software testing Process - Selecting and using Testing Tools*** (63 – 83, 108 -114)

**Unit III**

Overview of software Testing Process The Seven step Testing Process, Organizing for Testing (153 – 200), Verification Testing: Requirement Phase Testing, Design Phase Testing, Programming Phase Testing (291- 330) – Validation Testing (409 – 438) – Analysis and Reporting Test Result (459 – 482) **Acceptance and operational Testing (491- 518) – Post Implementation Analysis*** (571 - 581)

**Unit IV**

Software Development Methodologies: Software Development Methodologies – Methodology Maturity – Configuration Management Controls (583 – 602) **Rapid Application Development Testing – Internal Testing Controls*** (633 – 642)

**Unit V**

Testing in A Multiplatform Environment (717 – 726) Testing software Security (733 – 761) Testing a Data Warehouse (765 -774) Testing Web- Based System (799- 809) **Using Agile Methods Improve Software Testing*** (819 – 827)

***Self-Study**

**BOOKS FOR STUDY:**


1. Naresh Chauhan, *"Software Testing"*, Oxford University Press, Second Edition, 2016.
2. William E. Perry, *"Effective Methods for Software Testing"*, Wiley Publication, Third Edition, 2016.


**BOOKS FOR REFERENCE:**


1. Srinivasan Desikan, Gopalaswamy Ramesh, *"Software Testing Principles and Practices"*, Pearson Education, First Edition, Reprint 2017
2. Boris Beizer, *"Software Testing Techniques*", Van Nostrand Reinhold, First Edition, 2016.
3. Dr. K.V.K.K Prasad, *"Software Testing Tools"*, Dreamtech Publication, First Edition, Reprint 2015.


**E-RESOURCES:**

1. https://www.tutorialspoint.com/software_testing/index.htm
2. https://www.guru99.com/software-testing.html
3. https://www.javatpoint.com/software-testing-tutorial

**Programme** : **B.Sc Information Technology**

**Course Title** : **Elective : Embedded System** **Course Code** : **20UIT6EB2**

**Year** : **III** **Semester** : **VI**

**Hour/Week** : **6** **Credits** : **5**

**COURSE OBJECTIVES:**

1. To understand the concepts and architecture of embedded systems.
2. To understand the external interrupts and utilize the timer concepts.
3. To understand the peripheral connection and analog to digital conversion.
4. To understand the serial I/O Ports and connectivity.
5. To understand scheduling algorithms and memory management.

**COURSE OUTCOMES:**

After learning the course, the students will be able to

| | | |
|---|---|---|
| **CO1** | Understand the general process of embedded system development. | K2 |
| **CO2** | Able to handle external interrupts and timer utilization in system. | K3 |
| **CO3** | Able to connect with peripheral devices and understand the concept of Analogue to digital. | K3 |
| **CO4** | Understand various input and output ports and connect with peripheral devices. | K2 |
| **CO5** | Able to apply various data structure and scheduling algorithms for memory management. | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | M | M | S | | S | S | M | S |
| **CO2** | S | S | M | M | S | | S | S | M | S |
| **CO3** | S | S | S | M | S | | S | M | S | S |
| **CO4** | S | S | S | S | S | | M | M | M | S |
| **CO5** | S | S | S | S | S | | S | M | S | S |

**S - Strong; M - Medium; L - Low**

**UNIT I:**

PIC Microcontroller (16F87XX) - Introduction-Hardware architecture-pipelining-program memory-considerations-register file structure and addressing mode-CPU registers-instruction set-simple operations.

**Introducing Hardware Architecture with pipelining program memory.***

**UNIT II:**

External Interrupts and Timers- Overflow-RBo/INT external interrupt input capture mode-compare mode-timer 1/CPP-programmable -Timer 1 External event counter-timer 1 sleep mode-PWM output-port B change interrupts.

**Illustrating the External Interrupts and Timers.***

**UNIT III:**

Peripherals-Initialization and programming of I2C bus for Peripherals chip access-A/D converter-UART.

**Initializing the Peripherals with Chip accessing.***

**UNIT IV:**

I/O Port Expansion-Synchronous serial port module-serial peripherals interface-output port expansion-input port expansion-LCD display.

**Designing the I/O Port Expansion and Synchronous Serial Port Modules.***

**UNIT V:**

Software Architecture and RTOS- Software architecture: Round Robin-round Robin with interrupts-function-queue-scheduling architecture-ROTS-task task status-task and data-semaphores and shared data-message queues-mail boxes and pipes-timer function-events-memory management-interrupts routines.

**Architecture framework for the Software with various Functions.***

***Self-study**

**BOOKS FOR STUDY:**

1. David E.Simon, '*An Embedded Software Primer'*, Addison Wesley**,** 2015.
2. Krzysztof Iniewski, *'Embedded Systems-Hardware Design and Implementation*', Wiley, 2016.

**BOOKS FOR REFERENCE:**

1.John B.Peatmen, '*Design with PIC Microcontrollers'*, Pearson Education, New Edition,2015.

2.Tony Givargis and Frank Vahid, *'Embedded System Design: A Unified Hardware / Software Introduction',* Wiely Publisher, Student Edition, 2016.

**E-RESOURCES:**

1. https://www.tutorialspoint.com/embedded_systems/index.htm
2. https://www.javatpoint.com/embedded-system-tutorial

**Programme : B.Sc Information Technology**

**Course Title : Elective : Compiler Design** **Course Code : 20UIT5EC2**

**Year : III** **Semester : V**

**Hour/Week : 6** **Credits : 5**

## COURSE OBJECTIVES

1. Learn the design principles of a Compiler.
2. Learn the various parsing techniques and different levels of translation.
3. Learn how to optimize and effectively generate machine codes.
4. Learn the process of translating a modern high-level language to executable code required for compiler construction.
5. Provide an understanding of the fundamental principles in compiler design.

## COURSE OUTCOMES

After learning the course, the students will be able to

| | | |
|---|---|---|
| **CO1** | To realize basics of compiler design and apply for real time applications. | K1 |
| **CO2** | To introduce different translation languages | K3 |
| **CO3** | To understand the importance of code optimization | K3 |
| **CO4** | To know about compiler generation tools and techniques | K4 |
| **CO5** | To learn working of compiler and non-compiler applications | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | M | M | S | | S | S | M | S |
| **CO2** | S | S | M | M | S | | S | S | M | S |
| **CO3** | S | S | S | M | S | | S | S | S | S |
| **CO4** | S | S | S | S | S | | M | M | S | S |
| **CO5** | S | S | S | S | S | | S | S | S | S |

**S - Strong; M - Medium; L - Low**

**UNIT I**

Introduction: Compliers: Analysis of source program – Phases of compiler- cousins of compiler – grouping of phases. Simple one – pass compiler: Overview – Syntax definition – syntax – directed translation – parsing – translator for simple expressions. Lexical Analysis: removal of white space and comments – constant – recognizing identifiers and keyboards – a lexical analyzer – role of lexical analyzer – input buffering – specification of tokens – recognition of tokens (section 1.1 to 1.5, 2.5, 2.6, 3.1 to 3.4)

**Analysis of source program with different Phases.***

**UNIT II**

Symbol tables – incorporating a symbol table – symbol tables – entries – list data structures for symbol table – hash tables – scope information – Parsing – Principles top down parsing – predictive parsing, left recursion – role of parser – context-free grammars – writing a grammar – top down parsing – simple bottom up parsing – shift reduce parsing. (Section 2.7 to 7.6, 2.4 and 4.1 to 4.5). **Incorporating the Symbol Tableentries.***

**UNIT III**

Syntax – directed translation – A translator for simple expressions – abstract and concrete syntax, adapting translations scheme, optimizing translator – syntax – directed definitions – construction of syntax trees – bottom up evaluation of S- attributed definitions – L-attributed definitions – top-down translation. Type checking: type system, specifications of simple type checker. (Section 2.5, 5.1 to 5.5 and 6.1). **A Translator for Simple Expressions.***

**UNIT – IV**

Runtime Organization: Source language issues – storage organization – storage allocation strategies. Intermediate code generation: Intermediate languages – declarations – assignment statements. (Section 7.1 to 7.3, 8.1 to 8.3). **Organizing the source language issues.***

**UNIT – V**

Code generation – issues in design of code generator – target machine – run-time storage management – basic blocks and flow graphs. Code optimization introduction – Principle sources of optimization. (Section 9.1 to 9.4, 10.1, 10.2).

**Issues in Design of Code Generator.***

***Self-study**

**BOOKS FOR STUDY:**


1. A.V. Aho, R. Sethi, and J. D. Uliman,*Compilers, Principles, Techniques and Tools*, Addison Wesley Publishing Company, Revised 2016.
2. AlfredAho, Ravi Sethi, Jeffrey D Ullman,*Compilers Principles, Techniques and Tools*, Pearson Education Asia, 2013.


**BOOKS FOR REFERENCE:**


1. Allen I. Holub," *Compiler Design in C"*, Prentice Hall of India,Third Edition, 2013.
2. C. N. Fischer and R. J. LeBlanc, "*Crafting a compiler with C"*, Benjamin Cummings Publisher, 2013.


**E-RESOURCES:**

1. http://www.tutorialspoint.com/compiler_design/
2. http://nptel.ac.in/courses/106104123/Compiler%20DesignQuestions.pdf
3. http://www.vssut.ac.in/lecture_notes/lecture1422914957.pdf

**Programme : B.Sc Information Technology**

**Course Title : Elective : Multimedia** **Course Code : 20UIT6ED2**

**Year : III** **Semester : V**

**Hour/Week : 6** **Credits : 5**

## COURSE OBJECTIVES

1. To develop multimedia professionals equipped with knowledge, skills and practical experience within the domain of technology, creativity and enterprise.
2. With a strong focus on the creative aspects, there is a range of subjects that students have to study and practice.
3. These include Graphic Design, Animation, Audio and Video, and Design for learning, web design and development.
4. Understand multimedia in respect to many application including business, schools, home, education, and virtual reality.
5. Develop multimedia skills understanding the principal players of individual players in multimedia teams in developing projects.

## COURSE OUTCOMES

After learning the course, the students will be able to

| | | |
|---|---|---|
| **CO1** | Identify and describe the function of the general skill sets in the Multimedia industry. | K1 |
| **CO2** | Understand the representation and characteristics in different medias. | K2 |
| **CO3** | Initiate about the visual and audio systems to take in to design and implementation. | K1 |
| **CO4** | Ability to understand and develop the multimedia applications. | K2 |
| **CO5** | Understanding the graphical design, animation and to learn about the web design and development. | K3 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | M | M | M | S | | S | S | M | S |
| **CO2** | S | S | M | M | S | | S | M | M | S |
| **CO3** | S | S | S | M | S | | S | M | S | S |
| **CO4** | S | S | S | M | S | | M | M | M | S |
| **CO5** | S | S | S | M | S | | S | S | S | S |

**S - Strong; M - Medium; L – Low**

## GIMP

**Unit I**

What is Gimp (01-06) - The Tools (109-123) – Color Modes (187-190) – Transform Tools (155– Text and Fonts (165-166) – Brush Size & Shape (175-176) –- Layers and Floating Selections (315-330)

**Basics in GIMP designing.***

**Unit II**

An Introduction To Filters (365-366) – Animation Filters (369-370) – Artistic Filters (375-396) –Blur Filters (401-408).

**Different Animations using Filters.***

## INKSCAPE

**Unit III**

Inkscape Interface (03-09) –Working with file (10-14) - Selector Tool (15-20) – Using the Ruler (118-128) – Using group commands (276-277) – Creating Object Symbol (283-287– Text Effects (69- 70)-Color Management(104-105)-Create a Basic Icon(114-121).

**Working with Inkscape Commands.***

## 2D PENCIL

**Unit IV**

Properties Panel– Floating and Docking Panels– Tools Panel– Document Window– Drawing Tools– Document Library– Symbols – Basic Method of 2D Animation

**Different properties used in 2D Pencil.***

**Unit V**

Onion Skinning-Cartoon Animation Techniques– Vectors and Bitmaps - Importing sound from2D pencil– Exporting Video from2D pencil.

**Different Animation Techniques in Onion Skinning.***

***Self-study**

**BOOKS FOR STUDY:**

1. Olivier Lecarme, Karine Delvare, *The Book of GIMP*, Kindle Edition, 2015.
2. Bethany Hiitole, *Inkscape Starter*, Kindle Edition, 2018.

**BOOKS FOR REFERENCE:**

1. Steve Sayre, "*The Complete Guide To Gimp The Official Handbook"*, the Coriolis Group, 2015.
2. Adam Hyde, "*Ink Space Manual 3d Box Tool"*, Joshua Facemyer Publisher, First Edition, 2018.

**E-RESOURCES:**

1. http://spoken-tutorial.org/
2. https://inkscape.org/en/learn/books
3. https://www.pencil2d.org/

| | | | |
|---|---|---|---|
| **Programme** | **: B.Sc Information Technology** | | |
| **Course Title** | **: Elective : Computer Graphics** | **Course Code** | **: 20UIT6EE2** |
| **Year** | **: III** | **Semester** | **: VI** |
| **Hour/Week** | **: 6** | **Credits** | **: 5** |

**COURSE OBJECTIVES:**

1. To understand computational development of graphics with mathematics.
2. To learn the basic principles of 3- dimensional computer graphics
3. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
4. Provide an understanding of mapping from a world coordinate to device coordinates, clipping, and projections.
5. To Learn about various file format of Multimedia Systems

**COURSE OUTCOME:**

After learning the course, the students will able to

| | | |
|---|---|---|
| **CO1** | Understand the basic concepts used in computer graphics. | K1 & K2 |
| **CO2** | Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, and clipping. | K2 &K3 |
| **CO3** | Understand the importance of viewing and projections. | K2 & K3 |
| **CO4** | Analyse the technical aspect of Multimedia Systems | K3 |
| **CO5** | Analyse various file formats for audio, video and text media. | K3 & K4 |

**K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | M | L | M | | S | M | L | S |
| **CO2** | S | S | M | M | M | | S | M | L | S |
| **CO3** | S | S | M | M | M | | S | M | L | S |
| **CO4** | S | M | M | M | M | | S | L | L | S |
| **CO5** | S | M | M | M | M | | S | L | L | S |

**S – Strong; M – Medium; L – Low**

**UNIT I**

Interactive input devices: **Keyboards-Mouse-Trackball and Space ball-Joysticks-data Glove-Digitizers-Image Scanners-Touch Panels-Light pens***.

Output devices: Printers and Plotters, Output Primitives-DDA and Bresenhem's line algorithm-Bresenhem's circle algorithm-character generation.

**UNIT II**

Two dimensional transformations-scaling,Translation and Rotation-Matrix Representations-Composite transformations-Reflection-shearing, **Windowing and Clipping concepts-Zooming Effect***-Panning effect-Cohen and Sutherland line Clipping algorithm-interactive picture construction techniques.

**UNIT III**

Three Dimensional transformation-Scaling, translation, Rotation, Reflection, Shearing-Composite transformation-Back face removal-Depth buffer method-Scan line method-**Depth sorting method-Area Subdivision method***.

**UNIT IV**

Multimedia: Definition- Multimedia hardware-Multimedia software-Multimedia networking-Multimedia applications-Multimedia standards-**Multimedia PC.Text: Elements of Text-Text Technology-Fonts and coloring text***.

**UNIT V**

Digital representation of sound-Transmission of digital sound-Digital signal processing-Digital video and image compression: video compression techniques – **JPEG image compression standard – MPEG video compression standard***.

***Self-Study**

**BOOKS FOR STUDY:**


1. Donald Hearn, Pauline Baker and Warren Carithers, *"Computer Graphics with Open GL"*, Pearson Education India, Fourth Edition, 2015. (UNIT I,II,III)
2. Toy Vaughon, *"Multimedia Making it Work"*, McGraw-Hill; 8th edition, 2015 (UNIT IV).
3. John F Koegel Buford, *"Multimedia Systems"*, Addison Wesley, First Indian Reprint, 2012 (UNIT V).

**BOOK FOR REFERENCE:**

1. A.P.Godse, "*Computer Graphics & Multimedia*", Technical Publications, Second Edition, 2017.

**E-RESOURCES:**

1. https://www.javatpoint.com/computer-graphics-tutorial
2. https://www.tutorialspoint.com/multimedia/index.htm