NATIONAL EDUCATION POLICY-2020

Syllabus for Sridev Suman Uttarakhand University, Badshahithaul, Tehri Garhwal, Uttarakhand and Affiliated Colleges

B.Sc. IN INFORMATION TECHNOLOGY SYLLABUS

2023

Sri Dev Suman Uttarakhand University Badshahithol, Tehri (Garhwal)

Programme Prerequisites:

1. Students must have passed their 10+2 level of education from a recognised educational Board.
2. Keen Interest in computer & information technology.

Programme Introduction

B.Sc. I.T. is a 3 years long Undergraduate program. As the name suggests, this program revolves around the field of Information Technology. Basically, B.Sc. IT, is all about storing, processing, securing and managing Information. Information Databases, Networks, software development & testing and programming etc are some of the vital topics that one will come across in this program.

B.Sc. (Information Technology) degree is the comprehensive course that involves the study of computing technology, covering everything from installing applications to designing complex computer networks and information databases. This degree course includes the study of software development, databases, computer networking, web design, programming, etc.

Programme outcomes (POs): Through completion of the Bachelor of Science in Information Technology programme, students will:

PO 1	Apply knowledge of computing requirements and mathematics for technology solutions in business applications. ✓ Apply knowledge of applications development. ✓ Develop scripts for information technology applications. ✓ Develop computer code for business applications. ✓ Create, install, and configure virtual machines.
PO 2	Analyze a problem and identify and define the computing requirements for the appropriate solutions. ✓ Plan, install, manage, and troubleshoot a computer network. ✓ Apply telecommunications principles to design and configure a network. ✓ Plan and implement security technology.
PO 3	Design and use spreadsheets and data applications for business processes and tracking. ✓ Use spreadsheets for business applications and project tracking. ✓ Design a relational database using Microsoft Access.
Programme specific outcomes (PSOs) Certificate in Science	
PSO 1	Understand the fundamental concepts like what is information, how it can be managed must be acknowledged in business.
PSO 2	Understand the basic concepts of computer networks and various switching techniques.
PSO 3	Build web applications using HTML, JavaScript and PHP
Programme specific outcomes (PSOs) Diploma in Science	
PSO 1	Understand basic concepts of Databases
PSO 2	Learn fundamentals of Computer Programming.
Programme specific outcomes (PSOs) Bachelor of Science (with specialization in Information Technology)	
PSO 1	Illustrate the process of problem solving using Python programming language and apply solutions to real world problems.
PSO 2	To understand the basics of cyber security.
PSO 3	To Gain knowledge of the fundamentals and intermediate-level concepts of Operating Systems.

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 1st	**Semester:** I
Course Code: IT101	**Course Title:** I Introduction to Information Technology		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand about the fundaments of computer, types and its components, computer languages & its type.		
CO 2:	Understand about the information concepts and processing.		
CO 3:	Earn knowledge of different types of memory & networks.		
CO 4:	Know Operating system and different types of Operating system.		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks:30+70	**Min. Passing Marks:**		

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Fundamentals of Computers-Computer, Elements of computer, Generation of computers, Classification of Computers, Input & Output Devices ,Overview of Computer Hardware & Software, Memory.	12
II	Data and Databases, Types of Database, Big Data, Data Warehouse, Networking and Communication, History of Internet, Organizational Networking, Information System Security Triad, Tools of Information Security, Personel Information Security.	12
III	INFORMATION CONCEPT & PROCESSING – Definition of information, need for information, quality of information, value of information, categories and levels of information in business organization.	12
IV	PROGRAMMING LANGUAGE CLASSIFICATION-Computer languages, generation of languages,translators-interpreters, compilers, assembles, introduction to 4gls.	12
V	INFORMATION TECHNOLOGY APPLICATION IN INDIA-Scientific business, education and entertainment application, industry automation, weather forecasting , media for datatransmission, types of networking, client server architecture, NICNET, ERNET.	12

- Suggested Readings:
- Introduction to information technology, ITL education solution limited, personal education.
- P. K. Sinha & Priti Sinha: Computer Fundamentals (BPB)
- Foundation of information technology by D S Yadav . New age publication ltd.

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 1st	**Semester:** I
Course Code: IT102	**Course Title:** I Fundamentals of Programming using 'C'		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Illustrate the flowchart and designing an algorithm for a given problem to develop c programs.		
CO 2:	Learn how to apply logic for problems.		
CO 3:	To enable the students to develop logics and programs.		
CO 4:	Learn about Loops, Conditional statements, Array, Pointers, File Handling, Structure,Unions etc.		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks:30+70	**Min. Passing Marks:**		

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Programming in C: History, Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programms. Debugging Techniques, Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolicconstants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor	12
II	Operators: Unary operators, Arithmetic & logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, precedence and order of evaluation. Control Statements: if-else, switch, break, continue, the comma operator, goto statement.	12
III	Loops: for, while, do-while,Functions: built-in and user-defined, function declaration, definition and function call, parameter passing: call by value, call by reference, recursive functions, multifile programs.	12
IV	Arrays: Linear arrays, multidimensional arrays, Passing arrays to functions, Arrays and strings. .	12
V	Structure and Union: Definition and differences, self-referential structure. And address of(&) operator, pointer to pointer, Dynamic Momory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers.	12

- Suggested Readings:
- V. Rajaraman, "Fundamentals of Computers", PHI
- Hahn, "The Internet complete reference", TMH
- Peter Nortton's, "DOS Guide", Prentice Hall of India

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 1st	**Semester:** I
Course Code: IT103	**Course Title:** I Digital Electronics	

Course outcomes: On completion of the course, the student will be able to:

CO 1:	Understand the concepts of Boolean algebra, logic gates and design digital logic circuits.
CO 2:	Understand and design the combinational circuit such as adder, multiplexer, demultiplexer, encoder, decoder etc
CO 3:	Understand and design sequential circuit such as flip flops, counters etc

Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**
Max. Marks:30+70	**Min. Passing Marks:**

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Number system and codes: Binary, octal, hexadecimal and decimal Number systems and their inter conversion, BCD numbers (8421-2421), gray code, excess–3 code, cyclic code, code conversion, ASCII, EBCDIC codes. Binary addition and subtraction, signed and unsigned binary numbers, 1's and 2's complement representation.	12
II	Boolean Algebra: Basic logic circuits: Logic gates (AND, OR, NOT, NAND, NOR, Ex-OR, ExNOR and their truth tables,), Universal Gates, Laws of Boolean algebra, De-Morgan's theorem, Min term, Max term, POS, SOP, KMap, Simplification by boolean theorems, don't care condition	12
III	Combinational Circuit: Half adder, full adder, subtractor circuit. Multiplxer, demultiplexer, encoders, decorder, BCD to seven segment Decorder.	12
IV	Flip flop and Timing circuit : set-reset laches, D-flipflop, R-S flip-flop, J-K Flip-flop, Master slave Flipflop, edge triggered flip-flop.	12
V	Counters and registers: Synchronous/Asynchronous counter operation, Up/down synchronous counter, application of counter, Serial in/Serial out shift register, Serial in/Serial out shift register, Serial in/parallel out shift register, parallel in/ parallel out shift register, parallel in/Serial out shift register, Bi-directional register.	12

- Suggested Readings:
- Digital Fundamentals by Morris and Mano, PHI Publication
- Fundamental of digital circuits by A.ANANDKUMAR,PHI Publication
- Digital Fundamentals by FLOYD & JAIN, Pearsons Pub

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 1st	**Semester:** I
Course Code: IT104	**Course Title:** I Mathematical Foundation		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand the theory of Sets, Relations and functions.		
CO 2:	Understand and implement the Permutation and Combination.		
CO 3:	Understand and implement the Matrices and Groups.		
CO 4:	Understand the theory of normal algebraic system		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks:30+70	**Min. Passing Marks:**		
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			

Unit	Topic	No. of Lectures
I	Set Theory and Relation: Sets and Elements, Subsets ,Venn Diagrams ,Set Operations , Algebra of Sets, Duality, Finite Sets, Counting Principle, Classes of Sets, Power Sets, Mathematical Induction. Relations, Pictorial Representatives of Relations, Composition of Relations, Types of Relations, Closure Properties ,Equivalence Relations , Partial Ordering Relations	12
II	Functions: Definitions of functions, Classification of functions, Type of functions, Examples,Composition of functions, Inverse functions, Binary and n-ary operations, Characteristic function of a set, Hashing functions, Recursive functions, Permutation functions.	12
III	Matrix algebra: Introduction-Types of matrices, matrix operations, transpose of a matrix,determinant of matrix , inverse of a matrix, Cramer's rule, Eigen values	12
IV	Permutation and Combination - Mathematical Induction - Pigeon hole principle - Principle of Inclusion and Exclusion - generating function - Recurrence relations.	12
V	Groups: Algebraic systems, Definitions, Examples, Properties, Semigroups, Monoids, Homomorphism, Sub semigroups and Submonoids, Cosets and Lagrange's theorem, Normal subgroups, Normal algebraic system with two binary operations, Codes and group codes, Basic notions of error correction, Error recovery in group codes.	12

- Suggested Readings:
- Discrete Mathematics (Schaum's Outlines)" by Seymour Lipschutz and Marc Laras Lipson
- B. S. Vatsa-Discrete Mathematics –New Age International Limited Publishers, New Delhi.

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 1st	**Semester:**1st
Course Code: IT105	**Course Title:** LAB: Programming in C		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Program in C Programming Language to Solve Problems using Computer		
CO 2:	Recognize and understand the syntax and construction of C programming code.		
Credits: 2		**Core Compulsory**	
Max. Marks: 30+70		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			

Unit	Topic	No. of Lectures
	Lab Experiment List	
	● To learn elementary techniques involving arithmetic operatorsand mathematical. ● expressions, appropriate use of selection (if, switch, conditional operators) and ● control structures ● Learn how to use functions and parameter passing in functions, writing recursive programs. ● Write Programs to learn the use of strings and string handlingoperations. ● Problems which can effectively demonstrate use of Arrays.Structures and Union. ● Write programs using pointers. ● Write programs to use files for data input and output. ● Write a program to calculate simple and compound interest. ● Write a program to swap values of two variables with and without using third variable. ● Write a program to input name, marks of 5 subjects of a student and display the name of thestudent, the total marks scored, percentage scored and the class of result. ● Write a Program to Check Whether a Number is Prime or not.	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva-Voce	5
Practical Assessment	20
Total	30

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 1st	**Semester:** I
Course Code: IT106		**Course Title:** Lab: Office Automation	
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	create and format a word document, presentations and files		
CO 2:	formatting the worksheets		
Credits: 2		**Core Compulsory**	
Max. Marks: 30+70		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			

Unit	Topic / Lab Experiment List	No. of Lectures
	1. Create a news-paper document with at least 200 words, • Use margins as, top:1.5, bottom:2, left:2, right:1 inches. • Use heading "Gandhi Jayanti", font size: 16, font color: red, font face: Arial Black. • With first letter "dropped" (use drop cap option) of the first paragraph containing a picture at the right side • Use three columns from the second paragraph onwards till the half of the page. • Then use heading "Computer basics" • Create paragraph using two columns till the end of the page. 2. Create a Mathematical question paper using, at least five equations • With fractions, exponents, summation function • With at least one „m*n" matrix • Basic mathematical and geometric operators. • Use proper text formatting, page color and page border. 3. Create a flowchart using • Proper shapes like ellipse, arrows, rectangle, and parallelogram. • Use grouping to group all the parts of the flowchart into one single object. 4. Create a table using table menu with, • At least 5 columns and 10 rows. • Merge the first row into one cell. • Merge the second row into one cell, then split the second row into three cells. • Use proper table border and color. • Insert proper content into the table with proper text formatting. 5. Create a table using two columns, • The left column contains all the short-cut keys and right side column contains the function of the short-cut keys. • Insert a left column using layout option. Name the heading as Serial No. 6. Create two letters with the following conditions in Ms Word and find the difference. • Write a personal letter to your friend using at least 100 words and two paragraphs. The date must be in top-right corner. Use "justify" text alignment and 1.5 line spacing for the body of the letter. Letter must contain proper salutation and closing. • Use step by step mail-merge wizard to design a letter. 7. Create a letter, which must be sent to multiple recipients.	**60**

- Use Mail-Merge to create the recipient list.
- Use excel sheet to enter the recipient.
- Start the mail merge using letter and directory format. State the difference.

8. Create a table "Student result" with following conditions.
   - The heading must contain, Sl. No., Name, Mark1, Mark2, Mark3, Total, average and result with manual entry.
   - Use formulas for total and average.
   - Find the name of the students who has secured the highest and lowest marks.
   - Round the average to the nearest highest integer and lowest integer (use ceiling and floor function respectively).
9. Create a power-point presentation with minimum 5 slides.
   - The first slide must contain the topic of the presentation and name of the presentation.
   - Must contain at least one table.
   - Must contain at least 5 bullets, 5 numbers.
   - The heading must be, font size:32, font-face: Arial Rounded MT Bold, font-color: blue.
   - The body must be, font size: 24, font-face: Comic Sans MS, font-color: green.
   - Last slide must contain "thank you".
10. Create a power-point presentation with minimum 10 slides
    - Use word art to write the heading for each slides.
    - Insert at least one clip-art, one picture
    - Insert at least one audio and one video
    - Hide at least two slides
11. Create a power-point presentation with minimum 5 slides
    - Use custom animation option to animate the text; the text must move left to right one line at a time.
    - Use proper transition for the slides.
12. Create a database "Student" with,
    - At least one table named "mark sheet" with field name "student name, roll number, mark1, mark2, mark3, mark4, total"
    - The data types are, student name: text, roll number: number, mark1 to mark4: number, total: number. Roll number must be the primary key.
    - Enter data in the table. The total must be calculated using update query.
    - Use query for sorting the table according to the descending/ascending order of the total marks.

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	**Marks**
Record File	5
Viva Voce	5
Practical Assessment	15
Total	25

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 1st	**Semester:** II
Course Code: IT201	**Course Title:** I Data Structure using 'C'		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand concepts such as Data Organizations, Need of Data Structures, Types of Data Structure, Algorithm Complexity, and Time-Space trade-off.		
CO 2:	Understand and apply data structures such as Stacks, Queues, Arrays, and Linked List.		
CO 3:	Understand the concept of different searching and sorting algorithms.		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks:30+70	**Min. Passing Marks:**		
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			

Unit	Topic	No. of Lectures
I	**Introduction to Data Structures:** Basic Terminology, Data type, Data object, Need of Data Structure, Types of Data Structure, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off.	12
II	**Arrays & Linked Lists:** Arrays, Single and Multidimensional Arrays, address calculation, application of arrays,Linked list: Representation and implementation of Singly Linked Lists, Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to and from Linked Lists, Doubly linked list.	12
III	**Stacks & Queues:** Stacks: Array and linked representation and implementation of stack, Operations on Stacks: Push & Pop, Applications of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Recursion: Introduction, recursion in C, example of recursion, recursive functions. Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Insert, Delete, Full and Empty. Circular queue, Deques, and Priority Queues.	12
IV	**Trees & Graphs:** Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic expressions, Complete Binary Tree., Traversing Binary trees, Binary Search Tree, searching BST, insertion and deletion in BST. Graph: Basic terminology, Traversal: BFS, DFS. Spanning Tree: Prims, Kruskal Algorithm, Dijkstra's Algorithm..	12
V	**Searching & Sorting:** Searching- Sequential search, binary search. Sorting algorithms with efficiency- Bubble sort, selection sort, Insertion sort, Merge sort, Quick Sort.	12

- Suggested Readings:
- Data Structures- Seymour Lipschutz
- Data Structures using C and C++- Tanenbaum

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 1st	**Semester:** II
Course Code: IT202	**Course Title:** Multimedia	

Course outcomes: On completion of the course, the student will be able to:

CO 1:	Define what is Multimedia and how it works
CO 2:	Understand multimedia components using various tools and techniques.
CO 3:	Discuss about different types of media format and their properties.

Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**
Max. Marks:30+70	**Min. Passing Marks:**

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Introduction: Introduction to Multimedia, Multimedia objects, Multimedia in business & work. Multimedia Hardware, Memory & Storage Devices, Communication devices, multimedia software's, presentation tools, tools for object generations, video, sound, image Capturing, authoring tools card and page based authoring tools.	12
II	Multimedia Building Blocks Text, sound, MIDI, Digital Audio, audio file formats, MIDI underwindows environment, Audio & video Capture.	12
III	Speech Compression & Synthesis: Digital Audio concepts, Sampling variables, Lossless compression of sound, lossy compression & silence compression.	12
IV	Images Multiple monitors, bitmaps, vector drawing, lossy graphic compression, image file formation animation, Images standards, JPEG Compression, Zig Zig Coding.	12
V	Video Video representation, Colors, Video compression, MPEG standard, MHEG Standards,recent development in Multimedia.	12

- Suggested Readings:
- Tay Vaughan "Multimedia, Making it work," Osborne Hill
- Buford, "Multimedia Systems," Addison Wesley
- Mark Nelson "Data Compression Book", BPB

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 1st	**Semester:** II
Course Code: IT203	**Course Title:** OOPS with C++	

Course outcomes: On completion of the course, the student will be able to:

CO 1:	Understand concepts such as OOPS, Data Types, Function and Dynamic Memory Allocation
CO 2:	Understand and apply Class, Constructor, Accessing Members of a Class and Overloading
CO 3:	Understand the concept of Inheritance, virtual functions and Files

Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**
Max. Marks:30+70	**Min. Passing Marks:**

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Introduction: Introduction to OOP, Basic Concepts of OOP, Applications of OOP. Introduction to C++, Introduction to C++ stream I/O, declarations in C++, Creating New data types in C++, function Prototypes, Inline functions, Reference Parameters, Const Qualifier, Dynamic memory allocation, default arguments, Unary Scope resolution operator, Linkage specifications.	12
II	Class, Constructors, Friend Class : Introduction, Comparing class with Structure, Class Scope, Accessing Members of a class, Constructor, Destructor, Const objects, Const member functions, Friend class, Friend function, This pointer, Data abstraction and Information hiding, container classes and Iterators	12
III	Overloading & Inheritance: Operator Overloading, Fundamentals, Restrictions, Overloading stream, Insertion and stream extraction operators, Overloading unary & binary operators, Converting between types, Overloading ++ and --. Inheritance, Introduction, Protected members, Casting base _class pointers to derived _class pointers Overloading Base class members in a Derived class, Public, Protocols and Private inheritance, Direct base classes and Indirect Base Classes, Using Constructors and Destructors in Derived classes, Implicit Derived class object to base class object conversion.	12
IV	Virtual Functions: Introduction, Type fields and switch statements, Virtual functions, Abstract base classes and concrete classes, Polymorphism, Dynamic binding, Virtual destructors.	12
V	C++ Stream I/O: Streams, Stream Input, Stream Output, Unformatted I/O, Stream manipulators, Stream format states, Stream error, States. Files : File Operations –File pointers – error Handling during file Operations	12

- Suggested Readings:
- Yashwant Kanetkar, “Let Us C++”.
- E. Balagurusamy “Object Oriented Programming with C++”.

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board

Subject: Information Technology

Programme/Class: Certificate	**Year:** 1st	**Semester:** II
Course Code: IT204	**Course Title:** I Organizational Behavior	

Course outcomes: On completion of the course, the student will be able to:

CO 1:	Understand the conceptual framework of the discipline of OB and its practical applications in the organizationalset up.
CO 2:	To deeply understand the role of individual, groups and structure in achieving organizational goals effectively andefficiently.
CO 3:	To accept and embrace in working with different people from different cultural and diverse background in theworkplace.

Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**
Max. Marks:30+70	**Min. Passing Marks:**

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Fundamentals of Organizational Behaviour: Nature, Scope, Definition and Goals of Organizational Behaviour, Fundamental Concepts of Organizational Behaviour, Models of Organizational Behaviour, Emerging aspects of Organizational Behaviour: TQM, Managing Cultural Diversity, Managing the Perception Process	12
II	Attitude Values and Motivation: Effects of employee attitudes Personal and Organizational Values Job Satisfaction Nature and Importance of Motivation Achievement Motive Theories of Work Motivation: Maslow's Need Hierarchy Theory, McGregor's Theory 'X' and Theory 'Y'	12
III	Personality: Definition of Personality, Determinants of Personality Theories of Personality – Trait and Type Theories, The Big Five Traits, Myers-Briggs Indicator, Locus of Control, Type A and Type B Assessment of Personality	12
IV	Work Stress: Meaning and definition of Stress, Symptoms of Stress Sources of Stress: Individual Level, Group Level, Organizational Level Stressors, Extra Organizational Stressors Effect of Stress – Burnouts Stress Management – Individual Strategies, Organizational Strategies Employee Counselling	12
V	Group Behaviour and Leadership: Nature of Group, Types of Groups Nature and Characteristics of team building, Effective Teamwork Nature of Leadership, Leadership Styles Traits of Effective Leaders	12

- Suggested Readings:
- Organizational Behavior Text, Cases and Games- By K. Aswathappa, Himalaya Publishing House, Mumbai, Sixth Edition (2005)
- Organizational Behavior Human Behavior at Work by J. W. Newstrom, Tata McGraw Hill Publishing Company Limited, New Delhi, 12 th Edition (2007

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 1st	**Semester:**II
Course Code: IT205	**Course Title:** LAB: Data Structure	
Course outcomes:	On completion of the course, the student will be able to:	
CO 1:	Implement different sorting and searching algorithms	
CO 2:	Implement the stack, Queue and their applications.	
CO 3:	Implement various types of linked lists and their applications.	
Credits: 2		**Core Compulsory**
Max. Marks: 30+70		**Min. Passing Marks:**
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		

Unit	Topic	No. of Lectures
	Lab Experiment List	
	• Write a program in C to implement 1D array and different operations in an array. • Write a program in C to implement 2D array and different operations in an array. • Write a program in C to implement the Stack and PUSH POP operations using array. • Write a program in C to implement queue and its operations. • Write a program in C to implement circular queue and its operations. • Write a program in C to implement singly linked list and its operations. • Write a program in C to implement insertion sort. • Write a program in C to implement selection sort. • Write a program in C to implement bubble sort • Write a program to swap values of two variables with and without using third variable. • Write a program in C to implement quick sort. • Write a program in C to implement linear search. • Write a program in C to implement binary search.	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva-Voce	5
Practical Assessment	20
Total	30

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 1st	**Semester:**II
Course Code: IT206	**Course Title:** LAB: C++		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Program in C++ Programming Language to Solve Problems using Computer		
CO 2:	Use OOPs to Model Real World Problems and Solve Them.		
Credits: 2		**Core Compulsory**	
Max. Marks: 30+70		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			

Unit	Topic	No. of Lectures
	Lab Experiment List	
	● Learn how to implement OOPs in C++. ● Demonstration of class and object. ● appropriate use of selection (if, switch, conditional operators) and control structures ● Develop OOPs solutions to problems. ● Write programs using polymorphism. ● Write programs using inheritance ● Demonstration of virtual function. ● Demonstration of static function. ● Demonstration of friend function and class ● Demonstration of unary operator overloading. ● Demonstration of binary operator overloading. ● Write programs using pointers.	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva-Voce	5
Practical Assessment	20
Total	30

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 2nd	**Semester:** III
Course Code: IT301	**Course Title:** PHP & MYSQL		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand the server side scripting language, PHP		
CO 2:	Understand the PHP Get and Post methods working difference		
CO 3:	Develop knowledge of MySQL commands		
CO 4:	Use PHP to access a MySQL database		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks: 30+70	**Min. Passing Marks:**		

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Introduction to PHP: Web Architecture , PHP language building blocks Comparing PHP with other Web scripting languages or technology, Installation of PHP, PHP delimiters, Variable initialization with PHP, PHP Data types, PHP Constants, PHP Operators, Conditional Statements If, If else, If else if else, Nested If else, Switch Case, Jump Statements (Break , Continue , Exit), Looping (Iteration) For loop, While loop, Do while loop, Nested Loop.	12
II	Introducing Array How to use an important programming construct: arrays, Numerically Indexed arrays, Non-Numerically Indexed arrays (Associative Array), Multidimensional arrays, Array sorting	12
III	Manipulation user input Presenting the user with input options via different HTML form elements, Retrieving form data with $_POST,$_GET and $_REQUEST arrays, Preserving Data in Form inputs.	12
IV	Functions Defining functions, Using parameters, Understanding scope, Returning values, Call By Value & Call By reference , Using Require() and include(), Array , String , Math , Date functions	12
V	MySQL Database: Introduction to DBMS and Mysql, Creating a MySQL Database, Creating Database Tables, Column Data Types, Implementing Insert/Delete/Update and select Query, Aggregate Functions, Having and Group By Clause, Joining Table, Implementing Keys & Constraint, Dropping Tables and Databases, Mysql database connectivity.	12

- Suggested Readings:
- PHP: The Complete Reference, Steven Holzner , McGraw Hill Education
- Learning PHP, MySQL & Java Script, Robin Nixon, O'Reilly
- Head First PHP & MySQL, Lynn Beighley, O'Reilly

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 2nd	**Semester:** III
Course Code: IT302	**Course Title:** Web Technology	

Course outcomes: On completion of the course, the student will be able to:

CO 1:	Develop basic HTML pages with formatting, links, images, tables, and forms.
CO 2:	Apply CSS to style HTML pages with backgrounds, colors, fonts, borders, and layout.
CO 3:	Create interactive web pages with JavaScript by manipulating the DOM, handling events, and validating user input.
CO 4:	Utilize server-side scripting with PHP to handle form submissions and connect to a MySQL database.

Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**
Max. Marks: 30+70	**Min. Passing Marks:**

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Introduction to HTML: Basics of HTML, formatting and fonts, commenting code, Hyperlink, lists, tables, images, forms, Meta tags, Character entities, frames and frame sets, Overview and features of HTML5.	12
II	Style Sheets: Need for CSS, Introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS	12
III	Client-Side Scripting: Introduction to JavaScript, Variables and Data Types, Statements and Operators, Control Structures, Conditional Statements, Loop Statements, Object-Based Programming, Functions, Objects, Message box in JavaScript, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes, JavaScript with HTML, Events, Event Handlers, Forms, Forms Array. Document Object Model, (DOM) manipulation, Validating user input using JavaScript	12
IV	Server-Side Scripting: Introduction to PHP, Variables, operators, and control structures in PHP, Functions and arrays in PHP, Server-side form handling and processing, Advance Features: Cookies and Sessions, Introduction to MySQL and database connectivity	12
V	RESTful Web Services and APIs: Introduction to REST architecture, Understanding RESTful web services, Designing RESTful APIs, HTTP methods and status codes for RESTful APIs, Implementing RESTful APIs using Node.js and Express	12

- Suggested Readings:
- HTML5 for Web Designers by Jeremy Keith
- JavaScript: The Good Parts by Douglas Crockford
- Headfirst PHP & MySQL by Lynn Beighley & Michael Morrison

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 2nd	**Semester:** III
Course Code: IT303	**Course Title:** Computer Networks	

Course outcomes: On completion of the course, the student will be able to:

CO 1:	Understand the computer network concepts.
CO 2:	Understand the OSI and TCP/IP Model and working of its different layers.
CO 3:	Earn knowledge of DNS, FTP, HTTP
CO 4:	Know Cryptography and Network Security

Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**
Max. Marks: 30+70	**Min. Passing Marks:**

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Introduction: Goals and Applications of Networks, Network structure and architecture, services, network topology , OSI reference model, TCP/IP Model, Physical Layer- transmission, switching methods	12
II	Medium access sub layer: Channel allocations, LAN protocols, ALOHA Protocols-Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, Ethernet, Error correction & detection algorithms, elementary data link layer protocols, sliding window protocols, error handling.	12
III	Network Layer: Point-to Point networks, concept of virtual circuit and LAN, routing algorithms, congestion control algorithms, internetworking, TCP/IP protocol, UDP, SCTP, IP addresses, classfull and classless addressing, Subneting,IPV4, IPv6 Packet Format	12
IV	Transport Layer: Design issues, connection management, Internet Transport Protocol(UDP), Ethernet transport Protocol, Transmission Control Protocol. (TCP).	12
V	Application Layer: Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Introduction to Cryptography and Network Security Communication Security (IPSec, Firewalls).	12

- Suggested Readings:
- Computer Networks by A. S Tanenbaum, 4 thEdition", Pearson education
- Data Communication and Networking by Forouzan TMH
- Data and Computer Communication by W. Stallings, Macmillan Press

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate		**Year:** 2nd	**Semester:** III
Course Code: IT304	**Course Title:** Cyber Security & Cyber Law		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	To understand the concept of Cyber Security.		
CO 2:	Understand about the security attacks and Cyber security models		
CO 3:	Learn the foundations of Cyber security Policy		
CO 4:	To understand cyber crimes and financial frauds		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks: 30+70	**Min. Passing Marks:**		
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			

Unit	Topic	No. of Lectures
I	Introduction to Cyber Security, Need for security, Concept of Cyber Space, Cyber Crimes and Cyber-attack. Fundamental security principles – threats, attacks and vulnerability. Key Security triad – Confidentiality, Integrity and Availability.	12
II	Introduction to different classes of security attacks - active and passive. Impact of attacks on an organization and individuals. Principles of Cybersecurity - Apply cybersecurity architecture principles. Cyber security models (the CIA triad, the star model, the Parkerian hexad).	12
III	Defining a Cyber Security policy, General security expectations, roles and responsibilities in the organization – Stakeholders.	12
IV	Introduction to key security tools including firewalls, anti-virus and cryptography – Identify security tools and hardening techniques – Prevention of cyber-attacks. Security Countermeasure tools and techniques - Encryption standards.	12
V	Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences.	12

- Suggested Readings:
- William Stallings, (2016)"Principle of Computer Security", McGraw Hill Education, Fourth Edition
- William, Stallings. (2018). Effective Cyber security: A Guide to Using Best Practices and Standards, Addison - Wesley Professional Publishers, 1st Edition.
- Foundation of information technology by D S Yadav . New age publication ltd.

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 2nd	**Semester:** III
Course Code: IT305	**Course Title:** LAB: PHP & MYSQL	
Course outcomes:	On completion of the course, the student will be able to:	
CO 1:	Use Building Blocks of PHP and different types of arrays and functions.	
CO 2:	Working with Forms, Sessions, Cookies and Interacting with MySQL using PHP.	
Credits: 2		**Core Compulsory**
Max. Marks: 30+70		**Min. Passing Marks:**
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		

Unit	Topic	No. of Lectures
	Lab Experiment List	
	• Create a PHP program to find odd or even number from given number. • Write a PHP program to find maximum of three numbers. • Write a PHP Program to demonstrate the function. • Write a PHP program that demonstrate form element (input elements). • Write a PHP program that demonstrate passing variable using URL. • Write a PHP program that demonstrates use of session. • Write a program that demonstrates use of cookies. • Write a PHP program to create a database using MySQL. • Write a PHP program to drop a database using MySQL. • Write a PHP program to insert record into a table using MySQL. • Write a program to update table using MySQL. • Write a PHP program to drop table using MySQL.	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva-Voce	5
Practical Assessment	20
Total	30

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 2nd	**Semester:** III
Course Code: IT306	**Course Title:** LAB : Web Technology		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	To Design and create websites.		
CO 2:	To conduct exploratory user interface design.		
Credits: 2		**Core Compulsory**	
Max. Marks: 30+70		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			
Unit	**Topic**		**No. of Lectures**
	Lab Experiment List		
	● Create a basic HTML page with proper formatting, links, images, and lists. ● Create web pages using HTML simple tags. ● Add CSS to the HTML page to enhance the visual design with backgrounds, colors, fonts, and layout. ● Create cascading style sheet ● Write functions using scripting language ● Use JavaScript to manipulate the DOM of the HTML page, create event handlers, and validate user input in a form ● Develop a server-side script using PHP to process form submissions and save data to a MySQL database. ● Design and implement a RESTful API using Node.js and Express to retrieve and display data from the MySQL database on a web page. ● Implement minor application with HTML, CSS, JavaScript, and PHPcode. ● Develop a website for any real-world problem		**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	**Marks**
Record File	5
Viva-Voce	5
Practical Assessment	20
Total	30

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 2nd	**Semester:** IV
Course Code: IT401	**Course Title:** Programming in JAVA		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand Java Basics and use the java SDK environment to create , debug and run simple java program.		
CO 2:	Implements the object-oriented concepts using Java.		
CO 3:	Develop Java applets.		
CO 4:	Know interface, Super class and Method overriding		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks: 30+70	**Min. Passing Marks:**		
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			

Unit	Topic	No. of Lectures
I	Introduction to Java Procedure Vs Object oriented Programming with reference to OOPSprinciples, History of Java, Java features, JDK, JVM, Hello world program in Java, Compilation Using Java and execution using Java.	12
II	Data types, Tokens in java Tokens of Java, Data types in Java with size and range, simple, floating, Boolean etc. Type conversions, Type casting, declaring variables, Arrays in Java Simple programs in Java base on variables and constants	12
III	Java Operators Arithmetic Operators, Relational, Logical, Bitwise, Boolean operators and their use in Java programs. Control Statement in Java Loops (for, while, do- while), Decision making statement (If- then- end if), nested If, Nested Loops, Switch- case and sample programs .	12
IV	Object Oriented Programming In Java Concept of Class and objects in java, Java Class creation, scope Identifiers, java methods, object and use of methods by objects, sample class based programs in java, method overloading in Java, Abstract class and it's use, java Constuctors.	12
V	Inheritance & Multithreading in Java Define Inheritance, Types of inheritance in Java and use in Programs, interface, Super class, Method overriding, Java Thread model, native methods of threads class. Implementation of threads in java, Simple Applet programming in Java.	12

- Suggested Readings:
- Complete reference Java by Herbert Schildt(5th edition)
- Java 2 Programming Black Book, Steven Horlzner
- Programming with java, a Primer, 4th edition, By E Balgurusamy

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 2nd	**Semester:** IV
Course Code: IT402	**Course Title:** I DBMS	

Course outcomes: On completion of the course, the student will be able to:

CO 1:	Understand terms related to database design and management
CO 2:	Assess various database models.
CO 3:	Implement relational databases using MySQL
CO 4:	Know SQL Query INSERT, SELECT, FROM Clause, WHERE Clause.

Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**
Max. Marks: 30+70	**Min. Passing Marks:**

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Introduction to DBMS: Introduction of Database Management System, Objective of Database Management System, Importance of DBMS, Merit and Demerit of DBMS, Application of DBMS.	12
II	Database Design, Architecture and Model: Overview of The Database Designing Process and View of Data, Structure of Database Management System, Level Database Architecture and Data Independence, Database Languages: DDL, DML, QBE; Data Models: Hierarchical, Network, Relational, E-R Model, Object Base Data Model; E-R Diagram: Concepts, Relationship, Entity Relationship Diagram	12
III	Relational Database Model & Database Normalization: Structure of RDBMS and Terminology, Database Schema and Schema Diagram. Keys: Super, Candidates, Primary, Foreign, Composite etc., Definition and Importance of Normalization, Functional dependencies. Normalization:1NF, 2NF, 3NF, BCNF and 4NF.	12
IV	Creating and Altering Database and Tables (SQL): Introduction to SQL, Creating Database with Different Type of Arguments and Alter Database, Creating Normal tables and Complex tables with different Type of Constraints (Key, Check, Default); Alter Tables: Adding and Dropping Attributes and Other Constraints; Drop Statement: Table, Database.	12
V	Manipulating and Querying Data: INSERT, SELECT, FROM Clause, WHERE Clause; ORDER and GROUP by Clause, Select Statement; INNER JOINS, OUTER JOIN and CROSS JOIN; Building Nested Queries, UPDATE Statement and DELETE Statement; Creating and Altering View.	12

- Suggested Readings:
- Navathe E, "Database management systems",
- Silberschatz & Korth, Database system Concepts, TMH
- Bipin Desai, An Introduction to Database System, Galgotia Pub

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 2nd	**Semester:** IV
Course Code: IT403	**Course Title:** Operating System	

Course outcomes: On completion of the course, the student will be able to:

CO 1:	Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.
CO 2:	Analyse important algorithms e.g. Process scheduling and memory management algorithms
CO 3:	Dead lock management techniques,memory management techniques

Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**
Max. Marks:30+70	**Min. Passing Marks:**

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	**Introduction:** Basics of Operating Systems: Definition – Generations of Operating systems – Types of Operating Systems, OS Service, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems – Concept of Virtual Machine.	12
II	**Process Management**: Processes: Definition, Process Relationship, Process states, Process State transitions, Process Control Block, Context switching – Threads – Concept of multithreads. **Process Scheduling:** Definition, Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response,Time (Definition only), Scheduling algorithms: Pre-emptive and Non, pre-emptive, FCFS – SJF – RR, Multiprocessor scheduling: Types, Performance evaluation of the scheduling.	12
III	**Inter-process Communication:** Race Conditions, Critical Section, Mutual Exclusion, Peterson's Solution, The Producer Consumer Problem, Semaphores, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc	12
IV	**Deadlocks:** Definition, Deadlock characteristics, Deadlock Prevention, Deadlock Avoidance: banker's algorithm, Deadlock detection and Recovery.	12
V	**Memory Management:** Basic Memory Management: Definition, Logical and Physical address map , Memory allocation : Contiguous Memory allocation, Fixed and variable partition, Internal and External fragmentation and Compaction , Paging : Principle of operation, Page allocation, Hardware support for paging, Protection and sharing,	12

- Suggested Readings:
- A Silberschatz, P B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
- A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 2nd	**Semester:** IV
Course Code: IT404	**Course Title:** Cloud Computing Tools & Techniques	
Course outcomes:	On completion of the course, the student will be able to:	
CO 1:	Understand the basics of cloud computing along with virtualization.	
CO 2:	Basic understanding about cloud and virtualization along with it how one can migrate over it.	
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**	
Max. Marks: 30+70	**Min. Passing Marks:**	

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Cloud Computing, Cloud components, Essential characteristics, On-demand selfservice, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.	12
II	Cloud Insights Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors,security, Limitations – Sensitive information - Application development-security level of third party - security benefits, Regularity issues: Government policies.	12
III	Cloud Architecture- Layers and Models Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.	12
IV	Cloud Simulators- CloudSim and GreenCloud Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud	12
V	Introduction to VMWare Simulator Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines understanding virtual machines, create a new virtual machine on local host,	12

- Suggested Readings:
- Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter,TATA McGraw- Hill , NewDelhi – 2010
- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate,Online - Michael Miller
  - Que 2008

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 2nd	**Semester:** IV
Course Code: IT405	**Course Title:** LAB: JAVA	
Course outcomes:	On completion of the course, the student will be able to:	
CO 1:	Program in C Programming Language to Solve Problems using Computer	
CO 2:	Recognize and understand the syntax and construction of C programming code.	
Credits: 2		**Core Compulsory**
Max. Marks: 30+70		**Min. Passing Marks:**
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		

Unit	Topic	No. of Lectures
	Lab Experiment List	
	• Write a java program to find the Fibonacci series using recursive and non recursive functions. • Write a java program to multiply two given matrices • Write a java program for Method overloading, method overriding and Constructoroverloading. • Write a java program to display the employee details using Scanner class. • Write a java program to represent Abstract class with example. • Write a java program to implement Interface using extends keyword. • Write a java program to implement different types of constructor and destructor • . Write a java program to implement single inheritance. • Write a java program to implement multilevel inheritance. • Write a java program to implement hierarchical inheritance.	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva-Voce	5
Practical Assessment	20
Total	30

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 2nd	**Semester:** IV
Course Code: IT406	**Course Title:** LAB: UNIX		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Program in C Programming Language to Solve Problems using Computer		
CO 2:	Recognize and understand the syntax and construction of C programming code.		
Credits: 2		**Core Compulsory**	
Max. Marks: 30+70		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			

Unit	Topic	No. of Lectures
	Lab Experiment List	
	● To learn directory navigation in Unix-like systems. ● To practice Unix commands ● Use of basic Unix Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch,file, wc, sort, cut, grep, dd, dfspace, du, ulimit. ● Practice pattern matching with awk, grep. ● Write a shell script to change date format. Show the time taken in executionof this script. ● Write a shell script to print file names in directory showing date of creation &serial no. of file. ● Write a shell script to count lines, words & characters in its input. (do not usewc). ● Write a shell script to print end of a Glossary file in reverse order using array. ● Write a shell script to compute GCD & LCM of two numbers. ● Write a shell script to find whether a given number is prime..	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva-Voce	5
Practical Assessment	20
Total	30

Subject: Information Technology			
Programme/Class: Diploma		**Year:** 3rd	**Semester:** V
Course Code: IT501	**Course Title:** Python Programming		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand the basics of Python programming, including the interpreter in interactive and script mode, program structure, indentation, identifiers, keywords, constants, variables, and operators.		
CO 2:	Develop programs using conditional and loop blocks and understand the concepts of functions and organize Python code using functions.		
CO 3:	Demonstrate proficiency in file operations in Python.		
Credits: 4		**Core Compulsory**	
Max. Marks: 30+70		**Min. Passing Marks:**	

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Basics of Python programming, Python interpreter - interactive and script mode, the structure of a program, indentation, identifiers, keywords, constants, variables, types ofoperators, precedence of operators, data types, mutable and immutable data types, statements, expressions, evaluation of expressions, comments, input and output statements, data type conversion.	12
II	Python Program Flow Control Conditional blocks: if, else and else if, Simple for loopsin python, For loop using ranges, string, list and dictionaries. Use of while loops in python, Loop manipulation using pass, continue, break and else. Programming using Python conditional and loop blocks.	12
III	Python Complex data types: Using string data type and string operations, Defining list and list slicing, Use of Tuple data type. String, List and Dictionary, Manipulations Building blocks of python programs, string manipulation methods,	12
IV	Python Functions, Organizing python codes using functions. Classes and Objects: An introduction to object-oriented programming in Python.	12
V	Python File Operations: Reading files, Writing files in python, Understanding read functions, read(), readline(), readlines().	12

Suggested Readings:

- T. Budd, Exploring Python, TMH, 1st Ed, 2011
- Python Tutorial/Documentation www.python.or 2015
- Learning Python, 5th Edition" by Mark Lutz

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: NONE

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Certificate

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 3rd	**Semester:** V
Course Code: IT502	**Course Title:** Software Engineering		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Select and implement different software development process models.		
CO 2:	Extract and analyze software requirements specifications for different projects.		
CO 3:	Apply different testing and debugging techniques and analyzing their effectiveness.		
CO 4:	Understand Software Maintenance and Software quality		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks:30+70	**Min. Passing Marks:**		

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Introduction to Software Engineering ,The Evolving Role of Software, Definition & Concept Software Engineering ,Software Characteristics , Software Applications, Software Evolution, Software Crisis & Horizon, Software Myths.	12
II	Software Development Life Cycle(SDLC)and Methodologies: Introduction, Activities of SDLC, A Generic Process Model ,Prescriptive Process models, Waterfall Model, Incremental Process Models, Evolutionary process Models (Prototyping and Spiral Model), Concurrent Models, Types.	12
III	Software Requirement Analysis and Specifications: Software Requirement Specifications, Need of SRS, Steps for constructing good SRS, Behavioral and Non-Behavioral requirements, Analysis Model Design Concepts & Principle, top down and bottom up- design, Cohesion & Coupling,	12
IV	Coding: Top-Down and Bottom-Up programming, Structured programming, Programming style, Do's and Don'ts for Coding. Software Testing: Validation and Verification, Black Box testing approach, White Box testing approach, Levels of testing: Unit Testing, Integration Testing, Validation testing,System testing and debugging.	12
V	Software Maintenance: Software Maintenance Process and its types, Introduction to Reverse Engineering. Software Reliability & Quality Assurance: Software Reliability issues, Software quality, Overview of Quality Standards like ISO 9001	12

- Suggested Readings:
- Ian Sommerville. Software Engineering, Pearson Education (Addison Wesley)
- Waman S. Jawadekar,"Software Engineering: Principles and Practice", McGrawHill
- R. S. Pressman, "Software Engineering – A practitioner's approach", McGraw Hill

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 3rd	**Semester:** V
Course Code: IT503	**Course Title:** Computer Graphics	

Course outcomes:	On completion of the course, the student will be able to:
CO 1:	Understand the structure and components of an interactive computer graphics system.
CO 2:	Understand line drawing and circle drawing algorithm, line clipping algorithm and polygon clipping algorithms.
CO 3:	Understand geometrical transformations and its operations, Colour Model and its conversion

Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**
Max. Marks:30+70	**Min. Passing Marks:**

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	**Introduction of Computer Graphics :** Computer Graphics and its application, components, computer graphics hardware and software, Display Devices and types, Architecture of Raster and Random scan display devices, plasma panel display, LCD , LED.	12
II	**Introduction of Point Plotting Technique & Coordinate System :** DDA Line Drawing Algorithm, Bresenham's line drawing algorithm, Circle Generation Algorithm : Midpoint Circle Generation Algorithm, Bresenham's Algorithm for Circle Generation.	12
III	**Introduction of Transformation and Transformation Principles :** Two Dimensional Transformation, Translation, Scaling, Shearing, reflection and Rotation, Composite transformation, Instant transformation and concatenation of matrices, Homogeneous coordinate and matrices.	12
IV	**Intro of Clipping and Windowing and Viewing Transformation:** Viewing coordinate references frame and window–to-viewport, mapping, Point clipping and Line clipping, Cohen Sutherland algorithm, Midpoint subdivision algorithm, Sutherland-Hodgeman polygon clipping algorithm	12
V	**Color Model :** CIE Chromaticity digram, color (XYZ,RGB,CMY,CMYK,HSV,YIQ,HLS,HIS), Conversions between color models.	12

- Suggested Readings:
- Computer Graphics , Hearn & Baker, PHI
- J.D.Foley, A.Van Dan, Feiner, Hughes Computer Graphics Principles & Practice 2nd edition Publication Addison Wesley 1990.

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 3rd	**Semester:** V
Course Code: IT504	**Course Title:** I Internet of Things	
Course outcomes:	On completion of the course, the student will be able to:	
CO 1:	Understand building blocks of Internet of Things and characteristics.	
CO 2:	Understand the IOT protocols, application and web of things.	
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**	
Max. Marks:30+70	**Min. Passing Marks:**	

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Introduction: IOT - What is the IoT and why is it important? Elements of an IoT ecosystem,Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.	12
II	IOT PROTOCOLS - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFIDProtocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security	12
III	IOT ARCHITECTURE - IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction	12
IV	WEB OF THINGS - Web of Things versus Internet of Things – Two Pillars of the Web –Architecture StandardizationforWoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals andBusiness Intelligence.	12
V	IOT APPLICATIONS - IoT applications for industry: Future Factory Concepts, BrownfieldIoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT-A, Hydra.	12

- Suggested Readings:
- Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012.
- Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet ofThings”, Springer, 2011.
- Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applicationsand Protocols”, Wiley, 2012.

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology

Programme/Class: Certificate	**Year:** 3rd	**Semester:** V
Course Code: IT505	**Course Title:** LAB: Python	
Course outcomes:	On completion of the course, the student will be able to:	
CO 1:	Write, Test and Debug Python Programs.	
CO 2:	Create Conditionals and Loops for Python Programs.	
Credits: 2		**Core Compulsory**
Max. Marks: 30+70		**Min. Passing Marks:**
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4		

Unit	Topic	No. of Lectures
	Lab Experiment List	
	• Write a program in python to check if a number belongs to the Fibonacci sequence. • Write a program in python to solve Quadratic Equations. • Write a program in python to implement a sequential search. • Write a program in python to find the sum of n natural numbers. • Write a program in python to display Multiplication Tables.. • Write a program in python to check if a given number is a Prime Number or not. • Write a program in python to create a calculator program. • Write a program in python to demonstrate use of List. • Write a program in python to demonstrate use of Dictionaries. • Write a program in python to demonstrate class and object. • Write a program in python to demonstrate Inheritance and its type.	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva-Voce	5
Practical Assessment	20
Total	30

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 3rd	**Semester:** V
Course Code: IT506	**Course Title:** LAB: Computer Graphics		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Program in C Programming Language to Solve Problems using Computer		
CO 2:	Recognize and understand the syntax and construction of C programming code.		
Credits: 2		**Core Compulsory**	
Max. Marks: 30+70		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			

Unit	Topic	No. of Lectures
	Lab Experiment List	
	● To draw a line using Simple DDA algorithm ● To study the various graphics commands in C language ● To draw a line using Bresenham's Line algorithm ● Develop the C program for to display different types of lines ● To draw a circle using Bresenham's circle algorithm ● To draw a circle using mid point circle algorithm ● To implement line clipping using Cohen-Sutherland line clipping algorithm ● To translate any object ● To scale any object ● To rotate any object ● To implement Boundary fill algorithm ● To implement point clipping algorithm ● Perform the Polygon clipping algorithm	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva-Voce	5
Practical Assessment	20
Total	30

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 3rd	**Semester:** VI
Course Code: IT601	**Course Title:** I Dot Net using C#		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Acquire the knowledge of the structure and model of the programming language C #		
CO 2:	Understand the use of programming language C # for various programming technologies		
CO 3:	Evaluate user requirements for software functionality required to decide whether the programming language C # can meet user requirements		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks:30+70	**Min. Passing Marks:**		
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			

Unit	Topic	No. of Lectures
I	The .NET Framework: Introduction, Common Language Runtime, Common Type System, Common Language specification, The Base Class Library, The .Net class library Intermediate language, Just-in time Compilation, Garbage Collection, Application Installation and Assemblies, Web services, Unified classes.	12
II	C# Basics: Introduction, Data Types, Identifiers, Variables and constants, C# Statements, Object Oriented Concept, Object and Classes, Arrays and Strings, System collections, Delegates and Events, Indexes, Attributes, versioning.	12
III	C# Using Libraries: Namespace- System, Input Output, Multi-Threading, Networking and Sockets, Data Handling, Windows Forms, C# in web application, Error Handling	12
IV	Advanced Features Using C#: Web services, Windows services, messaging, Reflection, COM and C#, Localization.	12
V	Advanced Features Using C#: Distributed Application in C#, XML and C#, Unsafe Mode, Graphical Device Interface with C#, CASE Study (Messenger Application)	12

- Suggested Readings:
- Jeffrey Richter, "Applied Microsoft .NET Framework Programming", (Microsoft)
- Balagurusamy, "Programming with C# ", TMH
- Wiley," Beginning Visual C# 2008",Wrox

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 3rd	**Semester:** VI
Course Code: IT602	**Course Title:** Data warehousing & Data mining		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand the Data Warehouses, OLAP and data processing.		
CO 2:	Understand the concept of classification, different classification algorithms and their applications.		
CO 3:	Understand the data mining concept, application and their usage.		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks:30+70	**Min. Passing Marks:**		

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Data Mining:- Concepts and Applications, Data Mining Stages, Data Mining Models, Data Warehousing (DWH) and On-Line Analytical Processing (OLAP), Need for Data Warehousing, Challenges, Application of Data Mining Principles, OLTP Vs DWH, Applications of DWH	12
II	Data Preprocessing: Data Preprocessing Concepts, Data Cleaning, Data integration and transformation, Data Reduction, Discretization and concept hierarchy	12
III	Classification Models: Introduction to Classification and Prediction, Issues regarding classification and prediction, Decision Tree- ID3, C4.5, Naive Bayes Classifier.	12
IV	Rule based classification-Neural Networks-Back propagation. Support Vector Machines, Lazy Learners-K Nearest Neighbor Classifier. Accuracy and error Measures evaluation. Prediction:-Linear Regression and Non-Linear Regression	12
V	Cluster Analysis: Introduction, Concepts, Types of data in cluster analysis, Categorization of clustering methods. Partitioning method: K-Means and K-Medoid Clustering.	12

- Suggested Readings:
- Alex Berson And Stephen J.Smith, "Data Warehousing, Data Mining And OLAP",Tata McGraw − Hill Edition, Thirteenth Reprint 2008.
- Jiawei Han And Micheline Kamber, "Data Mining Concepts And Techniques", Third Edition, Elsevier, 2012.

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 3rd	**Semester:** VI
Course Code: IT603	**Course Title:** Big Data		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Provide an overview of an exciting growing field of Big Data analytics		
CO 2:	Introduce the tools required to manage and analyze big data like Hadoop, MapReduce etc.,		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks:30+70	**Min. Passing Marks:**		
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			

Unit	Topic	No. of Lectures
I	Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications. Introduction to Big Data- Evolution of Big data, Best Practices for Big data Analytics, Big data characteristics, Validating, The Promotion of the Value of Big Data, Big Data Use Cases, Characteristics of Big Data Applications, Perception and Quantification of Value, Understanding Big Data Storage, A General Overview of High, Performance Architecture, HDFS, MapReduce and YARN, Map Reduce Programming Model	12
II	Frameworks-Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and Zoo Keeper, IBM InfoSphere Big Insights and Streams	12
III	Clustering and Classification-Advanced Analytical Theory and Methods: Overview of Clustering, K-means, Use Cases - Overview of the Method, Determining the Number of Clusters, Diagnostics, Reasons to Choose and Cautions. Classification: Decision Trees, Overview of a Decision Tree	12
IV	The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree, Decision Trees in R, Naïve Bayes, Baye‟sTheorem, Naïve Bayes Classifier	12
V	Stream Memory and Spark- Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Introduction to Spark Concept, Spark Architecture and components	12

- Suggested Readings:
- David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration
- Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 3rd	**Semester:** VI
Course Code: IT604	**Course Title:** MAT LAB		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Acquire the knowledge of the matlab software package		
CO 2:	Understand the use of Control statements, loop and functions		
CO 3:	Know basic 2D plots, Histogram and Numerical methods for differential equations.		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks:30+70	**Min. Passing Marks:**		
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			

Unit	Topic	No. of Lectures
I	Defining Variables – functions – Matrices and Vectors –Strings – Input and Output statements -Script files – Arrays in Mat lab – Addressing Arrays – Dynamic Array – Cell Array – Structure Array – File input and output – Opening & Closing – Writing & Reading data from files	12
II	Relational and logical operators – Control statements IF-END, IF-ELSE – END, ELSEIF, SWITCH CASE – FOR loop – While loop – Debugging – Applications to Simulation – miscellaneous MAT lab functions & Variables.	12
III	Basic 2D plots – modifying line styles – markers and colors – grids – placing text on a plot – Various / Special Mat Lab 2D plot types – SEMILOGX – SEMILOGY – LOG- LOG – POLAR – COMET – Example frequency response of filter circuits	12
IV	Linear algebric equations – elementary solution method – matrix method for linear equation – Cramer's method – Statistics, Histogram and probability – normal distribution – random number generation – Interpolation – Analytical solution to differential equations – Numerical methods for differential equations.	12
V	Simulink – Simulink model for a dead zone system, nonlinear system – Applications in DSP – Computation of DFT & FFT – Filter structure – IIR & FIR filter design – Applications in Communication PCM, DPCM, DM, DTMF- Interfacing of Matlab with event driven simulators.	12

- Suggested Readings:
- Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson, Third Edition, 2010.
- Stormy Attaway, 'MATLAB: A Practical Introduction to Programming and Problem Solving', fifth Edition

Suggested equivalent online courses:

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 3rd	**Semester:** VI
Course Code: IT605	**Course Title:** LAB: C#		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Create various software in C# programming language.		
CO 2:	Write, compile and debug programs and implements the concept of object oriented programming in C# language.		
Credits: 2		**Core Compulsory**	
Max. Marks: 30+70		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			

Unit	Topic	No. of Lectures
	Lab Experiment List	
	• Write a program in C# to solve Quadratic Equations. • Write a program in C# to implement a sequential search. • Write a program in C# to find the sum of n natural numbers. • Write a program in C# to display Multiplication Tables.. • Write a program in C# to check if a given number is a Prime Number or not. • Write a C# programs to demonstrate the concepts of Constructors. • Write a C# programs to demonstrate the concepts of Inheritance • Write a C# programs to demonstrate the concepts of Polymorphism • Write a C# programs to demonstrate the concepts of Label, Text Box and Button controls. • Write a C# programs to demonstrate the concepts of Combo Box and List Box controls.. • Create a Windows application in C# for registration form and fill the details and when youclick the submit button it display the details in the message box • Design a window based application using C# • Develop a C# application to print the students list using classes andobjects	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva-Voce	5
Practical Assessment	20
Total	30

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 3rd	**Semester:** VI
Course Code: IT606	**Course Title:** Lab Data Mining using Python		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Program in python Programming Language to Solve Problems in data mining field.		
CO 2:	Implement the data mining algorithm using python programming language		
Credits: 2		**Core Compulsory**	
Max. Marks: 30+70		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			
Unit	**Topic**		**No. of Lectures**
	Lab Experiment List		
	• Write a program in python to find the sum of n natural numbers. • Write a program in python to display Multiplication Tables. • Write a program in python to create a calculator program. • Write a program in python to check if a given number is a Prime Number or not. • Implementing data mining K-Means Algorithm in python • Implementing data mining KNN Algorithm in python Language. • Write a python program to remove stop words. • Write a python program to convert upper case data to lower case. • Write a pyhon program to find the sentiment of the sentence. • Write a python program to plot pie chart, bar graph • Write a python program to find the polarity of the sentence.		**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	**Marks**
Record File	5
Viva-Voce	5
Practical Assessment	20
Total	30