Syllabus for B. Sc. Information Technology (Hons) under CBCS w.e.f. the Academic Year 2016-2017

Semester - I		Credits
Core-1	Programming Fundamentals using C	4
	C Programming Lab	2
Core-2	Computer System Architecture	6
GE-1(Generic Elective)	<From other subject>	
AECC(Ability Enhancement Compulsory Course)	Environmental Studies	2
Semester - II		
Core-3`	Data Structures	4
	Data Structure Lab	2
Core-4	Data Communication and Networking	6
GE-2(Generic Elective)	<From other subject>	
AECC-2(Ability Enhancement Compulsory Course)	MIL Communication	2
Semester - III		
Core-5	Object Oriented Programming in C++	4
	C++ Programming Lab	2
Core-6	Operating Systems	6
Core-7	Internetworking	6
GE-3(Generic Elective)	<From other subject>	
SEC-1(Skill Enhancement Course)	Communicative English	2
Semester - IV		
Core-8	E-Commerce	6
Core-9	Software Engineering	6
Core-10	Database Management Systems	4
	Database Lab	2
GE-4(Generic Elective)	<From other subject>	
SEC-2(Skill Enhancement Course)	<From the pool of SEC courses>	2
Semester - V		
Core-11	Web Technology	6
Core-12	Java Programming	4
	Java Programming Lab	2
DSE-1 (Discipline Specific Elective) **Any one**	Information Security /Computer Graphics/	6
DSE-2(Discipline Specific Elective) **Any one**	Artificial Intelligence / Introduction to Data Sciences	6
Semester - VI		
Core-13	Programming in Visual Basic	4
	Visual Basic lab.	2

Core-14	Data Warehousing and Data Mining	6
DSE-3(Discipline Specific Elective) **Any one**	Cloud Computing / Information Theory and Coding	6
DSE-4(Discipline Specific Elective)	Software Development Project Work	6
	Total	**140**

Note:

1. **There is no midterm Exam for the practical/Lab papers**
2. **When the AECC & SEC courses are practical in nature then there will be no Midterm exam and it will be of 50 marks, otherwise it will be distributed as End Sem (40 marks) + Midterm (10 marks).**

SEMESTER - I

Core – 1

Programming Fundamentals using C

Unit -1
Overview of Procedure oriented programming, Data types, Defining and Initializing Variables, Scope of Variables,Keywords, Casting of Data Types, Operators (Arithmetic, Relational, and Logical), main() function, Compiling and Executing a program, Using Comments in programs, Character I/O (getc, getchar, putc), printf(), scanf(), Basic Header Files (stdio.h, conio.h, math.h, string.h, etc).

Unit -2
Simple Expressions in C, Understanding precedence of Operators in Expressions, Conditional Statements (IF, IF… ELSE, Nested IF, Switch-Case), Iterative Statements(FOR, WHILE, and DO-WHILE), Use of BREAK and CONTINUE in Loops, Nested loops.

Unit -3
Use of functions, Call by Value, Call by Reference, Functions returning value, Void function,One Dimensional Arrays (Declaring an Array, Initializingan Array, Accessing individual elements in an Array, Manipulating array elements usingloops), Use Various types of arrays (integer, float and character arrays / Strings), Two-dimensional Arrays, Workingwith Rows and Columns of a matrix.

Unit -4
Understanding use of structures, Declaring, initializing and using simplestructures, Manipulating individual members of structures, Array ofStructures, Understanding Pointer Variable, Simple use of Pointers, Pointer arithmetic, Differentiating between static and dynamic memory allocation, use of malloc and calloc functions,Simple file handling operations.

Books:

1. Programming in ANSI C - E. Balguruswamy, TMH
2. Let us C - Yaswant Kanitkar, BPB

C Programming Lab

1. Write a program to find the maximum among three numbers.
2. Write a program to find factorial of a number.
3. Write a program to print the Fibonacci series.
4. Write a program to print the prime numbers between 1 to n.
5. Write a program to check if it a Palindrome (e.g., madam).
6. Write a program to check if it is an Armstrong number. (An Armstrong number of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself)
7. Write program to reverse the digits of an input number.
8. Write a program to find the sum of digits of a number.
9. Write a program to find the GCD and LCM of two numbers.
10. Write a program to perform different arithmetic operations using switch….case.
11. Write a program to count the number bits "1" in a given binary number.
12. Write a program to find the factorial of a number using function.
13. Write a program to perform the arithmetic operations using function.
14. Write a program to find the largest element in an array.
15. Write a program to add two matrices.
16. Write a program to multiply two matrices.
17. Write a program to find the position of a given character in a string.
18. Write a program to count the number of times a character occurs in a string.
19. Write a program to create records of 10 students using structure.
20. Write a program to count the number of words, number of lines in a text file.

Core – 2

Computer System Architecture

Unit -1
Number systems – Decimal, Binary, Octal and Hexa-decimal number systems and their inter conversion, 1's & 2's complement, Binary Fixed- Point Representation, Arithmetic operations on Binary numbers, Overflow & underflow. Logic Gates, AND, OR, NOT gates and their Truth tables, NOR, NAND & XOR gates, Boolean Algebra – Basic Operations and Boolean Law's, Demorgan's theorem.

Unit -2
Sum of Product & Product of Sum, K-Map, Combinational & Sequential circuits, Half Adder & Full Adder, Adder & Subtractor, Multiplexer, De-multiplexer, Encoder, Decoder.

Unit -3
Flip-flops - RS, D, JK & T Flip-flops, Registers, Shift Registers, Counters.

Unit -4
Central Processing Unit: General register organisation, Stack organisation, Instruction Formats, Addressing modes, Memory: Main memory, Auxiliary memory, DMA- control signals for DMA transfers, Block diagram of DMA controller, DMA transfer in a microcomputer system.

Books:

1. Computer System Architecture - M. Mano, Pearson Education
2. Computer Organization, Fifth edition - Carl Hamacher, McGrawHill
3. Digital Design - M. M. Mano, Pearson Education Asia
4. Computer Fundamentals - B. Ram, New Age International Publishers

SEMESTER - II

Core - 3

Data Structures

Unit -1
Primitive and non-primitive data types, Linear and non-linear data structures, Memory representation of Arrays (Single and Multi-dimensional Arrays), Representation of Stack, Queue,and Circular Queue, Insertion and deletion operations on these data structures,Applications of stack and Queue: Evaluation of recursive functions, Job Queues.

Unit -2
Limitations of Array representation, Linked List and its advantages, Representation of Singly, Doubly and Circularly linked Lists, Insertion and deletion operations on these data structures, Link list representation for Stack and Queue,Applications of linked list: Representation of polynomials, Sparse Matrix and its representation using Array and Linked list.

Unit -3
Introduction to Tree as a data structure, Binary Tree: Definition, related terminologies, Memory representation of Binary tree using array and linked list, Operations such as Inorder, Preorder, and Post order Traversals (recursive algorithms only), Binary Search Tree,Threaded Binary Tree (Representation only),Concept of Height-Balanced Tree.

Unit -4
Searching and Sorting techniques: Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Bubble sort, Insertion Sort, Comparison of Sorting techniques. Merging of arrays.

Books:

1. Data Structures, Schaume's Outlines, By Lipschutz TMH Publications
2. Data Structures, By Ellis Horowitz, SartajSahani, Galgotia Publications
3. Data Structures using C & C++ By Aaron M. Tenenbaum, YedidyahLangsam PHI

Data Structure Lab

1. Write a program in C to search for an item in an array and display its position using Linear search.
2. Write a program in C to search for an item in an array and display its position using Binary search.
3. Write a program in C to arrange a set of numbers in ascending order of values using Selection sort technique.
4. Write a program in C to arrange a set of numbers in ascending order of values using Bubble sort technique.
5. Write a program in C to perform Insertion and Deletion operations in a Stack represented as an array.
6. Write a program in C to perform Insertion and Deletion operations in a Queue data structure represented as an array.

7. Write a program in C to perform Insertion and Deletion operations in a Circular Queue represented as an array.
8. Write a program in C to perform Insertion and Deletion operations in a Stack represented as a linked list.
9. Write a program in C to perform Insertion and Deletion operations in a Queue data structure represented as a linked list.
10. Write a program in C to merge two sorted arrays.

Core - 4

Data Communication and Networking

Unit - 1

Overview of Data Communications and Networking: Introduction, Network Models
Physical Layer: Signals, Digital Transmission, Analog Transmission, Multiplexing, Transmission Media, Circuit Switching and Telephone Network.

Unit - 2

Data Link Layer: Error Detection and Correction, Data Link Control and Protocol, Point to Point Access: PPP, Multiple Access, Local Area Networks: Ethernet, Wireless LANs, Backbone Networks, Virtual LANs, Cellular Telephone and Satellite Networks, Virtual Circuit Switching.

Unit - 3

Network Layer: Host-to-Host Delivery: Internetworking, Addressing and Routing, Network Layer Protocols: ARP, IPv4, ICMP, and IPv6, Routing, Unicast and Multicast Routing

Unit - 4

Transport Layer: Process-to-Process Delivery: UDP and TCP, Congestion Control.
Application Layer: Client-Server Model, Socket Interface, Domain Name System (DNS), Electronic Mail (SMTP), and File Transfer (FTP), HTTP and WWW.

Books:

1. Data Communications and Networking - B A Forouzan, TMH.
2. Computer Networks - A S Tanenbaum, PHI
3. Data and Computer Communications - W Stallings, PHI

SEMESTER - III

Core - 5

Object Oriented Programming in C++

Unit -1

Object Oriented Programming concept, Procedural vs OOP programming, OOP terminology and features, Tokens, Character set, Keywords, Data-types, Constants and variables, expressions, Standard Library and header files. Operator and Expressions: Arithmetic Operator, Increment/Decrement Operator, Relational Operator, Logical Operator and conditional operators, library functions, Logical Expressions.

Unit - 2
Control statements,IF, IF …ELSE, Nested IF, Switch….Case, Looping statements, While, Do-while, For statements, nested loops.
Classes and Objects: Need for Classes, Declaration of Classes, referencing class Members, Data members and member Functions, Inline Functions, Creation of objects

Unit -3
Use of access specifiers, Public and Private, Function Overloading, use of Constructors and Destructors, Types of constructors: default, parameterized, and copy constructors, Operator overloading, Friend function, Arrays of objects.

Unit - 4
Concept of Inheritance, Types of inheritance: Single level, multi-level, multiple, hybrid, Use of protected access specifier, Function overriding,Exception handling, Simple file handling.

Books:

1. Object Oriented Programming with C++ -E. Balaguruswamy, TMH
2. Let us C++ -YashavantKanetkar, BPB
3. Object Oriented Programming with C++ -Sourav Sahay, Oxford University Press
4. The C++ Programming Language - Bjarne Stroustrup, Addison-Wesley

C++ Programming Lab

1. Define a class called STUDENT with the data members Roll No., Name, Marks secured in five subjects. Write member functions to do the following:
    i. Read data
    ii. Find the total mark and division
    iii. Display Roll No., Name, Total mark, and Division
2. Define a class called SHAPE with appropriate data members. Find the area of different geometrical shapes using function overloading.
3. Define a class called ACCOUNT with the data members Account no. Customer name, Amount and initialize with suitable constructor. Write member functions to do the following:
    i. Deposit amount
    ii. Withdraw amount
    iii. Check balance
4. Using operator overloading add two given Lengths expressed as Feet and Inch.
5. Using operator overloading add two given TIMEs expressed as Hour : Minute : Second.
6. Concatenate two strings by overloading the '+' operator.
7. Define a class called PLAYER with the data members Player ID, player name, highest runs scored, batting average, and number of wickets taken. Create 10 player instances (using array of objects) and initialize them with parameterized constructors. Write a member function to display the details of a player on inputting the player ID.
8. Define a class called PERSON with the data members Name, DOB, PAN #. Inherit two classes from it (i) CUSTOMER with A/C no. & Amount and (ii) EMPLOYEE with Organization, Designation & Salary. Write suitable member functions to do the following:
    i. Input data for both base as well as derived class objects
    ii. Display customer details along with name, DOB and PAN #

iii. Display employee details along with name, DOB and PAN #

9. Define a class called STACK and implement the PUSH and POP operations on it.
10. Define a class called QUEUE and implement the Insertion and Deletion operations on it.

Core - 6

Operating Systems

Unit -1
Introduction, Basic OS functions, resource abstraction, types of operating systems–Batch, Multi programming, Time sharing, and Real time systems; operating systems for personal computers, Operating System Organization, Processor and user modes, kernels, system calls and system programs.

Unit -2
Process Management, Process State Transition diagram, Non-pre-emptive and pre-emptive scheduling algorithms: FCFS, Shortest Job First, Round Robin, Priority Scheduling, Concurrent processes, concept of critical section, semaphores, Concept of Deadlock, Condition for deadlock. Concept of deadlock prevention, detection and recovery.

Unit -3
Memory Management, Physical and virtual address space, memory allocation strategies: fixed and variable partitions, Paging, Segmentation, Demand paging, virtual memory, Page replacement techniques (FIFO, LRU and Optimal).

Unit -4
File and I/O Management, Directory structures:Single level, multi-level, and tree structured directory, Concept of file, file operations, file allocation methods, Disk scheduling techniques(FCFS, Shortest Seek Time First, and Scan), File Protection and Security Policy, File Authentication andAccess control.

Books:

1. Operating Systems Concepts -A. Silberschatz and P.B. Galvin, John Wiley
2. Operating Systems - A Concept based Approach – D M Dhamdhere, TMH
3. Modern Operating Systems - A.S. Tanenbaum, Pearson Education
4. Operating Systems - Concepts and design- M. Milenkovic, Tata McGraw Hill

Core - 7

Internetworking

Unit - 1
An Overview on Internet, Internet services, Internet protocols and standardization, Review of Network technologies, TCP/IP
Internetworking Concepts, Architectural model, Application level interconnection, Network level interconnection, Properties of the Internet, Interconnection through IP Gateways or routers, Internet and Intranet

Unit - 2

Internet Address, Universal identifiers, Three primary classes of IP addresses, Classless IP address, Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format, Transport Gateways and subnet addressing, Multicast addressing.

Internet Protocol, Connectionless delivery system, Internet Datagram, Table driven IP routing, Bootstrap protocol (BOOTP)

Unit - 3

Routing, The origin of Gateway routing tables, Automatic route propagation, Vector distance (Bellman-Ford) routing, Gateway to Gateway Protocol (GGP), Exterior Gateway Protocol (EGP), Interior Gateway Protocol, Routing Information Protocol (RIP)

Unit - 4

Enterprise Networking, Broadband, High speed dedicated WAN services and switched WAN services, ISDN, BISDN and ATM services, Virtual private network concepts, DNS, DHCP Servers, FTP, TELNET, E-Mail, Firewall, Activities of Firewall, Configuration of firewall

Books:

1. Internetworking with TCP / IP - Douglas E .Comer, PE.
2. TCP/IP protocol suite - Forouzan Behrouz A, TMH.
3. Computer Networks – Andrew S. Tanenbaum, PHI.
4. Data and Computer Communication - William Stallings, PHI.

SEMESTER - IV

Core - 8

E-Commerce

Unit - 1

Introduction to E-Commerce, Definition, Scope of E-Commerce, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

E-Commerce business models, B2B, B2C, C2C, Electronic Markets, Electronic Data Interchange (EDI), Technology, Standards, Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce.

Unit - 2

Electronic Payment system (EPS): Over view of EPS, smart card, credit card and debit card based EPS, financial instrument. Home banking, On-line banking

E-business, Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing

Unit - 3

Legal issues, Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract.

Security threats, transaction security Security Solutions, Symmetric and Asymmetric Cryptosystems, and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol

Unit - 4

Mobile Commerce: Introduction to mobile commerce, Mobile computing applications, WAP technology, mobile information devices, client- server network

Books:

1. E-Commerce-Strategy, Technologies & Applications - David Whitley, TMH
2. E-Commerce- The cutting edge of business - Kamlesh K. Bajaj, TMH
3. E-Commerce - Ritendra Goel, New Age International

Core - 9

Software Engineering

Unit -1

The Evolving Role of Software, Software Characteristics, Software Engineering Approach, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

Unit -2

Software Requirement Analysis: Requirement Analysis and Modelling Techniques, Flow Oriented Components of SRS, Need for SRS, Software Project Management:Project Estimation, Project Scheduling,Software Risks:Risk Management, Risk Identification, Risk Projection and Risk Refinement, RMMM.

Unit -3

Software Quality: Software Quality Assurance, Metrics for Process and Projects, Software Design: Design Concepts, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture.

Unit -4

Software Testing:Strategic Approach to SoftwareTesting, Test case generation, Validation Testing, System Testing, Black-Box Testing, White-Box Testing, Path Testing.

Books:

1. Fundamentals of Software Engineering - Rajiv Mall
2. Software Engineering: A Practitioner's Approach - R.S. Pressman

Core - 10

Database Management Systems

Unit -1

Concept of Database and DBMS, Characteristics of database approach, Role of DBMS, Data models

(Relational, Hierarchical, network and Object-oriented), Layered architecture of DBMS, Data independence.

Unit -2

Entity Relationship(ER) Modeling, Entity types, relationships, constraints. Relational data model, relational constraints, Mapping ER models to relational database, Relational algebra, SQLqueries.

Unit -3

Database design, Data dependencies (functional transitive, and multi-valued), Normalforms(INF, 2NF, and 3NF), Database transactions: Transaction Processing, ACID properties, concurrency control.

Unit -4

File Structure and Indexing, overview of File organizations (Sequential, Indexed, and Direct Access files), Indexing (Primary index, secondary index, clustering index), Concept of B and B+ trees.

Books:

1. Database Systems Concepts - A. Silberschatz, H. F. Korth, S. Sudarshan (McGraw Hill)
2. Fundamentals of Database Systems - Elmsari and Navathe (Addision Wesley)
3. Database Management Systems – Rajiv Chopra, S Chand

Database Lab

Create tables as indicated against each question and write SQL statements to answer the given queries:

1. Student (roll_no, name, department, marks), Attendance (roll_no, department, attendance)
    a) Create the table with above schema
    b) Display the details of the students
    c) Display the details of the student with attendance less than 20
    d) Find the average mark of student having attendance less than 20
    e) Find the average mark.
    f) Display the details of the students whose name starts with ‘s’
    g) Display details of the student with mark greater than 70
    h) Display the details of the students whose name starts with ‘s’ or ‘c’
    i) Find subject wise average mark
    j) Display details of the students whose age is between 20 and 23

2. Course (roll_no, subject, mark) Attendance (roll_no, name, attendance)
    a) Create the table with above schema
    b) Find the Roll no. of the student securing the highest mark in a given subject
    c) Display the roll_no, marks of student who have taken the subject “IT”
    d) Display the average marks of the students who have attendance less than 25
    e) Find average mark for each subject
    f) Find lowest marks in each subject
    g) Find the Roll no.s of the students securing highest mark in each subject
    h) Find the student names with highest and lowest attendance
    i) Display the subjects taken by the students whose attendance more than 30
    j) Display the attendance details of the students whose mark less than 200

3. Employee (Emp_Id, Name, Address, Salary) Leave(Emp_Id,Leave_Taken)
    a) Create the table with above schema
    b) Count the number of employee with salary greater than 5000
    c) Find average salary of the employee who have taken more than 15 leaves
    d) Find average salary of all the employees
    e) Display the details of the employee with highest salary
    f) Display the leave details of the employee whose name starts with 'R'
    g) Display the details of the employee whose salary less than 3000
    h) Count the number of employee belongs to "Education" department
    i) Display the details of the employee whose salary is between 10000 and 20000
    j) Find average salary of the employees belong to "Revenue" department

SEMESTER - V

Core - 11

Web Technology

Unit - 1

Developing Static Web Pages, types and issues, tiers; WWW-Basic concepts, web client and web server, http protocol, universal resource locator (url), HTML- different tags, sections, image & pictures, listings, tables, frame, frameset, forms

Unit - 2

Developing Dynamic Web Pages, need for dynamic web pages; an overview of DHTML, cascading style sheet (css), comparative studies of different technologies of dynamic page creation.
Active Web Pages, Need for active web pages; Java applet life cycle

Unit - 3

Java Script, Data types, variables, operators, conditional statements, array object, date object, string object.
Java Servlet, Servlet environment and role, HTML support, Servlet API, The servlet life cycle, Cookies and Sessions.

Unit - 4

JSP architecture, JSP servers, JSP tags, understanding the layout in JSP, Declaring variables, methods in JSP, inserting java expression in JSP, processing request from user and generating dynamic response for the user, inserting applets and java beans into JSP, using include and forward action, comparing JSP and CGI program, comparing JSP and ASP program; Creating ODBC data source name, introduction to JDBC.

Books:

1. Web Technologies - Godbole A. S. & Kahate A., TMH
2. Web Technology & Design - Xavier C., New Age Publication
3. Java Server Programming, J2EE edition, WROX publishers

Core - 12

Java Programming

Unit -1
Java Architecture and Features, Difference betweenC++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords, DataTypes, Operators, Expressions, Executing Basic Java Programs, Conditional and looping statements.

Unit -2
Java Methods, Definition, Scope, Passing and Returning Arguments, Type Conversion and TypeChecking, Built-in Java Class Methods, Using Arrays(1-D and 2-D),Java Strings: Java String class, Creating and Using String Objects,Manipulating Strings.

Unit -3
Defining and Using Classes in Java, Controlling Access to Class Members, Constructors, Method Overloading, Class Variables and Methods, Objectsas parameters, final keyword.

Unit -4
Inheritance (Single Level and Multilevel), Method Overriding, Interfaces and Packages, Extending interfaces and packages,Introduction to Applets, Writing Java Applets, Event Handling in Java.

Books:

1. Programming with Java - E. Balaguruswamy, 4th Edition, McGraw Hill
2. Programming in Java - Sachin Malhotra and Saurabh Choudhury, Oxford University Press
3. Programming with JAVA -John R. Hubbard, Schaum's Series, McGraw Hill

Java Programming Lab

1. Write a Java Program to define a class called Student (Name, Roll No, Course, Marks in five papers). Find division of the student.
2. Write a Java Program to define a class, describe its constructor, overload the Constructor and instantiate its object.
3. Write a Java Program to define a class, define instance methods and overload them and use them for dynamic method invocation.
4. Write a Java Program to demonstrate use of sub class.
5. Write a Java Program to demonstrate use of nested class.
6. Write a Java Program to implement array of objects.
7. Write a Java program to practice using String class and its methods.
8. Write a Java Program to implement inheritance and demonstrate use of method overriding.
9. Write a program to demonstrate use of implementing interfaces.
10. Write a program using Applet to display a message in the Applet.

Discipline Specific Electives

DSE – 1

(Under DSE-1, a student has to choose either Information Security or Computer Graphics)

Information Security

Unit -1
Introduction to Information security, Security issues,types of Attacks, Security Services, Cryptography, Encryption and decryption techniques, Substitution ciphers,Transpositions Cipher, Confusion, diffusion, Symmetric and Asymmetric Encryption, DES, Hash function, key exchange

Unit -2
Program Security:Secure programs, Non malicious Program errors, Malicious codes, virus, Trap doors, Salamiattacks, Covert channels, Control against program
Protection in OS: Memory and Address Protection, Access control, File Protection, User Authentication

Unit -3
Database Security:Requirements, Reliability, Integrity, Sensitive data, Inference, Multilevel Security
Security in Networks:Threats in Networks, Security Controls, firewalls, Intrusion detection systems, Secure e-mails

Unit -4
Administrating Security:Security Planning, Risk Analysis, Organisational Security Policy, Physical Security, Ethical issuesin Security, Cyber criminals and Cyber laws, DigitalSignatures, Digital Certificates

Books:
1. Security in Computing - C. P. Pfleeger and S. L. Pfleeger, PHI
2. Network Security Essentials - Applications and Standards - W. Stallings, PHI

Computer Graphics

Unit -1
Definition, Application, Pixel, Frame Buffer, Raster and Random Scan display, Display devicesCRT, Color CRT Monitors, Scan Conversion of line- DDA algorithm of line drawing, Scan conversion of circle- Bresenham's circle generating algorithm, Polygon Filling-Scan line polygon filling algorithm.

Unit -2
2-D transformation, Translation, Rotation, Scaling, Homogeneous Coordinates, 3-D transformation, Translation, Rotation Scaling, Reflection, Shear.

Unit -3
Window to view port transformation, clipping, line clipping, Cohen –Sutherland line clipping, Polygon clipping, Sutherland and Gary Hodgman polygon clipping algorithm.

Unit -4
Hidden Surface removal—Depth comparison, Z-Buffer Algorithm, Back-Face Removal, The Painter's Algorithm, Scan-Line Algorithm, Subdivision Algorithm.

Books:

1. Computer Graphics – Donald Hearn and M. Pauline Baker (Pearson)
2. Computer Graphics - Zhigang Xiang, Roy A. Plastock (McGraw-Hill, India)
3. Computer Graphics – Er. Rajiv Chopra, (S. Chand Publication)
4. Principles of Interactive Computer Graphics − W.M. Newmen, R F Sproull (McGraw Hill)

DSE – 2

(Under DSE-2, a student has to choose either Artificial Intelligence or Introduction to Data Science)

Artificial Intelligence

Unit -1

Definition of AI, Characteristics of AI problems, AI problem solving approaches, State space search, problem reduction, search techniques, Breadth first and Depth first techniques, Heuristic search techniques, Hill climbing, Best first search.

Unit -2

Knowledge representation in AI, propositional logic, Semantic nets, Frames, and Scripts.
Handling uncertainty in AI problems, Probabilistic reasoning, Bayesian Belief networks

Unit -3

Concept of Learning, types of learning, Artificial Neural networks, ANN structures, Feed forward networks, Back propagation network, Applications of ANN.

Unit -4

Natural language processing, levels of knowledge used in language understanding, parsing, top-down and bottom-up parsing, transition networks
Expert systems, ES architecture, need for ES, steps for developing an expert system.

Books:

1. Artificial Intelligence: A Practical Approach – Rajiv Chopra, S. Chand publications
2. Introduction to Artificial Intelligence and Expert Systems – D W Patterson, PHI

Introduction to Data Science

Unit -1

Data Scientist's Tool Box: Turning data into actionable knowledge, introduction to thetools that are used in building data analysis software: version control, markdown, git,GitHub, R, and RStudio.

Unit -2

R Programming Basics: Overview of R, R data types and objects, reading and writingdata, Control structures, functions, scoping rules, dates and times, Loop functions,debugging tools, Simulation, code profiling

Unit -3

Getting and Cleaning Data: Obtaining data from the web, from APIs, from databasesand from colleagues in various formats. Basics of data cleaning and making data

Exploratory Data Analysis: techniques for summarizing data, eliminating or sharpening potential hypotheses about the world, common multivariate statistical techniques tovisualize high-dimensional data.

Unit -4

Concepts and tools behind reporting modern data analyses in areproducible manner, To write a document using R markdown, integrate live R code into statistical program, compile R markdown documents using knitr and related tools,organize data analysis so that it is reproducible and accessible to others.

Books:

1. Doing Data Science: Straight Talk from the Frontline - Rachel Schutt, Cathy O'Neil, Schroff/O'Reilly
2. Data Science for Business: What You Need to KnowAbout Data Mining and Data-Analytic Thinking - Foster Provost, Tom Fawcett, O'Reilly
3. Data Smart: Using data Science to Transform Information intoInsight John W. Foreman, John Wiley & Sons
4. Mining the Social Web: Data mining Facebook, Twitter, Linkedln,Google+,GitHub, and More - Matthew A. Russel, O'Reilly Media

SEMESTER - VI

Core - 13

Programming in Visual Basic

Unit - 1

GUI Environment: Introduction to graphical user interface (GUI), programming language (procedural, object oriented, even driven), The GUI environment, compiling, debugging and running the programs. Controls: Introduction to controls text boxes, frames, check boxes, option buttons, images, setting boarders and styles, the shape control, the line control, working with multiple controls.

Unit - 2

Operations: Data types, constants, named & intrinsic, declaring variables, scope of variables, VAL function, arithmetic operations, formatting data. Decision Making: If statement, comparing strings, compound conditions (and, or, not), nested if statements, case structure, using if statements with option buttons & check boxes, displaying message in message box, testing whether input is valid or not.

Unit - 3

Modular programming: Menus, sub-procedures and sub-functions defining / creating and modifying a menu, using common dialog box, creating a new sub-procedure, passing variables to procedures, passing argument by value or by reference, writing a function/ procedure. Forms handling.

Unit - 4

Iteration handling: Do/ loops, for/ next loops, using msgbox function, using string function, Arrays and Grouped data control: Arrays-1-dimension arrays, initializing an array using for each, user-defined data types, accessing information with user-defined data types, using list boxes with array, Database connectivity.

Books:

1. Programming in Visual Basic 6.0 – Julia Case Bradley, Anita C. Millispangh, TMH

Visual Basic Lab

1. To implement a Visual Basic program to calculate the simple interest and compound interest.
2. To implement a Visual Basic program to generate Fibonacci series.
3. To implement a Visual Basic program to create a scientific calculator using control arrays.
4. To implement a Visual Basic program to perform string operations based on the user choice.
5. To implement a Visual Basic program to perform matrix operations.
6. To implement a Visual Basic program to prepare salary calculation of employees.
7. To create a Visual Basic application with MDI features and text editing capabilities.
8. To create a Visual Basic application to compute discounts for different product and print the net price.
9. To implement a Visual Basic program to design a calendar.
10. To implement a Visual Basic program to create a student mark sheet.

Core – 14

Data Warehousing and Data Mining

Unit -1
Concept of a Data warehouse, features of data warehousing: subject oriented, integrated, time variant, and non-volatile, multi-dimensional data model, data cubes, OLAP operations: roll-up, drill-down, slice and dice, Architecture of data warehouse.

Unit -2
Concept of Data mining, data mining techniques, process of knowledge discovery in databases, mining frequent patterns, market basket analysis, Association rule mining, Interestingness measures.

Unit -3
Classification and prediction, classification techniques, decision tree, rule-based classification, k-Nearest neighbor classifier, Bayesian classification, linear regression.

Unit -4
Cluster analysis, clustering techniques, k-Means and k-Medoids methods, Introduction to Hierarchical and Density-Based methods, Outliers.
Applications of data mining in finance, business, social networks, and web mining

Books:

1. Data Mining: Concepts and Techniques - J Han and M Kamber, Elsevier
2. Data Mining Techniques - Arun K Pujari, University Press

Discipline Specific Electives

DSE – 3

(Under DSE-3, a student has to choose either Cloud Computing or Information Theory and Coding)

Cloud Computing

Unit -1

Recent trends in Computing: Grid Computing, Cluster Computing, DistributedComputing,Utility Computing, Cloud Computing,Cloud serviceproviders, Benefits and limitations of Cloud Computing

Unit -2

Cloud Computing Architecture, Comparison with traditionalcomputing architecture (client/server), Services provided at various levels, ServiceModels- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software asa Service(SaaS), How Cloud Computing Works, DeploymentModels- Public cloud, Private cloud, Hybrid cloud, Community cloud

Unit -3

Service Management in Cloud Computing, Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware:Traditional vs. Cloud, Economics of scaling.
Examples of cloud systems like Google App Engine, Microsoft Azure, AmazonEC2.

Unit -4

Cloud Security, InfrastructureSecurity, Network levelsecurity, Hostlevelsecurity, Application levelsecurity, Data security and Storage- Data privacy and security Issues, Jurisdictionalissues raised by Data location, Authentication in cloud computing

Books:

1. Cloud Computing – U S Pandey and K Choudhary, S Chand
2. Cloud Computing: Principles and Paradigms - Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley

Information Theory and Coding

Unit - 1

Information Theory, Information – Entropy, Information rate, classification of codes, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding

Joint and conditional entropies, Mutual information, Discrete memory less channels, BSC, BEC, Channel capacity, Shannon limit.

Unit - 2

Source Coding: Text, Audio And Speech; Text: Adaptive Huffman Coding, Arithmetic Coding
Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers
Speech: Channel Vocoder, Linear Predictive Coding

Unit - 3

Source Coding: Image And Video; Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG , Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, MPEG standard

Unit - 4

Error Control Coding: Block Codes; Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes, Encoder and decoder - CRC

Books:

1. Information Theory, Coding and Crptography - R Bose
2. Introduction to Error Control Codes - S Gravano, Oxford University Press
3. Digital Communication - Amitabha Bhattacharya, TMH

DSE – 4

Software Development Project Work

A student has to undertake a software development project work under the guidance of a teacher during the 6th semester. After completion of the project, the student has to submit a project report which will be evaluated by an External Examiner.

Two Generic Elective Courses (GE) meant for Honours Students of other Disciplines (Each course is of 6 credits)

Generic Elective Courses (GE)

Computer Science Paper - 1
Problem Solving using Computers

Unit -1

Computer Fundamentals: Introduction to Computers: Characteristics of Computers, Uses of Computers, Types and generations of Computers.
Basic Computer Organization - Units of a computer, CPU, ALU, memory hierarchy,registers,I/O devices.

Unit - 2

Techniques of Problem Solving: Flowcharting, algorithms, Programdesign, coding, compilation, program execution, Debugging, Types of errors in programming, Documentation, Structuredprogramming, Top-down and bottom-up program design

Unit -3

C Programming: Defining and Initializing Variables, Scope of Variables,Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, relational, and Logical), Using Comments in programs, Character I/O (getc, getchar, putc), Formatted and Console I/O (printf(), scanf(), Basic Header Files (stdio.h,iostream.h, conio.hetc).

Unit -4

Conditional Statements in C Programming: IF, IF..ELSE, Nested IF, Switch-Case statements, Looping Statements: FOR loop, WHILE loop and Do-WHILE loop

One Dimensional Arrays, Two-dimensional Arrays, Concept of Structure, accessing structure members, User-defined Functions in C

Books:

1. Computer Fundamentals - P. K. Sinha &Priti Sinha, BPB Publications
2. Computer Fundamentals - Anita Goel, Pearson Education
3. Programming in ANSI C - E. Balguruswamy, TMH
4. Let us C –YaswantKanitkar, BPB

Computer Science Paper - 2

Database Management Systems

Unit -1

Concept of Database and DBMS, Characteristics of database approach, Role of DBMS, Data models (Relational, Hierarchical, network and Object-oriented), Layered architecture of DBMS, Data independence.

Unit -2

Entity Relationship(ER) Modeling, Entity types, relationships, constraints. Relational data model, relational constraints, Mapping ER models to relational database, Relational algebra, SQLqueries.

Unit -3

Database design, Data dependencies (functional transitive, and multi-valued), Normalforms(INF, 2NF, and 3NF), Database transactions: Transaction Processing, ACID properties, concurrency control.

Unit -4

File Structure and Indexing, overview of File organizations (Sequential, Indexed, and Direct Access files), Indexing (Primary index, secondary index, clustering index), Concept of B and B+ trees.

Books:

1. Database Systems Concepts - A. Silberschatz, H. F. Korth, S. Sudarshan (McGraw Hill)
2. Fundamentals of Database Systems - Elmsari and Navathe (Addision Wesley)
3. Database Management Systems – Rajiv Chopra, S Chand

B. Sc. Information Technology (Regular) under CBCS

w.e.f. the Academic Year2016-2017

Semester - I		**Credits**
Core- A1	Problem Solving using Computer	4
	C Programming Lab	2
Core- B1	<From other subject>	
Core- C1	<From other subject>	
AECC(Ability Enhancement Compulsory Course)	Environmental Studies	2
Semester - II		
Core- A2	Database Management Systems	4
	Database Lab	2
Core- B2	<From other subject>	
Core- C2	<From other subject>	
AECC-2(Ability Enhancement Compulsory Course)	MIL Communication	2
Semester - III		
Core- A3	Operating Systems	6
Core- B3	<From other subject>	
Core- C3	<From other subject>	
SEC-1(Skill Enhancement Course)	Communicative English	2
Semester - IV		
Core- A4	E-Commerce	6
Core- B4	<From other subject>	
Core- C4	<From other subject>	
SEC-2(Skill Enhancement Course)	<From the pool of SEC courses>	2
Semester - V		
DSE-A1 (Discipline Specific Elective) **Any one**	Web Technology / Data Communication and Networking	6
DSE-B1 (Discipline Specific Elective) **Any one**	<From other subject>	6
DSE-C1 (Discipline Specific Elective) **Any one**	<From other subject>	6
SEC-3 (Skill Enhancement Course)	<From the pool of SEC courses>	2
Semester - VI		
DSE-A2 (Discipline Specific Elective) **Any one**	Project work/Dissertation	6
DSE-B2 (Discipline Specific Elective) **Any one**	<From other subject>	
DSE-C2 (Discipline Specific Elective) **Any one**	<From other subject>	
SEC-4 (Skill Enhancement Course)	<From the pool of SEC courses>	2
	Total	**120**

SEMESTER - I

Core Paper– 1

Problem Solving using Computers

Unit -1

Computer Fundamentals: Introduction to Computers: Characteristics of Computers, Uses of Computers, Types and generations of Computers.

Basic Computer Organization - Units of a computer, CPU, ALU, memory hierarchy,registers,I/O devices.

Unit - 2

Techniques of Problem Solving: Flowcharting, algorithms, Programdesign, coding, compilation, program execution, Debugging, Types of errors in programming, Documentation, Structuredprogramming, Top-down and bottom-up program design

Unit -3

C Programming: Defining and Initializing Variables, Scope of Variables,Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, relational, and Logical), Using Comments in programs, Character I/O (getc, getchar, putc), Formatted and Console I/O (printf(), scanf(), Basic Header Files (stdio.h,iostream.h, conio.hetc).

Unit -4

Conditional Statements in C Programming: IF, IF..ELSE, Nested IF, Switch-Case statements, Looping Statements: FOR loop, WHILE loop and Do-WHILE loop

One Dimensional Arrays, Two-dimensional Arrays, Concept of Structure, accessing structure members, User-defined Functions in C

Books:

5. Computer Fundamentals - P. K. Sinha &Priti Sinha, BPB Publications
6. Computer Fundamentals - Anita Goel, Pearson Education.
7. Programming in ANSI C - E. Balguruswamy, TMH
8. Let us C –YaswantKanitkar, BPB

C Programming Lab

21. Write a program to find the maximum among three numbers.
22. Write a program to find factorial of a number.
23. Write a program to print the Fibonacci series.
24. Write a program to print the prime numbers between 1 to n.
25. Write a program to check if it a Palindrome (e.g., madam).
26. Write a program to check if it is an Armstrong number. (An Armstrong number of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself)
27. Write program to reverse the digits of an input number.
28. Write a program to find the sum of digits of a number.
29. Write a program to find the GCD and LCM of two numbers.
30. Write a program to perform different arithmetic operations using switch….case.
31. Write a program to count the number bits "1" in a given binary number.

32. Write a program to find the factorial of a number using function.
33. Write a program to perform the arithmetic operations using function.
34. Write a program to find the largest element in an array.
35. Write a program to add two matrices.
36. Write a program to multiply two matrices.
37. Write a program to find the position of a given character in a string.
38. Write a program to count the number of times a character occurs in a string.
39. Write a program to create records of 10 students using structure.
40. Write a program to count the number of words, number of lines in a text file.

SEMESTER - II

Core Paper - 2

Database Management Systems

Unit -1
Concept of Database and DBMS, Characteristics of database approach, Role of DBMS, Data models (Relational, Hierarchical, network and Object-oriented), Layered architecture of DBMS, Data independence.

Unit -2
Entity Relationship(ER) Modeling, Entity types, relationships, constraints. Relational data model, relational constraints, Mapping ER models to relational database, Relational algebra, SQLqueries.

Unit -3
Database design, Data dependencies (functional transitive, and multi-valued), Normal forms(INF, 2NF, and 3NF), Database transactions: Transaction Processing, ACID properties, concurrency control.

Unit -4
File Structure and Indexing, overview of File organizations (Sequential, Indexed, and Direct Access files), Indexing (Primary index, secondary index, clustering index), Concept of B and B+ trees.

Books:

4. Database Systems Concepts - A. Silberschatz, H. F. Korth, S. Sudarshan (McGraw Hill)
5. Fundamentals of Database Systems - Elmsari and Navathe (Addision Wesley)
6. Database Management Systems – Rajiv Chopra, S Chand

Database Lab

Create tables as indicated against each question and write SQL statements to answer the given queries:

4. Student (roll_no, name, department, marks), Attendance (roll_no, department, attendance)
    k) Create the table with above schema
    l) Display the details of the students
    m) Display the details of the student with attendance less than 20
    n) Find the average mark of student having attendance less than 20

o) Find the average mark.
p) Display the details of the students whose name starts with 's'
q) Display details of the student with mark greater than 70
r) Display the details of the students whose name starts with 's' or 'c'
s) Find subject wise average mark
t) Display details of the students whose age is between 20 and 23

5. Course (roll_no, subject, mark) Attendance (roll_no, name, attendance)
   k) Create the table with above schema
   l) Find the Roll no. of the student securing the highest mark in a given subject
   m) Display the roll_no, marks of student who have taken the subject "IT"
   n) Display the average marks of the students who have attendance less than 25
   o) Find average mark for each subject
   p) Find lowest marks in each subject
   q) Find the Roll no.s of the students securing highest mark in each subject
   r) Find the student names with highest and lowest attendance
   s) Display the subjects taken by the students whose attendance more than 30
   t) Display the attendance details of the students whose mark less than 200

6. Employee (Emp_Id, Name, Address, Salary) Leave(Emp_Id,Leave_Taken)
   k) Create the table with above schema
   l) Count the number of employee with salary greater than 5000
   m) Find average salary of the employee who have taken more than 15 leaves
   n) Find average salary of all the employees
   o) Display the details of the employee with highest salary
   p) Display the leave details of the employee whose name starts with 'R'
   q) Display the details of the employee whose salary less than 3000
   r) Count the number of employee belongs to "Education" department
   s) Display the details of the employee whose salary is between 10000 and 20000
   t) Find average salary of the employees belong to "Revenue" department

SEMESTER - III

Core Paper – 3

Operating Systems

Unit -1

Introduction, Basic OS functions, resource abstraction, types of operating systems–Batch, Multi programming, Time sharing, and Real time systems; operating systems for personal computers, Operating System Organization, Processor and user modes, kernels, system calls and system programs.

Unit -2

Process Management, Process State Transition diagram, Non-pre-emptive and pre-emptive scheduling algorithms: FCFS, Shortest Job First, Round Robin, Priority Scheduling, Concurrent processes, concept of critical section, semaphores, Concept of Deadlock, Condition for deadlock. Concept of deadlock prevention, detection and recovery.

Unit -3

Memory Management, Physical and virtual address space, memory allocation strategies: fixed and variable partitions, Paging, Segmentation, Demand paging, virtual memory, Page replacement techniques (FIFO, LRU and Optimal).

Unit -4

File and I/O Management, Directory structures: Single level, multi-level, and tree structured directory, Concept of file, file operations, file allocation methods, Disk scheduling techniques(FCFS, Shortest Seek Time First, and Scan), File Protection and Security Policy, File Authentication and Access control.

Books:

5. Operating Systems Concepts -A. Silberschatz and P.B. Galvin, John Wiley
6. Operating Systems: A Concept based Approach – D M Dhamdhere, TMH
7. Modern Operating Systems - A.S. Tanenbaum, Pearson Education
8. Operating Systems- Concepts and design - M. Milenkovic, Tata McGraw Hill

SEMESTER - IV

Core Paper – 4

E-Commerce

Unit - 1

Introduction to E-Commerce, Definition, Scope of E-Commerce, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

E-Commerce business models, B2B, B2C, C2C, Electronic Markets, Electronic Data Interchange (EDI), Technology, Standards, Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce.

Unit - 2

Electronic Payment system (EPS): Over view of EPS, smart card, credit card and debit card based EPS, financial instrument. Home banking, On-line banking

E-business, Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing

Unit - 3

Legal issues, Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract.

Security threats, transaction security Security Solutions, Symmetric and Asymmetric Cryptosystems, and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol

Unit - 4

Mobile Commerce: Introduction to mobile commerce, Mobile computing applications, WAP technology, mobile information devices, client- server network

Books:

4. E-Commerce-Strategy, Technologies & Applications - David Whitley, TMH
5. E-Commerce- The cutting edge of business - Kamlesh K. Bajaj, TMH
6. E-Commerce - Ritendra Goel, New Age International

SEMESTER - V

Discipline Specific Electives

DSE Paper – 1

(Under DSE, a student has to choose either Web Technology or Data Communication and Networking)

Web Technology

Unit - 1

Developing Static Web Pages, types and issues, tiers; WWW-Basic concepts, web client and web server, http protocol, universal resource locator (url), HTML- different tags, sections, image & pictures, listings, tables, frame, frameset, forms

Unit - 2

Developing Dynamic Web Pages, need for dynamic web pages; an overview of DHTML, cascading style sheet (css), comparative studies of different technologies of dynamic page creation.
Active Web Pages, Need for active web pages; Java applet life cycle

Unit - 3

Java Script, Data types, variables, operators, conditional statements, array object, date object, string object.
Java Servlet, Servlet environment and role, HTML support, Servlet API, The servlet life cycle, Cookies and Sessions.

Unit - 4

JSP architecture, JSP servers, JSP tags, understanding the layout in JSP, Declaring variables, methods in JSP, inserting java expression in JSP, processing request from user and generating dynamic response for the user, inserting applets and java beans into JSP, using include and forward action, comparing JSP and CGI program, comparing JSP and ASP program; Creating ODBC data source name, introduction to JDBC.

Books:

4. Web Technologies - Godbole A. S. & Kahate A., TMH
5. Web Technology & Design - Xavier C., New Age Publication
6. Java Server Programming, J2EE edition, WROX publishers

Data Communication and Networking

Unit - 1

Overview of Data Communications and Networking: Introduction, Network Models
Physical Layer: Signals, Digital Transmission, Analog Transmission, Multiplexing, Transmission Media, Circuit Switching and Telephone Network.

Unit - 2

Data Link Layer: Error Detection and Correction, Data Link Control and Protocol, Point to Point Access: PPP, Multiple Access, Local Area Networks: Ethernet, Wireless LANs, Backbone Networks, Virtual LANs, Cellular Telephone and Satellite Networks, Virtual Circuit Switching.

Unit - 3

Network Layer: Host-to-Host Delivery: Internetworking, Addressing and Routing, Network Layer Protocols: ARP, IPv4, ICMP, and IPv6, Routing, Unicast and Multicast Routing

Unit - 4

Transport Layer: Process-to-Process Delivery: UDP and TCP, Congestion Control.
Application Layer: Client-Server Model, Socket Interface, Domain Name System (DNS), Electronic Mail (SMTP), and File Transfer (FTP), HTTP and WWW.

Books:

4. Data Communications and Networking - B A Forouzan, TMH.
5. Computer Networks - A S Tanenbaum, PHI
6. Data and Computer Communications - W Stallings, PHI

SEMESTER - VI

DSE Paper – 2
Software Development Project Work

A student has to undertake a software development project work (Preferably in C) under the guidance of a teacher during the 6^{th} semester. After completion of the project, the student has to submit a project report which will be evaluated by an External Examiner.