UNIVERSITY OF KERALA

Course Structure and Syllabus for Career Related First Degree Programme in

COMPUTER APPLICATION (BCA)

**Under Choice based Credit and Semester System
(CBCS) System 2 (b)**

(2018 Admission onwards)

SCHEME

Semester 1

Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
			Hrs per week			
EN1111.4	2	English 1	3	-	-	3
MM1131.9	3	Mathematics I	3	1	-	4
CP1121	3	Computer Fundamentals & Organization	3	-	-	3
CP1131	3	Digital Electronics	3	-	-	3
CP1141	3	Introduction to Programming	3	1	-	4
CP1142	3	C Programming Lab	-	-	4	4
CP1122	3	Open Office Lab	-	-	4	4
TOTAL	20		15	2	8	25

Semester 2

Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
EN1211.4	2	English II	3	-	-	3
MM1231.9	3	Mathematics II	3	1	-	4
CP1241	3	Environmental Studies	3	1	-	4
CP1242	3	Object Oriented Programming	3	-	-	3
CP1243	3	Data Structures in C	3	-	-	3
CP1244	3	Object oriented programming Lab	-	-	4	4
CP1245	3	Data Structure Lab	-	-	4	4
TOTAL	20		15	2	8	25

Semester 3

Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
CP1331	2	Value Education	3	-	-	3
CP1341	3	Computer Networks& Security	3	1	-	4
CP1342	3	Operating Systems	3	1	-	4
CP1343	3	Database Management Systems	3	-	-	3
CP1344	3	Programming in JAVA	3	-	-	3
CP1345	3	DBMS Lab	-	-	4	4
CP1346	3	Java Programming Lab	-	-	4	4
TOTAL	20		15	2	8	25

Semester 4

Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
				Hrs per week		
CP1441	3	Software Engineering	3	-	-	3
CP1442	3	Web Programming& Python	3	-	-	3
CP1443	3	PHP & MySQL	3	-	-	3
CP1444	3	Data Mining & Warehousing	3	1	-	4
CP1445	2	**Mini project**	-	1	3	4
CP1446	3	PHP & MySQL Lab	-	-	4	4
CP1447	3	Web Programming & Python Lab	-	-	4	4
TOTAL	20		12	2	11	25

Semester 5

Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
				Hrs per week		
CP1541	3	Data Analytics	3	-	-	3
CP1542	3	Information Systems & Knowledge Management	3	1	-	4
CP1543	3	Visual Programming	3	1	-	4
CP1551.1 CP1551.2 CP1551.3	2	**Open Course** Digital Marketing Internet & WWW Cyber Security	3	-	-	3
CP1544	3	Software Testing	3	-	-	3
CP1545	3	Data Analytics Lab	-	-	4	4
CP1546	3	Visual Programming Lab	-	-	4	4
TOTAL	20		15	2	8	25

Semester 6

Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
				Hrs per week		
CP1641	3	Multimedia Systems	3	-	-	3
CP1642	4	Object Oriented Analysis and Design	3	-	-	3
CP1643	3	Design and Analysis of Algorithms	3	1	-	4
CP1661.1 CP1661.2 CP1661.3	3	**Elective** Geographical Information System Entrepreneurship and Innovation Internet of Things (IoT)	3	-	-	3
CP1644	3	Trends in Computing	-	-	4	4
CP1645	4	Major Project	-	-	8	8
TOTAL	20		12	1	12	25

SPOKEN TUTORIAL SUBJECTS

S. No	Course Code	Course	Spoken Tutorial Courses
1	CP1121	Computer Fundamentals and Organization	Introduction to Computers
2	CP 1242	Object Oriented Programming	C and CPP
3	CP1344	Programming in JAVA	Java
4	CP1442	Web Programming &Python	Python
5	CP1541	Data Analytics	R

Division of Marks (Lab Examination)

(Computer Science)
1. First program should be sufficiently simple **– 25 marks**
   (Logic – 10 marks, Successful compilation – 10 marks, Result – 5 marks)
2. Second program should be based on advanced concepts **- 30 marks**
   (Logic – 15 marks, Successful compilation – 10 marks, result – 5 marks)
3. Viva Voce **- 15 marks**
4. Lab Record **- 10 marks**

   Total Marks **- 80 marks**

(Digital Electronics)
1. Procedure- Theory/Connection Diagram/ Equation **- 20 Marks**
2. Manipulation of Experiment- Connection/Soldering **- 15 Marks**
3. Observation/Tabulation/Calculation **- 10 Marks**
4. Result **- 10 Marks**
5. Identification of Circuit Components **- 10 Marks**
   (Resistors Using Color Codes, Capacitors, Diodes, Transistors etc)
6. Lab Record **- 5 marks**
7. Viva **- 10 Marks**

   Total Marks **- 80 Marks**

SEMESTER ONE

Semester 1				Hrs per week			
Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
EN1111.4	2	English I	3	-	-	3
MM1131.9	3	Mathematics I	3	1	-	4
CP1121	3	Computer Fundamentals & Organization	3	-	-	3
CP1131	3	Digital Electronics	3	-	-	3
CP1141	3	Introduction to Programming	3	1	-	4
CP1142	3	C Programming Lab	-	-	4	4
CP1122	3	Open Office Lab	-	-	4	4
TOTAL	**20**		**15**	**2**	**8**	**25**

CP1121: COMPUTER FUNDAMENTALS AND ORGANIZATION

1. AIM
- To create the overall generic awareness about the field of Information Technology and to impart knowledge in the functional organization of physical components and architecture of a computer.

2. OBJECTIVES

On the completion of this course, the student will be able:
- To get the basic concepts of Computers.
- To get the functional knowledge about PC hardware, operations and concepts.
- To understand the functional units of a standard PC and it's working.
- To understand the memory organization in a computer.

3. SYLLABUS

Module I: Characteristics of Computer;Von Neumann model; Inside a Computer: SMPS, Motherboard, BIOS, CMOS, Ports and Interfaces, Expansion Cards, Ribbon Cables,ASCII; Types of Input Devices, Types of Output Devices.

Module II: Memory Representation, Hierarchy, Memory Units: RAM (SRAM, DRAM); ROM; Secondary Storage Devices: Magnetic Tape, Magnetic Disk, Types of Magnetic Disks, Optical Disk, Types of Optical Disks; USB: Pen drive, External Hard Disk; Memory Stick; CPU Registers, Cache Memory, Operations in Cache memory, hit ratio; Virtual Memory.

Module III: Instruction Format; Instruction Cycle: Fetch Cycle, Execution Cycle; Instruction Set: CISC Architecture, RISC Architecture, Comparison; Memory Chips; Pipelining and Parallel Processing; Micro-programmed Control and Hardwired Control.

Module IV: Input/Output Organization: Asynchronous Data Transfer, Programmed I/O (concepts only); Interrupts: Types of interrupts, processing interrupts, interrupt hardware and priority, DMA: DMA Controller, DMA Transfer Modes; I/O Processor.

4. REFERENCES

4.1 Core
- Introduction to Information Technology, 2nd Edition, ITL Education Solutions Limited, Pearson.
- John D.Carpinelli, Computer systems Organization & Architecture, Pearson Education.

4.2 Additional
- E.Balaguruswamy, Fundamentals of Computers, McGraw hill, 2014
- Carl Hamacher, Vranesic, Zaky, Computer Organization 4th Edition, McGraw-Hill

4.3 Activities and assignments:*Applications of Computers in various fields; Pioneers in IT; IT Policy, IT and Development; IT in India (major initiatives, key institutions, statistics), IT in Kerala (major initiatives, key institutions, statistics); Careers in IT; Computer faults: hardware & software; types of faults; diagnostic programs and tools; printer problems; monitor problems, problem diagnosis, organization of a modern PC.*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1131: DIGITAL ELECTRONICS

1. AIM
- To impart basic knowledge in digital and logic circuits and to introduce basic concepts of data communications

2. OBJECTIVES
- To review basic electronic concepts
- To review data representation techniques
- To introduce student to basic concepts of digital logic
- To introduce the design of basic logical circuits.

3. SYLLABUS

Module I: Review of Basic Electronics: Diodes – half wave and full wave rectifiers. Zener diode, Zener diode as a voltage regulator, Bipolar Junction Transistors, Transistor configurations- CE characteristics, relation between transistor currents, Transistor biasing methods (CE configuration), small signal CE amplifiers– graphical analysis of the small signal CE amplifier (frequency response, bandwidth and gain in dB) .RC phase shift oscillator, A stable multi-vibrator (555 timer).

Module–II: Data Representation: Concept of number system bases – binary, decimal and hexadecimal number systems and conversion between each, Binary arithmetic: Addition, subtraction 1s and 2s complement system, multiplication. Codes: BCD, ASCII, Floating point representation

Module III: Boolean algebra: Boolean functions: AND, OR and NOT, NAND, NOR and XOR. Truth tables, Combinational logic in Venn diagrams. Realization of other logic gates using NAND and NOR. Laws of Boolean Algebra, DeMorgan's theorems. Min terms, SOP expressions, Max terms, POS expressions, Karnaugh maps. Flip flops – SR flip flop, JK flip flop, Master Slave, D and T flip flops.

Module IV: Digital Circuits: Multiplexer, Full and half adders, Subtractors – half and full subtractors, Comparators – 1 bit and 2 bit, Counters, Decoder and display, shift registers, de-multiplexer and keyboard encoder.

4. REFERENCES

4.1 Core
- B L Theraja –Basic Electronics-Chand Publications

4.2 Additional
- M Morris Mano – Digital Logic and Computer Design-Pearson,2013
- Thomas L Floyd –Digital Fundamentals- Pearson, 2013

4.3 Internet resources:
- www.prenhall.com/mano

4.3 Activities and assignments: *Miscellaneous Topics: Advances in Electronics: Evolution of Transistor Technology, Nano Technology, Molecular Electronics.*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1141: INTRODUCTION TO PROGRAMMING

1. AIM
- To Expose students to algorithmic thinking and problem solving and impart moderate skills in programming in an industry-standard programming language.

2. OBJECTIVES
- To expose students to algorithmic thinking and algorithmic representations.
- To introduce students to basic data types and control structures in C.
- To introduce students to structured programming concepts.
- To introduce students to standard library functions in C language.

3. SYLLABUS

Module I: Introduction to programming: Algorithm & Flow charts: Definitions, Symbols used to draw flowcharts, Program Writing – Structure of the Program, top down design, Source code, Object code, Executable file, Variables and Constants, Rules for naming the Variables/Identifiers; Basic data types of C, int, char, float, double; storage capacity – range of all the data types;

Module II: Basic Elements: Operators and Expressions: Expression Evaluation (Precedence of Operators); simple I/O statements, Control structures, if, if else, switch-case, for, while, do-while, break, continue. Arrays: Defining simple arrays, Multi-dimensional arrays, declaration, initialization and processing.

Module III: Functions & Pointers: concept of modular programming, Library, User defined functions, declaration, definition & scope, recursion, Pointers: The & and * Operators, pointer declaration, assignment and arithmetic, visualizing pointers, call by value; call by reference, dynamic memory allocation. Storage classes.

Module IV: Advanced features: Array & pointer relationship, pointer to arrays, array of pointers. Strings: String handling functions; Structures and unions; File handling: text and binary files, file operations, Functions for file handling, Modes of files

4. <u>REFERENCES</u>

4.1 Core

- E. Balaguruswamy, *Programming in ANSI C*, McGrawhill, Sixth Edition

4.2 Additional

- Ashok N. Kamthene, *Programming in C*, Pearson Education, Second edition

4.3 Activities and assignments: *Pre-processor directives: #include, #define, macros with arguments, the operators# and ##, conditional compilations, multiple file programming; creating header files, program verification, algorithm efficiency analysis; int86 functions and graphic functions.*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1142: C PROGRAMMING LAB

Part A

The C laboratory work will consist of 25-30 Experiments

1-15.Testing out and interpreting a variety of simple programs to demonstrate the syntax and use of the following features of the language: basic data types, operators and control structures.

Part B

16. 1-D Arrays: A variety of programs to declare, initialise, read, print and process 1-D arrays of various basic data types. Processing to include, selection, sum, counting, selective sum, selective counting, reversing etc.

17. Pointers: A large number of trivial programs involving all possible data types to familiarize the syntax of pointers in a variety of situations and to draw memory diagrams based on the observations.

18. Structures: A variety of programs to declare, initialise, read, print and process structures made up of a variety of data types and structures.

19. 2-D Arrays: A variety of programs to declare, initialise, read, print and process 2-D arrays of various basic data types. Processing to include, selection, sum, counting, selective sum, selective counting, reversing etc.

20. Array of Structures and Structure of Arrays: Programs to demonstrate declaration and processing of structure of arrays and array of structures.

21. Pointers to Arrays: A number of programs to demonstrate handling of 1-D and 2-D arrays using pointers and to draw memory diagrams based on the observations.

22. Pointers to Structures: A number of programs to demonstrate use of pointers to structures and to draw memory diagrams based on the observations.

23. Functions –I: Simple Examples of declaring and using functions of the following categories (i)no argument, no return, (ii) argument, no return, (iii) no argument, return, (iv) argument, return, all pass by value

24. Functions –II: Declaring and using functions with pass by reference, Passing and Returning structures, Recursive functions.

25. Files: Simple Example involving use of multiple files: declaring, opening, closing, reading from and writing to text files.

26. Files: Example involving use of multiple files: declaring, opening, closing, reading from and writing to binary files.

27. Library functions: A variety of Examples demonstrating (i) string processing functions (ii) a variety of selected library functions

28. Debugging programs involving syntactic and/or logical errors

29-30: Developing programming solutions to problems including program design, algorithm development and data structure selection.

4. REFERENCES
4.1 Core
- Deitel & Deital, *C: How to Program*, Pearson Education
- Alan R Feuer, *The C Puzzle Book*, Pearson Education
- Yashvant Kanetkar, *Test Your C Skills*, BPB Publications, 3rd Edition
  NB:- Activities and assignments are not meant for End_Semester_Examination

CP1122: OPEN OFFICE LAB
Part A.
- To experience the features of Linux Operating System
- Working with Linux commands

Part B.
- Working with word processor
- Working with worksheet
- Working with presentation.

SEMESTER TWO

Semester 2			Hrs per week			
Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
EN1211.4	2	English II	3	-	-	3
MM1231.9	3	Mathematics II	3	1	-	4
CP1241	3	Environmental Studies	3	1	-	4
CP1242	3	Object Oriented Programming	3	-	-	3
CP1243	3	Data Structures in C	3	-	-	3
CP1244	3	Object oriented programming Lab	-	-	4	4
CP1245	3	Data Structure Lab	-	-	4	4
TOTAL	**20**		**15**	**2**	**8**	**25**

CP1241: ENVIRONMENT STUDIES
1. AIM
- To get awareness on natural systems and resources, biodiversity and conservations
- To get basic knowledge on pollution and methods to solve these problems

2. OBJECTIVES
- To impart the knowledge on the environmental systems
- To impart the knowledge on the biodiversity and conservations
- To impart the knowledge on the environmental pollution and policies and practices
- To impart the knowledge on the impact of human communities on the environments

3. SYLLABUS
Module I: Environmental Studies – Introduction, Multidisciplinary nature, Scope and importance, Concept of sustainability and sustainable development. **Ecosystems** – Structure, function, Energy flow, food chains, food webs and ecological succession, Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, **Natural Resources -**Renewable and Non---renewable Resources, Land resources and use, land degradation, soil erosion and desertification, Deforestation - Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations, Water: Use

and over---exploitation of surface and ground water, floods, droughts, conflict over water - international & interstate, Energy resources- renewable and non-renewable, use of alternate energy sources, growing energy needs.

Module II: Biodiversity and Conservation - Levels of biological diversity: genetic, species and ecosystem diversity; Bio geographic zones of India; Biodiversity patterns and global biodiversity hot spots, endangered and endemic species of India, Threats - habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, Eco-system and bio-diversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Module III: Environmental Pollution - Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution, Nuclear hazards and human health risks, Solid waste management: Control measures of urban and industrial waste, Pollution case studies. **Environmental Policies & Practices -** Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture, Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).Nature reserves, tribal populations and rights, and human wild life conflicts in Indian context.

Module IV: Human Communities and the Environment – Human population growth: Impacts on environment, human health and welfare., Resettlement and rehabilitation of project affected persons; case studies., Disaster management: floods, earthquake, cyclones and landslides., Environmental movements: Chipko Silent valley, Bishno is of Rajasthan., Environmental ethics: Role of Indian and other religions and cultures in environmental conservation., Environmental communication and public awareness, case studies(e.g., CNG vehicles in Delhi).**Fire & safety:**Fire Detection Systems, Fire Control Systems, Care, maintenance, and Inspection

4. REFERENCES
4.1 Core
- "Text book for Environmental Studies for undergraduate courses of all branches of Higher Education", Erach Bharucha for University Grants Commission.
- Fire Safety Management Handbook, Third Edition, Daniel E. Della-Giustina

4.2 Additional
- N Arumugan and V Kumaresan, "Environmental Studies", Saras Publication, 2014

4.3 Activities and Assignments: *Case studies of different environmental systems, pollution control organization report collections, different environmental protection activities and study reports.*
NB:- Activities and assignments are not meant for End_Semester_Examination

CP1242: OBJECT ORIENTED PROGRAMMING
1. AIM
- To introduce the student to the basic concepts of object orientation and impart skills in an Industry standard object oriented language

2. OBJECTIVES
On the completion of this course, the student will be able to
- Understand the concepts of classes and object
- Define classes for a given situation and instantiate objects for specific problem solving
- Reuse available classes after modifications if possible
- Possess skill in object oriented thought process

3. SYLLABUS
Module 1: **Concepts of OOP**: Introduction OOP, Procedural Vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP, Object Oriented Concepts, **C++ Basics** : Overview, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting,

control structures .**C++ Functions** : Simple functions, Call and Return by reference, Inline functions, Macro Vs. Inline functions, default arguments.

Module 2: **Classes and objects** in C++, access modifiers, static data members and member functions, friend functions and friend class , **Constructors and Destructors**, Overloading of functions,Operators Overloading- Unary and Binary, Overloading rules,Type conversion.

Module 3: **Inheritance**- parent and child classes, private, public and protected inheritance, Multiple inheritance and multi-level inheritance, Virtual base classes. Dynamic memory allocaton using new and delete operators, dynamic objects.

Module 4: **Binding & Polymorphism**: Early binding, Late Binding, Pointers to derived class objects, virtual functions, Pure virtual functions, abstract classes, object slicing, **I/O and File management**: Concept of streams, cin and cout objects, C++ stream classes, Unformatted and formatted I/O, manipulators, File stream, C++File stream classes, File management functions, File modes, Binary and randomfiles, Exception handling in C++: try, throw and catch.

4. REFERENCES

4.1 Core

- Ashok N. Kamthane, *Object oriented Programming with ANSI & Turbo C++,* Pearson

4.2 Additional

- H M Deitel and P J Deitel, *C++: how to program*, Pearson Education
- Robert Lafore, *Object Oriented Programming in Turbo C++*, Galgotia Publications

4.3 Activities And Assignments:*Evolution of OOP – history of C and C++, Review of features ofC++ common with C and also minor variations; study of File stream classes in C++. Templatesclass and function templates, Templates versus macros, String objects in C++, StandardTemplate Library in C++.*
NB:- Activities and assignments are not meant for End_Semester_Examination

CP1243: DATA STRUCTURES

1. AIM

- To introduce students to various data structures and their features and applicability.

2. OBJECTIVES

By the end of the course, students should:

- Be able to write well-structured programs in C
- Be familiar with data structures like array, structures, lists, stacks, queues, trees and graphs
- Able to implement the above data structures in C/C++
- Able to appreciate various searching and sorting strategies
- Able to select appropriate data structures for solving a given problem

3. SYLLABUS

Module I: Sequential searching, binary searching, Hashing – linear hashing, hash functions, hash table searching, Sorting: bubble sort, selection sort, Stacks and Queues: FIFO and LIFO data structures – stacks using (i) pointers and (ii) arrays. Queues using (i) pointers and (ii) arrays, Operations on stack and queues; applications polish notation.

Module II: Linked Lists: Concept of static versus dynamic data structures, implementation of linked lists using pointers, operations on linked lists: insertion, deletion and traversing. Doubly linked lists and circular linked lists, applications of linked lists.

Module III: Trees: Concept of linear versus non-linear data structures, various types of trees – binary, binary search trees. Creating a binary search tree, traversing a binary tree (in-order, pre-order and post-order), operations on a tree –insertion, deletion and processing, expression trees, implementation using pointers, applications.

Module IV: Graphs, graph traversal- depth-first and breadth-first traversal of graphs, applications.

4. REFERENCES
4.1 Core
- A.K.Sharma, *Data Structures Using C*, Pearson, Second edition, 2011

4.2 Additional
- Nair A.S., Makhalekshmi,*Data Structures in C*, PHI, Third edition 2011.

4.3 Assignments and Activities:*Multi-way search trees, B-trees, Huffman trees, case studies.*
NB:- Activities and assignments are not meant for End_Semester_Examination

CP1244: OBJECT ORIENTED PROGRAMMING LAB

The laboratory work will consist of 15-20 experiments, only by using class concept
Part A
1. Testing out and interpreting a variety of simple programs to demonstrate the syntax and use of the following features of the language: basic data types, operators and control structures.
2. Solving a problem using (i) structures and (ii) classes and comparison between the two (the problem logic and details should be kept minimal and simple to enable focus on the contrast between the two methods, for example declaring result of a set of students defining the name and total marks in the program itself).
3. Class definitions and usage involving variety of constructors and destructors

Part B
4. Programs involving various kinds of inheritances,
5. Programs involving operator overloading and type conversions
6. Programs involving virtual base classes, friend functions
7. Program to demonstrate early and late binding
8. Program to allocate memory dynamically
9. Programs to demonstrate(i) string processing (ii) file streams (iii) a variety of selected library functions
10. Exception handling
11. Handling of 2-D arrays using pointers
12. Debugging programs involving syntactic and/or logical errors

CP1245: DATA STRUCTURES LAB

1. AIM:
- To provide an opportunity for hands-on practice on different algorithms using various data structures.

2. OBJECTIVES:
This course will provide hands-on practice in all the following topics, using either C or C++:
- Stack and queues
- managing both singly and doubly linked list
- different trees, construction and traversal
- Searching and sorting

3. SYLLABUS
The laboratory work will consist of 15 - 20 experiments like
Part A
1. Linked list: traversal, node deletion, node insertion in singly, doubly and circular lists
2. Implementation of different searching techniques
3. Implementation of different sorting techniques

Part B
1. Stacks: matrix representation and linked list representation: Push, Pop
2. Queues: matrix representation and linked list representation: Add, delete

3. Circular queue implementation
4. Evaluation of expression using stacks
5. Tree traversal
6. Evaluation of expression using binary trees.
7. Infix to postfix and prefix conversion
8. Creating and processing binary search tree

SEMESTER THREE

Semester 3			Hrs per week			
Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
CP1331	2	Value Education	3	-	-	3
CP1341	3	Computer Networks& Security	3	1	-	4
CP1342	3	Operating Systems	3	1	-	4
CP1343	3	Database Management Systems	3	-	-	3
CP1344	3	Programming in JAVA	3	-	-	3
CP1345	3	DBMS Lab	-	-	4	4
CP1346	3	Java Programming Lab	-	-	4	4
TOTAL	20		15	2	8	25

CP1331: VALUE EDUCATION

1. AIM
- To get an awareness on different humanitarian and social tools like NSS, NCC
- Discuss the importance on the awareness on the situations like disaster management and organ donations

2. OBJECTIVES
- To impart the knowledge about the NSS, NCC
- To explore the idea on national integration and importance humanitarian values on national calamities like disaster management.
- To impart knowledge on the importance of organ donation and social welfares

3. SYLLABUS
Module I: NSS: *Introduction*: Basic Concepts, History, aims, Objectives -Emblem, Flag, motto, song, badge etc. Organizational structure, roles and responsibilities of various NSS functionalities.*NSS Programmes and activities -* regular activities, special camping Day camps, adaptation, Methodology of conducting survey, financial pattern of the scheme, other youth programme/schemes of GOI, Coordination with different agencies, Maintenance of the Diary. *Youth Development Programmes -* National Youth Policy, Youth development programmes at the National Level, State Level and voluntary sector, youth-focused and youth-led organisations. *Additional Life Skills***:** Positive thinking, self-confidence and self-esteem, setting life goals and working to achieve them, management of stress including Time management.
Module II: NCC: History, NCC –functions and duties, committees, aims, Moto, flag, Song, organization – RDC, CATC, NIC, Advanced leadership course, Army attachment camp, Hiking and trekking camps, ThalSainik Camp, Vayu Sainik Camp, NauSainik camp, All Indian Yachting regatta, rock climbing camps, Naval Wing activities, Air Wing Activities, Youth exchange programme, achievements.

Module III: Disaster Management: Introduction to disasters – concepts, and definitions – disaster, hazard, vulnerability, resilience, risks - Bomb threat. Earth quake, Explosion, Hazardous material spill/release, Campus shooting, Terrorist incidence, Disaster classifications, causes, impacts – social, economic, political, environmental, health, psychosocial etc, Financial emergency, A sudden health emergency, Unexpected loss of income, Death in the family or other family emergency, Rent in arrears and risk of eviction, National disaster, Different impacts – in terms of caste, class, gender, age, location, disability, global trends in disasters, urban disasters, pandemics, complex emergencies, climate change. Disaster risk management – disaster relief – water, food, sanitation, shelter, health, waste management.

Module IV: Organ Donation: History, ethical issues in organ donation and transplantation, types of organ donation, How organ donation works, Legislation and global perspectives, Bioethical issues, Political issues, religious view point, distribution, suicide, controversies, public service announcements, how to become an organ donor, donation process, organ donation organization in different countries.

4. REFERENCES
4.1 Core

- National Service Scheme – A Youth Volunteers Programme for Under Graduate students as per UGC guidelines J.D.S.Panwar et al. Astral International. New Delhi.
- "Army NCC cadet, Handbook specialized subjects", Director General, 2013
- NCC, National Cadet Corps, A Concise Handbook of NCC Cadets for 'A', 'B' & 'C'Certificate Examinations"
- Govt. of India Disaster Management act 2005
- Govt. of India 2009, National Disaster Management Policy
- Gupta Anil K, Sreeja S Nair, 2011, Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
- Organ Donation: Medline Plus
- Organdonor.gov, "Timeline of Historical Events and Significant Milestones", US Government Information on Organ Donation and Transplantation
- David Hamilton "History of Organ Transplanation", University of Pittsburgh Press 2012

4.2 Activities and Assignments: *Preparing various NSS activities reports, case studies, preparing program plans, preparation of disaster management activities and collection different agency reports, collection of different organ donation activity reports.*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1341: COMPUTER NETWORKS AND SECURITY

1. AIM
- To introduce computer networks as well as methods of information security.

2. OBJECTIVES
On completion of this course student shall be able to understand:
- The basic transmission technologies and characteristics
- The use of layer architecture for networking systems
- The main design issues of transport protocols and the mechanism to control traffic flow and congestion.
- The concept of Information security policies

3. SYLLABUS
Module I: Introduction to networks – Data Communication – Data flow simplex, Half duplex, Full duplex-Type of Connection – broadcast, Point–to-Point, multi-drop. Bandwidth- bit rate, baud rate. Transmission media –Copper wires, fibre optics, Radio transmission, microwave, Satellite. Switching - circuit, packet, message.

Module II: Network software **-** standards- Layering, packets, Layered PDUs, ISO-OSI model, TCP/IP model – Comparison. Framing- bit oriented, byte oriented, Error correction – detection – parity, hamming code, CRC. Flow control – stop and wait, sliding window, Error control - Stop &wait ARQ,

Go Back N ARQ, Piggybacking, pipelining, Ethernet, Multiple Access Protocols - pure- slotted ALOHA, CSMA, CSMA/CD. LAN Standards, Token bus, Token ring, Interfacing devices – bridge, hub, switch, router, gateway.

Module III: Internetworking- datagrams, fragmentation – Routing-Flooding, Distance vector routing, Link state routing. Concepts of congestion control-leaky bucket algorithm. Process to Process delivery - TCP, UDP, Application Layer -DNS, Remote login, file transfer protocol (FTP).

Module IV: Information Security: Network security – concepts and policies, cryptography -encryption, ciphers, steganography, symmetric and public key encryption, RSA algorithm, authentication methods, message digest, digital signatures, DSS, E-mail security, MIME, IP Security, Web Security: Secure Socket layer. Malicious Software, viruses & anti-virus software, firewall. Security and Law: - Regulations in India. Indian Copyright Act, Consumer Protection Act. Future Trends – The Law of Convergence.

4. REFERENCES
4.1 Core
- Brijendra Singh, Data Communication and Computer Networks, 3/e, PHI
- Brijendra Singh, *Cryptography & Network Security*, PHI.
- Pachghare, V.K., *Cryptography and Information Security,* PHI

4.2 Additional
- Behrouz A Forouzan, Data Communication and Computer networks, 4thed,McGraw Hill
- Achyut S Godbole, Data communications and networks, McGrawHill, Second
- Tanenbaum, "computer-networks-a--4th-edition"

4.3 Assignments and activities:*AES, Blowfish algorithms, Kerberos, Comparison of PGP and/ SMIME. Study of common malicious software, Anti-viruses. Firewall, Trusted systems. Information Technology Act2000/2008.*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1342: OPERATING SYSTEMS
1. AIM
- To introduce students to basic functions and the theoretical underpinning's of modern operating systems

2. OBJECTIVES
To introduce students to:
- Fundamental concepts of systems software and functions of operating systems as a resource manager
- Strategies for constrained resource allocation and process scheduling
- Memory and I/O Management techniques
- Salient features of popular operating systems.

3. SYLLABUS
Module I: Introduction to operating system: Introduction, Operating system structures-Operating System Operations, operating system services, user operating system interface, system programs, system calls, Types of System Calls, operating system structure. **Process Management**: Process concept, Process Scheduling, Operations on processes, Inter-process communication, Threads-Overview, Multithreading model, Thread Libraries, Threading issues; CPU Scheduling: Basic concepts, scheduling criteria, Scheduling algorithms.

Module II: Process synchronization: Background, Critical section problem, Peterson's solution, Semaphore, Classical synchronization problem-bounded buffer problem, reader/writer problem. The Dining Philosophers problem. **Deadlocks:** deadlock characterization, methods for handling deadlock-deadlock prevention, deadlock avoidance, deadlock detection, deadlock recovery.

Module III: Memory Management & Protection: Basic Hardware, Address binding, Logical versus physical address space, Swapping, Contiguous memory allocation- memory mapping and protection,

memory allocation, fragmentation. Non-contiguous allocation – paging, segmentation. **Virtual memory**- Demand Paging, page replacement, Allocation of Frames, Thrashing, Allocating Kernel Memory. Protection and Security: Protection -principles of protection, domain of protection, access matrix, access control; Security- threats, user authentication.

Module IV: Storage management: File system Interface - file concept, access methods, directory structure, File Sharing, **File system implementation**- file system structure &implementation, directory implementation, allocation methods, free space management; Mass storage management - disk structure, disk scheduling, RAID;I/O Systems – I/O hardware, Application I/O interface, kernel I/O subsystem.

4. REFERENCES

4.1 Core

- Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, *Operating System Concepts*7th edition

4.2 Additional

- Achyut S Godbole, *Operating systems*, McGRawhill, Third Edition

4.3 Activities and Assignments: *case study of popular Operating Systems like Android, Windows, Sun Solaris, IOS etc*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1343: DATABASE MANAGEMENT SYSTEMS

1. AIM

- To introduce basic concepts of data bases, and related techniques and tools

2. OBJECTIVES

- Be aware of basic concepts of data bases and data base management systems
- Be aware of concepts of relational data bases.
- Know to normalize relational data bases
- Skilled in using relational algebra and relational calculus
- Develop skills to write database queries

3. SYLLABUS

Module I: Introduction: evolution of data base systems, overview of database management systems, Relational data model, mathematical definition, candidate, primary and foreign keys, set operations on relations, insertion, deletion and update operations, attribute domains.

Module II: The E-R Model, Entities and attributes, 1-1 and many-1, many-many relationships. Security – Physical and Logical, Design and maintenance issues, integrity.

Module II: Relational algebra and relational calculus, Introduction to SQL, Table creation, selection, projection and join using SQL

Module IV: Functional Dependencies – Inference axioms, Normalization, 1NF, 2NF, 3NF and Boyce - Codd Normal forms, Lossless and lossy decompositions.

4. REFERENCES

4.1 Core

- Ramon A. Mata-toledo and Pauline K. Cushman, *Fundamentals of Relational Data Bases*, SchaumOutlines, Tata McGraw Hill

4.2 Additional

- AtulKahate, *Introduction to Data Base Management Systems*, Pearson Education

4.3 Assignments and activities: *Study of features of MS Access, Open Office Base, Oracle, mySQL, emerging areas.*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1344:   PROGRAMMING IN JAVA
1. AIM
- To introduce students to basic features of Java language and selected APIs

2. OBJECTIVES
- Let students install and work with JDK, also make them aware the use of java doc.
- Practice basic data types, operators and control structures in Java
- Practice basic handling of classes and objects in Java
- Introduce the following selected APIs: I/O, Strings, Threads, AWT, Applet, Networking
- Idea to approach and use a new package

3. SYLLABUS
Module I: A simple Java Application, a simple Java Applet , Brief History of Java, Special Features of Java, Data Type & Operators in Java, Arrays, Objects, the Assignment Statement, Arithmetic Operators, Relational and Logical Operators in Java, control Structures, The Java Class, Constructor, Finalizers, Classes inside classes: composition

Module II: Inheritance & Interface, Deriving Classes, Method Over-riding, Method Overloading, Access Modifiers, Abstract Class and Method, Interfaces, Packages, Imports and Class Path.

Module III: Exception Handling, The Try-Catch Statement, Catching more than one Exception, The Finally Clause, Generating Exceptions, Threads: Introduction, Creating Threads in Applications, Method in Thread Class, Threads in Applets.

Module IV: Java APIs – overview of APIs, IO Packages, Java Input Stream Classes, Java Output Stream Classes, File Class, Graphic & Sound: AWT and Swing, Graphic methods, Fonts, Loading and Viewing Images, Loading and Playing Sound, AWT & Event Handling, Layouts, **JDBC.**

4. REFERENCES
4.1 Core
- *Java Programming*, *Schaum Outline Series*

4.2 Additional
- Deitel, *Java: How To Program*, Pearson Education
- E Balagurusamy, "Programming with Java – A Primer", McGraw Hill, 2017

4.3 Assignments and Activities:*Creation of simple programs with interfaces, concepts of Oops.*
NB:- Activities and assignments are not meant for End_Semester_Examination

CP1345:   DBMS LAB

The laboratory work will consist of 15-20 Experiments. Tools to be used include: Personal Oracle 8/ MS Access / Open Office Base. Experiments will cover creating tables including defining relations between them, practicing SQL, Experiments designed around a case study, miscellaneous topics including security, connecting databases to front-end applications. Some sample topics are given below:

Part A
1. SQL statement for creating, listing, dropping, checking, updating tables
2. Record manipulation using-insert, delete, update
3. Experiments that clarify the importance of keys (Except foreign key)
4. Queries with an Expression and a column alias
5. A simple query that aggregates (groups) over a whole table
6. A query with a literal string in the SELECT list
7. Queries with sub string comparison and ordering
8. Query using the "IS NULL" syntax to list (compare '=NULL' instead of IS NULL")
9. Finding values within a certain range
10. Using the --"BETWEEN" keyword
11. SQL functions (String, Numeric, Date functions)
12. Aggregate Functions

Part B

13. A Join between two tables (Natural Join, Theta Join etc.)
14. Foreign Key
15. Nested queries
16. The EXISTS and UNIQUE function in SQL
17. Renaming attributes and joined tables
18. Statements related with VIEWs

CP1346:   JAVA PROGRAMMING LAB

The laboratory work will consist of 15-20 Experiments
Part A
1. Testing out and interpreting a variety of simple programs to demonstrate the syntax and use of the following features of the language: basic data types, operators and control structures.
2. Class definitions and usage involving variety of constructors and finalizers
3. Programs involving various kinds of inheritances,
4. Program involving Method Over-riding, Method Over-loading
5. Program involving Abstract Class and Methods

Part B
6. Program involving Interface,
7. Program to demonstrate creation and handling of packages, their imports and Class Path.
8. Programs involving a variety of Exception Handling situations
9. Program to define a class that generates Exceptions and using objects of the class.
10. Program involving creating and handling threads in applications and applets.
11-12: Programs to demonstrate methods of various i/o classes
13. Programs to demonstrate methods of string class
14. Program to demonstrate AWT/Swing graphic methods
15. Program for Loading and Viewing Images, Loading and Playing Sound
16. Programs to demonstrate various Layouts
17-18 Programs to demonstrate event handling
19. Program to demonstrate simple server-client (using a single m/c both as client and server)
20. Debugging programs involving syntactic and/or logical errors

SEMESTER FOUR

Semester 4			Hrs per week			
Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
CP1441	3	Software Engineering	3	-	-	3
CP1442	3	Web Programming& Python	3	-	-	3
CP1443	3	PHP & MySQL	3	-	-	3
CP1444	3	Data Mining and Data Warehousing	3	1	-	4
CP1445	2	**Mini project**	-	1	3	4
CP1446	3	Web Programming & Python Lab	-	-	4	4
CP1447	3	PHP & MySQL Lab	-	-	4	4
TOTAL	**20**		**12**	**2**	**11**	**25**

- To enable the students to have a thorough understanding of the activities in development projects using Structured Analysis and Design

2. OBJECTIVES

At the end of the course, the students should be able to:

- Appreciate the importance of having a process for software development.
- Understand the various activities undertaken for a software development project following the Function oriented Design
- Understand the issues in code design and development
- Test software developed using SSAD

Module I: Introduction: Evolution; **Software life cycle models**: A few basic concepts, Waterfall model and its extension, Agile development models, Spiral model, Comparison of different life cycle models

Module II: Software Project Management, Project Planning, Metrics for project size estimations, Project Estimation Techniques, Basic COCOMO model, Risk Management, Software **Requirements Analysis and Specification**: Requirements gathering and analysis, Software Requirements Specification

Module III: Software Design: overview of the design process, How to characterise a good software design, Cohesion and Coupling, Approaches to software design, **Function oriented design**: Overview of SA/SD Methodology, Structured analysis, Developing the DFD model of a system, Structured Design, **User Interface design**: Characteristics of a good user interface, Basic concepts, Types of user interfaces

Module IV: Coding and Testing: Coding, Code review, Software documentation, Testing, Unit testing, Black box testing, white box testing: Basic concepts, Debugging Integration testing, system testing, **Software Reliability and quality management**: Software reliability, Software quality, **Software maintenance**: Characteristics of software maintenance, Software reverse engineering, **Emerging Trends:** Client Server Software, Client Server architectures, CORBA, Service Oriented Architectures (SOA), Software as a Service.

4. REFERENCES:

4.1 Core

- Rajib Mall, *Fundamentals of Software Engineering,* Fourth Edition, PHI

4.2 Additional

- Pankaj Jalote, *An Integrated Approach to Software Engineering*, Narosa
- Waman S.Jawadekar, *Software Engineering*, McGraw hill, 2013
- Software Engineering (Seventh edition), Ian Sommerville – Addison Wesley.
- Software Engineering: A practitioners approach (Sixth Edition), Roger S Pressman-Mc Graw Hill.
- *Journals and Magazines:* (i) Software Development, CMP Media. (ii) Software Quality Professional, ASQ.

4.3 Activities and Assignments: *Preparing various documents, case studies, preparing test plans, UML diagrams, Metrics for various development phases, Agile Programming Methodologies, extreme Programming, Formal Methods, CASE Tools.*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1442: WEB PROGRAMMING & PYTHON

1. AIM

- To Expose students to technology of web sites and to introduce various tools and languages required for technical and creative design of state-of-the-art web sites
- The basic features of python programming and impart skills in an Industry standard programming language

2. OBJECTIVES

- To impart basic skills in web page design using HTML
- To impart necessary ability to choose the appropriate web tools/languages for creating state-of-the art websites

- To Expose students to current trends and styles in web design and applications
- Understand the concepts of python programming

3. SYLLABUS

Module I: HTML - General Introduction to Internet and WWW; HTML: Structured language, Document types, Rules of html, Html tags, Head tags, Body tags, Headings , Divisions and Centering, Quotations, Preformatted text, Lists, Horizontal Rules, Block level elements, Text level elements, Character entities, Comments, Fonts, Tables: Table tags, Colors, Color names, Color values , Marquee tag.

Module II: Advanced HTML - Linking in html: Anchor tags, Layer tags, Link relationships, URL: Relative, Absolute, Image, Image maps, Frames: Layouts, Targeting, No frame tag, Floating frames, Audio, Embed tag, Forms: form tag and its attributes, Get, Post, Form field elements, Form accessibility enhancements: Access key, Tooltips, Browser-specific form accessibility improvements.

Module III: Introduction to Python - Features of Python - Identifiers - Reserved Keywords - Variables Comments in Python – Input , Output and Import Functions - Operators – Data Types and Operations – int, float, complex, Strings, List, Tuple, Set, Dictionary - Mutable and Immutable Objects – Data Type Conversion - Illustrative programs: selection sort, insertion sort, bubble sort

Module IV: Decision Making -conditional (if), alternative (if-else), if..elif..else -nested if - Loops for, range() while, break, continue, pass; Functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

4. REFERENCES
4.1 Core

- V.K. Jain, *Advanced Programming in Web Design*, Cyber Tech Publications
- "Taming PYTHON By Programming", Jeeva Jose Khanna Publications

4.2 Additional

- Joel Sklar, *Web Design Principles*, Vikas, 5thEdition
- The Complete Reference HTML & XHTML, Thomas A Powell, 4thEdition
- H M Deitel, P J Deitel& A B Goldberg, *Internet and Worldwide web programming: How toProgram*, 3/e, Pearson Education
- Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
- Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers,LLC,2013.
- Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.
  NB:- Activities and assignments are not meant for End_Semester_Examination

CP1443: PHP &MYSQL
1.   AIM
- To expose students to technology of web sites and to introduce various tools and languages required for technical and creative design of state-of-the-art web sites

2.   OBJECTIVES
- To impart basic skills in moderately complex use of the following tools/ scripts/ languages:
- To choose the appropriate web tools/languages for creating state-of-the art web sites
- To expose students to current trends and styles in web design and applications

3.   SYLLABUS
Module I: Overview of PHP, Benefits and drawbacks in running PHP as a Sever Side Script, PHP Language Basics: The building blocks of PHP: variables, globals & super globals Data types: Set type, type casting, test type, Operators & Expressions, Flow control functions in PHP, Functions: Defining a function variable scope, calling a function returning values, setting default values for arguments, passing variable reference, built in functions

Module II: Arrays: Creating arrays (associative & multidimensional), Array related functions. Working with Objects, Working with string functions: Formatting strings, Using Date and Time functions. Forms in PHP: Form elements, adding elements to a form, creating a simple input form, combining HTML & PHP code on a single page, redirecting the user, creating a send mail form, File upload form, working with files and directories.

Module III: Cookies: Introduction, different types of cookies, setting a cookie with PHP, deleting a cookie, session function overview: starting a session, working with session variables, passing session IDs in the query string, destroying sessions & unsetting variables, Working with images.

Module IV: Database concepts: Open source database software: MySQL features MySQL data types: Numeric, date & time, string Table creation in MySQL: insert, select, where clause, ordering the result, like operator Selecting Multiple tables: using join, using queries Modifying records: update command, replace command, delete command date & time functions in MySQL Interacting with MySQL using PHP: connecting to MYSQL ,Executing queries, Retrieving error messages, inserting data with PHP, retrieving data with PHP

4. REFERENCES
4.1 Core
- Julie C.Meloni, PHP, MySQL and Apache,Pearson Education

4.2 Additional
- Ivan Byross, PHP   for Beginners

4.3 Assignments and activities:*sample programs which connect PHP and database, case studies.*
      NB:- Activities and assignments are not meant for End_Semester_Examination

CP1444: DATA MINING AND DATA WARE HOUSES
1. AIM
- To get an entry level understanding of the concepts of data mining

2. OBJECTIVES
- To get an understanding of the general properties of data in large databases
- Understand a variety of real-world applications that require data mining
- How to discover useful patterns and associations in huge quantities of data

3. SYLLABUS
Module I: Introduction:-Data, Information, Knowledge, KDD, types of data for mining, Application domains, data mining functionalities/tasks. Data processing—Understanding data, pre-processing data-Form of data processing, Data cleaning(definition and Phases only), Need for data integration, Steps in data transformation, Need of data reduction

Module II: Data Warehouses-Databases, Data warehouses, Data Mart, Databases Vs Data warehouses, Data ware houses Vs Data mart, OLTP OLAP, OLAP operations/functions, OLAP Multi-Dimensional Models- Data cubes, Star, Snow Flakes, Fact constellation. Association rules- Market Basket Analysis, Criteria for classifying frequent pattern mining, Mining Single Dimensional Boolean Association rule-Apriori algorithm

Module III: Classification- Classification Vs Prediction, Issues, Decision trees, Bayes classification-Bayes Theorem, Naïve Bayesian classifier, K Nearest Neighbour method, Rule-Based classification-Using IF…THEN rules for classification

Module IV: Cluster analysis: definition and Requirements, Characteristics of clustering techniques, Types of data in cluster analysis, categories of clustering-Partitioning methods, K-Mean and K -method only, outlier detection in clustering.

4. REFERENCES
4.1 Core:
- Sunitha Tiwari & Neha Chaudary, Data Mining and Warehousing, Dhanpat Rai & Co.

4.2 Additional
- Jiawei Han & Micheline Kamber & Jian Pei Data Mining Concepts & Techniques

- Margaret H Dunham Data Mining-Introductory& Advanced Topics; Pearson

4.3 Assignment and activities: *Mining web, temporal, text, multimedia, medical data and other Applied Data mining areas; OLAP tools; Introduction to Rapid Miner and other free and open source data mining tools.*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1445: MINOR PROJECT

1. AIM

- To provide an opportunity to produce and develop socially useful software.
- To give an opportunity to students to prepare for major projects.

2. OBJECTIVE

- To provide an opportunity for structured team work and project management.
- To provide an opportunity to practice the various phases in the SDLC
- To introduce the prospect of effective technical documentation and presentation.
- To provide an opportunity to practice time, resource and person management.

3. GUIDELINES FOR MINOR PROJECT

The minor project is considered as a stepping stone in implementing Major projects. Hence students should plan and organize their minor projects meticulously and necessary discussions and planning should be done so as to achieve this objective. The following guidelines should be adhered to:

- Team size should preferably be three with a maximum limit of 4 members.
- Individual projects may be permitted in exceptional cases, for valid reasons
- Minor Projects should be purely internal in nature.
- No restriction on tools/platform/language chosen should be made.
- Internal guide(s) should be assigned to each team.
- Two interim reports(one after analysis and another after design) should be submitted to internal guides.
- The number of records to be submitted is limited to team size + one (Departmental copy). Hard binding of reports is optional.
- The report format guidelines used to document Major Projects should be followed for making the final report and evaluation will be made on the same grounds.

4. EVALUATION

4.1 Criteria for external evaluation of Minor Project

External evaluation is done by an external examiner appointed by the University.The following components are to be assessed for the End Semester Evaluation of the Minor Project:

- Quality of documentation- 30 marks
- Presentation of work- 25 marks
- Viva - 25 marks

Total - 80 marks

4.2 Criteria for internal evaluation of Minor Project

Internal evaluation is be done by conducting a Viva by a team of evaluators comprising of the concerned guides and/or Head of the Department.The following are the components for internal evaluation of the Minor Project:

Presentation of the work   -5 marks
Individual involvement & team work/ Attendance   - 5marks
Timely submission and assessment of 2 interim reports   -10 marks

Total - 20 marks

CP1446: PHP and MYSQL LAB

The laboratory work will consist of 15 -20 Experiments

Part A (MYSQL)
- Database creation, table creation, insertion, updation, deletion and select.
- Programs to connect PHP and MYSQL
- Setup WAMP/XAMPP Server or Setup Apache, MySQL and PHP separately in your PHP Lab.

Part B (PHP)
- Write a PHP program to generate a random number between 1 and 100.
- Modify above program to accept range of the random number from HTML interface.
- Programs involving various control structures like if, else, elseif/else if', Alternative Syntax for 'if, else, elseif/else if'
- Programs involving various control structures like while, do-while, for, foreach, switch, break, continue. Try alternative syntax for while, do-while, for, foreach, switch.
- Programs involving the declaration, return, require, include, require- once, include_once and goto.
- Programs to demonstrate PHP Array functions, PHP Array Sorting, PHP Key Sorting, PHP Value Sorting, PHP Multi Array Sorting, PHP Array Random Sorting,
- Programs to demonstrate PHP Array functions. PHP Array Reverse Sorting, Array to String Conversion, Implode() function, String to Array, Array Count, Remove Duplicate Values
- Programs to demonstrate PHP Array functions. array Search, Array Replace, Array Replace Recursive, Array Sub String Search
- Demonstrate the use of regular expression to compare two strings.
- Extract Domain name from URL
- Find the number of rows from a MYSQL database for your query.
- Generate a Guestbook which will allow your website visitor to enter some simple data about your website.
- Develop a PHP program for Email Registration.
- Develop a project for making Application form and performing Degree Admission On-line.

CP 1447: WEB PROGRAMMING and PYTHON LAB

The laboratory work will consist of 15-20 Experiments

Part A (Web Programming)
1. Practicing basic HTML tags, text tags test styles, paragraph styles, headings, lists
2. Tables in HTML, Frames in HTML, nested frames, Link and Anchor Tags
3. Including graphics, video and sound in web pages, including Java applets
4. Layers & Image Maps
5. Creating animated Gifs
6. Cascading Style sheets
8. HTML forms and Fields
9. Development of a web site involving a variety of tools practiced above

PART B (Python)
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.
- Programs to demonstrate creating and handling of modules and packages
- Programs involving a variety of Exception Handling situations
- GUI programming

SEMESTER FIVE

Semester 5			Hrs per week			
Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
CP1541	3	Data Analytics	3	-	-	3
CP1542	3	Information systems & Knowledge Management	3	1	-	4
CP1543	3	Visual Programming	3	1	-	4
CP1551.1 CP1551.2 CP1551.3	2	**Open Course** Digital Marketing Internet & WWW Introduction to Cyber Security	3	-	-	3
CP1544	3	Software Testing	3	-	-	3
CP1545	3	Data Analytics Lab	-	-	4	4
CP1546	3	Visual Programming Lab	-	-	4	4
TOTAL	20		15	2	8	25

CP1541: DATA ANALYTICS

1. AIM

- ▪ Understand the principles and purposes of data analytics, and articulate the different dimensions of the area.

2. OBJECTIVES

The student should be able to get the idea:

- ▪ To work with and manipulate a data set to extract statistics and features, coping with missing and dirty data.
- ▪ To get the basic knowledge of HADOOP
- ▪ To appreciate the need for privacy, identify privacy risks in releasing information, and design techniques to mediate these risks.

3. SYLLABUS

Module 1: Introduction, how analytics is used in practice, analytics works in different companies Google, Facebook, Kaggle, and Netflix. **BIG DATA**–Introduction, why big data – evolution principles-difference from regular data - convergence of key trends – A Wider Variety of Data **-** unstructured data – Big Data Business Models, Enabling Big Data Analytic Applications. **Big data analytics in industry**– Digital Marketing and the Non - line World **-** web analytics – big data and marketing – New School of Marketing - fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies

Module II:Big Data Technology -Old vs. New Approaches, Data Discovery, Open-Source Technology, Cloud and Big Data, Predictive Analytics, Software as a Service, Mobile Business Intelligence, Crowdsourcing Analytics, Inter- and Trans-Firewall Analytics, R&D Approach Helps Adopt New Technology, Adding Big Data Technology into the Mix, **Information Management - B**ig Data Foundation, Big Data Computing Platforms, Big Data Computation, Big Data Storage, Big Data Computational Limitations, Big Data Emerging Technologies.**Business Analytics** - geospatial intelligence, Consumption of Analytics, Creation and Visualizing, Tools for Analytic Applications.

Module III:The People Part of the Equation - Evolution of Data Science, Learning over Knowing, Data Scientist Skills, Critical Thinking, Holistic View of Analytics, Setting Up the Right Organizational Structure forInstitutionalizing Analytics, **Data Privacy and Ethics -** Privacy Landscape, Customer Relationship Management, Rights and Responsibility, Technologies for anonymizing data,

Module IV:BASICS OF HADOOP - Introduction to Hadoop - Data, Data Storage and Analysis, Querying, Comparison with Other Systems- Relational Database Management Systems, Grid Computing, Volunteer Computing, A Brief History of Apache Hadoop.Design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization, Avro – file-based data structures, HADOOP RELATED TOOLS - Hbase – data model and implementations – Hbase clients.

4.   REFERENCES
- Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
- Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1542: INFORMATION SYSTEMS AND KNOWLEDGE MANAGEMENT
1. AIM
- To get basic idea on Information and knowledge management Systems.
- Discuss the intellectual methods for designing and deploying a Knowledge Management System.
- Go through various tools used in Knowledge Management and its applications.

2. OBJECTIVES
- To impart the term Information Systems and knowledge Management.
- To explore the idea on Knowledge Management system development and its implementation.
- To impart knowledge on various tools used forKnowledge Management and discuss its applications

3. SYLLABUS

Module 1: Evolution of Information Systems and Total Quality Management, Birth of computing, Evolution of Modern Computing, Data, Information Processing, Information Technologies, Evolution of Information Systems, Implementation of organisational information systems, Modern organisational information systems, Deployment of information systems, Industrial evolution, Quality methodologies, Total Quality Management, Artificial intelligence, Emerging business paradigm, Knowledge organisation.

Module 2: Knowledge and Knowledge Management, Data-Information-Knowledge-Business Intelligence, Attributes of Knowledge, Expression of Knowledge, Human thinking and Learning, Tacit and Explicit Knowledge, Knowledge: A driver for Creativity and Innovation, Knowledge: A strategic resource, Business benefits of knowledge, Tools for knowledge management.

Knowledge Management, Knowledge Initiatives, Knowledge Management Process, Knowledge Management and Development Life cycle, Knowledge Networking, Principles behind KM success, Thematic Analysis of Knowledge Management, SECI Model: Knowledge Transformation and Dynamics.

Module 3: Knowledge Management System and Development, Generic model of Knowledge Management System, Knowledge Management System: Development Life Cycle, Knowledge Management System: Application Cycle, Challenges in Developing KMS, KMS Life Cycle, KM System Architecture, Knowledge Construction Architecture, Implementation of KMS, The learning concept and Knowledge Management System.Introduction to KM, Establish a knowledge strategy framework, Validation of Knowledge, Validation of knowledge through Knowledge Models, Knowledge Creation, Acquisition of Knowledge, Knowledge Acquisition Techniques.

Module 4: Application phase and Organisation Learning, Knowledge Transfer, Knowledge sharing: A process, Knowledge Transferring sharing and tools, Codification of Knowledge, build a knowledge Maps, Designing Knowledge Transfer and Sharing strategy, Network structures for Knowledge Transfer, Knowledge Asset, Intellectual Capital and Property, Skandia model for measuring Intellectual capital, Successful Implementation of KM Initiative.Building a Learning organisation, Five core Disciplines of

a Learning organisation, The concept of Learning Organisation, Organisation Learning, Organisation Knowledge, Human Resource Management for KM, Paradigm shift in HRM functions.Information and Communication Technology(ICT), Unified communication Technology(UCT), WiMAX Technology.

4. REFERENCES

4.1 Core

- Knowledge Management – Waman S Jawadekar, Tata McGraw Hill Education Private Limited-2011
- Knowledge Management – E Sudhir Warier, Vikas Publishing House Pvt. Ltd. - 2009

4.2 Activities& Assignment:*Highlight the key steps to be performed in solving a Knowledge ManagementModel case;*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1543: VISUAL PROGRAMMING

1. AIM

- To get basic idea on ASP.NET web programming.

2. OBJECTIVES

On completion this course, student should able to:

- Get basic information about the features of visual studio tools
- Get the awareness of how to use cookies
- Get the idea of using SSL with GUI

3. SYLLABUS

Module 1: An Introduction to ASP.NET web programming – An introduction to web programming, an introduction to ASP.NET application development, quick preview of how an ASP.NET application works. Visual Studio features for working with CSS.Introduction to server controls, how to work with button controls, text boxes, labels, check boxes, radio button, list controls, and other web server controls like image, hyperlink, file upload, and calendar controls.

Module 2: Introduction to validation controls, basic validation controls, validation techniques and advanced validation controls. How to manage state – how to use view state, session state and application state.How to use cookies.

Module 3: An introduction to database programming – Introduction to relational database, how to use SQL to work with data in database. Introduction to ADO.NET 4. How to use SQL data source, how to use custom statements and stored procedures, Data list controls, Data binding, advanced features of a SQL data source.

Module 4: Customise the GridView control, Update GridView data, DataListView controls, FormView Control, ListView control and update ListView data.Introduction to SSL, how to get and use digital source certificate, how to use a secure connection, Introduction to authentication, how to setup authentication and authorization, how to use login controls, how to configure ASP.NET application, how to deploy an ASP.NET application.

4. REFERENCES

4 Core

- **Anne Boehm**, Murach's ASP.NET 4 web programming with VB 2010, Shroffs publishers and Distributors Pvt. Ltd

4.2 Additional

- **ImarSpaanjaars**, Beginning ASP.NET 4.0 in C# and VB, Wiley publishers
- **Simon Smart**, learn ASP.NET 4.0, C# and VB 2010, publishers Smart Method

4.3Assignments And Activities: Preparations of sample projects using ASP.NET with visual studio tools, Web pages with SSL connectivity.

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1551:OPEN COURSE
CP1551.1: DIGITAL MARKETING
1. AIM
- To introduce the student to the basic concepts of digital marketing functions
- To impart skills in the use of different types of payment tools with proper awareness on legal and secure transactions.

2. OBJECTIVES

At the end of this course, the students will be able to
- To familiarize students with Digital marketing function in organizations.
- Also aims to equip the students with understanding different modes of payments, beware of security and legal issues in digital marketing

3. SYLLABUS

Module I: Introduction: Nature, Scope and Importance of Digital Marketing; Evolution of Digital Marketing; Core Concepts-Inbound Marketing, Content Marketing, Email Marketing, Influential Marketing; Holistic Digital Marketing Concept, 10Ps of digital marketing; Digital Marketing Environment: Macro and Micro Environment.

Module II: E-banking: approaches, devices, services, benefits, drawbacks, Electronic payment systems-credit cards, debit cards, smart cards, credit accounts, cyber security, encryption, secret key cryptography, public key cryptography, digital signatures, firewalls

Module III: Digital Marketing: Search Engine Optimization (SEO), Social Media, Content Marketing; Email Marketing, Mobile Marketing. Challenges for Digital Marketing: Increased Security Risk, Cluttered Market, Less Focus on Keywords, More Ad Blockers, Increased Ad Costs**.**

Module IV: Digital Marketing: Pay per Click-Search Engine Advertising, Advantages, Factors, Conversion Rate Optimization (CRO); Digital Marketing- Web Analytic. Social Media Marketing: Face book, Pinterest, Twitter, LinkedIn, YouTube, Google Adwords, Google Analytics; Issues and Future enhancement of Digital Marketing.

4. REFERENCES:
- **Core**
  - Ian Dodson-*The art of Digital Marketing*, Wiley

4.2 Additional
- Puneet Singh Bhatia- *Fundamentals of Digital Marketing*, Pearson Education

4.3 Assignments and activities: *Collection of current marketing tools, case studies, new trends.*
NB:- Activities and assignments are not meant for End_Semester_Examination

CP1551.2: INTERNET AND WWW
1. AIM:
- To introduce to Internet and World Wide Web.

2. OBJECTIVES:
- To understand the basic concepts of Networks.
- To learn the working of Internet.
- Exposure to Network Protocols.
- Exposure to WWW.

3. SYLLABUS

Module I: Introduction to Network-Types of Network-Network Topologies, Intranet, Extranet-Advantages, Internet-History, Modes of Connecting to Internet-Dialup Access-Direct to dedicated connections, Internet Service Providers, Domain Name Service, Internet Addresses-Addressing Scheme-IPV6,Modems,Communication Software, Internet tool-File Transfer Protocols, Search Tools, Telnet.

Module II: Introduction to WWW-WWW and HTTP, Webpage, Introduction to Web Browser-Book Marks-Comparison, Directories, Search Engines-Search Fundamentals-Search Terminology-Search Strategies – Search Generalization-Search Specialization-Working.

Module III: Uniform Resource Locator (URL) Introduction to TCP/IP-TCP/IP Model, Email-Working with Email-Sending Mail-Reading Mail-Replying to Mail-Deleting Mail-Advantages and Disadvantages of Email, Basics of Chat Rooms, SMTP.

Module IV: Introduction to Web Server-Personal Web Server (PWS)-Internet Information Server (IIS)-Apache Webserver-Benefits of Web Server, Introduction to Security-Internet Security-Identifying Network Stations, Network Protocols-Internet Security Threats.

4. REFERENCES

4.1 Core

- Dr. Surender Jangra, "Basics of Internet and Web", Vayu Education of India. New Delhi 110002

4.2 Additional

- Raymond Greenlaw, Ellen Hepp "Fundamentals of Internet and the World Wide Web, McGraw-Hill.

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1551.3: CYBER SECURITY

1. AIM
   - To introduce the issues and methods of information security and its guidelines.

2. OBJECTIVES:

On completion of this course student shall:
   - Understand high-level overview of information security principles.
   - Understand different roles and responsibilities of security professionals
   - Understand cryptography and information system risk management.
   - Be aware of multiple security control families as well as benefits of each control family

3. SYLLABUS

Module I: Introduction to Information systems: Modelling business process, components, categories, Individuals in information system, Developing information systems; **Information Systems:** threats, Information assurance, cyber security and security risk analysis; **Application security:** Data Security considerations, security technology, intrusion detection access control

Module II: Security threats: Introduction to security threats, Network and services attack, security threats to e-commerce

Module III: Security Policies: Introduction, Why we need security policies, Security policy development, Email security policies, Policy review process, corporate policy, sample template of cyber security policy

Module IV: Information security standards: Why ISO, IT ACT 2000, copyright, Patent, Intellectual property right, Cyber laws in India, Software Licensing, Semi conductor law and patent law,

4. REFERENCES

Core: Fundamentals of Cyber security, MayankBhushan, BPB publication, First Edition 2017

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1544: SOFTWARE TESTING

1. AIM:
   - To provide students the knowledge of testing software

2. OBJECTIVES:

At the end of this course, the student will able to
   - Discuss the basic concept of testing

- Explain the different types of testing
- Describe the tools used for testing

3. SYLLABUS

Module I: Introduction: purpose of testing, testing and debugging, models for testing, types of testing, types of bugs. Flow graphs and path testing:-Basic concept of path testing, predicates, path predicates and achievable, path sensitizing, path instrumentation.

Module II: White box testing, static testing:-static testing by Humans, static analysis tools. Structural testing, code coverage testing, code complexity testing, challenges in white box testing.

Module III: Black testing-Requirements based testing, positive and negative testing, Boundary value analysis, Decision Table, equivalence partitioning, state based or Graph based testing, compatibility testing, User Documentation testing, Domain testing.

Module IV: Test management and automation:-Introduction, Test planning, Test management, Test process, Test reporting; Test automation. Test tools

4. REFERENCES

4.1 Core

- Software testing principles and practices, Pearson by Srinivasan Descikan,Gopalaswamy Ramesh.
- Basis Beizes,software. testing techniques,Dreamtech,Second edition

4.2 Additional

- Edward Kit,Software Testing in the Real world, Pearson Education of India.
- K.K Prasad, Software Testing Tools,Dreamtech.

4.3 Assignment and activities:*case studies on different testing methodologies and comparison of time complexities.*

> **NB:- Activities and assignments are not meant for End_Semester_Examination**

CP1545: DATA ANALYTICS LAB

1. AIM

- Optimize business decisions and create competitive advantage with Big Data analytics

2. OBJECTIVES

- To impart the term Information Systems and knowledge Management.
- To explore the idea on Knowledge Management system development and its implementation.

3. SYLLABUS

Part A

- Program related to module I and II of CP1541:Data Analytics

Part B

- Program related to module III and IV of CP1541: Data Analytics

CP1546: VISUAL PROGRAMMING LAB

1. AIM

- To get basic idea on ASP.NET web programming.

2. OBJECTIVES

On completion this course, student should able to:

- Get basic information about the features of visual studio tools
- Introduction to ASP.NET Web Application
- Get the idea of using SSL with GUI

3. SYLLABUS

Part A

- Programs related to module I and II of CP1543:Visual Programming

Part B

- Programs related to module III and IV of CP1543: Visual Programming

SEMESTER SIX

Semester 6			Hrs per week			
Course code	Credits	Course Name	Lecture	Tutorial	Lab	Total
CP1641	3	Multimedia Systems	3	-	-	3
CP1642	4	Object Oriented Analysis and Design	3	-	-	3
CP1643	3	Design and Analysis of Algorithms	3	1	-	4
CP1661.1 CP1661.2 CP1661.3	3	**Elective** Geographical Information System Entrepreneurship and Innovation Internet of Things (IoT)	3	-	-	3
CP1644	3	Trends in Computing	-	-	4	4
CP1645	4	Major Project	-	-	8	8
TOTAL	**20**		**12**	**1**	**12**	**25**

CP1641: MULTIMEDIA SYSTEMS

1. AIM
- To introduce students to various multimedia elements along with the theoretical underpinnings and to expose them to integration of these elements.

2. OBJECTIVES
By the end of this course, students should be:
- Familiar with features of text, audio, images, video and active contents
- Familiar with the file formats for the above elements
- Aware of various application softwares used to process the above elements
- Aware of various applications of multimedia

3. SYLLABUS
Module I: Concept of Multimedia, Hypertext, Hypermedia, History of multimedia, Multimedia hardware: CD-ROM, DVD, Microphone, Speakers, Soundcards, Video Camera, MIDI, Applications of multimedia in entertainment, education, health etc.

Module II: Graphic and image data representation, spatial and temporal resolution of images, grey level and colour images, basic concepts, computer image processing (image synthesis, image analysis, image recognition, image transmission), animations, image data compression, image file formats(JPEG, MPEG).

Module III: Analog and digital video, basic concepts, computer video format, frame rates, sync, resolution, colour video formats- NTSC,PAL and SECAM, analog video artifacts, video equipments, digital video compression

Module IV: Sound/Speech processing: Basic Sound concepts- Computer representation of sound, Audio formats, MIDI-basic concepts, devices, messages, software, Speech- generation, analysis, transmission.

4. REFERENCES
4.1 Core
- Ralf Steinmetz and KlaraNahrstedt,*Multimedia Applications*, Pearson Education

4.2 Additional
- Malay K. Pakhira, *Computer Graphics Multimedia and Animation*, PHI, 2008.
- Judith Jeffcoate, *Multimedia in Practice: Technology & Applications*, PHI

4.3 Assignment and activities: *Multimedia on the mobile platform, Multi-media networks, Streaming media, quality of service, Introduction to Macromedia Flash, Multimedia on Linux, Multimedia on the web. Virtual Reality systems*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1642: OBJECT ORIENTED ANALYSIS AND DESIGN

1. AIM
- Provide an environment for the students to design projects using object oriented approach

2. OBJECTIVES
At the end of this course, the students will be able to
- Discuss various OOA approached
- Describe the concept of unified modelling language
- Explain different diagrams used

3. SYLLABUS
Module 1: Object Oriented Concepts, class, object, defining a class, Comparison between Algorithmic Decomposition and Object Oriented Decomposition, Object Oriented Themes: Abstraction, Encapsulation, Inheritance, polymorphism.

Module 2: Concept of unified modelling language, Object Oriented Analysis and Design using UML, UML Diagrams: Class Diagram, representing various features of a class, messages, use case diagram, identifying use cases, examples.

Module 3: interaction diagrams: Sequence Diagram, examples, elements of a sequence diagram, system-level and service level diagrams, benefits of sequence diagram, Collaboration Diagram, elements examples

Module 4: Activity Diagram, State Chart Diagram, Component Diagram, modelling interfaces, Deployment Diagram, elements, examples.

4. REFERENCES
4.1 Core
- Ali Bahrami - *Object Oriented Systems Development*, McGrawHill

4.2 Additional
- Grady Booch, *Object Oriented Analysis and Design*, Addison Wesley, Pearson
- Edward Yourdon , Carl Argila, *Case Studies in Object-Oriented Analysis and Design*
- Joey F. George, Dinesh Batra, Joseph S. Valacich, Jeffrey A. Hoffer, *Object-Oriented Systems Analysis and Design*

4.3 Assignment & Activities: *Case study: generating UML diagrams for a system.*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1643: DESIGN AND ANALYSIS OF ALGORITHMS

1. AIM
- To make students able to devise and analyze new algorithms by themselves.

2. OBJECTIVES
On completion this course, student should:
- Be able to analyze the complexity of algorithms
- Be able to select good algorithms from among multiple solutions for a problem
- Have better knowledge on fundamental strategies of algorithm design and awareness on complex algorithm design strategies
- Implement some typical algorithms

3. SYLLABUS
Module I: Algorithm Analysis: Algorithm, Properties of a good algorithm, efficiency considerations, Complexity: time complexity, space complexity, Asymptotic notations: Big O notation, best case, worst

case, average case, simple examples, recursion and its elimination- recursive and no-recursive algorithms for binary search.

Module II: Algorithm design techniques-Divide and conquer method: binary search as a divide-and-conquer algorithm, finding maximum and minimum, Strassen's matrix multiplication, Greedy method: Knapsack problem, minimum cost spanning trees, Prim's algorithm, Kruskal's algorithm.

Module III: Dynamic programming: principle of optimality, all pair shortest paths, single source shortest paths, travelling sales person's problem, Back tracking: implicit constraints and explicit constraints, 8 queen's problem, Branch and bound: LC search

Module IV: Standard Algorithms: sorting- quick sort, merge sort, complexity of sorting algorithms, Deterministic and non-deterministic algorithms, NP-hard and NP complete- basic concepts.

4. REFERENCES
4.1 Core
- AnanyLevitin, *Introduction to design and analysis of algorithms*, Pearson, Second Edition

4.2 Additional
- Ellis Horowitz, SartajSahni, SanguthevarRajasekharan *–Computer Algorithms / C++*, SecondEdition- Universities Press.

4.3 Assignments And Activities:*Studies on complexities of various algorithms, best case, average case worst case analysis.*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP 1661 ELECTIVE
CP 1661: GEOGRAPHICAL INFORMATION SYSTEMS
1. AIM
- Introduce the fundamental concepts and applications of GIS

2. OBJECTIVES
- Understand spatial data and principles of relational database model
- An overview of the process of creating an integrated GIS
- Use of GIS in decision making

3. SYLLABUS

Module I: Fundamentals: Defining GIS, Components of a GIS, Spatial Data, Maps and spatial data, other sources of spatial data.

Module II: Data Models and Database Management: Spatial data models and data structures, why database approach, Database Data Models, Creating a database, GIS database applications

Module III: Data Input, Editing and Analysis: Methods of Data Input, Data Editing, Measurements in GIS, Queries, Buffering and Neighbourhood functions, Integrating data – Map Overlay.

Module IV: Output and Applications of GIS: Maps as output, Non-Cartographic output, Spatial Multimedia, GIS and Spatial Decision Support, Computer methods for handling spatial data, GIS applications, GIS users, GIS in the 21st century.

4. REFERENCES:
4.1 Core
- Ian Heywood, Sarah Cornelius, Steve Carver – An Introduction to Geographical Information Systems, Third Edition – Pearson Education

4.2 Additional:
- Peter A. Burrough and Rachael A. McDonnell – Principles of Geographical Information Systems, Oxford University Press
- M.Anji Reddy, Remote Sensing and Geographical Information Systems, Third Edition, BS Publications
- C.P.Lo.Albert K.W.Yeung, Concepts and Techniques of Geographic Information System- Eastern Economy Edition

4.3 Assignment and activities: *Issues in GIS – Data quality issues, Human and organizational issues, GIS project design and management*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1661: ENTREPRENEURSHIP DEVELOPMENT

1. AIM
- To equip the students to have a practical insight for becoming an entrepreneur.

2. OBJECTIVES
- To familiarize the students with the latest programs of the government authorities in promoting small and medium industries.
- To impart knowledge regarding how to start new ventures.

3. SYLLABUS

Module I: Concepts of entrepreneur: Entrepreneur- Definitions-Characteristics of entrepreneur-Classification of entrepreneur-Entrepreneurial traits- Entrepreneurial functions-role of entrepreneurs in the economic development- Factor effecting entrepreneurial growth- Entrepreneurship - Meaning-definition- Entrepreneur Vs Intrapreneur- Women Entrepreneurs-Recent development -Problems-Entrepreneurial Development Programmes- Objectives of EDP-Methods of training- Phases of EDP.

Module II: Institutional support and incentives to entrepreneurs- Functions of Department of Industries and Commerce (DIC) - Activities of Small Industrial Development Corporation (SIDCO)-Functions of National Small Industries Corporation(NSIC)-Functions of Small Industries Development Bank of India (SIDBI)-Khadi Village Industry Commission (KVIC)-Small Industries Service Institute (SISI)-Functions and services of Kerala Industrial Technical Consultancy Organisation (KITCO)-Activities of Science and Technology Entrepreneurship Development Project (STEDP)-Strategies of National entrepreneurship Development Board(NEDB)-Objectives of National Institute for entrepreneurship and small business development (NIESBUD)- Techno park-Functions of techno park Incentives-Importance- Classification of incentives- Subsidy- Types of Subsidy.

Module III: Micro Small and Medium Enterprises- Features- Objectives- Importance- Role of SME in the economic development- MSME Act 2006- Salient features- Credit Guarantee Fund Trust Scheme for MSMEs - Industrial estates-Classification-Benefits-Green channel- Bridge capital- Seed capital assistance-Margin money schemes –Single Window System- Sickness- Causes –Remedies- Registration of SSI

Module IV: Setting up of Industrial unit-(Only Basic study) Environment for Entrepreneurship –Criteria for selecting particular project- Generating project ideas-Market and demand analysis-Feasibility study-Scope of technical feasibility- Financial feasibility- Social cost benefit analysis-Government regulations for project clearances -Import of capital goods- approval of foreign collaboration-Pollution control clearances- Setting up of micro small and medium enterprises-Location decision- Significance. Project Report – Meaning – Definition-Purpose of project reports-Requirements of good report-Methods of reporting-General principles of a good reporting system - Performa of a project report.

4. REFERENCES

4.1 Core
- Shukla M. B., *Entrepreneurship and Small Business Management*, Kitab Mahal Allahabad.

4.2 Additional
- Sangram Keshari Mohanty, *Fundamentals of Entrepreneurship,* PHI Learning Pvt. Ltd., New Delhi.
- H. Nandan, *Fundamentals of Entrepreneurship*, PHI Learning Pvt. Ltd., New Delhi.
- Dr.Vasant Desai*, Small-Scale Industries and Entrepreneurship*, Himalaya Publishing, Delhi.
- C. N. Sontakki, *Project Management*, Kalyani Publishers, Ludhiana.
- Peter F. Drucker, *Innovation and Entrepreneurship,* Routledge Taylor & Francis Group
- Dr.Vasant Desai, *Small Business Entrepreneurship,* Himalaya Publications.
- MSME Act 2006.

CP 1661.3: INTERNET OF THINGS

1. AIM

- To introduce the basic concepts of the convergence of operational technology (OT) and informational technology (IT)

2. OBJECTIVES

- To get a deep dive into IoT network engineering, from smart objects and the network that connects them to applications, data analytics, and security.
- To guide through the different types of smart objects, from those that simply record information to those that are programmed to perform actions in response to changes.
- To guide through the different common application protocols to generic and web-based protocols.
- To get basic knowledge about the security practices for IT and OT and details how security is applied to an IoT environment.

3. SYLLABUS

Module I: Introduction to IoT: - Genesis of IoT, Digitization, Impact, Connected Roadways - Challenges- safety, mobility, environment, Connected Factory -industry – mechanical assistance, mass production, electronics and control, integration, Smart Connected Buildings – heating, ventilation, HVAC systems, BAS System, BACNet, Smart Creatures, Convergence of IT and OT, IoT Challenges – Scale, Security, Privacy, Big data and data analytics. **IoT Network Architecture and Design: -** Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack

Module II: Engineering IoT Networks: Smart Objects **-** Sensors, Actuators, and Smart Objects, Sensor Networks, **Connecting Smart Objects:** Communications Criteria IoT Access Technologies

Module III: IP as the IoT Network Layer: Business Case for IP, Need for Optimization, Optimizing IP for IoT, Profiles and Compliances, **Application Protocols for IoT:** Transport Layer, IoT Application Transport Methods

Module IV: Securing IoT: A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment, **Public Safety:** Overview of Public Safety, An IoT Blueprint for Public Safety, Emergency Response IoT Architecture, IoT Public Safety Information Processing, School Bus Safety

4. REFERENCES

4.1 Core

- David Hanes, " IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things", Cisco Press, Pearson, 2017.

4.2 Additionals

- Graham meikle, "The internet of things", polity press, 2017
- Andrew Minteer, "Analytics for the internet of things: Intelligent analytics for your intelligent devices", Packt publishing, 2017
- Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, **"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",** 1st Edition, Academic Press, 2014.
- Peter Waher**, "**Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
- Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1644: TRENDS IN COMPUTING

1. AIM

- Introduce advanced computing technologies and their application areas

2. OBJECTIVES

- To introduce the broad perceptive of cloud architecture& model
- To introduce basics of edge computing and application
- How problems solved using soft computing

3. SYLLABUS

Module I: Cloud Computing: Technologies for network Based system-system models for distributed and cloud computing, Cloud Types, Cloud models- characteristics-cloud services (IaaS, PaaS, SaaS) – public vs. private cloud-computing on demand.

Module II: Data Storage in the cloud: Understanding, Advantages and Disadvantages of Cloud Based Data Storage; Service Oriented architecture- understanding SOA, web service; Implementing real time application over cloud platform.

Module III: Edge Computing: Overview, Edge computing terms and definitions, advantages, applications-**grid computing**: **g**rid layered architecture, Distributed computing, **mobile edge computing**: introduction, reference architecture, application in 5G technologies.

Module IV: soft computing: soft computing vs. hard computing: Introduction to Neural Network-Intelligence, Neurons, Artificial Neural network, Application scope of neural network, Brain vs computer. Problem areas, Training of artificial networks- supervised and Unsupervised; From ordinary set to fuzzy sets- Basics of Fuzzy set logic Theory, Foundation of fuzzy logic- fuzzy sets; Application.

4. REFERENCES

4.1Core

- Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
- Venkatakrishna & etal, Principles of Grid computing - Concepts and application, Ane Books
- Kris Jamsa, Cloud Computing; Jones & Bartlett Lerning.
- Rahul Deva &GarimaKulshreshtha. Soft computing. Shrof publishers & Distributers Pvt. Ltd.

4.3 Additional

- Micheal Berkhold, David. j. Hand**,** "Intelligent Data Analysis", springer,2007
- Google Apps by Scott Granneman,Pearson
- Cloud Computing : A Practical Approach, Antohy T Velteet.alMcGraw Hill,
- Cloud Computing Bible by Barrie Sosinsky, Wiley India
- Edge computing IEEE journals and magazine
- Data Analytics made accessible Dr. Anil Maheswari
- Anand Rajaraman and Jeffry David Ullman "mining of massive Datasets" Cambridge university press
- Rajkumar Buya and etal, Cloud computing – Principles and paradigm, Wiley Publishers
- S. Rajasekaran&G.A.VijayalakshmiPai. Neural Networks. Fuzzy Logic and Genetic algorithms Syntheais and application. PHI Learning Private Limited.
- Mahesh Mahajan & Rajdev Tiwari, Introduction to soft computing . Acme Learning
- Dilip K Pratihar, soft computing – fundamentals & applications , Narosa.
- S.N.Sivanandam, S.N. Deepa, Principles of soft computing,Wiley India.

4.3 Assignment and activities: *Study of cloud computing, Migrating to cloud, revolutionary development in edge computing, GPS application, Hadoop technology, Engineering, Industries, government application of Big data*

NB:- Activities and assignments are not meant for End_Semester_Examination

CP1645: MAJOR PROJECT

1. AIM

- To expose student to industry-standard project practices, through a real-life project work under time and deliverable constraints, applying the knowledge acquired through various courses.

2. OBJECTIVES

- To provide an opportunity to apply the knowledge gained through various courses in solving a real life problem
- To provide an opportunity to practice different phases of software/system development life cycle
- To introduce the student to a professional environment and/or style typical of a global IT industry
- To provide an opportunity for structured team work and project management
- To provide an opportunity for effective, real-life, technical documentation
- To provide an opportunity to practice time, resource and person management.

3. PROJECT GUIDELINES

- Group Size – Maximum 4, most preferably- 3
- No. of records – No. of group members+ 1 (Department copy)
- Certificate should include the names of all members

The minimal phases for the project are: Project feasibility, Investigation of system requirements, Data and Process Modelling, System Design, Program design, Program coding and unit testing, System integration, System implementation and acceptance testing.

3.1 Planning the Project: The Major Project is an involved exercise which has to be planned well in advance. The topic should be chosen in Semester 4 itself and the study of Course CS1342 should as far as possible, be based on the project topic, although in cases with valid reasons, the project guide may waive this condition. Related reading, training and discussions should start from semester 5 itself.

3.2 Selection of project work: Project work could be of 3 types:

a) Developing solution for a real-life problem: In this case, a requirement for developing a computer based solution already Exists and the different stages of system development life cycle is to be implemented successfully. Examples are Accounting Software Package for a particular organization, Computerization of administrative functions of an organization, Web Based Commerce, etc. The scope for creativity and exploration in such projects is limited, but if done meticulously, valuable experience in the industrial context can be gained.

(b) Innovative Product development: These are projects where a clear-cut requirement for developing a computer based solution may not be existing, but a possible utility for the same is conceived by the proposer. An Example is a Malayalam Language Editor with Spell Checker, Computer Music Software for Indian Music, Heat Engines Simulation Software for eLearning, Digital Water Marking Software etc.

(c) Research level project: These are projects which involve research and development and maynot be as structured and clear cut as in the above case. Examples are Malayalam Character Recognition, Neural Net Based Speech Recogniser, Biometric Systems, Machine Translation System etc. These projects provide more challenging opportunities to students and can be attempted.

If any student identifies proper support in terms of guidance, technology and references from External organizations and also the supervisors are convinced of the ability of the student(s) to take up the project, it shall be permitted. The methodology and reporting of such projects could be markedly different from type (a) and is left to the proposer/external supervisor of the projects.

3.3 Selection of Team: To meet the stated objectives, it is imperative that Major Project is donethrough a team effort**.** Though it would be ideal to select the team members at random

(drawing lots) and this should be strongly recommended, due to practical considerations, students may also be given the choice of forming themselves into teams preferably **3** in numbers up to a maximum of **4** members (teams less than 3 members may be permitted in certain cases, for valid reasons). A gender mix should also be strongly suggested. A team leader shall be elected through drawing lots. Teams shall maintain team meeting minutes and ensure that every team member has tasks assigned in writing. Team meeting minutes shall form a part of the Project Report. Even if students are doing projects as groups, each one must independently take up different modules of the work and must submit the reports also independently (though, in such cases, some common materials is permissible).Evaluation will also be done independently.

3.4 Selection of Tools: No restrictions shall be placed on the students in the choice ofplatforms/tools/languages to be utilized for their project work, though open source is strongly recommended, wherever possible. No value shall be placed on the use of tools in the evaluation of the project.

3.5 Selection of Organization & Guide: No restrictions shall be placed on the students in thechoice of organization where project work may be done, in terms of locality, type (public/private) etc. It is the duty of the Head of Institute/Principal of College to ensure that the Aim, Objectives and full project guidelines are communicated to the external organization. The guide should ideally be a post-graduate with minimum 2 years of work experience.

Students may also choose to do project in the college/institute (or partially in the college/institute and partially in an external organization), especially product-based work, but in such cases the supervisors must ensure that (i) industry practices are followed (ii) the students undertake a planned visit to an IT industry with international operations to make up for the loss of experience and (iii) the services of an external guide with industry experience is obtained.

3.6 Project Management: Head of Department /Institute should publish a list ofstudents, projects topics, internal guide and external organization (if any) and teams agreed, before the end of semester 5. Changes in this list may be permitted for valid reasons and shall be considered favourably by Head of Department /Institute any time before commencement of the project. Any request for change after commencement should considered by a committee of 3 teachers and their recommendation shall be accepted by Head of Department/ Institute.

Gantt-chart of proposed activities and a draft statement of project deliverables (which maysubsequently be altered if justified) should be prepared before the commencement of the project. The actual completion of each phase should be noted on the chart in the course of the project work. Team meetings should document the progress of the project. Students should submit a fortnightly report of progress which could be indication of percentage of completion marked on the original Gantt-chart, with any notes attached. Students should ideally keep a daily activity log sheet. Changes in the submitted documents are possible, as project development is essentially an evolutionary process. The project guide must ensure that changes are necessary due to the knowledge gained in succeeding phases of the project. The date of Completion of a phase should be brought forward if the changes made are deemed to be errors and not due to additional knowledge gained from a succeeding phase.

3.7 Documentation:

The following are the major guidelines: The final outer dimensions of the report shall be 21 cm X 30 cm. The colour of the flap cover shall be light green. Only hard binding should be done, with title of the Project and the words "< TITLE> BSc(CS) Project Report 2018" displayed on the spine in 20 point, Bold, Times New Roman.   It is highly recommended that Latex be used for documentation.

• The text of the report should be set in 12 pt, Times New Roman, 1.5 Spaced.

• Headings should be set as follows: CHAPTER HEADINGS 20 pt, Times New Roman, Bold, All Caps, Centered.

1. SECTION HEADINGS 12 pt, Times New Roman, Bold, All Caps, Left Adjusted.

1. 1 Section Sub-headings 12 pt, Times New Roman, Bold, Left Adjusted.
Titles of Figures, Tables etc are done in 12 point, times New Roman, Italics, Centered.

<PROJECT TITLE>

<STUDENT NAME>

<COLLEGE NAME and EMBLEM>

PROJECT REPORT

Submitted in partial fulfilment of the

Requirements for the award of

Bachelor of Computer applications degree of

University of Kerala

2018

Some general guidelines on documentation stylistics are:
- Double quotes and single quotes should be used only when essential. Words put in quotes are better highlighted by setting them in italics. Eg: This process is known as "morphing". This process is known as *morphing.*
- Page numbers shall be set at right hand top corner, paragraph indent shall be set as 3.
- Only single space need be left above a section or sub-section heading and no space may be left after them.
- Certificate should be in the format: "Certified that this report titled....................... is a bonafide record of the project work done by Sri/Kum....................... under our supervision and guidance, towards partial fulfillment of the requirements for the award of the Degree of BSc (Computer Science) of the University of Kerala" with dated signatures of Internal Guide, external guide and also Head of Department/Institute.
- If the project is done in an external organization, another certificates on the letterhead of the organization is required: "Certified that his report titled.............................. is a bonafide record of the project work done by Sri/Kum............................ under any supervision and guidance, at the ....Department of.................... (Organization) towards partial fulfilment of the requirements for the award of the Degree of BSc (Computer Science) of the University of Kerala".
- References shall be IEEE format (see any IEEE magazine or transaction). Take care in use of italics and punctuation. While doing the project, keep note of all books you refer, in the correct format, and include them in alphabetical order in your reference list. Eg: A book is cited as: Kartalopoulos, S V Understanding Neural Networks and Fuzzy Logic, BPB Publishers, 1996, pp. 21-27. (pp.21-27 indicates that pages 21-27 have been referred. If the whole book is being referred, this may be omitted. If a single page is referred, say 7, it may be cited as p.**7.**
- **Report writing is NOT a hasty activity done after finishing the project**. Students must try to develop the report along with the work, so as to give it flesh and blood. Drafts should be read, modified, spell checked and grammar checked at least thrice during the course of the project and before a final printout is taken, the same may be got approved from the internal guide.
- The students should send two interim reports after the analysis and design phases of the project to internal guides. This will also help the students in their report writing.

- A soft copy of the complete documentation, including source code, should be maintained for any clarification during assessments.
- The Gantt chart, fortnightly progress reports recorded in team meeting minutes mentioned in section 3.5 should appear as appendix to the project report.

Regarding the body of the report, as an indicative example, the following is given (though students should not attempt to fit every kind of project report into this format):

  – Organizational overview (of the client organization, where applicable)
  – Description of the present system
  – Limitations of the present system
  – The Proposed system- Its advantages and features
  – Context diagram of the proposed system.
  – DFD of the proposed system with at least one additional level of Expansion
  – Structure Chart/E-R diagrams of the System
  – System flowchart
  – Files or tables (for DBMS projects) list. Class names to be entered for each file in OO systems.
  – List of fields or attributes (for DBMS projects) in each file or table.
  – File table that shows the files/tables used by each program and the files are read, written to, updated, queried or reports were produced from them.
  – Reports List with column headings and summary information for each report.
  – System Coding and variable/file/table naming conventions
  – System controls and standards
  – Screen layouts for each data entry screen.
  – Report formats for each report.

Program documentation is suggested on the following lines:

  – Program id
  – Program function explanation
  – Program level pseudocode or flowchart.
  – Data entry screen (reproduced from system documentation).
  – Report layout (reproduced from system documentations)
  – Decision tables, decision trees, with English Explanation where necessary.
  – Program listing
  – Test data
  – Test results.

3.8 Methodology:

Wherever applicable, object oriented approach should be used for software development. The project report should generally contain details of the following steps *(though students should notattempt to fit every kind of project into this format):*

(a) Analysis
  – Study of existing systems and its drawbacks
  – Understanding the functionalities of the system in detail
  – Preparation of requirements
  – Conduct of Feasibility study
  - Development of DFD/use case diagrams

(b) Design
  – Design of each subsystems/modules
  – Design of each classes
  – Design of Algorithms for problem solving
  – User interface /Input/ Output Design
  – Any other steps if necessary

(c) Coding and Implementation

(d) Testing
(e) Security, Backup and Recovery Mechanisms
(f) On line help and User Manuals
(g) Upgradability Possibilities

3.9 Project IPR & Utilization: The intellectual property rights in all project work done by the students shall vest with the University of Kerala, except in cases where some external organizations seek undertaking from students to concede IPR in all work done in their organization or under their guidance. Where possible, students should attempt to obtain at least a joint IPR for the University. In cases where project works are of public utility, students shall be asked to publish their work including source code and documentation, in so far as their rights are clear.

4. REFERENCES
4. 1 Core
- S A Kelkar, *Software Project Management*, Prentice Hall of India
- W Alan Randolph, Barry Z. Posner, *Effective project planning and management*, PHI

4.2 Additional
- Greg Mandanis, *Software Project Management Kit for Dummies*, IDG Books Joel Henry, *Software Project management*
- Frederic P B, Mythical Man-month, *Essays on Software Engineering*, Addison Wesley David Lamport, *Latex: A document Preparation System*, 2/e, Pearson Edn

5. EVALUATION
5.1 Criteria for external evaluation of Major Project
External evaluation is done by an external examiner appointed by the University
The following components are to be assessed for the End Semester Evaluation of the Major Project:
- Quality of documentation- 30 marks
- Presentation of work- 25 marks
- Viva - 25 marks
  Total - 80 marks

5.2 Criteria for internal evaluation of Major Project
Internal evaluation is be done by conducting a viva voce by a team of evaluators comprising of the concerned guides and/or Head of the Department. The following are the components for internal evaluation of the Major Project:
- Presentation of the work-5 marks
- Individual involvement & team work/ Attendance- 5marks
- Timely submission and assessment of 2 interim reports -10 marks

1. **Total - 20 marks**