Scheme & Syllabus of
Bachelor of Computer Applications
(BCA)

Batch 2021 onwards

By
Department of Information Technology

Sardar Beant Singh State University, Gurdaspur

Bachelors of Computer Applications (BCA):
It is a Under Graduate (UG) Programme of 3 years duration (6 semesters)

Eligibility: All those candidates who have passed the 10+2 or its equivalent examination in any stream conducted by a recognized Board / University / Council.

Or

Those candidates who have passed their Matriculation examination **AND** have also passed three year Diploma in any Trade from Punjab State Board of Technical Education & Industrial Training, Chandigarh or such Examination from any other recognized State Board of Technical Education, or Sant Longowal Institute of Engineering & Technology, Longowal.

BCA (Lateral Entry): It is a Under Graduate (UG) Programme of 2 years duration (4 semesters)
Eligibility: All those candidates who have passed Matriculation examination **AND** have also passed 3 Year Diploma in any Trade from Punjab State Board of Technical Education & Industrial Training, Chandigarh or such Examination from any other recognized State Board of Technical Education, or Sant Longowal Institute of Engineering & Technology, Longowal.

Or

10+2 with 1 year Diploma in Computer Application / IT (or equivalent) from a recognized University with Mathematics as course at 10+2 or DIT / DCA level.

(Gureshpal Singh)　　　　　(Anil)　　　　P a g e | **1**

PROGRAM OUTCOMES (POs)

Program: BCA

1. **Basic knowledge:** An ability to apply knowledge of basic mathematics, science and domain knowledge to solve the computational problems.

2. **Discipline knowledge**: An ability to apply discipline –specific knowledge to solve core and/or applied computational problems.

3. **Experiments and practice:** An ability to plan and perform experiments and practices and to use the results to solve computational problems.

4. **Tools Usage**: Apply appropriate technologies and tools with an understanding of limitations.

5. **Profession and society**: Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional practice.

6. **Environment and sustainability**: Understand the impact of the computational solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

7. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the professional practice.

8. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

9. **Communication:** An ability to communicate effectively.

10. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes.

First Semester

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BCAM-21101	Mathematics	4	0	0	40	60	100	4
BCCS-21102	Computer Fundamental	4	0	0	40	60	100	4
BCCS-21103	Problem Solving using C	4	0	0	40	60	100	4
BCCS-21104	Problem Solving using C Laboratory	0	0	4	60	40	100	2
BCCS-21105	Computer Fundamentals Laboratory	0	0	4	60	40	100	2
BCHU-21106	English	3	0	0	40	60	100	3
BCHU-21107	English Practical/Laboratory	0	0	2	60	40	100	1
BCCS-21108	Human Values, De-addiction and Traffic Rules	3	0	0	40	60	100	3
	TOTAL	**18**	**0**	**10**	**380**	**420**	**800**	**23**

Second Semester

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BCCS-21201	Fundamentals of Statistics	4	0	0	40	60	100	4
BCCS-21202	Computer System Architecture	4	0	0	40	60	100	4
BCCS-21203	Object Oriented Programming usingC++	4	0	0	40	60	100	4
BCCS-21204	Object Oriented Programming usingC++ Laboratory	0	0	4	60	40	100	2
BCCS-21205	Fundamentals of Statistics Laboratory	0	0	4	60	40	100	2
BCCS-21206	Computer System Architecture Laboratory	0	0	4	60	40	100	2
BCCS-21207	Environmental Studies	2	0	0	40	60	100	2
		14	**0**	**12**	**340**	**360**	**700**	**20**

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Third Semester

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BCCS-21301	Computer Networks	4	0	0	40	60	100	4
BCCS-21302	Operating Systems	4	0	0	40	60	100	4
BCCS-21303	Data Structures	4	0	0	40	60	100	4
BCCS-21304	Operating Systems Laboratory	0	0	4	60	40	100	2
BCCS-21305	Computer Networks Laboratory	0	0	4	60	40	100	2
BCCS-21306	Data Structures Laboratory	0	0	4	60	40	100	2
BCCS-21307	PC Assembly & Troubleshooting	3	0	0	40	60	100	3
BCCS-21308	PC Assembly & Troubleshooting Laboratory	0	0	2	60	40	100	1
		15	**0**	**14**	**400**	**400**	**800**	**22**

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Fourth Semester

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BCCS-21401	Software Engineering	4	0	0	40	60	100	4
BCCS-21402	Database Management Systems	4	0	0	40	60	100	4
BCCS-21403	Programming in Python	4	0	0	40	60	100	4
BCCS-21404	Database Management Systems Laboratory	0	0	4	60	40	100	2
BCCS-21405	Programming in Python Laboratory	0	0	4	60	40	100	2
BCCS-21406	Web Designing	3	0	0	40	60	100	3
BCCS-21407	Web Designing Laboratory	0	0	4	60	40	50	2
		15	**00**	**12**	**340**	**360**	**700**	**21**

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Fifth Semester

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BCCS-21501	Programming in Java	4	0	0	40	60	100	4
BCCS-21502	Computer Graphics	4	0	0	40	60	100	4
BCCS-21XXX	Elective-I	4	0	0	40	60	100	4
BCCS-21504	Software Project Management	4	0	0	40	60	100	4
BCCS-21505	Computer Graphics Laboratory	0	0	4	60	40	100	2
BCCS-21506	Programming in Java Laboratory	0	0	4	60	40	100	2
BCCS-21507	Minor Project	0	0	4	60	40	100	2
		16	00	12	340	360	700	22

Elective -I	
Course Code	Course Title
BCCS-21701	Data Warehouse and Mining
BCCS-21702	Cryptography and Network Security
BCCS-21703	Artificial Intelligence
BCCS-21704	Distributed Systems

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Sixth Semester

CourseCode	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BCCS-21601	Android Programming	4	0	0	40	60	100	4
BCCS-21602	Android Programming Laboratory	0	0	4	60	40	100	2
BCCS-21603	Cyber Laws & IPR	4	0	0	40	60	100	4
BCCS-21604	E- Commerce	4	0	0	40	60	100	4
BCCS-21XXX	Elective-II	4	0	0	60	40	100	4
BCCS-21605	Major Project	0	0	12	120	80	200	6
	Seminar						100	
		16	00	16	420	380	800	24

Elective -II	
Course Code	**Course Title**
BCCS-21705	Machine Learning
BCCS-21706	Internet of Things
BCCS-21707	Digital Marketing
BCCS-21708	Cloud Computing

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1st Semester

BCAM-21101 Mathematics

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Course Objectives: To provide knowledge of combinatorial problems, algebraic structures and graph theory required for building mathematical foundation of computer science.

1. Sets: Set Introduction, Objectives, Representation of Sets (Roster Method, Set Builder Method), Types of Sets (Null Set, Singleton Set, Finite Set, Infinite Set,Equal Set, Equivalent Set, Disjoint Set, Subset, Proper Subset, Power Set, Universal Set) and Operation with Sets (Union of Set, Intersection of Set, Difference of Set, Symmetric Difference of Set) Universal Sets, Complement of a Set.

2. Logic Operations: Logic Statement, Connectives, Basic Logic Operations (Conjunction, Disjunction, Negation) Logical Equivalence/Equivalent Statements, Tautologies and Contradictions.

3. **Matrix:** Matrices Introduction, Types of Matrix (Row Matrix, Column Matrix, Rectangular Matrix, Square Matrix, Diagonal Matrix, Scalar Matrix, UnitMatrix, Null Matrix, Comparable Matrix, Equal Matrix), Scalar Multiplication,Negative of Matrix, Addition of Matrix, Difference of two Matrix,

Multiplication of Matrices, Transpose of a Matrix.

4. Statics: Progressions Introduction, Arithmetic Progression, Sum of Finite number ofquantities in A.P, Arithmetic Means, Geometric Progression, Geometric Mean

Course Outcomes: After the completion of this subject, students will learn to:

1. Represent data using various mathematical notions.
2. Explain different terms used in basic mathematics.
3. Describe various operations and formulas used to solve mathematical problems.

Text Books:

1. Discrete Mathematics and Its Applications by Kenneth H. Rosen, Mc Graw Hill, 6thEdition.
2. College Mathematics, Schaum's Series, TMH.

Reference Books:

1. Elementary Mathematics, Dr. RD Sharma

2. Comprehensive Mathematics, Parmanand Gupta Ele

ments of Mathematics, ML Bhargava

BCCS-21102 Computer Fundamentals

Internal Marks: 40	**L T P**
External Marks: 60	**4 0 0**
Total Marks: 100	

Course Objective: The subject aims to provide the student with an understanding of basic concepts of computer science and engineering and introduction to the fundamentals of hardware, software and programming. An understanding to various emerging Technologies such as IoT, Cloud computing and Big Data.

1. Introduction to Computer: Definition, Computer Hardware & Computer Software Components: Hardware – Introduction, Input devices, Output devices, Central Processing Unit, Memory- Primary and Secondary. Software - Introduction, Types – System and Application.   (4)

2. Programming Paradigms and Development Tools: – Problem Analysis, Program Constructs Sequential, Decision, Loop), Algorithms, Flowcharts, Pseudocode. Decision table, Modular Programming, Top– down and Bottom–up Approaches, functional, Procedural object–oriented, and logic programming, Programming Languages – Syntax & Semantics.   (8)

3. Operating system: Definition, Functions, Types, Classification, Elements of command based and GUI based operating system. Computer Network: Overview, Types (LAN, WAN and MAN), Data communication, topologies.   (8)

4. Internet: Overview, Architecture, Functioning, Basic services like WWW, FTP, Telnet, Gopher etc., Search engines, E-mail, Web Browsers.   (4)

5. Internet of Things (IoT): Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things.   (4)

6. Emerging Technologies: Applications and use cases Cloud Computing: Nature and benefits, AWS, Google, Microsoft & IBM Services, Virtual Reality, Grid computing, Green computing, Big data analytics, Quantum Computing and Brain Computer Interface.   (8)

Course Outcomes:
After completing this course student will be able to:
1. Demonstrate the knowledge of the basic structure, components, features and generations of computers.
2. Describe the concept of computer languages, language translators and construct algorithms
3. Compare and contrast features, functioning & types of operating system and computer networks.
4. Demonstrate architecture, functioning & services of the Internet. Illustrate the emerging trends and technologies in the field of Information Technology.

Suggested Books:
1.   Computers Today: Suresh K. Basandra, Galgotia, Updated Edition,2012.

2.   Gurvinder Singh & Rachhpal Singh: A Test Book on Windows Based Computer Courses,

Kalyani Publishers, 10th Edition 2008.

3.   Norton, Peter: Introduction to Computers, McGraw Hill

4.   Martin, James: Telecommunications and the Computer, PHI

5.   Distributed and Cloud Computing, 1st edition, Morgan Kaufmann, 2011 by Hwang &

Dongarra & Fox

BCCS-21103 Problem solving using C

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Course Objective:

1. To learn the fundamental programming concepts and methodologies which are essential to building good C programs.
2. To practice the fundamental programming methodologies in the C programming language via laboratory experiences.
3. To code, document, test, and implement a well-structured, robust computer program using the C programming language.
4. To write reusable modules (collections of functions).

1. Introduction to Program Development: Problem Analysis, Designing a solution**.**
Overview of C: Brief history of C, introduction to different versions of C. General Structure of a C program, stages in the development of a C program**.**
Data Types, Operators & Expressions: Constants and variables, data types, declaring variables, storage classes, different types of expressions and their evaluation, conditional expression, assignment statement, enumerated data type, redefining/creating data types, type casting.
Console Input/Output: Standard input/output devices, unformatted input/output functions (character I/O functions and string I/O functions), formatted input/output functions (scanf( ) function and printf ( ) function).   (6)

2. Control Statements: Decision making using if, if – else, elseif and switch statements, Looping using for, while and do – while statements, transferring program control using break and continue statements
Arrays & Strings: Introduction to arrays, declaring arrays, initializing arrays, processing of arrays, introduction to strings. Structures & Unions: Introduction to structures, declaring structures, initializing structures, accessing elements of structures, array of structures, nested structures, passing structures as arguments to a function, introduction to unions**.**   (10)

3. Functions: Defining a function, local variables, return statement, invoking a function, specifying and passing arguments (including arrays, strings) to a function, function prototyping and use of header files, building own library, recursion.
Pointers: Why pointers? Declaring pointers, accessing values via pointers, pointer arithmetic, pointers

to arrays, Array of pointers, pointers to strings, pointers to structures, self–referential structures.
Program Structure: Program structure revisited, managing multi–file programs using traditional approach of separate compilations and project facility of Turbo C compiler, storage classes revisited.
File I/O: Introduction to files, different ways of file processing (standard I/O & system I/O), description of various library functions for file handling, updating files.   (10)

4. Introduction to Object Oriented Paradigm – Object Oriented programming and C++, Structured Programming methodology, its shortcomings, advantages of OOPS (Object Oriented Programming Style). OOP concepts: Abstraction, Encapsulation, Data Hiding, Inheritance, Polymorphism. Overview of C++ – Data types, Input/output statements, Flow of control – looping statements, branching statements, Pointers & references, namespaces.   (10)

5. Class design: constructors, destructors, operator overloading, reuse through inheritance, virtual functions, exception handling. I/O with stream classes, memory management
The Standard Template Library (STL): containers, algorithms, iterators, adaptors, function objects
                                                                                              (4)

Course Outcomes:
After completing this course student will be able to:
1. Describe the advantages of a high level language like C, the programming process, and the compilation process**.**
2. To describe and use software tools in the programming process**.**
3. To apply good programming principles to the design and implementation of C programs**.**
4. To design, implement, debug and test programs using the fundamental elements of C
5. To demonstrate an understanding of primitive data types, values, operators and expressions in C

Suggested Books:
1. E.Balagurusamy "Programming in C". Tata McGraw Hill
2. Y. Kanetkar "Let Us C". BPB publication
3. Ashok N. Kamthane "Programming with ANSI and TURBO C". Pearson Education
4. Lafore R, Object Oriented Programming, Third Edition, Galgotia Publications
5. Byron S. Gottfried, Programming in C, Second Edition, McGraw Hills.
6. R.S. Salaria,Problem Solving and Programming in C, Second Edition

BCCS-21104 Problem solving using C

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

1. Write C program to input and output the text message.
2. Write C Program to perform all arithmetic operations.
3. Write C Program to utilize the math function.
4. Write C Program to perform the mathematical expressions.
5. Write C Program for Local and Global Variables.
6. Write C Program for internal static and external static variables.
7. Write C Program to find the roots of a Quadratic equation.

8. Write C Programs for all the Operators. (Arithmetical, Logical, Relational, Bitwise).
9. Write C Programs for Increment and Decrement Operators.
10. Write C Programs to implement the Ternary Operator.
11. Write C Programs for special Operators.
12. Write C Programs for all the Control Structures. (Sequential Control Structures, Conditional Control Structures, Iterative Control Structures).
13. Write C Programs to display the different types of patterns using nested for loop.
14. Write C Program for Statements. (switch, break, goto, continue etc.,).
15. Write C Program to print biggest number from n numbers.
16. Write a C Program to find the given integer number is even or odd number.
17. Write a C Program to calculate the factorial of a given number.
18. Write a C Program to swap the two numbers using temp variable and without using temp variable.
19. Reading and Printing a single dimensional array of elements.
20. Ascending and descending of an array.
21. Sum of all odd numbers and sum of all even numbers in a single dimensional array.
22. Mathematical operations on single dimensional arrays.
23. Reading and Printing a multi dimensional array of elements.
24. Mathematical operations on multi dimensional array of elements.
25. Passing an array element to a function.
26. Reading and Printing a string.
27. C Programs on String functions.
28. Write a C program to calculate string length by writing the user-define function.
29. Function declaration and initialization.
30. C Program to differentiate the parameters and arguments in functions.
31. Programs for different types of inbuilt functions.32. Call by value and Call by reference programs in functions.
33. Write a program to swap the given 2 number using passing by reference.
34. Write C Programs to perform all valid arithmetic operations using pointers.
35. C programs on Structures and accessing of members of the structures.
36. Write a C program to print a book information (Book name, Book no, author name) by writing a structure.
37. Write a C program by passing structure elements to a function and display employee information (emp no, emp name, emp salary, and emp address).
38. C Programs on Reading a file from the secondary storage device.
39. C Program on writing and appending a file on the secondary storage device.
40. C Program on Opening and closing a file.

Text Books:
1. C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications.
2. Let Us C by Yashwanth Kanethar.
3. "Programming in ANSI C" by E. Balaguruswamy.
4. Programming in C, 2nd Edition, Oxford by Pradip Dey, Mannas Ghosh.

BCCS-21105 Computer Fundamentals Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

Word Orientation:

The instructor needs to give an overview of word processor.
Details of the four tasks and features that would be covered Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

1. Using word to create Resume Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.
2. Creating an Assignment Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3. Creating a Newsletter Features to be covered :- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs
4. Creating a Feedback form Features to be covered: - Forms, Text Fields, Inserting objects, Mail Merge in Word.

Excel Orientation:

The instructor needs to tell the importance of Excel as a Spreadsheet tool, give the detailsof the four tasks and features that would be covered Excel – Accessing, overview of toolbars, saving excel files

1. Creating a Scheduler Features to be covered :- Gridlines, Format Cells, Summation, auto fill, Formatting Text
2. Calculations Features to be covered :- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP
3. Performance Analysis Features to be covered :- Split cells, freeze panes, group and outline, Sorting,Boolean and logical operators, Conditional formatting
4. Game (like Cricket, badminton) Score Card Features to be covered :- Pivot Tables, Interactive Buttons, Importing Data, DataProtection, Data Validation

Presentation Orientation

1. Students will be working on basic power point utilities and tools which help themcreate basic power point presentation. Topic covered includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows

2. This session helps students in making their presentations interactive.Topics covered includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video,Objects, Tables and Charts

3. Concentrating on the in and out of Microsoft power point. Helps them learn bestpractices in designing and preparing power point presentation. Topics covered includes: - Master Layouts (slide, template, and notes), Types ofviews (basic, presentation, slide slotter, notes etc), Inserting – Background,textures, Design Templates, Hidden slides. Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing

4. Power point test would be conducted. Students will be given model power point presentation which needs to be replicated

Internet and its Applications

The instructor needs to tell the how to configure Web Browser and to use search enginesby defining search criteria using Search Engines

1. To learn to setup an e-mail account and send and receive e-mails
2. To learn to subscribe/post on a blog and to use torrents for accelerated downloads
3. Hands on experience in online banking and Making an online payment for any domestic bill

BCHU-21106 English

Internal Marks: 40   **L T P**
External Marks: 60   **3 0 0**
Total Marks: 100

Course Objectives
The main goal of this course is to help you improve your spoken English skills to enable you to communicate more effectively in English. Paraphrasing and elaboration skills; coherent organization of information at sentence and discourse levels; interactive skills to enhance comprehension**.**

1. Introduction
*   Theory of Communication
*   Types and modes of Communication

2. Language of Communication
*   Verbal and Non-verbal
*   (Spoken and Written)
*   Personal, Social and Business

- Barriers and Strategies
- Intra-personal, Inter-personal and Group communication

3. Reading and Understanding
- Close Reading
- Comprehension
- Summary Paraphrasing
- Analysis and Interpretation
- Translation (from Hindi/Punjabi to English and vice-versa)
- Literary/Knowledge Texts

4. Writing Skills
- Documenting
- Letter Writing
- Report Writing
- Making notes.

Course Outcomes:
1. The objective of this course is to introduce students to the theory, fundamentals and tools of communication.
2. To help the students become the independent users of English language.
3. To develop in them vital communication skills which are integral to theirpersonal, social and professional interactions.
4. The syllabus shall address the issues relating to the Language of communication.
5. Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills such as report writing, note taking etc.

Suggested Books:
1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.
4. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brati Biswas
5. On Writing Well. William Zinsser. Harper Resource Book. 2001
6. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

BCHU-21107 English Practical/Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 2**
Total Marks: 100

Course Outcomes:
- The objective of this course is to introduce students to the theory, fundamentals and tools of communication.
- To help the students become the independent users of English language.
- To develop in them vital communication skills which are integral to personal, social and professional interactions.
- The syllabus shall address the issues relating to the Language of communication.
- Students will become proficient in professional communication such as interviews, group discussions and business office environments, important reading skills as well as writing skills such as report writing, note taking etc.
- The recommended readings given at the end are only suggestive; the students and teachers have the freedom to consult other materials on various units/topics given below.Similarly, the questions in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommended books.

Interactive practice sessions in Language Lab on Oral Communication

- Listening Comprehension
- Self Introduction, Group Discussion and Role Play
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations
- Monologue
- Effective Communication/ Mis- Communication
- Public Speaking

BCCS-21108 Human Values, De-addiction and Traffic Rules

Internal Marks: 40   **L T P**
External Marks: 60   **3 0 0**
Total Marks: 100

Course Objective:
It helps students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature. Ability to develop appropriate technologies and management patterns to create harmony in professional and personal life..

1. Introduction - Need, Basic Guidelines, Content and Process forValue Education (6)

1. Understanding the need, basic guidelines, content and process for Value Education

2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self- exploration

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority

5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

2. Understanding Harmony in the Human Being - Harmony in Myself!

1. Understanding human being as a co-existence of the sentient 'I' andthe material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
3. Understanding the Body as an instrument of 'I' (I being the doer, seerand enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in'I'
5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*;correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure *Sanyam* and *Swasthya* - Practice Exercises and Case Studies will be taken up in PracticeSessions   (10)

3. Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

1. Understanding harmony in the Family- the basic unit of humaninteraction
2. Understanding values in human-human relationship; meaning of
    Nyaya and program for its fulfillment to ensure *Ubhay-tripti*;
    Trust (*Vishwas*) and Respect (*Samman*) as the foundational values ofrelationship
3. Understanding the meaning of *Vishwas*; Difference between intentionand competence

4. Understanding the meaning of *Samman*, Difference between respect
5. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj*), Universal Order (*Sarvabhaum Vyawastha)*- from family to world family!- Practice Exercises and Case Studies will be taken up in Practice Sessions.

4. Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions.

5. Implications of the above Holistic Understanding of Harmony on Professional Ethics

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics:
   a) Ability to utilize the professional competence for augmenting universal human order,
   b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
   c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:
   a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
   b) At the level of society: as mutually enriching institutions and organizations

Suggested Books
1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press.

Reprinted 1986,1991.

5. PL Dhar, RR Gaur, 1990, Science and Humanism, Common wealth Publishers.

6. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik)Krishi Tantra Shodh, Amravati.

8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. BehrensIII, 1972, Limits to Growth – Club of Rome's report, Universe Books.

9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &Engineers, Oxford University Press

2nd Semester

BCCS -21201 Fundamentals of Statistics

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Course Objective: This course is designed to understand the basic and advanced concepts of data structures and to highlight the importance of data structures in developing and implementing efficient algorithms. Another objective of the course is to develop ability in students to design algorithms for real life problems.

1. **Statistics and Probability:**
   Introduction to Statistics, Origin of Statistics, Features of Statistics, Scope of Statistics, Functions of Statics, Uses and importance of Statistics, Limitation of Statistics, Distrust of Statistics , Collection of Data: Introduction to Collection of Data, Primaryand Secondary Data, Methods of Collecting Primary Data, Methods of Secondary Data, Statistical Errors, Rounding off Data (Approximation).   (8)

2. **Classification of Data Frequency Distribution:**
   Introduction Classification of Data, Objectives of Classification, Methods of Classification, Ways to Classify Numerical Data or Raw Data. Tabular, Diagrammatic and Graphic Presentation of Data: Introduction to Tabular Presentation of Data, Objectives of Tabulation, Components of a Statistical Table, General Rules forthe Construction of a Table, Types of Tables, Introduction to Diagrammatic Presentation of Data, Advantage and Disadvantage of Diagrammatic Presentation, Types of Diagrams, Introduction to Graphic Presentation of Data, Advantage and Disadvantage of Graphic Presentation, Types of Graphs.   (12)

3. **Sorting, Hashing & String Matching**
   Measures of Central tendency: Introduction to Central Tendency,Purpose and Functions of Average, Characteristics of a Good Average, Types of Averages, Meaning of Arithmetic Mean,Calculation of Arithmetic Mean, Merit and Demerits ofArithmetic Mean, Meaning of Median, Calculation of Median, Merit and Demerits of Median, Meaning of Mode, Calculation ofMode, Merit and Demerits of Mode, Harmonic Mean- Properties- Merit and Demerits.

4. **Measures of Dispersion**
   Meaning of Dispersion, Objectives of Dispersion, Properties of a good Measure of Dispersion, Methods of Measuring Dispersion, Range Introduction, Calculation ofRange , Merit and Demerits of Range, Mean Deviation, Calculation of Mean Deviation , Merit and Demerits of Mean Deviation, Standard Deviation Meaning, Calculation of StandardDeviation , Merit and Demerits of Standard Deviation, Coefficient of Variation, Calculation of Coefficient Variance, Merit and Demerits of Coefficient of Variation. Binary heaps, heap operations, implementation and applications. Binomial Heaps, Fibonacci Heaps

   Course Outcomes:
   After completing this course student will be able to:
   1. Understand the science of studying & analyzing numbers.
   2. Identify and use various visualization tools for representing data.
   3. Describe various statistical formulas.

4. Compute various statistical measures.

Suggested Books:
1. Statistics and Data Analysis, A.Abebe, J. Daniels, J.W.Mckean, December 2000.
2. Statistics, Tmt. S. EzhilarasiThiru, 2005, Government of Tamilnadu.
3. Introduction to Statistics, David M. Lane.
4. Weiss, N.A., Introductory Statistics. Addison Wesley, 1999.
5. Clarke, G.M. & Cooke, D., A Basic course in Statistics. Arnold, 1998.

BCCS -21202 Computer system architecture

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Course Objective: This course is intended to teach the basics involved in data representation and digital logic circuits used in the computer system. This includes the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design. This course will also expose students to the basic architecture of processing, memory and i/o organization in a computer system.

1. **Logic Gates:**
    AND, OR, NOT, NAND, NOR, XOR, XNOR, NAND & NOR as Universal Gates, Logic Gates Applications.

2. **Boolean Algebra:**
    Introduction, Theorems, Simplification of BooleanExpression using Boolean Algebra, SOP & POS Forms, Realization of Boolean Expression using Gates, K-Maps, Simplification of BooleanExpression using K-Maps.

3. **Combinational Logic Circuits:**
    Half Adder & Half Subtractor, Full Adder &Full Subtractor, Parallel Binary Adder, Binary Adder/Subtractor. Multiplexers & Demultiplexers, Implementation of Boolean equations using Multiplexer and Demultiplexer, Encoders & Decoders.

4. **Sequential Logic Circuits:** Latch, Flip Flops- R-S Flip-Flop, J-K Flip-Flop, Race Around Condition, Removing Race Around Condition, Master-Slave J-K Flip-Flop, D Flip-Flop, T Flip-Flop, Applications of Flip-Flops.

5. **Introduction to Computer Organization:** Introduction to Computer and CPU (Computer Organization, Computer Design and Computer Architecture), Stored Program Concept- Von Neumann Architecture, HarvardArchitecture, RISC and CISC Architecture.

6. **Register Transfer and Micro operations**- Introduction to Registers, Instruction Format, Types of Instructions- Memory Reference Instructions, Register Reference Instructions and Input-Output Instructions.

7. **Common Bus System**: Introduction to Common Bus System, Types of Buses(Data Bus, Control Bus, Address Bus), 16-bit Common Bus System—Data.

Course Outcome:
1.Point of view and interfacing of various peripheral devices used with the system. Know about the basic functioning of various parts of computer system from hardware
2.Learn number system and various types of micro-operations of processor.
3.Learn the communication of various components through common bus.
4.Learn how to design Combinational & Sequential circuits

Suggested Books:

1. Computer System Architecture, M.M. Mano, Third Edition, PHI.
2. Digital Computer Electronics, Malvino, Second Edition, Mc-Graw Hill.
3. Modern Digital Electronics, R. P. Jain, Fourth Edition, TMH.

BCCS – 21203 Object Oriented Programming using C++

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Course Objectives:
To understand how c++ improves C with object oriented features.
To learn how to write inline features for efficiency and performance.
To learn the syntax and semantics of the c++ classes for code reuse.
To understand the concept of data abstraction and encapsulation

1. Principles of object oriented programming
Introduction to OOP and its basic features, Basic components of a C++, Program and program structure, Compiling and Executing C++ Program. Difference between Procedure Oriented Language(C) and Object Oriented Language   (12)

2. Classes & Objects and Concept of Constructors
Defining classes, Defining member functions, Declaration of objects to class, Access to member variables from   objects, Different forms of member functions, Access specifiers (Private, public, protected), Array of objects.Introduction to constructors, Parameterized constructors, Copy Constructor, Multiple constructors in class, Dynamic initialization of objects, Destructors. (10)

3. Inheritance and Operator overloading

Introduction to Inheritance, Types of inheritance: - Single inheritance, Multipleinheritance, Multilevel inheritance, Hierarchical inheritance, Hybrid inheritance, Defining operator overloading, Overloading of Unary and Binary operators, Rules for overloading operators   (12)

4. Polymorphism and File Handling

Early Binding, Late Binding, Virtual Functions, pure virtual functions, AbstractClasses. Opening and Closing File, Reading and Writing a file. (10)

Suggested books:
1. Object Oriented Programming with C++, E. Balagurusami, Fourth Edition, TataMc-Graw Hill.
2. Object Oriented Programming in Turbo C++, Robert Lafore, Fourth EditionGalgotia Publications
3. The C++ Programming Language, Bjarna Stroustrup, Third Edition, Addison-Wesley Publishing
4. Object Oriented Programming Using C++, Salaria, R. S, Fourth Edition, KhannaBook Publishing.

Course Objectives:
- To learn programming from real world examples.
- Solutions to various problems with the help of C++ language.
- To create computer based solutions to various real-world problems using C++
- To learn various concepts of object oriented approach towards problem solving

BCCS 21204 Object Oriented Programming using C++ Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

Course Objectives
To understand how C++ improves C with object-oriented features.
To learn how to write inline functions for efficiency and performance.
To learn the syntax and semantics of the C++ programming language.
To learn how to design C++ classes for code reuse.
To learn how to implement copy constructors and class member functions.
To understand the concept of data abstraction and encapsulation.
To learn how to overload functions and operators in C++.
To learn how containment and inheritance promote code reuse in C++.
To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
To learn how to design and implement generic classes with C++ templates.
To learn how to use exception handling in C++ programs.

C++Assignments:
1. Write a program to enter mark of 6 different subjects and find out the total mark.
2. Write a function using reference variables as arguments to swap the values of pair of integers.
3. Write a function to find largest of three numbers.
4. Write a program to find the factorial of a number.
5. Write the above program for handling n number of account holders using array of objects.
6. Write a C++ program to compute area of right angle triangle, equilateral triangle, Isosceles triangle using function overloading concept.
7. Write a program for overloading of Unary ++ operator.
8. Write a program for overloading of Binary + operator.
9. Write a program of Virtual Functions.
10. Write a program of Abstract Classes.
11. Write a program to read and write from file.

Reference Books:
1. Object Oriented Programming with C++, E. Balagurusami, Fourth Edition, TataMc-Graw Hill.
2. Object Oriented Programming in Turbo C++, Robert Lafore, Fourth EditionGalgotia Publications.
3. The C++ Programming Language, Bjarna Stroustrup, Third Edition, Addison-Wesley Publishing Company.
4. Object Oriented Programming Using C++, Salaria, R. S, Fourth Edition, KhannaBook Publishing.

Course Outcome
- Represent data using various Frequency table and Graphs.
- Apply various operations/ formulas using any software/package to solve statistical problems.

BCCS 21205 Fundamentals of Statistics Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

Prerequisite: Students must have the knowledge of Spreadsheet.
Co requisite: The students will develop analytical behavior & will have better understanding of analyzing data and testing hypotheses.
Additional material required in ESE: Minimum two exercises of each concept will be recorded in the file and the file will be submitted in End Semester Examinations.

Instructions: Sample exercises are given below and Instructor can increase or decrease the experiments as per the requirement.
1. Display the Maximum and Minimum market data.
2. Display year wise strength of the students of a college in Tabular form & Graphical form.
3. Calculate the average marks of the students of your College.
4. Print measure of Central Tendency using grouped and ungrouped data.

5. Construct & print frequency distribution using data with the following Techniques:
   (a) Histogram (b) Frequency Polygon (c) Frequency Curve(d) Ogive curves.
6. Find out & display the Median and Mode from the following series by using suitable method:
   Class   156-158   158-160   160-162   162-164   164-166
   Frequency   4   8   28   51   89
7. Calculate an appropriate measure of dispersion using grouped and ungrouped data.
8. Make an array and calculate range of the data.
9. Represent the placement record of the students of your college.
10. Calculate & display Letter Grade using spreadsheet.
11. Represent the following data by suitable graphs, determine therefrom the number of children having IQ (i) Below 105 (ii) Above 124.

IQ	75-84	85-94	95-104	105-114	115-124	125-134
No. of Children	8	20	45	54	28	16

Reference Books:
1. Statistics for Economics, TR Jain, VK Ohri.
2. Statistics and Data Analysis, A.Abebe, J. Daniels, J.W.Mckean, December 2000.

E-Books/ Online learning material
1. https://www.meritnation.com/cbse-class-11- commerce/economics/class_13_tr_jain.
2. http://college.cengage.com/mathematics/brase/understandable_statistics/97 80618949922_ch03.pdf
3. http://www.rockcreekschools.org/pages/uploaded_files/Excel%201%20Lab%2 0Exercises.pdf

Course Outcome: After studying this course, students will be able to:
1. Represent data using various Frequency table and Graphs.
2. Apply various operations/ formulas using any software/package to solve statistical problems.

BCCS- 21206 Computer System Architecture Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

Course objectives

Understanding the behavior of Logic Gates, Adders, Decoders, Multiplexers and Flip-Flops.

Understanding the behavior of ALU, RAM, STACK and PROCESSOR from working modules and

the modules designed by the student as part of the experiment.

EXPERIMENTS

1. To verify the Truth Table of Basic Logic Gates
2. To verify the Truth Table of Combinational Logic Gates
3. To verify the Truth Table of Universal Logic Gates
4. To verify the Truth Table of Half Adder Combinational Circuit
5. To verify the Truth Table of Full Adder Combinational Circuit

6. To verify the Truth Table of Half Subtractor Combinational Circuit
7. To verify the Truth Table of Full Subtractor Combinational Circuit
8. To verify the Truth Table of Decoder Combinational Circuit
9. To verify the Truth Table of Encoder Combinational Circuit
10. To verify the Truth Table of Multiplexer Combinational Circuit
11. To verify the Truth Table of De Multiplexer Combinational Circuit
12. To verify the Truth Table of S-R Flip-Flop
13. To verify the Truth Table of J-K Flip-Flop
14. To verify the Truth Table of Master Slave J-K Flip-Flop
15. To verify the Truth Table of D Flip-Flop
16. To verify the Truth Table of T Flip-Flop
17. To verify the working of Asynchronous Up Counter
18. To verify the working of Asynchronous Down Counter
19. To verify the working of Asynchronous MOD-N Counter

Course outcome
- Explain the basics of organizational and architectural issues of a digital computer and Classify and compute the performance of machines, Machine Instructions.
- Describe various data transfer techniques in digital computer and the I/O interfaces.
- Analyze the performance of various classes of Memories, build large memories using small memories for better performance and analyze arithmetic for ALU implementation
- Describe the basics of hardwired and micro-programmed control of the CPU, pipelined architectures , Hazards and Superscalar Operations

Reference Books:
1. Computer Organization and Architecture, Stallings, Eighth Edition, PHI.
2. Modern Digital Electronics, R. P. Jain, Fourth Edition, TMH.
3. Digital Logic & Computer Design, D. Morris Mano, Second Edition, PHI.
4. Digital and Electronic Circuits, T. C. Bartee, McGraw Hill.

BCCS - 21207 Environmental Studies

Internal Marks: 40 **L T P**
External Marks: 60 **2 0 0**
Total Marks: 100

Course objective:
To consider how the natural and built environments shape and are shaped by multiple socio-cultural and political factors.
To think across and beyond existing disciplinary boundaries, mindful of the diverse forms of knowledge and experience that arise from human interactions with the world around them.
To live responsibly and appreciate the environmental and cultural histories of the places they inhabit.
To cultivate compassion, curiosity, collaboration, and hope.
To nurture knowledge, respect, and love for the natural and human communities of central Maine, the place

where they spend four formative years of their lives.
To develop skills of analysis and communication, bearing in mind disciplinary traditions and diverse publics.

1. Introduction to Environmental Studies
Multidisciplinary nature of Environmental Studies: Scope & ImportanceNeed for Public Awareness

2. Ecosystems Concept of an Ecosystem
Structure & functions of an ecosystem (Producers, Consumers& Decomposers) Energy Flow in an ecosystem : Food Chain, Food web and Ecological PyramidsCharacteristic features, structure & functions of following Ecosystems: Forest EcosystemAquatic Ecosystem (Ponds, Lakes, River & Ocean)

3. Natural Resources Renewable & Non-renewable resources Forest Resources
Their uses, functions & values (Biodiversity conservation, role in climate change, medicines) & threats (Overexploitation, Deforestation, Timberextraction, Agriculture Pressure), Forest Conservation Act Water Resources: Their uses (Agriculture, Domestic & Industrial), functions & values,Overexploitation and Pollution of Ground & Surface water resources (Case study of Punjab), Water Conservation, Rainwater Harvesting, Land Resources: Land as a resource; Land degradation, soil erosion and desertification

4. Energy Resources
Renewable & non-renewable energy resources, use of alternate energy resources (Solar, Wind, Biomass, Thermal), Urban problems related to Energy

5. Biodiversity & its conservation
Types of Biodiversity: Species, Genetic & Ecosystem India as a mega biodiversity nation, Biodiversity hot spots and biogeographic regions ofIndia Examples of Endangered & Endemic species of India, Red data book

6. Environmental Pollution & Social Issues
Types, Causes, Effects & Control of Air, Water, Soil & Noise PollutionNuclear hazards and accidents & Health risks
Global Climate Change: Global warming, Ozone depletion, Acid rain, Melting ofGlaciers & Ice caps, Rising sea levels Environmental disasters: Earthquakes, Floods, Cyclones, Landslides

7. Field Work
Visit to a National Park, Biosphere Reserve, Wildlife Sanctuary Documentation & preparation of a Biodiversity (flora & fauna) register ofcampus/river/forest

8. Visit to a local polluted site
Urban/Rural/Industrial/Agricultural Identification & Photography of resident or migratory birds, insects (butterflies)Public hearing on environmental issues in a village

Course outcomes:
1. Understand core concepts and methods from ecological and physical sciences and their application in environmental problem-solving.

2. Appreciate key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.

3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.

4. Appreciate that one can apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.

5. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world

Suggested Books:

1. Bharucha, E. Text Book for Environmental Studies. University GrantsCommission, New Delhi. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB) Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p De A.K., Environmental Chemistry, Wiley Eastern Ltd.

3rd

Semester

BCCS-21301 Computer Networks

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Course Objective:

1. To develop an understanding of modern network architectures from a design and performance perspective.
2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
3. To provide an opportunity to do network programming
4. To provide a WLAN measurement ideas.

1. Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless   LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency   division, Time division and Wave division, Concepts on spread spectrum.   (8)

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA   (8)

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.   (8)

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm. (8)

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography   (8)

Course Outcomes

Students will be able to:
1. Familiar with the different Network Models.
2. Understand different network technologies and their application.
3. Update with different advanced network technologies that can be used to connect different networks
4. Familiar with various hardware and software that can help run a smooth network

Suggested Books

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGrawHill.

2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.

BCCS-21302 Operating System

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Course Objective:

1. To learn the fundamentals of Operating Systems.
2. To learn the mechanisms of OS to handle processes and threads and their communication
3. To learn the mechanisms involved in memory management in contemporary OS
4. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
5. To know the components and management aspects of concurrency management
6. To learn to implement simple OS mechanisms

1. Fundamentals of Operating system: Introduction to Operating system,Functions of an operating system. Operating system as a resource manager. Structure of operating system (Role of kernel and Shell). Views of operating system. Evolution and types of operating systems.
Process & Thread Management: Program vs. Process; PCB, State transition diagram, Scheduling Queues, Types of schedulers, Concept of Thread, Benefits, Types of threads, Process synchronization.

(12)

CPU Scheduling: Need of CPU scheduling, CPU I/O Burst Cycle, Pre- emptive vs. Non-pre-emptive scheduling, Different scheduling criteria's, scheduling algorithms (FCSC, SJF, Round-Robin, Multilevel Queue).

2. Memory Management: Introduction, address binding, relocation, loading, linking, memory sharing and protection; Paging and segmentation; Virtual memory: basic concepts of demand paging, page replacement algorithms.   (12)

3. I/O Device Management: I/O devices and controllers, device drivers;disk storage.
File Management: Basic concepts, file operations, access methods, directory structures and management, remote file systems; file protection.

4. Advanced Operating systems: Introduction to Distributed Operating system,Characteristics, architecture, Issues, Communication & Synchronization; Introduction Multiprocessor Operating system, Architecture, Structure, Synchronization & Scheduling; Introduction to Real-Time

Operating System, Characteristics, Structure & Scheduling. Case study of Linux operating system

Course Outcomes

Students will be able to:
1. Discuss the evaluation of operating systems.
2. Explain different resource managements performed by operating system.
3. Describe the architecture in terms of functions performed by different types of operating systems.
4. Analyze the performance of different algorithms used in design of operating system components.

Suggested Books:

1. Operating System Principles by Abraham Silberschatz and Peter Baer Galvin,Seventh Edition, Published by Wiley-India.

2. Principals of Operating System by Naresh Chauhan, Published by OXFORDUniversity Press, India.

BCCS-21303 Data Structures

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Course Objective:

1. Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
2. Choose the appropriate data structure and algorithm design method for a specified application.
3. Write programs using object-oriented design principles.
4. Solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, tournament trees, binary search trees, and graphs and writing programs for these solutions.
5. Solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking, and branch and bound and writing programs for these solutions.

1. Introduction to Data Structures:
Algorithms and Flowcharts, Basics Analysis on Algorithm, Complexity of Algorithm, Introduction and Definition of Data Structure, Classification of Data, Arrays, Various types of Data Structure, Static and Dynamic Memory Allocation, Function, Recursion.
Arrays, Pointers and Strings:
Introduction to Arrays, Definition, One Dimensional Array and Multi- Dimensional Arrays, Pointer, Pointer to Structure, various Programs for Array and Pointer. Strings. Introduction to Strings,

Definition, Library Functions ofStrings.   (12)

2. Stacks and Queue
Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack and Multiple Stacks. Implementation of Multiple Stack Queues, Introduction to Queue, Definition, Queue Implementation, Operationsof Queue, Circular Queue, De-queue and Priority Queue.   (8)

3. Linked Lists and Trees
Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, And Circular Doubly Linked List.
Trees
Introduction to Tree, Tree Terminology Binary Tree, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree B Tree, B+ Tree.   (12)

4. Graphs, Searching, Sorting and Hashing
Graphs: Introduction, Representation to Graphs, Graph Traversals Shortest Path Algorithms.
Searching and Sorting: Searching, Types of Searching, Sorting, Types of sorting like quick sort, bubble sort, merge sort, selection sort.
Hashing: Hash Function, Types of Hash Functions, Collision, Collision Resolution Technique (CRT), Perfect Hashing   (12)

Course Outcomes:
Students will be able to
   1. Apply appropriate constructs of Programming language, coding standards for application Development.
   2. Use appropriate data structures for problem solving and programming.
   3. Use algorithmic foundations for solving problems and programming.
   4. Apply appropriate searching and/or sorting techniques for application development.
   5. Develop programming logic and skills.

Suggested Book:
   1. Brijesh Bakariya. Data Structures and Algorithms Implementation through C, BPB Publications.
   2. Kruse R.L. Data Structures and Program Design in C; PHI
   3. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., "Data Structures andAlgorithms", AddisonWesley

BCCS-21304 Operating System Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

List of practical exercises

1. To explore and installation process different operating systems like Linux, Windows etc.

2. Virtualization, Installation of Virtual Machine Software and installation of Operating System on Virtual Machine

3. Execute various basic and advance Linux commands, commands for files and directories, creating and viewing files, File comparisons, and Disk related commands.

4. Execute Linux commands for Processes in Linux, connecting processes with pipes, background processes, managing multiple processes.

5. Study and usage of VI Editor.

6. Basics of Shell programming, various types of shell, Shell Programming in bash.

7. Study and implementation of shell variables, shell keywords.

8. Implement conditional statements, looping statement and case statement in Shell programming.

9. Implement parameter passing and arguments in Shell programming.

10. Implement Shell programs for automate system tasks and report printing.

BCCS-21304 Computer Networks Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

List of practical exercises

1. Familiarization with networking components and devices: LAN Adapters, Hubs, Switches, Routers etc.

2. Familiarization with transmission media and tools: Coaxial cable, UTP cable, Crimping tool, Connectors etc.

3. Preparing straight and cross cables.

4. Study of various LAN topologies and their creation using network devices, cables and computers.

5. Configuration of TCP/IP Protocols in Windows and Linux.

6. Implementation of resource sharing (file, printer etc.).

7. Designing and implementing class A, B and C networks.

8. Subnet planning and its implementation.

9. To configure dynamic IP address for a computer connected to a LAN.

10. Use of commands like ping, ipconfig for trouble shooting network related problems.

11. Develop a program to compute the Hamming Distance between any two code words.

12. Installation of FTP server and client.

13. To configure proxy server.

14. Familiarization with network simulation tools.

BCCS-21306 Data Structures Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

List of practical exercises, to be implemented using object- oriented approach in C++ Language.

1. Write a menu driven program that linear array: implements following operations (using separate functions) on linear array: Insert a new element at end as well as at a given position, Delete an element from a given whose value is given or whose position is given, To find the location of a given element, To display the elements of the linear array.

2. Write a menu driven program that maintains a linear linked list whose elements are stored in on ascending order and implements the following operations (using separate functions): Insert a new element, Delete an existing element, Search an element, Display all the elements

3. Write a program to demonstrate the use of stack (implemented using linear array) in converting arithmetic expression from infix notation to postfix notation.

4. Program to demonstrate the use of stack (implemented using linear linked lists) in evaluating arithmetic expression in postfix notation.

5. Program to demonstration the implementation of various operations on a linear queue represented using a linear array.

6. Program to demonstration the implementation of various operations on a circular queue represented using a linear array.

7. Program to demonstration the implementation of various operations on a queue represented using a linear linked list (linked queue).

8. Program to illustrate the implementation of different operations on a binary search tree.

9. Program to illustrate the traversal of graph using breadth-first search.

10. Program to illustrate the traversal of graph using depth-first search.

11. Program to sort an array of integers in ascending order using bubble sort.

12. Program to sort an array of integers in ascending order using selection sort.

13. Program to sort an array of integers in ascending order using insertion sort.

14. Program to sort an array of integers in ascending order using radix sort.

15. Program to sort an array of integers in ascending order using merge sort.

16. Program to sort an array of integers in ascending order using quick sort.

17. Program to sort an array of integers in ascending order using heap sort.

18. Program to sort an array of integers in ascending order using shell sort.

19. Program to demonstrate the use of linear search to search a given element in an array.

20. Program to demonstrate the use of binary search to search a given element in a sorted array in ascending order.

BCCS-21307 PC Assembly & Troubleshooting

Internal Marks: 40   **L T P**
External Marks: 60   **3 0 0**
Total Marks: 100

Course Objective: The aim of the subject is to make the students familiar with Assembling and set up computer systems. It also aims to teach about Configuring and install computers, connect and configure various peripheral devices Diagnose and Troubleshoot issues in Computer Systems.

1. History of Computer:
Brief history of computer on the basis Hardware. Computer system modules/ components and its operations, need of hardware and software for computer to work, different hardware components within a computer and connected to a computer as peripheral devices, different processors used for personal computers and notebook computers.

(12)

2. Performance and Installation:
Perform installation, configuration, and upgrading of microcomputer/ computer: Hardware and software requirement, Assemble/setup microcomputer/ computer systems, accessory boards, types of motherboards, selection of right motherboard, Installation replacement of motherboard, troubleshooting problems with memory.
.   (8)

3. Install/connect associated peripherals:
Working of printers and scanners, Installation of printers and scanners, sharing a printer over a local area network, troubleshooting printer and scanner problems, troubleshooting hard drive problems. Drivers: Meaning, role and types.

(12)

4. Diagnose and troubleshooting of microcomputer:
Computer systems hardware & software and other peripheral equipment: Approaches to solve a PC problem, troubleshooting a failed boot before the OS is loaded, different approaches to installing and supporting I/O device, managing faulty components. Booting and its types.

(12)

(Gureshpal Singh)   (Anil)   P a g e | **40**

Course Outcomes:
Students will be able to:
1. Assemble and set up computer systems.
2. Configure and install computers
3. Install, connect and configure various peripheral devices
4. Diagnose and Troubleshoot issues in Computer Systems

Suggested Book:
1. PC Hardware: The Complete Reference, McGraw-Hills
2. The Indispensable PC Hardware Book (4th Edition) Hans-Peter Messmer
3. PC Hardware: A Beginner's Guide by Ron Gilster.

BCCS-21308 PC Assembly & Troubleshooting Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 2**
Total Marks: 100

List of assignments:

1. Assembling and De Assembling of Computer System

2. Loading and configuration procedure of Microsoft Client O/S Win XP /Win 7 and Windows 8

3. Installation of utility tools (Software)

4. Installation of utility tools (Drivers)

5. Firewall configuration, Antivirus/Internet security loading and configuration procedure

6. Installation and configuration of I/O devices – Printers, Webcams, Scanners.

7. Installation and configuration of I/O devices – Digital Camera, USB Wi-fi, USB BT, USB Storages, Projectors

8. Multiple OS loading and trouble shooting

4th
Semester

BCCS-21401 Software Engineering

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Course Objectives:
To Aware about the engineering approach to analysis, design and built the software and Understand the phases and activities involved in the conventional software life cycle models.

1. Software Process Model:

The Nature of Software, Need of Software Engineering, Prescriptive Process Models, Specialized Process Models, The Unified Process.   (08)

2. Software Requirement and Cost Estimation

Role of a system analyst, SRS, Properties of a good SRS document, functional and non-functional requirements, Decision tree and Decision table, Formal Requirements Specification, Software Cost Estimation.   (10)

3. Software Designing:

Software design and its activities, Preliminary and detailed design activities, Characteristics of a good software design, Features of a design document, Cohesion and Coupling, Structured Analysis, Function Oriented Design, Object-Oriented Design.   (10)

4. Software Testing:

Testing Fundamentals, Unit Testing, Integration Testing, Validation Testing, System Testing, Maintenance and Reengineering, Measures, Metrics, and Indicators, Software Measurement, Metrics for Requirements Model, Metrics for Design Model, Metrics for Testing, Metrics for Maintenance.
(10)

Course Outcomes: After the completion of this subject, students will able to:

1. develop requirement analysis and software specification document.
2. Implement various software development process models.
3. develop design for software development.
4. construct test cases

Text Books:
1. Software Engineering–A Practitioner's Approach, Roger S.Pressman, Seventh Edition, McGrawHill, 2010.

Reference Books:
1. An Integrated Approach to Software Engineering, Pankaj Jalota, Third Edition, Narosa Publishing House, 2005
2. Software Engineering, Ian Sommerville, Ninth Edition, Addison-Wesley, 2011

BCCS-21402 Database Management System

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
    Total Marks: 100

Course Objective: The subject aims to provide the student with an understanding Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database and Formulate, using SQL, solutions to a broad range of query and data update problems. It also aims to Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

1. Introduction to DBMS: Introduction of DBMS, Data Modeling for a Database, Three level Architecture of DBMS, Components of a DBMS. Introduction to Data Models, Hierarchical, Network and Relational Model, Comparison of Network, Hierarchical and Relational Model, Entity Relationship Model. (9)

2. RDBMS and SQL Fundamental: – Relational Database, Relational Algebra and Calculus, SQL Fundamentals, DDL, DML, DCL, PL/SQL Concepts, Cursors, Stored Procedures, Stored Functions, Database Triggers. (8)

3. Normalization: Introduction to Normalization, First, Second, Third Normal Forms, Dependency Preservation, Boyce-Codd Normal Form, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Domain-key normal form (DKNF).
(8)

4. Database Security: Database Recovery, Concurrency Management, Database Security, Integrity and Control. Structure of a Distributed Database, Design of Distributed Databases.
(8)

Course Outcomes:
After completing this course student will be able to:
5. Construct database for software applications.
6. Understand approaches for database optimization.
7. Formulate, using SQL, solutions to a broad range of query and data update problems..
4. Understand the concept of Transaction and Query processing in DBMS.

Suggested Books:
1. "An Introduction to Database System", Bipin C. Desai, Galgotia Publications Pvt Ltd-New Delhi, Revised Edition, (2012).
2. "Database System Concepts", Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Tata McGraw Hill, 6th Edition, (2013).

BCCS-21403 Programming in Python

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
   Total Marks: 100

Course Objective:

The subject aims to provide the student with an familiarization with Python environment, data types, operators used in Python. The aim of the subject is to enable the students to Compare and contrast Python with other programming languages and Learn the use of control structures and numerous native data types with their methods.

1. Introduction to Python Programming Language:
Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages. Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command. Operators in Python, Expressions, Precedence, Association of Operators, Non Associative Operators.

(10)

2. Control Structures:
Decision making statements, Python loops, Python control statements. Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).
(10)

3. Python Functions and Modules:
Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables. Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages.

(10)

4. Exception Handling and File Management:
Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python. File Management in Python: Operations on files (opening, modes, attributes, encoding, closing), read() & write() methods, tell() & seek() methods, renaming & deleting files in Python, directories in Python.
(10)

Course Outcomes:
After completing this course student will be able to:

1. Compare and contrast Python with other programming languages.
2. To describe and use software tools in the programming process**.**
3. Learn the use of control structures and numerous native data types with their methods.
4. To design, implement, debug and test programs using the fundamental elements of python.

Suggested Books:
1. Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.
2. Programming in Python, Pooja Sharma, BPB Publications, 2017.
3. Core Python Programming, R. Nageswara Rao, 2nd Edition, Dreamtech.

BCCS-21404 DBMS Laboratory

Internal Marks: 60	**L T P**
External Marks: 40	**0 0 4**
Total Marks: 100	

1. Used of CREATE, ALTER, RENAME and DROP statement in the database tables (relations)

2. Used of INSERT INTO, DELETE and UPDATE statement in the database tables (relations)

3. Use of simple select statement.

4. Use of select query on two relations

5. Use of nesting of queries.

6. Use of aggregate functions.

7. Use of substring comparison.

8. Use of order by statement.

9. Consider the following schema for a Library Database:

BOOK (Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS(Book_id,Author_Name)

PUBLISHER (Name, Address, Phone) BOOK_COPIES (Book_id, Branch_id, No-of_Copies)

BOOK_LENDING (Book_id, Branch_id, Card_No,   Date_Out,Due_Date)

LIBRARY_BRANCH (Branch_id, Branch_Name, Address)

Write SQL queries to

1. Retrieve details of all books in the library_id, title, name of publisher, authors, number of copies in each branch, etc.

2. Get the particulars of borrowers who have borrowed more than 3 books between Jan 2018 to Jun 2018

3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.

4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.

5. Create a view of all books and its number of copies that are currently available in the Library.

10. Consider the following schema for Order Database:

SALESMAN (Salesman_id, Name, City, Commission) CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id) ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id) Write SQL queries to

1. Count the customers with grades above Amritsar's average.
2. Find the name and numbers of all salesmen who had more than one customer.
3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)
4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

11. Write a PL/SQL code to add two numbers and display the result. Read the numbers during run time.

12. Write a PL/SQL code to find sum of first 10 natural numbers using while and for loop.

13. Write a program to create a trigger which will convert the name of a student to upper case before inserting or updating the name column of student table.

14. Write a PL/SQL block to count the number of rows affected by an update statement using SQL%ROWCOUNT

15. Write a PL/SQL block to increase the salary of all doctors by 1000.

Suggested Books:

1. "SQL, PL/SQL The Programming Language of Oracle", 4th Revised Edition, Ivan Bayross (2009).
2. Oracle PL/SQL Programming", 5th Edition, Steven Feuerstein and Bill Pribyl (2009).

BCCS-21405 Programming in Python Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

1. Compute sum, subtraction, multiplication, division and exponent of given variables input by the user.

2. Compute area of following shapes: circle, rectangle, triangle, square, trapezoid and parallelogram.

3. Compute volume of following 3D shapes: cube, cylinder, cone and sphere.

4. Compute and print roots of quadratic equation $ax^2+bx+c=0$, where the values of a, b, and c are input by the user.

5. Print numbers up to N which are not divisible by 3, 6, 9,, e.g., 1, 2, 4, 5, 7,….

6. Write a program to determine whether a triangle is isosceles or not?

7. Print multiplication table of a number input by the user.

8. Compute sum of natural numbers from one to n number.

9. Print Fibonacci series up to n numbers e.g. 0 1 1 2 3 5 8 13…..n

10. Compute factorial of a given number.

11. Count occurrence of a digit 5 in a given integer number input by the user.

12. Print Geometric and Harmonic means of a series input by the user.

13. Evaluate the following expressions: **a.** $x-x^2/2!+x^3/3!- x^4/4!+… x^n/n!$

                                                                  b. $x-x^3/3!+x^5/5!- x^7/7!+… x^n/n!$

14. Print all possible combinations of 4, 5, and 6.

15. Determine prime numbers within a specific range.

16. Count number of persons of age above 60 and below 90.

17. Compute transpose of a matrix.

18. Perform following operations on two matrices.

     1) Addition 2) Subtraction 3) Multiplication

19. Count occurrence of vowels.

20. Count total number of vowels in a word.

21. Determine whether a string is palindrome or not.

22. Perform following operations on a list of numbers:

1) Insert an element 2) delete an element 3) sort the list 4) delete entire list

23. Display word after Sorting in alphabetical order.

24. Perform sequential search on a list of given numbers.

25. Perform sequential search on ordered list of given numbers.

26. Maintain practical note book as per their serial numbers in library using Python dictionary.

27. Perform following operations on dictionary

1) Insert 2) delete 3) change

28. Check whether a number is in a given range using functions.

29. Write a Python function that accepts a string and calculates number of upper case letters and lower case letters available in that string.

30. To find the Max of three numbers using functions.

31. Multiply all the numbers in a list using functions.

32. Solve the Fibonacci sequence using recursion.

33. Get the factorial of a non-negative integer using recursion.

34. Write a program to create a module of factorial in Python.

35. Design a Python class named Rectangle, constructed by a length & width, also design a method which will compute the area of a rectangle.

36. Design a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.

37. Design a Python class to reverse a string 'word by word'.

38. Write a Python program to read an entire text file.

39. Design a Python program to read first n lines of a text file.

40. Construct a Python program to write and append text to a file and display the text.

Suggested Books:

1. Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.

2. Programming in Python, Pooja Sharma, BPB Publications, 2017.

3. Core Python Programming, R. Nageswara Rao, 2nd Edition, Dreamtech.

BCCS-21406 Web Designing

Internal Marks: 40   **L T P**
External Marks: 60   **3 0 0**
Total Marks: 100

Course Objectives
The main goal of this course is to Understand the core concepts of Internet and Web Services and to describe and differentiate Programming Language and Markup Language. Subject also aims to list various web pages and web sites together to Capture user input from the remote users.

1. Introduction Internet and HTML

Basic concepts, communicating on the internet, internet domains, internet server identities, establishing connectivity on the internet client IP address. Information Files Creation, Web Server, Web Client/Browser, Hyper Text Markup Language (HTML Tags, Paired Tags, Singular Tags), Commonly Used Html Commands (Document Head, Document Body), Title and Footer, Text Formatting (Paragraph Breaks, Line Breaks), Emphasizing Material in a Web Page (Heading Styles, Drawing Lines). Basic Formatting Tags
HTML Basic Tags, Text Formatting (Paragraph Breaks, Line Breaks), Emphasizing Material in a Web Page (Heading Styles, Drawing Lines), Text Styles (Bold, Italics, Underline), Other Text Effects (Centering (Text, Images etc.), Spacing (Indenting Text), HTML Color Coding.   (10)

2. HTML Components

Type of Lists (Unordered List (Bullets), Ordered Lists (Numbering), Definition Lists. Using The Border Attribute, Using The Width And Height Attribute, Using The Align Attribute, Using The Alt Attribute. Introduction (Header, Data rows, The Caption Tag), Using the Width and Border Attribute, Using the Cell padding Attribute, Using the Cell spacing Attribute, Using the BGCOLOR Attribute, Using the COLSPAN and ROWSPAN Attributes Links (External Document References, Internal Document References), Image As Hyperlinks. Introduction to Frames: The<FRAMESET> tag, The <FRAME> tag, Targeting Named Frames. DHTML: Cascading Style Sheets, Style Tag.
                                                                             (10)

3. Forms Used by a Web Site

The Form Object, The Form Object's Methods (The Text Element, The Password Element, The Button Element, The Submit (Button) Element, The Reset (Button) Element, The Checkbox Element, The Radio Element, The Text Area Element, The Select and Option Element, The Multi Choice Select Lists Element).   (10)

4. Introduction to JavaScript

JS Introduction, Where To, Output, Statements, Syntax, Comments, Variables, Operators,

Arithmetic, Assignment, Data Types, Functions, Objects, Events, Strings, String Methods, Numbers, Number Methods, Arrays, Array Methods, Array Sort, Array Iteration, Dates, Date Formats, Date Get Methods, Date Set Methods, Math, Random, Booleans, Comparisons, Conditions, Switch, Loop For, Loop While, Break, Type Conversion, Bitwise, RegExp, Errors, Scope, Hoisting, Strict Mode, JSON, Forms, Forms API JS Functions, Function Definitions, Function Parameters, Function Invocation, Function Call, Function Apply, Function Closures (10)

Course Outcomes: After the completion of this subject students will be able to :

1. Understand the core concepts of Internet and Web Services.
2. Describe and differentiate Programming Language and Markup Language.
3. List various web pages and web sites together.
4. Capture user input from the remote users.
5. Learn connectivity concepts of Front End and Back End process.

Suggested Books:
1. Internet for EveryOne: Alexis Leon, 1st Edition, Leon Techworld, Publication, 2009.
2. Greenlaw R; Heppe, "Fundamentals of Internet and WWW", 2nd Edition, Tata McGraw-Hill,2007
3. Raj Kamal, "Internet& Web Technologies", edition Tata McGraw-Hill Education.2009.

BCHU-21407 Web Designing Laboratory

Internal Marks: 60	**L T P**
External Marks: 40	**0 0 4**
Total Marks: 100	

1. Create a simple HTML page to demonstrate the use of different tags.

2. Design index page of a book on web designing.

3. Display Letter Head of your college on a web page.

4. Create a Hyperlink to move around within a single page rather than to load another page.

5. Display letter using different Text formatting Tags.

6. Design Time Table of your department and highlights of most important periods.

7. Use Tables to provide layout to your web page.

8. Embed Audio and Video into your web page.

9. Divide a web page vertically and horizontally and display logo of your college in left pane and logo of university in right pane.

10. Create a student Bio- Data.

11 .Design front page of hospital with different style sheets.

12. Design a web page and display two different pages at a time.

13. Write a program to create a login form. On submitting the form, the user should get navigated to a profile page using JavaScript.

14. Write a code to create a Registration Form. On submitting the form, the user should be asked to login with the new credentials using JavaScript.

15. Write an HTML code to create your Institute website/Department website/ Tutorial website for specific subject. Also use Java Script for validation.

5th

Semester

BCCS-21501 Programming in Java

Internal Marks: 40	**L T P**
External Marks: 60	**4 0 0**
Total Marks: 100	

Course Objective: This course provides an introduction to object oriented programming (OOP) using the Java programming language. Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm

1. **Fundamentals**

   Java Programming Fundamentals: Introduction to Java, Stage for Java, Origin, Challenges of Java, Java Features, Java Program Development, ObjectOriented Programming.

   Java Essentials: Elements of Java Program, Java API, Variables and Literals,Primitive Data Types, The String class, Variables, Constants, Operators, Scopeof Variables & Blocks, Types of Comment in Java. (10)

2. **Control Statements:** Decision making statements (if, if-else, nested if, else if ladder, switch, conditional operator), Looping statements (while, do-while, for,nested loops), Jumping statements (Break and Continue).

   Classes and Objects: Basic concepts of OOPS, Classes and Objects, Modifiers, Passing arguments, Constructors, Overloaded Constructors, Overloaded Operators, Static Class Members, Garbage Collection.

   Inheritance: Basics of inheritance, Inheriting and Overriding Super class methods, Calling Super class Constructor, Polymorphism, Abstract Classes, Final Class. (12)

3. **Arrays and Strings:** Introduction to array, Processing Array Contents, Passingarray as argument, Returning array from methods, Array of objects, 2D arrays,Array with three or more dimensions. String class, string concatenation, Comparing strings, Substring, Difference between String and String Buffer class, String Tokenizer class.

   Interface and Packages: Basics of interface, Multiple Interfaces, Multiple Inheritance Using Interface, Multilevel Interface, Packages, Create and AccessPackages, Static Import and Package Class, Access Specifiers.

   Exception Handling: Introduction, Try and Catch Blocks, Multiple Catch, Nested Try, Finally, Throw Statement, Built-In Exceptions. (10)

4. **Multithreading:** Introduction, Threads in Java, Thread Creation, Lifecycle ofThread, Joining a Thread, Thread Scheduler, Thread Priority, Thread Synchronization.

   Applets: Introduction, Applet Class, Applet Life Cycle, Graphics in Applet, Event-Handling.

   File and I/O Streams: File Class, Streams, Byte Streams, Filtered ByteStreams, Random Access File Class, Character Streams. (12)

Course Outcomes:

6. The model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism
7. Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections
8. How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.
9. How to test, document and prepare a professional looking package for each business project using javadoc.

Suggested Books:

1. Programming with Java A Primer, 5th Edition, E. Balagurusamy, TMH.
2. Java Programming for Core and Advanced Learners, Sagayaraja, Denis, Karthik, Gajalakshmi, Universities Press.
3. Java Fundamentals, A Comprehensive Introduction, H. Schildt, D. Skrien, TMH.

Reference Books:

1. Java, The complete Reference, H. Schildt, 7th Edition, TMH.

BCCS-21502 Computer Graphics

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Course Objective: The main objective of the course is to introduce students with fundamental concepts and theory of computer graphics. It presents the important drawing algorithm, polygon fitting, clipping and 2D transformation curves and an introduction to 3D transformation.

1. **Introduction**
   Introduction to Computer Graphics
   Applications of Computer Graphics. Graphs and Types of Graphs

   Input Devices: Light Pens, Graphic Tablets, Joysticks, Track Ball, Data Glove, Digitizers, Image Scanner.
   Video Display Devices: Refresh Cathode Ray Tube, Raster Scan displays, Random Scan displays, Color CRT - monitors and Color generating techniques (Shadow Mask, Beam Penetration), Flat-Panel Displays; 3-DViewing Devices, Graphics monitors and workstations, Color Models (RGB and CMY), Lookup Table.

   Introduction Virtual Reality & Environments: Applications in Engineering, Architecture,

Education, Medicine, Entertainment, Science, Training.   (11)

2. **Scan-Conversions**
   Process and need of Scan Conversion, Scan conversion algorithms for Line, Circle and Ellipse using direct method, Bresenham's algorithms for line & circle and Midpoint Ellipse Algorithm along with their derivations, Area Filling Techniques, Flood Fill Techniques, Character Generation.

3. **2 – Dimensional Graphics**
   Cartesian and need of Homogeneous co-ordinate system, Geometrictransformations (Translation, Scaling, Rotation, Reflection, Shearing),Viewing transformation and clipping (line, polygon and text) using Cohen- Sutherland, Sutherland Hodgeman and Liang Barsky algorithm for clipping.

4. **3 – Dimensional Graphics**
   Geometric Transformations(Translation, Scaling, Rotation), Mathematics of Projections (Parallel &Perspective). Color Shading. Introduction to Morphing techniques.

Course Outcomes:
After completing this course student will be able to:
1. Explain the applications, areas, and graphic pipeline, display and hardcopy technologies.
2. Apply and compare the algorithms for drawing 2D images also explain aliasing, anti aliasing and half toning techniques.
3. Analyze and apply clipping algorithms and transformation on 2D images.
4. Solve the problems on viewing transformations and explain the projection and hidden surface removal algorithms.

Suggested Books:
1. D. Hearn and M.P. Baker, *Computer Graphics*, PHI New Delhi.
2. J.D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes,. R.L Phillips, *Computer Graphics Principles & Practices*, Second Edition, Pearson Education, 2007.
3. R.A. Plastock and G. Kalley, *Computer Graphic*, McGraw Hill, 1986.

BCCS-21701 Data Warehousing and Mining (Elective-I)
Internal Marks: 60   **L T P**
External Marks: 40   **4 0 0**
Total Marks: 100

Course Objectives:
- To introduce students to the basic concepts and techniques of Data Mining.
- To introduce a wide range of clustering, estimation, prediction, and classification algorithms.
- To introduce mathematical statistics foundations of the Data Mining Algorithms.
- To introduce basic principles, concepts and applications of data warehousing.

1. **Introduction**

   Need for strategic information, difference between operational and Informational data stores Data warehouse definition, characteristics, Data warehouse role and structure, OLAP Operations, Data mart, Different between data mart and data warehouse, Approaches to build a data warehouse, Building a data warehouse, Metadata & its types.   (11)

2. **Data Pre-processing**

   Need, Data Summarization, Methods. Denormalization, Multidimensional data model, Schemas for multi- dimensional data (Star schema, Snowflake Schema, Fact Constellation Schema, Difference between different schemas.

   Data warehouse architecture, OLAP servers, Indexing OLAP Data, OLAP query processing, Data cube computation   (11)

3. **Data Mining**

   Definition, Data Mining process, Data mining methodology, Data mining tasks, Mining various Data types & issues. Attribute-Oriented Induction, Association rule mining, Frequent itemset mining, The Apriori Algorithm, Mining multilevel association rules.   (12)

4. **Classification**

   Overview of classification, Classification process, Decision tree, Decision Tree Induction, Attribute Selection Measures. Overview of classifier's accuracy, Evaluating classifier's accuracy, Techniques for accuracy estimation, Increasing the accuracy of classifier.   (7)

5. **Clustering**

   Introduction to Clustering, Types of clusters, Clustering methods, Data visualization & various data visualization tools   (3)

Course Outcomes:

  After completing this course, students will be able to:

   1.   Justify the need of Data Warehousing & Mining
   2.   Differentiate between the Transactional and Analytical data models.
   3.   Identify the real life applications where data mining can be applied.
   4.   Apply different data mining algorithms on wide range of data sets.

Suggested Books:

1. Data Warehousing, Data Mining & Olap by Berson, Tata Mcgraw- Hill.
2. Han J., Kamber M. and Pei J., Data mining concepts and techniques, Morgan Kaufmann Publishers (2011) 3rd ed.
3. Pudi V., Krishana P.R., Data Mining, Oxford University press, (2009) 1st ed.
4. Adriaans P., Zantinge D., Data mining, Pearson education press (1996), 1st ed.
5. Pooniah P., Data Warehousing Fundamentals, Willey interscience Publication,(2001), 1st ed.

BCCS-21702 Cryptography and Network Security (Elective-I)

Internal Marks: 60   **L T P**
External Marks: 40   **4 0 0**
Total Marks: 100

Course Objectives:

- Describe network security services and mechanisms.
- To learn about Symmetrical and Asymmetrical cryptography, Data integrity, Authentication, Digital Signatures.
- Understand various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc.

1. **Network Security Overview**
   Services, Mechanisms and Attacks, The OSI Security Architecture, Network security at various layers. A Model of Network Security.
   System Security- Intruders, Malicious Software, Viruses and Related Threats, Counter Measures, Firewalls and its Design Principles. (6)

2. **Symmetric Cryptography**
   Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.
   Block Cipher and the Data Encryption Standard: Simplified DES, Block Cipher Principles, The DES, The Strength of DES, Differential and Linear Cryptanalysis.
   Symmetric Ciphers: Triple DES, Blowfish. Confidentiality using Conventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation. (8)

3. **Asymmetric Cryptography**
   Public Key Encryption, Digital Signatures - Number Theory, Prime Numbers Formats and Euler's Theorems, Testing for Primality. Public Key Cryptography and RSA: Principles of Public Key Cryptosystems, The RSA Algorithms, Key Management, Diffie Hellman Key Exchange. (7)

4. **Authentication IP Security**
   Overview, IP Security Architecture, Authentication Header, Encapsulation Security Payload.
   Web Security: Web Security Requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction, Authentication Applications: Kerberos, X.509 Directory Authentication Service. Electronic Mail Security: Pretty Good Privacy. (7)

4. **Authentication Protocols**
   Message Authentication: Authentication Requirements, Authentication Functions, Message Authentication Codes, MD5 Message Digest Algorithms, Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols, Digital Signature Standards, digital certificates. (8)

Course Outcomes:
- Understand the most common type of cryptographic algorithm
- Understand the Public-Key Infrastructure
- Understand security protocols for protecting data on networks · Be able to digitally sign emails and files

Suggested Books:

1. William Stallings, Network Security Essentials, Applications and Standards, Pearson Education.
2. William Stallings, Cryptography and Network Security Principles and practice. 2/e, Pearson Education.
3. Bishop, Matt, Introduction to Computer Security. Addison-Wesley, Pearson Education, Inc.
4. Michael. E. Whitman and Herbert J. Mattord Principles of Information Security,
5. Cengage Learning Atul Kahate Cryptography & Network Security, TMH,

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BCCS-21703 Artificial Intelligence (Elective-I)
</div>

Internal Marks: 60	**L T P**
External Marks: 40	**4 0 0**
Total Marks: 100	

Course Objectives:

1. To provide a strong foundation of fundamental concepts in Artificial Intelligence
2. To provide a basic exposition to the goals and methods of Artificial Intelligence
3. To enable the student to apply these techniques in applications which involve perception, reasoning and learning

1. **Introduction-**What is intelligence? Foundations of artificial intelligence (AI). History of AI. AI problems: Toy Problems, Real World problems- Tic-Tac-Toe,Water Jug, Question-Answering, 8-puzzle, 8-Queens problem. Formulating problems, Searching for Solutions.
   Knowledge Representation: Propositional Logic, Propositional Theorem Proving-Inference and Proofs, Proof by Resolution, Horn Clauses and definite Clauses, Forward and Backward chaining; First order Logic, Inference in First Order Logic.   (10)

2. **Uncertain Knowledge and Reasoning:** Basic probability, Bayes rule, Beliefnetworks, Default reasoning, Fuzzy sets and fuzzy logic.
   Structured Knowledge: Associative Networks, Frame Structures, ConceptualDependencies and Scripts.   (10)

3. **Uninformed Search strategies-** Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search, Comparing uninformed search strategies.
   Informed (Heuristic) Search Strategies- Hill Climbing, Simulated Annealing, Genetic Algorithm, Greedy best-first search, A* and optimal search, Memory- bounded heuristic search.

(12)

4. **Natural language processing:** Grammars, Parsing.

   Pattern Recognition: Recognition and Classification Process-Decision Theoretic Classification, Syntactic Classification; Learning Classification Patterns, Recognizing and Understanding Speech.

   Expert System Architectures: Characteristics, Rule-Based System Architectures, Nonproduction System Architectures, Knowledge Acquisition and Validation   (12)

Course Outcomes:

- Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.
- Apply these techniques in applications which involve perception, reasoning and learning.
- Acquire the knowledge of real world Knowledge representation.
- Analyze and design a real world problem for implementation and understand the dynamic behavior of a system.
- Use different machine learning techniques to design AI machine and enveloping applications for real world problems.

Text Books:

1. Artificial Intelligence-A Modern Approach, Russel and Norvig, Prentice Hall.
2. Artificial Intelligence, Elaine Rich, Kevin Knight and SB Nair, 3 Ed.,TataMcGraw-Hill.
3. Artificial Intelligence And Expert Systems, D.W.Patterson, Prentice Hall.
4. Artificial Inteligence Structures and Strategies for complex Problem Solving,George F. Luger, Pearson Addison Wesley

BCCS-21704 Distributed Systems (Elective-I)

Internal Marks: 60   **L T P**
External Marks: 40   **4 0 0**
Total Marks: 100

Course Objectives:

This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.

1. **Introduction**
   Distributed computing systems (DCS) Introduction, DCS design goals: Transparencies, Fundamental issues. Distributed Coordination: Temporal ordering of events, Lamport's logical clocks, Vector clocks; Ordering of messages, Physical clocks, Global state detection   (7)

2. **Process synchronization**

Distributed mutual exclusion algorithms, Performance matrix, Inter-process communication   (7)

3. **Deadlocks**
Deadlocks, Load scheduling and balancing techniques Deadlock in distributed systems, Round robin load balancing, client side load balancing, server side load balancing, applications (such as routers)   (7)

4. **Distributed System Models**
System Architectures & Client-Server Models   (4)

5. **Distributed Algorithms**
Programming Systems Search Engines Page ranking, leader election, Hashing, Caching, Remote Procedure Call.   (5)

6. **Distributed computing platforms**
CORBA/ DCOM/ Java RMI/ Hadoop Map-Reduce, Workflow Systems: Grid Computing , Cloud Computing , Virtualization , IaaS Clouds , Filesystems, Networked Filesystems, Parallel Filesystems   (8)

7. **Distributed File systems**
Data-Intensive Computing, Distributed Hash Tables, Consistency Models, Fault Tolerance, Many-core Computing   (4)

Course Outcomes:
- To study hardware and software issues in modern distributed systems.
- To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
- To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
- Have Sufficient knowledge about file access.
- Have knowledge of Synchronization and Deadlock.

Text Books:

1. "An Introduction to Database System", Bipin C. Desai, Galgotia Publications PvtLtd-New Delhi, Revised Edition, (2012).
2. "Database System Concepts", Abraham Silberschatz, Henry F. Korth, S. Sudharshan,Tata McGraw Hill, 6th Edition, (2013).

Reference Books:

1. "SQL, PL/SQL The Programming Language of Oracle", Ivan Bayross, BPBPublications, 4th Revised Edition (2009)
2. "An Introduction to Database Systems", C. J. Date, A. Kannan, S. Swamynathan, 8th Edition, Pearson Education, (2006).
3. Database Management Systems, Raghu Ramakrishnan, McGraw-Hill, Third Edition,2014.

BCCS-21504 Software Project Management

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Course Objectives:

This course is aimed at introducing the primary important concepts of project management related to managing software development projects. Students will also get familiar with the different activities involved in Software Project Management. Further, they will also come to know how to successfully plan and implement a software project management activity, and to complete a specific project in time with the available budget.

1. **Introduction**

   Project Management Concepts The management spectrum, the people, the product, the process, the project, stakeholders, W5HH Principle, critical practices, the SPM plan, project-planning steps.
   (4)

2. **Process and Project Metrics**

   Metrics in the Process and Project Domains, Software Measurement, Size-Oriented Metrics, Function Oriented Metrics, Reconciling LOC and FP Metrics, Object-Oriented Metrics, Use Case-Oriented Metrics, Web App Project Metrics, Metrics for Software Quality, Integrating Metrics within the Software Process.   (6)

3. **Project Scheduling**

   Basic Concepts of Project Scheduling, The Relationship between People and Effort, Effort Distribution, Defining a Task Set for the Software Project, Refinement of Major Tasks, Time-Line Charts, Tracking the Schedule, Tracking Progress for an OO Project, Scheduling for Web App and Mobile Projects, Earned Value Analysis, Project Monitoring and Control.   (7)

4. **Risk Management**

   Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Assessing Overall Project Risk, Risk Projection, Assessing Risk Impact, Risk Refinement, Risk Mitigation, Monitoring, and Management, The RMMM Plan.   (5)

5. **Configuration Management**

   Elements of a Configuration Management System, Baselines, Software Configuration Items, Management of Dependencies and Changes, The SCM Repository, The SCM Process, Version Control, Change Control, Configuration Audit, Status Reporting, Configuration Management for Web and Mobile Apps   (5)

6. **Maintenance and Reengineering**

Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering Process Model, Reverse Engineering, Restructuring, Forward Engineering, The Economics of Reengineering. Overview of ISO-12207.   (6)

Course Outcomes:

- Identify the different project contexts and suggest an appropriate management strategy.
- Practice the role of professional ethics in successful software development.
- Identify and describe the key phases of project management.
- Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

Suggested books:

1. Software Engineering a Practitioner Approach, 7th Edition by R Pressman

2. Software Project Management Bob Hughes and Mike Cotterell Latest edition, McGraw Hill

BCCS-21505 Computer Graphics Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

List of Practicals:

1. Use of basic functions of graphic available like circle, putpixel, rectangle, arc, ellipse, floodfill, setcolor etc.
2. Design a logo/poster using primitive functions.
3. Draw a 3 D object using palettes.
4. Line Drawing Algorithm : Direct method and DDA
5. Bresenham's Line Drawing Algorithm
6. Circle Generating Algorithm : Equation and trigonometric function.
7. Bresenham's Circle Generating Algorithm
8. Draw an ellipse using Midpoint Algorithm.
9. Translation transformation on a polygon.
10. Scaling transformation on a polygon.
11. Rotation transformation on a polygon.
12. Reflection transformation on a polygon.
13. Shearing transformation on a polygon.
14. Mixed transformation on an object
15. Minor project (eg Game/ Animation etc.)

BCCS-21506 Programming in Java Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

List of Practicals:

1. Write a program to perform following operations on two numbers input by the user:
   1) Addition 2) subtraction 3) multiplication 4) division
2. Write a Java program to print result of the following operations.1. -15
   +58 * 45
   2. (35+8) % 6
   3. 24 + -5*3 / 7
   4. 15 + 18 / 3 * 2 - 9 % 3
3. Write a Java program to compute area of:
   1) Circle   2) rectangle   3) triangle   4) square
4. Write a program to convert temperature from Fahrenheit to Celsius degree using Java.
5. Write a program through Java that reads a number in inches, converts it to meters.
6. Write a program to convert minutes into a number of years and days.
7. Write a Java program that prints current time in GMT.
8. Design a program in Java to solve quadratic equations using if, if else
9. Write a Java program to determine greatest number of three numbers.
10. Write program that gets a number from the user and generates an integer between 1 and 7 subsequently should display the name of the weekday as per that number.
11. Construct a Java program to find the number of days in a month.

12. Write a program to sum values of an Single Dimensional array.

13. Design & execute a program in Java to sort a numeric array and a string array.

14. Calculate the average value of array elements through Java Program.

15. Write a Java program to test if an array contains a specific value.

16. Find the index of an array element by writing a program in Java.

17. Write a Java program to remove a specific element from an array.

18. Design a program to copy an array by iterating the array.

19. Write a Java program to insert an element (on a specific position) into Multidimensional array.

20. Write a program to perform following operations on strings:
    1) Compare two strings.
    2) Count string length.
    3) Convert upper case to lower case & vice versa.
    4) Concatenate two strings.
    5) Print a substring.
21. Developed Program & design a method to find the smallest number among three numbers.

22. Compute the average of three numbers through a Java Program.

23. Write a Program & design a method to count all vowels in a string.

24. Write a Java method to count all words in a string.

25. Write a method in Java program to count all words in a string.

26. Write a Java program to handle following exceptions:
    1) Divide by Zero Exception.
    2) Array Index Out Of B bound Exception.
27. To represent the concept of *Multithreading* write a Java program.

28. To represent the concept of all types of inheritance supported by Java, design a program.

29. Write a program to implement *Multiple Inheritance* using interface.

30. Construct a program to design a package in Java.

31. To write and read a plain text file, write a Java program.

32. Write a Java program to append text to an existing file.

33. Design a program in Java to get a list of all file/directory names from the given.

34. Develop a Java program to check if a file or directory specified by pathname exists or not.

35. Write a Java program to check if a file or directory has read and write permission.

6th

Semester

BCCS-21601 Android Programming

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Prerequisite: The course will help students to develop applications for Android Mobile Phone. The students will use a software emulator for the phone to develop the application and a real phone to demonstrate the application. The main emphasis is on the aspects like develop, debug and test a variation of an existing application. Students must know all the basic concepts of Java.
Co requisite: -NA-
Additional material required in ESE: Students can carry their own data cable to execute the application built on Simulator for the sake of fast speed.

Course Objective: To understand the basic concepts of mobile and Android programming languages and to learn the techniques of software development in Android.

Detailed contents:
1. **Introduction** (8)
   Characteristics of Mobile applications, Introduction to Android Development Environment, Advantages and Futures of Android, Architecture and working of Android, User-interface design for mobile applications and managing application data.

2. **Cloud Services** (7)
   Integrating cloud services, networking, OS and hardware into mobile- applications. Enterprise requirements in mobile applications: Performance,Scalability, Modifiability, Availability and Security.

3. **Mobile Software Engineering** (7)
   Mobile Software Engineering (Design Principles, Development, Testing methodologies for mobile applications.

4. **Directory Structure** (8)
   Directory Structure of an Android Project, Common Default Resources Folders, The Values Folder, Leveraging Android XML.

Course Outcomes:
After completing this course student will be able to:
1. Students will be able to do work on Android OS.
2. Students will be able to create different type of Android based applications.
3. Students will be able to discuss various security issues in Android platform.
4. Students will be able to implement various database applications and contentproviders.
5. Students will be able to differentiate among various types of operating systems.

Suggested Text Books:
1. Android Studio Application Development, Belen Cruz, Zapata, Packt Publishing
2. Deitel, P., Deitel, H., Deitle, A., and Morgano, M., Android for Programmers – An App-Driven Approach, Prentice Hall

Suggested Reference Books

1. Professional Mobile Application Development, JEFFMCWHERTER, SCOTTGOWELL, Wiley.
2. Professional Android 4 Application Development, Reto Meier, Wrox Publication
3. Beginning iPhone Development with Swift, David Mark, A press Publica

E Books/ Online learning material

1. d.android.com
2. Safari Textbooks Online: http://library.ohio-state.edu/search/y?SEARCH=Safari
3. https://www.androidauthority.com/best-ebook-ereader-apps-for-android-170696/

BCCS-21602 Android Programming Laboratory

Internal Marks: 60   **L T P**
External Marks: 40   **0 0 4**
Total Marks: 100

Prerequisite: The course will help students to develop applications for Android MobilePhone. The students will use a software emulator for the phone to develop the application and a real phone to demonstrate the application. The main emphasis is on the aspects likedevelop, debug and test a variation of an existing application. Students must know all thebasic concepts of Java.

Co requisite: -NA-

Additional material required in ESE: Students can carry their own data cable toexecute the application built on Simulator for the sake of fast speed.

1. Installation of Java, android Framework
2. Android SDK Manager and its all components
3. Programs based on the overriding, constructor, classes in Java
4. Programs based on the Final, this and static keyword in Java
5. Directory Structure of an Android Project, Common Default Resources Folders, The Values Folder, Leveraging Android XML.
6. Applications based on Text Boxes and Button
7. Applications based on Check Boxes and button
8. Applications based on Radio Buttons
9. Applications based on Intents and Intent Filters
10. Applications based on Activities and services
11. Applications based on Action Bar
12. Applications based on Option Menu
13. Applications based on Rating Bar
14. Applications based on Media Player
15. Applications based on Content Providers
16. Applications based on accessing camera
17. Applications based on accessing location
18. Applications based on the activation of sensors
19. Applications based on Animations

Reference Books:

1. Deitel, P., Deitel, H., Deitle, A., and Morgano, M., Android for Programmers – An App-Driven Approach, Prentice Hall, Upper Saddle River, NY, 2012, ISBN: 212136-0.
2. Professional Mobile Application Development, JEFFMCWHERTER, SCOTTGOWELL, Wiley.

BCCS-21603 Cyber Law & IPR

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Objective: To understand the basic concepts of Cyber laws and IPR languages and to learn the techniques of copyright.

Detailed contents:
1. **Introduction**   **(12)**
Overview of Computer and Web Technology, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level, Jurisdictional Aspects in Cyber Law Issues of jurisdiction in cyberspace, Types of jurisdiction, Minimum Contacts Theory, Sliding Scale Theory, Effects Test and International targeting, Jurisdiction under IT Act, 2000.

2. **Cyber Crimes& Legal Framework**   **(12)**
Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Ethics and Etiquettes of Cyber World, Cyber Pornography, Identity Theft & Fraud, Cyber Terrorism, Cyber Defamation, Right to Privacy and Data Protection on Internet, Concept of privacy, Threat to privacy on internet, Self-regulation approach to privacy.

3. **Overview of Intellectual Property Right**   **(10)**
Introduction and the need for intellectual property right (IPR), IPR in India – Genesis and Development IPR in abroad, Data Protection, Open Source Software, Macro economic impact of the patent system, Patent and kind of inventions protected by a patent, Patent document How to protect your inventions?, Granting of patent, Rights of a patent.

4. **Copyright, Related Rights and Trademarks**   **(10)**
What is copyright? Latest editions of Designs, what is covered by copyright? How long does copyright last? Why protect copyright? What are related rights? Distinction between related rights and copyright?, What is a trademark? Rights of trademark? What kind of signs can be used as trademarks?, types of trademark, function does a trademark perform, How is a trademark protected?,
How is a trademark registered?

Course Outcomes:
After completing this course student will be able to:

(Gureshpal Singh)   (Anil)   P a g e | **69**

1. Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
2. Students locate and apply case law and common law to current legal dilemmas in the technology field.
3. Students will be able to understand the basics of the four primary forms of intellectual property rights.
4. Students will be able to compare and contrast the different forms of intellectual property protection in terms of their key differences and similarities.
5. Students will be able to analyze the effects of intellectual property rights on society as a whole.

Suggested Text Books:
1. Anirudh Rastogi. Cyber Law, LexisNexis.
2. Vakul Sharma. Information Technology Law and Practice Cyber Laws and Laws Relating to E-Commerce, Universal Law Publishing.
3. Pankaj Sharma. Information Security and Cyber Laws, Kataria, S. K., & Sons.
4. Navneet Nagpal. Intellectual Property Right, Ebooks2go Inc.
5. Dr. S.K. singh. Intellectual Property Rights, Central Law Agency.

Suggested Reference Books
1. Professional Mobile Application Development, JEFFMCWHERTER, SCOTTGOWELL, Wiley.
2. Professional Android 4 Application Development, Reto Meier, Wrox Publication
3. Beginning iPhone Development with Swift, David Mark, A press Publication

BCCS-21604 E-Commerce

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Objective: To understand the basic concepts of E-Commerce and its framework and to learn the security issues under e-commerce.

Detailed contents:
1. **Introduction**   **(05)**
Introduction to E- Commerce, Generic Framework of E- Commerce, Business Models, Consumer Oriented E- Commerce Applications, Mercantile Process Models

2. **Network Infrastructure and Mobile Commerce**   **(09)**
Network Infrastructure for E-Commerce, Market forces behind I Way, Component of I way Access Equipment, Global Information Distribution Network, Broad band Telecommunication (ATM, ISDN, Frame Relay), Mobile Commerce, Mobile Computing Application, Wireless Application Protocols, WAP Technology

3. **Web Security**   **(10)**
   Security Issues on Web- World Wide Web & Security, Importance of Firewall- Components of Firewall, Factors to consider in Firewall Design, Limitations of Firewalls, Transaction Security Client Server Network, Emerging Client Server Security Threats-Network Security

4. **Security**   **(10)**
   Encryption Techniques, Symmetric Encryption- Keys and Data Encryption standard, Triple encryption, Asymmetric encryption- Secret Key Encryption, Public and Private pair key encryption, Digital Signatures-Virtual Private Network (VPN)

5. **Electronics Payments**   **(10)**
   Overview of Electronics payments, The SET Protocol, Payment Gateway, Certificates Digital Token, Smart Cards, Credit Cards, Magnetic Strip Cards, E-Checks, Credit/ Debit card EPS, Mobile Payments, Online Banking, Home banking, Emerging financial Instruments, EDI Application in Business, E-commerce laws, Forms of Agreement, Government Policies and Agenda, E-Commerce Strategy in Business Models and Internet.

Course Outcomes:
After completing this course student will be able to:
1. Distinguish the E-Commerce framework and business model applications
2. Outline the Infrastructure of E-commerce
3. Apply security algorithms
4. Identify and operate e-payment mechanisms

Suggested Text Books:
1. Ravi Kalakota and Andrew B Whinston, "Frontiers of Electronic Commerce", Pearson Education, 2013.
2. Greenstein and Feinman, "E-Commerce", TMH,2001

Suggested Reference Books
1. Denieal Amor, "The E-Business Revolution", Addison Wesley, Second edition 2002
2. Bajaj & Nag, "E-Commerce: The Cutting Edge of Business", TMH, Second Edition 2005
3. Diwan Parag / Sharma Sunil , "E-commerce :A Manager's Guide to E-Business" First edition 2000

BCCS-21705 Machine Learning (Elective- II)

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Objective: To understand the basic concepts of E-Commerce and its framework and to learn the security issues under e-commerce.

Detailed contents:
1. **Introduction** **(08)**
   What is Machine Learning, Unsupervised Learning, Reinforcement Learning Machine Learning Use-Cases, Machine Learning Process Flow, Machine Learning Categories, Linear regression and Gradient descent.

2. **Supervised Learning** **(12)**
   Classification and its use cases, Decision Tree, Algorithm for Decision Tree Induction Creating a Perfect Decision Tree, Confusion Matrix, Random Forest. What is Naïve Bayes, How Naïve Bayes works, Implementing Naïve Bayes Classifier, Support Vector Machine, Illustration how Support Vector Machine works, Hyper parameter Optimization, Grid Search Vs Random Search, Implementation of Support Vector Machine for Classification.

3. **Clustering** **(12)**
   What is Clustering & its Use Cases, K-means Clustering, How does K-means algorithm work, C-means Clustering, Hierarchical Clustering, How Hierarchical Clustering works.

4. **Reinforcement Learning** **(12)**
   Why Reinforcement Learning, Elements of Reinforcement Learning, Exploration vs Exploitation dilemma, Epsilon Greedy Algorithm, Markov Decision Process (MDP) Q values and V values, Q – Learning, α values.

Course Outcomes:
After completing this course student will be able to:
1. Know about the Learning methodologies of Artificial Neural Networks.
2. Learn the concept of clustering
3. Differentiate supervised and unsupervised learning
4. Understand the concept of Reinforcement learning

Suggested Text Books:
1. Pattern Reorganization and Machine learning by Christopher M. Bishop.
2. The elements of Statistical learning by Jeromeh. Friedman, Robert Tivshirani and Trevorhaspie.
3. Introduction to Machine Learning by Ethem Alpaydin. PHI Publisher.
4. Machine Learning, A practical approach on the statistical learinging theory by Rodrigo fernandes de Mello and Moacir Antonelli Ponti.
5. Machine Learning A probabilistic prospective by Kevin P. Murphy

BCCS-21706 Internet of Things (Elective- II)

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Detailed contents:
1. **Introduction**   **(11)**
   Definition and Need of IoT, Characteristics of IoT, Physical Design of IoT – IoT Protocols, Logical Design of IoT, IoT Enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels and Templates.

2. **Domain of IoT**   **(11)**
   Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle. M2M Applications, Software Defined Networks, Network Function Virtualization.

3. **Need IoT**   **(11)**
   Need for IoT System Management, Simple Network Management Protocol, Network Operator Requirements, NETCONF, YANG, IoT System Management with NETCOZF-YANG, IoT Design Methodology.

4. **Cloud Services for IoT**   **(11)**
   Introduction to Raspberry PI-Interfaces (serial, SPI, I2C), Introduction to Cloud Storage Models and Communication APIs Webserver – Web Server for IoT, Cloud for IoT, Security Management in an IoT System.

Course Outcomes:
After completing this course student will be able to:
1. To introduce the terminology, technology and applications of IoT
2. To use the concept of M2M (machine to machine) with necessary protocols
3. To implement data and knowledge management and use of devices in IoT Technology
4. To introduce the Raspberry PI platform, that is widely used in IoT applications

Suggested Text Books:
1. Internet of Things – A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, First Edition, 2015, University Press.

Reference Books:
1. The Internet of Things-Enabling Technologies, Platforms, and Use Cases, Pethuru Raj & Anupama C. Raman, CRC Press, 2017.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014
3. The Definitive Guide to the Internet of Things for Business, Syed Zaeem Hosain, Aeris

Communications, 2016, 2nd edition.
4. Internet of Things: Architecture and Design Principals, Raj Kamal, McGraw- Hill, 2017.

BCCS-21707 Digital Marketing (Elective- II)

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Detailed contents:

1. **Introduction to Digital Marketing**   **(11)**
   Difference between Traditional Marketing and Digital Marketing, Benefits of using Digital Media, Inbound and Outbound Marketing, Online marketing POEM: (Paid, Owned, and Earned Media), Components of Online Marketing (Email, Forum, Social network, Banner, Blog), Impact of Online Marketing, Basics of Affiliate Marketing, Viral Marketing, Influencer Marketing, Referral Marketing.
   Email Marketing: Email newsletters, Digests, Dedicated Emails, Lead Nurturing, Sponsorship mails and Transactional Emails, Drawbacks of EmailMarketing

   Social Media Marketing (SMM): Different types of Social Media Marketinglike Facebook, LinkedIn, Twitter, Video, Instagram etc.

2. **Search Engine Optimization (SEO)**   **(11)**
   About SEO, Need of an SEO friendly website, Importance of Internet and Search Engines; Role of Keywords in SEO.
   On-Page Optimization (Onsite): Basics of Website Designing / Development; HTML Basics for SEO; Onsite Optimization Basics; Website Structure and Navigation Menu Optimization; SEO Content Writing. Keywords Research and Analysis (eg. SWOT analysis of website, finding appropriate keywords).
   Off Page Optimization: Introduction; Local marketing of websites depending on locations; Promoting Subsequent pages of the website.
   Introduction to organic SEO vs non-organic SEO; Social Media Optimization Techniques and Page Rank Technology.

3. **Website Planning & Creation**   **(11)**
   Content Marketing Strategy: Goals and concepts, Strategic building blocks, Content creation & channel distribution, Tools of the trade, Advantages and challenges.
   Keywords Research and Analysis: Introduction to Keyword Research; Business Analysis; Types of Keywords; Keywords Analysis Tools.
   Web Presence: How to increase online presence and drive more traffic for a website, Search result visibility in search engines for chosen keyword and phrases, Using e-mail marketing to drive traffic for a website, Posting social media content for lead generation, Tools to create and manage content, Use of Blogging as content strategy.
   Creating content: Writing and posting content on the web and in social networks, blog and video; Create, manage and implement a content marketing strategy; Monitoring and recording results to

improve content marketing campaigns; Successful content marketing strategies and case studies.

4. **Online Advertising, Mobile Marketing and Web analytics** **(11)**
   Introduction to Online Advertising and its advantages, Paid versus Organic, Pay Per Click (PPC) Model. Basic concepts Cost per Click (CPC), CPM, CTR, CR etc. About Mobile Marketing, Objectives of Mobile Advertising, Creating a Mobile Marketing Strategy, Introduction to SMS Marketing. About Web Analytics, Types of Web Analytics (On-site, Off-site), Importance of Web
   Analytics

Course Outcomes:
After completing this course student will be able to:
1. Learn how to use new media such as mobile, search and social networking.
2. Understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy.
3. Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media.
4. Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan

Suggested Text Books:
1. Puneet Singh Bhatia, Fundamentals of Digital Marketing First Edition, Publication Pearson.
2. Vandana Ahuja, Digital Marketing 1st Edition, Publication Oxford
3. Shivani Karwal, "Digital Marketing Handbook: A Guide to search Engine Optimization, Pay Per Click Marketing, Email Marketing and Content Marketing", CreateSpace Independent Publishing Platform, 1st edition.

Reference Books:
1. Ian Dodson, The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted and Measurable Online Campaigns, Publication Wiley India Pvt Ltd.
2. Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 4.0: Moving from Traditional to Digital, Publication Wiley India Pvt Ltd.
3. Venakataramana Rolla, "Digital Marketing Practice guide for SMB: SEO, SEM and SMM", CreateSpace Independent Publishing Platform, First edition.
4. Enge, E., Spencer, S., Stricchiola, J., & Fishkin, R. (2012). The art of SEO. " O'Reilly Media, Inc.".

E Books/ Online learning material:
1. www.sakshat.ac.in
2. https://swayam.gov.in
3. https://www.edx.org/course/online-marketing-strategies-curtinx- mkt5x
4. https://www.emarketinginstitute. org/free-courses/ eMarketing Institute

BCCS-21708 Cloud Computing (Elective- II)

Internal Marks: 40   **L T P**
External Marks: 60   **4 0 0**
Total Marks: 100

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Detailed contents:

1. **Introduction** (12)
   Overview of Computing Paradigm: Recent trends in Computing -Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing.
   Introduction to Cloud Computing: Vision of Cloud Computing, Defining a Cloud, Cloud delivery Model, Deployment Model, Characteristics, Benefits of Cloud Computing, Challenges ahead. Cloud computing vs. Cluster computing vs. Grid computing.
   Migrating into a Cloud: Introduction, Broad approaches to Migrating into the Cloud, The Seven-Step Model of Migration Into a Cloud.

2. **Virtualization & Capacity Planning** (12)
   Virtualization: Introduction, Characteristics of Virtualized environment, Taxonomy of Virtualization techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Hypervisor Technology Examples- Xen, VMware, Microsoft Hyper-V.

   Capacity Planning: Elasticity vs Scalability, Introduction, Defining Baseline and Metrics-Baseline Measurements, System Metrics, Load Testing, Resource Ceilings, Server and Instance types; Network Capacity, Scaling.

3. **SLA Management** (10)
   SLA Management in Cloud Computing: Inspiration, Traditional Approaches to SLO Management, Types of SLA, Life Cycle of SLA, SLA management in Cloud. Automated Policy-based management.
   Securing Cloud Services: Cloud Security, Securing Data- Brokered Cloud Storage Access, Storage location and tenancy, Encryption, Auditing and compliance. Steps to ensure security over cloud.

4. **Cloud Platforms in Industry:** (10)
   Cloud Platforms in Industry: Amazon Web Services-Compute Services, Storage Services, Communication Services, Additional Services. Google App Engine-Architecture and Core Concepts, Application Life Cycle. Cost Model. Microsoft Azure-Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

Course Outcomes:

After completing this course student will be able to:

1. Ability to understand the basic concept and importance of cloud computing.
2. Access the suitability of migrating to a cloud solution for different applications.
3. Compare and evaluate the virtualization technologies.
4. Ability to monitor and manage the cloud resources, applications and data while addressing the security concerns.
5. Use cloud solutions offered by industry leaders for various applications.

Suggested Text Books:

1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi,

Tata McGraw Hill, ISBN-13: 978-1-25-902995-0, New Delhi, India, Feb 2013.
2. Cloud Computing Bible, Barrie Sosinsky, Wiley India Pvt. Ltd, ISBN-13: 978- 81-265-2980-3, New Delhi, India, 2011.
3. Cloud Computing: Principles and paradigms, Raj Kumar Buyya, James Broberg, Andrezei M. Goscinski, Wiley India Pvt. Ltd, ISBN-13: 978-81-265-4125-6, New Delhi, India, 2011

Reference Books:
1. Cloud Computing for Dummies, Fern Halper, Hurwitz, Robin Bloor, Marcia Kaufman, Wiley India Pvt. Ltd, ISBN-13: 978-0-47-0597422, New Delhi, India, 2011.
2. Dr. Saurabh Kumar, Cloud Computing: Insights into New-Era Infrastructure, Wiley India Pvt. Ltd, ISBN-13: 978-8-12-6528837, New Delhi, India, 2011.

E Books/ Online learning material
1. P.D. Kaur, I. Chana, Unfolding the distributed computing paradigm, in: Proceedings of the IEEE International Conference on Advances in Computer Engineering, ACE, Bangalore, Karnataka, India, 2010, pp. 339–342.
2. P. Mell and T. Grance, "The NIST definition of cloud computing (draft), NIST Spec. Publ. 800 (2011) 7.