NAGARJUNA
COLLEGE OF ENGINEERING & TECHNOLOGY

Outcome Based Education(OBE)/
Choice Based Credit System (CBCS) Curricula

2018-2019

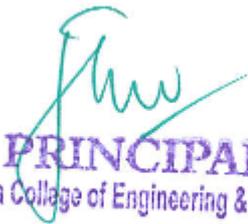Department of Computer Science and Engineering

NAGARJUNA COLLEGE OF ENGINEERING & TECHNOLOGY

Mudugurki Village, VenkatagiriKote Post**,**Devanahalli taluk,
Bangalore district - 562 164

NAGARJUNA
COLLEGE OF ENGINEERING & TECHNOLOGY

An Autonomous College under VTU

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

VISION

Excellence in creating globally competent professionals and moulding them as leaders in Computer Science & Engineering education and research.

MISSION

M1: Maintaining excellence in Computer Science & Engineering education through academic professionalism, teaching, curricula which reflect the changing needs of the society.

M2: Establishing centre of excellence by creating knowledge through research and industrial exposure in the area of Computer Science & Engineering.

M3: Developing communication skill, leadership qualities, team work & skills for continuing education among the students.

M4: Inculcating ethics, human values and skills for solving societal problems and environmental protection.

M5: Validate engineering knowledge through innovative research projects to enhance their employability and entrepreneurship skills.

III & IV Semesters

Scheme and Syllabus
With effect from Academic Year 2018-19

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates of Information Science and Engineering are expected to fulfill the following PEOs after a few years of their graduation.

PEO1: Pursue a successful career in the field of Information Science & Engineering or a related field utilizing his/her education and contribute to the profession as an excellent employee, or as an entrepreneur.

PEO2: Be able to work effectively in multidisciplinary environments and be responsible members/leaders of their communities

PEO3: The graduates of Information Science and Engineering Program should be able to establish an understanding of professionalism, teamwork, ethics, public policy that allows them to become good professional Engineers

PEO4: The graduates of Information Science and Engineering Program should be able to provide novel engineering solutions and efficient software designs with legal and ethical responsibility.

PEO5: Continuously improve by pursuing advanced degrees in engineering, business, or other professional fields through formal means or through informal self-study.

PROGRAM OUTCOMES (POs):

Graduates of the Information Science and Engineering Programme will be able to achieve the following POs:

PO1: Engineering Knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and **Information Science and Engineering** principles to the solution of complex problems in **Information Science and Engineering.**

PO2: Problem Analysis:

Identify, formulate, research literature, and analyze complex **Information Science and Engineering** problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3: Design/Development of Solutions:

Design solutions for complex **Information Science and Engineering** problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of Complex problems:

Use research-based knowledge and research methods including design of
experiments, analysis and interpretation of data, and synthesis of the information
to provide valid conclusions related to **Information Science and Engineering** problems.

PO5: Modern Tool Usage:

Create, select, and apply appropriate techniques, resources, and modern engineering
and IT tools including prediction and modeling to complex **Information Science
and Engineering** activities with an understanding of the limitations.

PO6: The Engineer and Society:

Apply reasoning informed by the contextual knowledge to assess societal, health,
safety, legal and cultural issues and the consequent responsibilities relevant to
the professional **Information Science and Engineering** practice.

PO7: Environment and Sustainability:

Understand the impact of the professional **Information Science and
Engineering** solutions in societal and environmental contexts, and demonstrate
the knowledge of, and need for sustainable development.

PO8: Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and
norms of the **Information Science and Engineering** practice.

PO9: Individual and Team work:

Function effectively as an individual, and as a member or leader in diverse teams,
and in multidisciplinary settings.

PO10: Communication:

Communicate effectively on complex **Information Science and Engineering**
activities with the engineering community and with society at large, such as, being able
to comprehend and write effective reports and design documentation, make
effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance:

Demonstrate knowledge and understanding of the engineering and
management principles and apply these to one's own work, as a member and leader

in a team, to manage **Information Science and Engineering** projects and in multidisciplinary environments.

PO12: Life Long Learning:

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

Program Specific Outcomes (PSOs) are what the graduates of a specific undergraduate engineering program should be able to do at the time of graduation.

PSO1: Professional Skills:

The ability to understand, analyze and develop algorithms and write Information application programs in the areas related to information technology

PSO2: Problem-Solving Skills:

Ability to understand the ethics, human values for solving societal problems and environmental protection

PSO3: Foundation of mathematical concepts:

Ability to understand the software development skills and practical knowledge for promoting research, higher studies and entrepreneurship.

Outcome Based Education(OBE)/
Choice Based Credit System (CBCS) Curricula

Third Semester B.E. - Scheme

Sl. No.	Course Code	Course	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	17CSM31	Engineering Mathematics-III (IC)	Mathematics	3-0-2-0	4	100
2	17CST32	Fundamentals of Computation Engineering	CSE	3-0-0-0	3	100
3	17CSI33	Data Structures with C (IC)	CSE	4-0-2-0	5	100
4	17CST34	Analog and Digital Electronics	CSE	3-0-0-0	3	100
5	17CST35	Computer Organization	CSE	3-0-0-0	3	100
6	17CSI36X	Foundation Elective-I (IC)	CSE	2-0-2-0	3	100
7	17CSL37	Analog and Digital Electronics Laboratory	CSE	1-0-2-0	2	100
8	17CSI38	Virtualization Foundations (IC)	CSE	1-0-2-0	2	100
9	17CSH39	Integrated Rural Development – Part 1	CSE	0-2-0-0	1	100
		Total		20-2-10-0	26	900

Foundation Elective-I (IC)

Sl. No.	Course Code	Course
1	17CSI361	Computer Communication and Networking
2	17CSI362	Creating Interactive and Responsive Web Pages
3	17CSI363	Principles of Programming

IC – Integrated Course   L – Lecture   T-Tutorials

P-Practical   S – Self Study

Fourth Semester B.E. - Scheme

Sl. No.	Course Code	Course	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	17CSM41	Engineering Mathematics-IV (IC)	Mathematics	3-0-2-0	4	100
2	17CST42	Formal Languages and Automata Theory	CSE	3-0-0-0	3	100
3	17CST43	Design and Analysis of Algorithms	CSE	3-0-0-0	3	100
4	17CSI44	Microprocessors (IC)	CSE	3-0-2-0	4	100
5	17CSI45X	Foundation Elective-II (IC)	CSE	3-0-2-0	4	100
6	17CST46X	Engineering Elective-III	CSE	3-0-0-0	3	100
7	17CSL47	Design and Analysis of Algorithms Laboratory	CSE	1-0-2-0	2	100
8	17CSI48	Cloud Computing Foundations (IC)	CSE	1-0-2-0	2	100
9	17CSH49	Integrated Rural Development – Part 2	CSE	0-2-0-0	1	100
		Total		20-2-10-0	26	900

Foundation Elective-II (IC)

Sl. No.	Course Code	Course
1	17CSI451	Unix and Shell Programming
2	17CSI452	Fundamentals of Multimedia
3	17CSI453	Introduction to Programming using Python

Engineering Elective-III

Sl. No.	Course Code	Course
1	17CST461	Introduction to Cyber Security and Cyber Laws
2	17CST462	Linear Integrated Circuits
3	17CST463	Control Systems

IC – Integrated Course   L – Lecture   T-Tutorials

P-Practical   S – Self Study

Fifth Semester B.E. – Scheme

Sl. No.	Course Code	Course	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	16IST51	Computer Networks	IS	3-0-0-0	3	100
2	16IST52	Microcontrollers	IS	3-0-0-0	3	100
3	16ISI53	Operating System (IC)	IS	3-0-2-0	4	100
4	16IST54	SoftwareEngineeringandTesting	IS	3-0-0-0	3	100
5	16ISI55X	Foundation Elective-IV(IC)	IS	3-0-2-0	4	100
6	16IST56X	Engineering Elective-V	IS	3-0-0-0	3	100
7	16ISL57	Computer Networks Laboratory	IS	1-0-2-0	2	100
8	16ISL58	Microcontroller Laboratory	IS	1-0-2-0	2	100
9	16ISH59	General Aptitude	IS/BS&H	2-0-0-0	2	100
		TOTAL		22-0-8-0	26	900

Foundation Elective-IV (IC)

Sl. No.	Course Code	Course
1	16ISI551	Advanced Algorithms
2	16ISI552	Object Oriented Programming with JAVA
3	16ISI553	Compiler Design(NPTEL/MOOCS)

Engineering Elective-V / PBL

Sl. No.	Course Code	Course
1	16IST561	Operations Research
2	16IST562	Object Oriented Modeling and Design
3	16IST563	Computer Architecture (MOOCS)/ Information Security (MOOCS)

Sixth Semester B.E. – Scheme

Sl. No.	Course Code	Course	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	16IST61	Unix System programming	IS	3-0-0-0	3	100
2	16ISI62	Android Programming (IC)	IS	3-0-2-0	4	100
3	16IST63	Embedded System	IS	3-0-0-0	3	100
4	16ISI64X	Foundation Elective-VI (IC)	IS	3-0-2-0	4	100
5	16IST65X	Engineering Elective-VII	IS	3-0-0-0	3	100
6	16HOE66X	Open Elective-VIII	IS/BS&H	2-0-0-4	3	100
7	16ISL67	Unix System programming Laboratory	IS	1-0-2-0	2	100
8	16ISH68	Technical Aptitude and GD	IS/BS&H	2-0-0-0	2	100
9	16ISP69	Mini project and Seminar	IS	2-0-0-0	2	100
		Total		22-0-6-4	26	900

Foundation Elective-VI (IC)

Sl. No.	Course Code	Course
1	16ISI641	Distributed Computing System
2	16ISI642	Database Concepts
3	16ISI643	Computer Graphics and Multimedia

Engineering Elective-VII /PBL

Sl. No.	Course Code	Course
1	16IST651	Data Mining
2	16IST652	Artificial Intelligence
3	16IST653	Introduction to CSS3 (MOOCS)

Open Elective–VIII

Sl. No.	Course Code	Course
1	16HOE661	Lab View – Level 1
2	16HOE662	Yoga and Meditation
3	16HOE663	Martial Arts
4	16HOE664	Music (Carnatic Vocal / Instrumental)
5	16HOE665	Dance
6	16HOE666	Sports
7	16HOE667	Online Certification Courses from IITs / IISc / SWAYAM / EDX

Seventh Semester B.E. – Scheme

Sl. No.	Course Code	Course	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	16IST71	Internet of Things	IS	3-0-0-0	3	100
2	16IST72	Image Processing	IS	3-0-0-0	3	100
3	16ISI73X	Foundation Elective-IX (IC)	IS	3-0-2-0	4	100
4	16IST74X	Engineering Elective-X	IS	3-0-0-0	3	100
5	16HOE75X	Open Elective-XI	IS/BS&H/ME	2-0-0-4	3	100
6	16HOE76X	Open Elective-XII	IS/BS&H	2-0-0-4	3	100
7	16ISL77	Internet of Things Laboratory	IS	1-0-2-0	2	100
8	16ISL78	Image processing Laboratory	IS	1-0-2-0	2	100
9	16ISP79	Project Phase-I and Seminar	IS	0-0-6-0	3	100
		Total		18-0-12-8	26	900

Foundation Elective-IX (IC)

Sl. No.	Course Code	Course
1	16ISI731	Soft Computing
2	16ISI732	Big Data
3	16ISI733	Web Technologies – Servlet, JSP

Engineering Elective-X / PBL

Sl. No.	Course Code	Course
1	16IST741	System Modeling and Simulation
2	16IST742	Machine Learning (NPTEL/MOOCS)
4	16IST743	Project Planning and Control (MOOCS)

Open Elective-XI

Sl. No.	Course Code	Course
1	16HOE751	Tax Management
2	16HOE752	Assessment of Building Energy Performance (Offered by ASHRAE)
3	16HOE753	National Disaster Management and Mitigation
4	16HOE754	Online certification courses from IITs/IISc/SWAYAM/EDX

Open Elective-XII

Sl. No.	Course Code	Course
1	16HOE761	Small and Medium Enterprise Management
2	16HOE762	Occupational Safety and Health Administration
3	16HOE763	Animation and Multimedia Engineering
4	16HOE764	Online certification courses from IITs / IISc / SWAYAM / EDX

Eighth Semester B.E. – Scheme

Sl. No.	Course Code	Course Name	Teaching Dept.	Total Credits	Marks
1	16ISP81	Project Phase-II	IS	4	100
2	16ISP82	Project Phase-III	IS	4	100
3	16ISP83	Evaluation and Viva-voce (External)	IS	10	100
		Total		18	300

IC – Integrated Course   L – Lecture   T-Tutorials

P-Practical   S – Self Study

Third Semester B.E. - Scheme

Sl. No.	Course Code	Course	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	17CSM31	Engineering Mathematics-III (IC)	Mathematics	3-0-2-0	4	100
2	17CST32	Fundamentals of Computation Engineering	CSE	3-0-0-0	3	100
3	17CSI33	Data Structures with C (IC)	CSE	4-0-2-0	5	100
4	17CST34	Analog and Digital Electronics	CSE	3-0-0-0	3	100
5	17CST35	Computer Organization	CSE	3-0-0-0	3	100
6	17CSI36X	Foundation Elective-I (IC)	CSE	2-0-2-0	3	100
7	17CSL37	Analog and Digital Electronics Laboratory	CSE	1-0-2-0	2	100
8	17CSI38	Virtualization Foundations (IC)	CSE	1-0-2-0	2	100
9	17CSH39	Integrated Rural Development – Part 1	CSE	0-2-0-0	1	100
		Total		**20-2-10-0**	**26**	**900**

Foundation Elective-I (IC)

Sl. No.	Course Code	Course
1	17CSI361	Computer Communication and Networking
2	17CSI362	Creating Interactive and Responsive Web Pages
3	17CSI363	Principles of Programming

IC – Integrated Course   **L – Lecture**   **T-Tutorials**

P-Practical   **S – Self Study**

Engineering Mathematics-III (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSM31	3:0:2:0	4	CIE:50 SEE:50	3 Hours	BS

Course Objectives:

This course will enable students to :

- Develop the application of mathematical skills in solving the engineering problems using computers.
- Learn to use the partial differential equations in engineering applications.
- Use of Transforms in the engineering problems.
- Find the approximated solutions to engineering problems numerically.

Syllabus

Module - I

Partial Differential Equations: Formation of PDE –Eliminating the Arbitrary constants and arbitrary functions, solutions of non homogenous PDE by direct integration, Method of separation of variables. Applications to PDE –Derivation of one dimensional of wave equation and solution by separation of variables-with specified boundary conditions. Derivation of one dimensional of Heat equation and solution by separation of variables-with specified boundary conditions.   **08 Hours**

Module - II

Fourier Series: Periodic functions, Dirchlet's conditions, Euler's Formulae-Fourier series of periodic functions of period 2l and 2π, Half range Fourier series, Practical harmonic analysis.   **08 Hours**

Module - III

Numerical Methods-I: Numerical solutions of Algebraic and transcendental equations-Regula Falsi Method and Newton Raphson Method. Finite Differences-Forward, Backward and Central differences, Newton's Forward Newton's Backward and Sterling's interpolation formulae. Lagrange's Interpolation formula (without proof). Numerical Differentiation using Newton's Forward and Backward formulae.

08 Hours

Module - IV

Numerical Methods-II: Numerical Integration-Trapezoidal rule, Simpson's 1/3rd and 3/8th rule. Numerical solutions of ordinary differential equations of first order and first degree- Picard's method, Taylor's Series method, Modified Eulers Method, Runge-Kutta Method of 4th order and Milne's Predictor-Corrector Method. **08 Hours**

Module - V

Introduction to SCILAB and its family, Menus and toolbars, Types of windows and types of files, SCILAB Helpsystem, Basic calculations in SCILAB, Basic variables, Functions- Elementary Mathematical, Builtin and User defined functions. Array operations, Matrix operations, Loops: for and while loops, condition statements- if-then and if-then-else statements, plotting of graphs, working with scripts and files.

08 Hours

List of SCILAB Experiments

Sl. No.	Name of the Experiment
1	SCILAB Environment
2	Basic operations in SCILAB
3	Basic Matrix operations
4	SCILAB programming environment
5	Use of Functions
6	Plotting of 2D and 3D Curves
7	Polynomial Evaluation and Determination of Roots of a Polynomial
8	Statistics using SCILAB
9	Differentiation and Integration using SCILAB
10	Numerical Methods using SCILAB

Course Outcomes:

On completion of this course, the students are able to :

- Form a partial differential equations and their solutions.
- Expressing the given functions as infinite series of sine and cosine.
- Find approximated solutions of algebraic equations by numerical methods.
- Determine differentiation and integration using numerical methods.
- Use the SCILAB to solve the various types engineering problems.

Text Books:

1. Dr. B.S. Grewal: "Higher Engineering Mathematics", (Chapters 10, 17, 18, 22, 23, 28-30), Khanna Publishers, New Delhi, 42nd Edition, 2012, ISBN 13: 9788174091956.

2. N.P. Bali and Dr. Manish Goyal: "A Text Book of Engineering Mathematics", (Chapters 10, 16, 17, 20, 22, 23), Laxmi Publications (P) Ltd., New Delhi, 9th Edition, 2014, ISBN: 9788131808320.

3. SCILAB Group: "Introduction to SCILAB, A Users Guide".

Reference Books:

1. Erwin Kreyszig: "Advanced Engineering Mathematics", (Chapters 11, 12, 19), Wiley Pvt. Ltd. India, New Delhi, 9th Edition, 2011, ISBN 13: 9788126531356.

2. B.V. Ramana: "Higher Engineering Mathematics", (Chapters 17-21, 32), Tata Mc Graw – Hill Publishing company Limited, New Delhi, 2nd Reprint, 2007, ISBN 13: 978-0-07063417-0.

3. S.S. Sastry: "Introductory methods of Numerical analysis", (Chapters 2,3,6), PHI Learning Private, Delhi, 5th Edition, 2013, ISBN 13: 978-81-203-4592-8.

4. Stormy Attaway: "A practical introduction to programming and problem solving", Elsevier, Boston, 2nd Edition

E-Resources:

1. http://bookboon.com/en/essential-engineering-mathematics-ebook

2. https://www.free-ebooks.net/ebook/essential-engineering-mathematics

3. https://www.scilab.org/resources/documentation/books

4. https://archive.org/details/AdvancedEngineeringMathematics10thEdition

5. https://mars.uta.edu/mae3183/simulation/introscilab_baudin.pdf

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Fundamentals of Computation Engineering

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CST32	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the logical notation of fundamental concepts such as sets, relations and functions.
- Understand the syntax and semantics of propositional and predicate logic.
- Translate statements from a natural language into its symbolic structures in logic.
- Understand the basic concepts of graph theory.
- Learn how to use graphs as a powerful modeling tool to solve practical problems in various fields.
- Get familiarized with modeling of computational methods..

Syllabus

Module - I

Set Theory: Sets and Subsets, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams.

Fundamentals of Logic: Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic. **08 Hours**

Module - II

Fundamentals of Logic (Contd.): Rules of Inference, Quantifiers, Definitions and Proofs of Theorems.

Relations: Cartesian Products and Relations, Properties of relations, Equivalence and Partial order relations. **08 Hours**

Module – III

Relations (Contd.): Relations as matrices and graphs, Posets and Hasse diagrams.

Functions: Functions –Plain and One-to-One, Onto Functions –Special Functions, Pigeon-hole Principle, Function Composition and Inverse Functions. **08 Hours**

Module – IV

Introduction to Graph Theory: Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits, , Hamilton Paths and Cycles. Graph Coloring, and Chromatic Polynomials.

Trees: Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes. **08 Hours**

Module – V

Fundamental Principles of Counting: The Rules of Sum and Product, Permutations, combinations – The Binomial Theorem, Combinations with Repetition.

The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, Generalizations of the Principle. **08 Hours**

Course outcomes:

On completion of this course, the students are able to :

- Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations and functions and develop the syntax and semantics of propositional and predicate logic.
- Prove and disprove results related to logic and define, compare and recognize relations.
- Define, compare and recognize functions and identify relations and functions with graphs, tables and sets of ordered pairs.
- Apply the abstract concepts of graph theory in modeling and solving non-trivial problems in different fields of study.
- Demonstrate the ability to solve problems using counting techniques and combinatorics

Text Book:

1. Ralph P. Grimaldi: "Discrete and Combinatorial Mathematics", (Chapters 1-3, 5, 7, 8, 11, 12), Pearson Education, 5th Edition, 2006, ISBN: 8177584243, 9788177584240.

Reference Books:

1. Kenneth H. Rosen: "Discrete Mathematics and its Applications", McGraw Hill, New Delhi, 7th Edition, 2010, ISBN : 0073383090.

2. J K Sharma: "Discrete Mathematics", Trinity, India, 4th Edition, 2015, ISBN: 978-93-5138-143-3.

3. D.S. Chandrasekharaiah: "Graph Theory and Combinatorics", Prism, Bengaluru, 4th Edition, 2013, ISBN: 978-81-7286-698-3.

4. Richard A. Brualdi: "Introductory Combinatorics", Pearson Education, India, 4th Edition, 2004, ISBN: 978-0-13-602040-0.

E-Resource:

1. https://www.pearsoned.co.in/grimaldidcm5e

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Data Structures with C (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSI33	4:0:2:0	5	CIE:50 SEE:50	3 Hours	FC

Course Objectives:
This course will enable students to:
- Understand the basics of structures and pointers.
- Learn the data structure for a specified application.
- Understand the impact of data structures on the performance of programs.
- Get exposed to various data structure concepts, such as stacks, queues, linear lists, heaps, trees and graphs.

Syllabus

Module – I

Structures and Unions: Introduction, Defining a structure, Declaring structure variables, Accessing structure members, Structure initialization, Size of structures, Copying and comparing structure variables, Array of structures, Arrays within structures, Structures within structures, Unions.

Pointers: Introduction, Accessing the variable and its address through the pointer, Declaring and initialization of pointer variables, Array of pointers, Pointer as function arguments, Functions returning pointers, Dynamic memory allocation - Introduction, malloc(), calloc(), realloc(). **08 Hours**

Module – II

Stack: Definition, Representing stacks in C - Implementing the PUSH and POP operation with example and testing for exceptional conditions, Infix, Postfix, and Prefix expressions. Program to evaluate a postfix expression with example, Program to convert an expression from infix to postfix. Recursion: Definition, Recursion in C with examples.

Queues: The Queue and its sequential representation, Implementation of queues in C, Insert and delete operations, Priority queue, Array implementation of a priority queue. **08 Hours**

Module – III

Linked Lists: Introduction, Inserting and removing nodes from a list, Linked list implementation of stacks, queues , List operations : *getnode* and *freenode*. Lists in C - Array implementation of lists and its limitations,Circular lists: Primitive operations on circular lists, implement stack and queue as a circular list, Doubly linked lists: Inserting and removing nodes from a list, Addition of long integer using Doubly linked lists. **08 Hours**

Module – IV

Trees: Introduction, Binary trees, Binary tree traversals: preorder, inorder and postorder, Threaded binary trees : insertion and deletion of a node, Heaps: insertion and deletion of a node, Max heap and min heap, Binary search trees: insertion and deletion of a node, searching a key element in binary search tree. **08 Hours**

Module – V

Efficient Binary Search Trees: Graph: Introduction, Abstract data type of graph, AVL trees - insertion and deletion of node, Red-black trees: insertion and deletion of a node, Splay trees: insertion and deletion of a node, **08 Hours**

Laboratory

Design, develop and implement the specified algorithms for the following problems using C/C++ language in LINUX environment and simulate the programs by using virtual lab.

1. Design, develop and execute a program in C based on the following requirements: An EMPLOYEE structure is to contain the following members: Employee_Number (an integer), Employee_Name (a string of characters), Basic_Salary (an integer), All_Allowances (an integer), IT (an integer), Net_Salary (an integer),Write a functions to read the data of an employee, to calculate Net_Salary and to print the values of all the structure members. (All_Allowances = 123% of Basic, Income Tax (IT) = 30% of the gross salary (gross salary = Basic_Salary + All_Allowance), Net_Salary = Basic_Salary + All_Allowances – IT).

2. Design, develop and execute a program in C to simulate the working of a Stack of integers using an array. Provide the following operations:

    a. Push   b. Pop   c. Display

3. Design, develop and execute a program in C to simulate the working of a queue of integers using an array. Provide the following operations:

    a. Insert   b. Delete   c. Display

4. Design, develop and execute a program in C to convert a given valid parenthesized infix arithmetic expression to postfix expression and then to print both the expressions. The expression consists of single character operands and the binary operators +, -, * and /.

5. a. Design, develop and execute a program in C to evaluate a valid postfix expression using Stack. Assume that the postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators are +, -, * and /.

    b. Simulation of the above program by using virtual lab.

6. Design, develop and execute a program in C to implement LIST (linked list) with functions to insert an element at the front of the list as well as to delete an element from the front of the list (FIFO), display the contents of the list.

7. Design, develop and execute a program in C to implement LIST (linked list) with functions to insert an element at the front of the list as well as to delete an element from the rear of the list or vice versa (LIFO), display the contents of the list.

8. Design, develop and execute a program in C to implement LIST (linked list) with functions to insert an element at the front/rear end of the list and search and delete a key element of the list, if exists and display the contents of the list.

9. Write a C program to support the following operations on a doubly linked list where each node consists of integers,
    a. Create a doubly linked list by adding each node at the front.
    b. Insert a new node to the left of the node whose key value is read as an input.
    c. Delete the node of a given data, if it is found, otherwise display appropriate message.
    d. Display the contents of the list.

10. Design, develop and execute a program in C to implement BIN_TREE that represents a Binary Tree, with functions to perform inorder, preorder and postorder traversals and demonstrate the traversals.

Course Outcomes:
On completion of this course, the students are able to:
*   Describe the concepts of structures and pointers.
*   Explain and illustrate the various stack and queue operations.
*   Interpret and design the programs using linked lists.
*   Implement binary trees, threaded binary trees, binary search trees using C language.
*   Implement AVL trees, Red-black trees and Splay trees using C language.

Text books:
1. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed : "Fundamentals of Data Structures in C", (Chapters 1,2,3,4,5,6,9,10), Universities Press-India, 2nd Edition, 2008, ISBN-13: 978-8173716058

Reference Books:
1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: "Introduction to Algorithms", PHI Learning Private Limited-India, 3rd Edition, 2010, ISBN-13: 978-8120340077

2. Aaron M. Tenenbaum: "Data Structures using C", Pearson Education-India , 2nd edition, 2003, ISBN-13: 978-8131702291

E-Resources:

1. https://www.cs.princeton.edu/
2. https://www.opendatastructures.org/ods-cpp
3. https://www.lib.mdp.ac.in/ebook/DSa
4. https://ww.cs-fundamentals.com/data-structures/introduction-to-data-structures.php
5. https://www.cprogramming.com/algorithms-and-data-structures.html
6. https://www.cprograms.in/

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Analog and Digital Electronics

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CST34	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand applications of diode as clippers, Limiters and clampers.
- Know the different types of amplifiers constructed from BJTs and MOSFETs.
- Acquire the knowledge about Boolean laws and theorems.
- Understand the various types of data processing circuits.
- Learn the working principles of various Flip-Flops, registers, counters.
- Understand the basic concepts of HDL.

Syllabus

Module - I

Diode Circuits: The ideal diode, The second approximation, The third approximation, DC resistance of a diode, Load lines, Clippers and Limiters, Clampers.

BJT Amplifiers: Emitter-biased amplifier, Small-signal operation, AC Beta, AC resistance of the emitter diode, Two- transistor models, Analyzing an amplifier, Voltage gain.   **07 Hours**

Module - II

MOSFETs: The Depletion-mode MOSFET, D-MOSFET curves, Depletion-mode MOSFET amplifiers, The enhancement-mode MOSFET, CMOS, E-MOSFET amplifiers.

OP-AMP's in Waveform conversion and Generation Circuits: Sine to rectangular, Rectangular to triangular, Triangular to pulse conversion circuits, Relaxation oscillator, Generating triangular waves.   **09 Hours**

Module - III

Combinational Logic Circuits: Boolean laws and theorems, Sum-of-Products method, Truth table to Karnaugh map, Pairs Quads, and Octets, Karnaugh simplifications, Don't-care conditions, Product-of-Sums method, Product-of-Sums simplifications, Simplification by Quine-McClusky method, Introduction to HDL, HDL implementation models.

Data-Processing Circuits: Multiplexers, Demultiplexers, 1-of-16 Decoder, Encoders, HDL implementation of data processing circuits.   **09 Hours**

Module - IV

Flip-Flops: Gated FLIP-FLOPs, Edge-triggered D FLIP-FLOP, Edge-triggered JK FLIP-FLOP, JK Master-slave FLIP-FLOP, Various representation of FLIP-FLOPs, HDL implementation of FLIP-FLOP.

Registers: Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In -Serial Out, Parallel In - Parallel Out.   **08 Hours**

Module - V

Registers: Applications of shift registers, Register implementation in HDL.
Counters: Asynchronous counters, Decoding gates, Synchronous counters, Changing the counter modulus, Decade counters, Counter design as a synthesis problem.

07 Hours

Course Outcomes:

On completion of this course, the students are able to :

- Use diodes in clippers, limiters and clampers.
- Analyze and design transistor and MOSFET amplifiers in different configurations.
- Apply K-Map and Quine-McClusky methods to simplify the given Boolean expressions.
- Design and implement registers using Flip-Flops.
- Design and develop counters using Flip-Flops.

Text Books :

1. Albert Malvino, David Bates: "Electronic Principles", (Chapters 3,4,8,12,20), TMH, New Delhi, 8th Edition, 2015, ISBN-9780073373881.

2. Donald P Leach, Albert Paul Malvino and Goutam Saha: "Digital Principles and Applications", (Chapters 3,4,8- 10), Tata McGraw Hill, New Delhi, India, 8th Edition, 2014, ISBN: 9789339203402.

Reference Books :

1. Robert L. Boylestad, Louis Nashelsky: "Electronic Devices and Circuit Theory", PHI/Pearson Education, New Delhi, 10th Edition, 2012, ISBN: 9788131764596.

2. David A. Bell: "Electronic Devices and Circuits", Oxford University Press, New Delhi, India, 5th Edition, 2010, ISBN: 9780195693409.

3. M Morris Mano: "Digital Logic and Computer Design", Pearson Education, Prentice Hall, 11th Edition, 2009, ISBN: 9788177584097.

4 R D Sudhaker Samuel: "Illustrative Approach to Logic Design", Sanguine-Pearson, New Delhi India, 2012, ISBN: 9788131765081.

E-Resources:

1. https://www.talkingelectronics.com/download/Malvino_electronic_principles.pdf.

2. https://www.rtna.ac.th/departments/elect/data/EE304/Electronic%20Devices%20and%20Circuit%20Theory.pdf

3. https://www.abebook.com/Digital_Principles_Applications_Seventh_Edition_Albert/4893172428/bd

Computer Organization

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CST35	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Become familiar with the basics of computer structure and its performance.
- Learn basics of assembly language programming.
- Understand connections of peripheral devices and interrupts generated by them.
- Understand the basics of data communication by using different types of buses.
- Learn internal structure of memory and CPU..

Syllabus

Module - I

Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Performance -Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement, Historical Perspective.   **08 Hours**

Module - II

Machine Instructions and Programs: Numbers,   Arithmetic   operations   and Characters, Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions.   **09 Hours**

Module - III

Input/ Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB.   **08 Hours**

Module - IV

Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations, Virtual Memories.   **08 Hours**

Module - V

Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand multiplications, Fast Multiplications, Integer Division, Floating-point Numbers and Operations. **08 Hours**

Course Outcomes:

On completion of this course, the students are able to :

- Describe basic structure and performance of computer.
- Explain basics of assembly language programming.
- Explain connections of peripheral devices, interrupts and DMA operations.
- Use different types of buses for data transmission and design of basic types of memory.
- Construct different types of arithmetic circuits.

Text Book:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: "Computer Organization", (Chapters 1,2,4-6) TMH, Mcgraw-Hill College Division, 5th Edition, 2002, ISBN :9781259005275.

Reference Books:

1. William Stallings: "Computer Organization and Architecture", PHI, Pearson Education, Delhi, 10th Edition, 2016, ISBN: 9780134101613.

2. David. A. Patterson, John L. Hennessy: "Computer Organization and Design The Hardware / Software Interface", ARM Edition, 5th Edition, Elsevier, 2014, ISBN: 97801240776263.

E-Resources:

1. https://books.google.co.in/books?isbn=0071089004
2. https://books.google.co.in/books?isbn=8177589938
3. https://books.google.co.in/books?isbn=0124078869

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Computer Communication and Networking (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSI361	2:0:2:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand the basics of data communication system and network models.
- Identify the need and techniques for digital and analog transmissions.
- Get exposed to different error detection and correction methods.

Syllabus

Module - I

Introduction to Communications: Data Communications, Networks - Physical structure, Categories of Networks, Network Models –The OSI Model, TCP/IP Protocol Suite. **06 Hours**

Module - II

Digital Transmission: Digital to Digital Conversion – Line coding, Line coding schemes (Unipolar, Polar, Bipolar only), Analog to Digital Conversion – PCM Encoder and Decoder, Transmission Modes. **05 Hours**

Module - III

Analog Transmission: Digital to Analog conversion - Introduction, ASK, PSK, FSK, Analog to Analog conversion – Introduction, AM, PM, FM. **05 Hours**

Module - IV

Multiplexing and Spectrum Spreading: Multiplexing - Introduction, FDM, Synchronous TDM, Statistical TDM, Spread Spectrum – Introduction, FHSS, DSSS.

05 Hours

Module - V

Error Detection and Correction: Introduction, Block Coding, Cyclic Codes – CRC, Polynomials, Cyclic code encoder using Polynomials, Advantages of cyclic codes. Checksum. **05 Hours**

Laboratory

1. Write a program to convert digital to analog data transmission.
2. Write a program to convert analog to digital data transmission.
3. Write a program for error detecting code using CRC-CCITT (16 bits).

4. Using TCP/IP sockets write a client server program to make the client send the file name and to make the server send back the contents of the request-ed file if present.

Course Outcomes:

On completion of this course, the students are able to :

- Describe the basics of data communication system and network models.

- Distinguish between different techniques of digital transmissions.

- Compare different methods of analog transmissions.

- Explain various types of multiplexing and spread spectrum mechanisms.

- Solve problems of error detection and correction using Block coding and CRC mechanisms.

Text Book:

1. Behrouz A. Forouzan: "Data Communication and Networking", (Chapters 1,2, 4-6, 10), McGraw Hill Education, New Delhi, India, 5th Edition, Copyright: 2013. Publi- cation Date: February 17, 2012, ISBN: 9781259064753.

Reference Books:

1. William Stallings: "Data and Computer Communication", Pearson Education, Delhi, 8th Edition, 2007, ISBN: 9788131715369.

2. Craig Zacker: "The Complete Reference Networking", McGraw-Hill Education, New Delhi, India, 1st Edition, 2002, ISBN: 13: 978-0070474161.

3. Wayne Tomasi: "Introduction to Data Communications and Networking", Pearson Education, Delhi, 1st Edition, ISBN 13: 978-8131709306.

E-Resources:

1. http://www.mhhe.com/engcs/compsci/forouzan/frontmatter.pdf.

2. http://ebookinga.com/data-communication-and-networking-tata-mcgraw-hil.

3. https://www.goodreads.com/book/show/209441.Introduction_to_Data_Com-munications_and_Networking.

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Creating Interactive and Responsive Web Pages (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSI362	2:0:2:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Learn the evolution of the World Wide Web and its relevance in today's world.
- Get a clear understanding of the technologies involved in developing a website.
- Learn web technology with a focus on creating interactive and responsive web pages.

Syllabus

Module - I

HTML 5 and CSS: Introduction to Hyper Text Markup Language, Key components of HTML document, HTML elements, Headers, Linking, Images, Unordered Lists, and Nested and ordered Lists.

Tables, Divs and forms: HTML Tables and Formatting, HTML Forms, Internal Linking, Creating and Using Images, Maps, Div and span tags. Introduction CSS, CSS selector, positioning, layouts, debugging. **06 Hours**

Module - II

JavaScript: Browser and Document object, scripts and HTML Document, variables, expressions, Data type conversions, decisions and loops, control structure, windows Document object, forms and form handling elements, scripting, event handling.

05 Hours

Module - III

jQuery: Using selectors with jQuery, Manipulating page elements with jQuery, jQuery event model, jQuery and Ajax, jQuery animation and advanced effects, jQuery plugins. **05 Hours**

Module - IV

Bootstrap: Bootstrap Scaffolding, Bootstrap CSS, Bootstrap Layout Components, Bootstrap JavaScript Plugins, Using Bootstrap. **05 Hours**

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Module - V

XML: What is XML? What are the differences between HTML and XML, what is the purpose of XML?

AJAX: AJAX Introduction, AJAX XML Http, AJAX Request, AJAX Response, AJAX with Server side. **05 Hours**

Hands on

1. HTML and CSS -

a. Create a HTML page to display the following content <Ensure the format is same as shwn below>; Use HTML Tables UnorderList and OrderList (UL and OL):

1. Development Environment	2. Spring Overview
• Eclipse (SpringSource Tool Suite distribution)	• Introduction to Spring configuration
• Apache Tomcat/VMware® vFabric™ tc Server	• Bean life cycle
• Spring Insight	• Simplifying configuration
• Testing tools	• Integration testing with Spring
3. Getting Started with Spring Web MVC	**4. Spring MVC Configuration Options**
• Spring model-view-controller (MVC) overview	• Spring MVC infrastructure Beans
• DispatcherServlet	• URL mappings
• Controller programming model overview	• Handler interceptors and handler adapters
• Spring MVC views	• Exception resolvers
• Simplifying configuration	• Message source

b. Create a HTML page to display testimonials received from customers along with their picture and Name as shown below:

2. Java Script and jQuery

a.   jQuery form validations:

Front-End: Develop below form using HTML to create new user:

Field Details:

1.   Name <String, Length(16), Mandatory, Validations: Minimum Length: 3, Can accept special characters>

2.   Email <String, Length(60), Mandatory, Validations: Should be a valid email id>

3.   Password <String, Length(16), Mandatory, Validations: Minimum Length: 5, Can accept special characters>

- Create Buttons - "Create an account" and "Cancel"

- Form should be Scrollable

- For field validations, use jQuery

- Ensure all validations pertaining to Name, Email and Password are taken care. If the use enters incorrect values appropriate error message should be displayed and should allow the user to enter correct data

b. jQuery image slider:

In an HTML page, insert a minimum of 5 images; Ensure inserted images are scrollable. Hint: To make images scrollable use jQuery image slider or use javascript.

Sample screen shot :

3. Develop below form using HTML to Search and Book Tickets:

Validations :

1. All fields are Mandatory except "Single Lady" Field
2. Onwards date must be less than Return date

4. Bootstrap, AJAX and jQuery:

a. Create a Bootstrap Page that helps maintain Employee Information in an organization.

b. When clicked on the "Add New Employee" button, load a dialog box as shown below

Validations:

1. All fields are Mandatory.

2. On successful submission of the form, the new employee details has to be appended as a last row in the table.

3. When clicked on the Edit icon, a similar pop-up as the "Add new Employee" form has to be displayed with the input fields populated with appropriate val-ues. When the form is submitted in the Edit flow, ensure all the validations are in place. The name of the button in the Edit flow has to be "Update" instead of "Add".

4. When clicked on the Delete icon, a confirmation dialog box has to be displayed with a message "Are you sure, you want to delete this entry?" If the user clicks "Yes", the corresponding row has to be deleted from the table. If the user clicks "No" the table has to remain unaffected.

Course Outcomes:

On completion of this course, the students are able to :

*   Develop web layouts with style sheets and web screens in a presentable form.

*   Write interactive web pages through form validations and other methods. Use the same in UI development.

*   Use the Java Script libraries to accelerate UI development.

*   Design and develop responsive and mobile first web pages.

*   Develop applications by using synchronous and asynchronous communication over web.

Text Book:

1. Jon Duckett: "Web Design with HTML, CSS, JavaScript and jQuery Set", Wiley, 1st Edition, 2014, ISBN 13: 978-1118907443.

Reference Books:

1. Jake Spurlock: "Bootstrap, Shroff", O'Reilly Media, United States of America, 1st Edition, 2013, ISBN: 978 -1 -4493-4391-0.

2. Bear Bibeault, Yehuda Katz and Aurelio De Rosa: "jQuery in Action", Dreamtech Press, New Delhi, India, 3rd Edition, 2015, ISBN: 978-1617292071.

E-Resources:

1. http://www.w3schools.com/

2. https://learn.jquery.com/

3. https://developer.mozilla.org/en-US/Learn/Getting_started_with_the_web/JavaScript_basics

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Principles of Programming (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSI363	2:0:2:0	3	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Learn data, data types, and basic statements.
- Gain knowledge about call-return architecture and ways of implementing them.
- Understand object-orientation, concurrency, and event handling in programming languages.
- Develop programs in non-procedural programming paradigms.

Syllabus

Module - I

Data, Data Types, and Basic Statements-I: Names, Variables, Binding, Type checking, Scope, Scope rules, Lifetime and garbage collection, Primitive data types, Strings, Array types, Associative arrays, Record types, Union types, Pointers and references.

05 Hours

Module - II

Data, Data Types, and Basic Statements-II: Arithmetic expressions, Overloaded operators, Type conversions, Relational and boolean expressions, Assignment statements, Mixed-mode assignments, Control structures, Selection, Iterations, Branching, Guarded statements. **05 Hours**

Module - III

Subprograms and Implementations-I: Subprograms, Design issues, Local referencing, Parameter passing, Overloaded methods, Generic methods, Design issues for functions. **05 Hours**

Module - IV

Subprograms and Implementations-II: Semantics of call and return, Implementing simple subprograms, Stack and dynamic local variables, Nested subprograms, Blocks, Dynamic scoping. **05 Hours**

Module - V

Object-Orientation, Concurrency, and Event Handling: Object-orientation, Design issues for OOP languages, Implementation of object-oriented constructs, Concurrency, Exception handling. **06 Hours**

Laboratory

1. Implement all major functions of string.h in single C program using switch case to select specific function from user choice (like strlen, strcat, strcpy, strcmp, strrev).

2. Write a program in C to reverse a linked list iterative and recursive.

3. Write a program in C to implement iterative Towers of Hanoi.

4. Write a program in C++ to count the no's of object of a class with the help of static data member, function and constructor.

5. Write a program in C++ to declare a class Time with data members mm for minutes, ss for seconds and hh for Hours.

6. Define a parameterize constructor to assign time to its objects. Add two time objects using member function and assign to third objects. Implement all possible cases of time.

Course Outcomes:

On completion of this course, the students are able to :

- Describe data and data types of programming languages.
- Explain basic statements of programming languages.
- Design subprogram constructs.
- Implement simple subprogram.
- Apply object-oriented, concurrency, and event handling programming constructs.

Text Book:

1. Robert W. Sebesta: "Concepts of Programming Languages", (Chapters 5-10,12, 14), 10th Edition, Addison Wesley, 2012, ISBN: 0-13-607347-6.

Reference Books:

1. R. Kent Dybrig:"The Scheme programming language", 4th Edition, MIT Press, 2009, ISBN: 978-0-262-51298-5.

2. Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009, ISBN: 0 262 15039 5.

3. Michael L. Scott, "Programming Language Pragmatics", 3rd Edition, Morgan Kaufmann, 2009, ISBN-13: 978-0123745149, ISBN-10: 0123745144.

E-Resources:

1. https://www.google.co.in/?gfe_rd=crandamp;ei=1r5PV7SWFtWQ2ASd3q3ADw #q=robert+w.+sebesta+concepts+of+programming+languages

2. https://www.google.co.in/?gfe_rd=crandamp;ei=1r5PV7SWFtWQ2ASd3q3ADw #q=michael+l.+scott+programming+language+pragmatics

3. https://www.google.co.in/?gfe_rd=crandamp;ei=1r5PV7SWFtWQ2ASd3q3ADw #q=programming+language+pragmatics+morgan+kaufmann+pdf

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Analog and Digital Electronics Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSL37	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand and design diode circuits such as clippers and clampers.
- Learn the design of OP-AMP circuits.
- Learn how to implement combinational circuits.
- Know how to design and implement sequential circuits.

Part-A

1. Design and construct a suitable circuit and demonstrate the working of posi-tive clipper, and clamper using diodes.
2. Construct a suitable circuit and determine the frequency response and band-width of a CE amplifier.
3. Design and implement relaxation circuit using OP-AMP to generate a rectan-gular wave from for a given frequency.
4. Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC.
5. Design and implement a mod-n (n<8) synchronous up counter using J-K Flip-Flop and demonstrate its working.
6. Design and implement a ring counter using 4-bit shift register and demon-strate its working.
7. Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9) and demonstrate its working.

Part-B (Virtual Lab)

1. Demonstrate the working of the positive clipper and clamper circuits.
2. Build the CE amplifier circuit and determine the voltage gain for two different values of supply voltage and for two different values of emitter resistance.
3. Build CMOS inverter using a simulation package and verify its truth table.
4. Develop the Verilog / VHDL code for an 8:1 multiplexer. Simulate and verify its working.
5. Develop the Verilog / VHDL code for D Flip-Flop with positive-edge trigger-ing. Simulate and verify its working.
6. Develop the Verilog / VHDL code for mod-8 up counter. Simulate and verify its working.
7. Develop the Verilog / VHDL code for switched tail counter. Simulate and ver-ify its working.

Course Outcomes:

On completion of this course, the students are able to :

- Analyze and design transistor and MOSFET Amplifiers in different configurations.
- Construct various diode circuits and OP-AMP circuits.
- Realize and verify truth tables of D Flip-Flop and 8:1 Multiplexer.
- Design and implement ring counter.
- Design and implement synchronous and asynchronous counters.

Text Books:

1. Albert Malvino, David Bates: "Electronic Principles", 8th Edition, TMH, New Delhi, 2015, ISBN: 9780073373881.

2. Donald P Leach, Albert Paul Malvino and Goutam Saha: "Digital Principles and Applications", 8th Edition, Tata McGraw Hill, New Delhi, India, 2014, ISBN: 9789339203402.

E-Resources:

1. http://elearning.vtu.ac.in>E-Notes>LD manual.

2. http://Faqexplorer.com

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Virtualization Foundations (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSI38	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the types of hypervisors and its features.
- Create a blank virtual machines using ESXi.
- Access VMware vCenter Server and the VMware ESXi hosts using vSphere Client.
- Create virtual networking and accessing storage.
- Convert a physical computer to Virtual Machine.
- Get a strong foundation for mastering computer virtualization.

Syllabus

Module - I

Introduction to Virtualization: Definition of Virtualization, Traditional versus Virtualized System, How Virtualization works, Need for Virtualization, Benefits of Virtualization, Definition of Hypervisor, Type-1 Hypervisor, Type-2 Hypervisor, Comparison of Type1 and Type2 Hypervisors, Types of Virtualization – Server Virtualization, Desktop Virtualization, Application Virtualization, Network Virtualization, Storage Virtualization. **03 Hours**

Module - II

VMware Player: Overview, Introduction to VMware Player, System Requirements, Installation of VMware Player, Enabling VT-x/AMD-v in BIOS, Creating a blank Virtual Machine, Installation of Open Suse 64-bit, Introduction to Virtual Appliance, Demonstration of Virtual Appliance, Introduction to Unity mode, Demonstration of Unity mode. **03 Hours**

Module - III

ESXi: Introduction to ESXi, ESXi Architecture, System Requirements, Installing ESXi, Installing Windows 2008 R2, Installing vSphere Client, Creating a VM on ESXi using vSphere Client, Installing a Guest OS on ESXi. **02 Hours**

Module - IV

Networking and Storage: Introduction to Virtual Networking, Virtual Networking - Components and Concepts, Virtual Networking in ESXi, Introduction to Storage, How Virtual Machines Access Storage, Types of Physical Storage.   **03 Hours**

Module - V

VMware Converter: Overview, Installation of VMware Converter, Converting a Physical Computer to a VM, Powering-on the converted VM.   **02 Hours**

Course Outcomes:

On completion of this course, the students are able to :

- Explain what virtualization is, and get an in-depth understanding of how things work at the ring level.
- Install VMware Player and create virtual machines using VMware Player. In specific, the module will guide on setting up a virtual lab environment using VMware Player.
- Install VMware ESXi, working with the vSphere Client, and managing a host using the vSphere Client.
- Cover the concepts of Virtual Networking and Storage with reference to ESXi.
- Use VMware Converter to convert physical computer into a virtual machine.

Reference Books:

1. Matthew Portnoy: "Virtualization Essentials", Wiley, 2012, ISBN: 978-1-118-17671-9.
2. Nelson Ruest, Danielle Ruest: "Virtualization, A Beginner's Guide", McGraw-Hill Education, 2009, ISBN-13: 978-0071614016.

E-Resources:

1. http://www.vmware.com/files/pdf/gated-vmw-ebook_virtualization-essentials.pdf..

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Integrated Rural Development – Part 1

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSH39	0:2:0:0	1	CIE:50 SEE:50	2 Hours	HSS

Course Objectives:

This course will enable students to:

- Gain an awareness of the existing challenges in rural areas of India
- Develop the ability to communicate and interact with rural sections of our society
- Use and apply their academic knowledge to facilitate rural development and uplift via targeted initiatives and activities.

Syllabus

Module - I

Introduction: Introduction to the course and its objectives; overview of typical challenges faced in villages; importance of integrating villages in mainstream society; relevance of course to nation building; division of students into groups; allotment of villages to student groups; assignment of mentors to student groups.   **03 Hours**

Module - II

Project Definition: Visit of student groups to respective villages with assigned mentors; interacting with villagers and ice-breaking activities; identifying possible project topics with the help of mentor and supervisor; student group discussion to finalize the project definition; review of project definition with mentor and supervisor.   **06 Hours**

Module - III

Project Conceptualization and Planning: Creation of plan to realize the project; review of plan with mentor and supervisor; assigning action items to students within the group; planning for needed logistics and infrastructure.   **06 Hours**

Module - IV

Project Realization: Execution of the project plan (for example by conducting workshops); aggregation of project deliverables like survey reports, collected data, interviews, and questionnaires; recording of impact of the project on the village; periodical review of the project execution status as well as the project deliverables (like aggregated data and survey reports) with mentor and supervisor.   **10 Hours**

Module - V

Project Reporting: Creation of project report by the student groups detailing the motivation for the project, the approach, the work packages along with student assignments, the execution of the project, impact of the project, and lessons learned by the students during the project; creation of a slide-set to present the project report during the final exam; review by mentor and supervisor. **03 Hours**

Course Outcomes:

On completion of this course, students will be able to:

- Develop the ability to interact and communicate with different sections of society, thus improving their communication skills.
- Understand the existing problems and needs of a village, thus developing an awareness of the challenges facing rural India.
- Conceptualize, plan, and realize measures to address these problems, thus improving their practical problem-solving and leadership skills.
- Make an impact to rural section of society, thus building their self-confidence.

Text Books:

1. Bhagawan Sri Sathya Sai Baba: "Service to Village is Service to God", Sri Sathya Sai Publications.

Reference Books:

1. Bhagawan Sri Sathya Sai Baba: "Man Management: A Value-Based Management Perspective", Sri Sathya Sai Publications.
2. Lt. Gen. M.L.Chibber:"Sai Baba's Mahavakya on Leadership : Book for Youth, Parents and Teachers."

E-Resources:

1. http://rural.nic.in/netrural/rural/index.aspx
2. www.annapoorna.org.in

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Engineering Mathematics-IV (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSM41	3:0:2:0	4	CIE:50 SEE:50	3 Hours	BS

Course Objectives:

This course will enable students to :
- Develop the application of mathematical skills in solving statistics and probability problems using computers.
- Use of Transforms in the engineering problems.
- Analyse the complex variables and functions
- Introduction of Statistical Software's.

Syllabus

Module - I

Random Variables: Discrete probability distribution, Continuous probability distribution, Expectation, Variance, Probability generating function, Binomial distribution, Poisson distribution, Exponential distribution and Normal distribution.

08 Hours

Module - II

Joint Probability: Joint probability distribution, discrete and independent random variables, expectation, covariance, correlation coefficient, probability vectors, stochastic matrices, fixed point matrices, regular stochastic matrices, Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states. **08 Hours**

Module - III

Complex variables: Functions of a complex variable, derivative of complex functions. **Analytic function**s: Cauchy's-Riemann equations in Cartesian and polar forms (No problems by using limits), Harmonic functions, construction of analytic functions by using Milne-Thomson method. Cauchy Theorem, Cauchy's integral formula-problems. **08 Hours**

Module - IV

Fourier Transforms: Infinite Fourier Transform, Fourier Sine and Cosine Transform and their inverse transforms-Problems.
Z-Transforms: Definition, Standard functions, statements of Linearity property, Damping and shifting rules-problems. Inverse Z-Transforms by partial fraction method. Difference equations– solutions by Z-transform. **08 Hours**

Module - V

Introduction to R, Basic Data types, vector operations, matrix construction, lists, data frames, Elementary statistics with R-Qualitative and Quantitative data, Numerical measures, probability distribution, interval estimation and simple linear regression.

08 Hours

List of R-Lab Experiments

Sl. No.	Name of the Experiment
1	Introduction to R Software and basic commands
2	Demonstration and operations of Vectors
3	Operations of Matrices
4	Demonstration of Lists
5	Demonstration of Data Frames
6	Qualitative Data Analysis
7	Quantitative Data Analysis
8	Numerical Measures of Data
9	Probability Distribution
10	Linear Regressions

Course Outcomes:

On completion of this course, the students are able to :

• Find the probability distribution of random experiments.
• Apply the stochastic process and Markov chain in prediction of future events.
• Evaluate the complex function differentiation and integration.
• Find Fourier and Z-transform of different function.
• Use the statistical software R for analyzing the data .

Text Books:

1. Dr. B.S. Grewal: "Higher Engineering Mathematics", Khanna publishers, New Delhi, 42nd Edition, 2012, ISBN: 9788174091956.
2. R.E. Walpole, R.H.Myers.R.S, L.Myers and K.Ye: "Probability and Statistics for Engineers and Scientists", Pearson Education, Delhi, 8th Edition, ISBN 13: 9780131877115.
3. W.N.Venables, D.M.Smith : "An introduction to R".

Reference Books:

1. Erwin Kreyszig: "Advanced Engineering Mathematics", (Chapters 13,14,19,21,24,25), Wiley Pvt. Ltd., India, New Delhi, 9th Edition, 2011, ISBN 13: 9788126531356.
2. John Verzani: "Using R for introductory Statistics", Champan and Hall/ CRC, New York, Washington D.C., ISBN: 978-1-59327-384-2.
3. Sheldom M Ross: "Probability models for Computer Science", Academic Press, 2009, ISBN: 9780124079489.
4. Murray R Spiegel, John Schiler and Alu Srinivasan: "Probability and Statistics", Schaum's Outline series, 2nd Edition, ISBN: 9780071795579.

E-Resources:

1. http://www.zums.ac.ir/ebooks/mathematics/essential-engineering-mathe-matic.
2. https://archive.org/details/AdvancedEngineeringMathematics10thEdition
3. https://www.r-project.org/
4. www.r-tutor.com

Formal Languages and Automata Theory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CST42	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the basic concepts of finite automata.
- Learn the regular expressions, languages and their applications.
- Describe the context free grammars, languages and their applications.
- Acquire knowledge about push down automata, languages and its types.
- Introduce Turing machines.

Syllabus

Module - I

Introduction to Finite Automata: Introduction to Finite Automata, The central concepts of Automata theory, Deterministic finite automata, Nondeterministic finite automata.

08 Hours

Module - II

Finite Automata, Regular Expressions: An application of finite automata, Finite automata with Epsilon-transitions, Regular expressions Finite Automata and Regular Expressions, Applications of Regular Expressions.　　**08 Hours**

Module - III

Regular Languages, Properties of Regular Languages: Regular languages, Proving languages not to be regular languages, Closure properties of regular languages, Decision properties of regular languages, Equivalence and minimization of automata.　　**08 Hours**

Module - IV

Context-Free Grammars and Languages: Context free grammars, Parse trees, Applications, Ambiguity in grammars and Languages.

Properties of Context-Free Languages: Normal forms for CFG's, Closure properties of CFL's.　　**08 Hours**

Module - V

Pushdown Automata: Definition of the Pushdown automata, The languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata.

Introduction to Turing Machine: The Turing machine.　　**08 Hours**

Course Outcomes:

On completion of this course, the students are able to :

- Design the different types of automata for given regular expression and regular languages.
- Write the grammar for the given regular expressions.
- Draw the parse tree for the given context free grammars.
- Design the PDA for the given languages.
- Convert the given PDA to its equivalent CFG and vice versa.

Text Book:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman: "Introduction to Automata Theory, Languages and Computation", (Chapters 1-8), Pearson New International Edition, 3rd Edition, 2014, ISBN-13: 978-0321455369.

Reference Books:

1. Peter Linz: "An Introduction to Formal Languages And Automata", Jones and Bartlett Publishers, 5th Revised Edition, 2011, ISBN-13: 978-1449615529, ISBN-10: 144961552X.

2. K.L.P. Mishra: "Theory of Computer Science, Automata, Languages, and Computation", PHI Learning, 3rd Edition, 2009, ISBN 10: 8120329686 ISBN 13: 9788120329683.

E-Resources:

1. http://www.ebook777.com/theory-finite-automata-introduction-format-languages.

2. http://www.techmela.ucoz.com/_id/o/22-introuctionto.pdf

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Design and Analysis of Algorithms

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CST43	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Acquire the knowledge of Algorithm and problem solving technique.
- Learn how to analyze the complexity of an algorithm in terms of time and space.
- Understand different techniques like divide and conquer, decrease and conquer etc., to solve problems.

Syllabus

Module - I

Introduction: What is an algorithm? Fundamentals of algorithmic problem solving, Fundamentals of the analysis of algorithm efficiency, Asymptotic Notations and basic efficiency classes, Mathematical Analysis of Non-Recursive and Recursive Algorithms Brute Force Approaches: Introduction, Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching. **08 Hours**

Module - II

Divide and conquer: Divide and Conquer: General Method, Binary Search, Merge Sort, Quick Sort and its performance.

Greedy method: The General Method, Job Sequencing with Deadlines, Minimum Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm, Single Source Shortest Paths. **08 Hours**

Module - III

Decrease and conquer approaches: Introduction, Insertion Sort, Depth First Search and Breadth First Search, Topological Sorting.

Transfer and conquer: Introduction, Balanced search trees, Heap and Heap sort. **08 Hours**

Module - IV

Space-Time Trade-offs: Introduction, Sorting by Counting, Input Enhancement in String Matching (Horspool algorithm).

Dynamic programming: The General Method, Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths Problem, The Travelling Salesperson problem, Computing a Binomial co-efficient. **08 Hours**

Module - V

Limitations of algorithmic power and coping with them: Lower-Bound Arguments, Decision Trees.

Backtracking: n - Queens problem, Subset – Sum Problem.

Hashing: Introduction, Open hashing, Closed hashing.

Branch and bound: Assignment problem, Knapsack problem.   **08 Hours**

Course Outcomes:

On completion of this course, the students are able to :

- Identify asymptotic notations and basic efficiency classes.
- Solve problems using various techniques like greedy and divide-and-conquer.
- Compute problems using various techniques like decrease-and-conquer and transfer-and-conquer.
- Use different algorithms like TSP, Floyd's etc. to solve real world problems.
- Develop solutions for n - Queens problem, Subset – Sum Problem, Assignment problem, Knapsack problem etc.

Text Books:

1. Anany Levitin: "Introduction to The Design and Analysis of Algorithms", (Chapters 1-5,7,9,11), Pearson Education, Delhi, 2nd Edition, 2007, ISBN: 9780321358288.

2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: "Fundamentals of Computer Algorithms", (Chapters 1,3-8,10-12), Universities Press, Hyderabad, 2nd Edition, 2007, ISBN: 10: 8173716129.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: "Introduction to Algorithms", PHI, London, England, 3rd Edition, 2010, ISBN: 9780262033848.

2. R.C.T. Lee, S.S. Tseng, R.C. Chang and Y.T. Tsai: "Introduction to the Design and Analysis of Algorithms A Strategic Approach", McGraw-Hill Higher Education, USA, International Edition, 2005, ISBN-13: 978-0071243469.

E-Resources:

1. http://www.pearsonhighered.com
2. http://www.ebooks.com
3. http://www.worldcat.org
4. http://www.citc.ui.ac.ir/zemoni/cls.pdf

Microprocessors (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSI44	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the basics of 8086 microprocessor family and its architecture.

- Become aware of constructing the machine codes for 8086 instructions.

- Learn 8086 instruction sets as needed to solve programming problems.

- Acquire knowledge about signals, timing and system connections for a simple 8086-based microcomputer.

- Understand how the 8086 responds to interrupts, how interrupts-service procedures are written and operation of peripheral devices.

Syllabus

Module - I

Computers, Microcomputers and Microprocessors- An Introduction: Types of Computers, How Computers and Microcomputers are used, an example, Overview of Microcomputer Structure and Operation, Microprocessor Evolution and Types, The 8086 Microprocessor Family-Overview, 8086 Internal Architecture, Introduction to Programming the 8086.   **08 Hours**

Module - II

8086 Family Assembler Language Programming-I: Constructing the machine codes for 8086 Instructions (MOV Instructions only), Assembly Language Program Development Tools, Data Transfer Instructions, Arithmetic Instructions.   **08 Hours**

Module - III

8086 Family Assembler Language Programming-II: Bit-manipulation Instructions, String Instructions, Program-Execution Transfer Instructions, Processor Control Instructions. Assembler Directives.   **08 Hours**

Module - IV

8086 System Connection Timing, Interrupts and Interrupt Applications: A Basic 8086 Microcomputer System, 8086 Bus activities during a read machine cycle, 8086 Bus activities during a write machine cycle, A closer look at the 8086, 8086 Interrupts and Interrupt Responses, Hardware Interrupt Applications, 8259 A Priority Interrupt Controller, Overview and System Connections, Software Interrupt Applications.

08 Hours

Module - V

Digital Interfacing: Programmable Parallel Ports and Handshake Input/Output, Methods of Data Transfer, Implementing Handshake Data Transfer, 8255A Internal Block Diagram and System Connections, 8255A Operational Modes and Initialization, Constructing and Sending 8255A Control Words, Interfacing a Microprocessor to Keyboards: Keyboard Types, Keyboard Circuit Connections and Interfacing. **08 Hours**

Laboratory

1. a) Search a key element in a list of 'n' 16-bit numbers using the Binary search algorithm.

   b) Read the status of eight input bits from the Logic Controller Interface and display 'FF' if the parity of the input read is even; otherwise display '00'.

2. a) Write two ALP modules stored in two different files; one module is to read a character from the keyboard and the other one is to display a character. Use the above two modules to read a string of characters from the keyboard terminated by the carriage return and print the string on the display in the next line.

   a) Implement a BCD Up-Down Counter on the Logic Controller Interface.

3. a) Sort a given set of 'n' numbers in ascending order using the Bubble Sort algorithm.

   a) Read the status of two 8-bit inputs (X and Y) from the Logic Controller Interface and display X*Y.

4. a) Display the message "Welcome To Microprocessor Lab" at the centre of the screen, clear the screen before displaying the message.

   a) Display messages FIRE and HELP alternately with flickering effects on a 7-segment display Interface for a suitable period of time. Ensure a flashing rate that makes it easy to read both the messages (Examiner does not specify these delay values nor is it necessary for the student to compute these values).

5. a) Reverse a given string and check whether it is a palindrome or not.

   a) Assume any suitable message of 12 characters length and display it in the rolling fashion on a 7-segment display interface for a suitable period of time Ensure a flashing rate that makes it easy to read both the messages. (Examiner does not specify these delay values nor is it necessary for the student to compute these values).

6. a) Read your name from the keyboard and display it at a specified location on the screen after the message "What is your name?", you must clear the entire screen before display.

b) Drive a Stepper Motor interface to rotate the motor in specified direction (clockwise or counter-clockwise) by N steps (Direction and N are specified by the examiner). Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student).

7. a) Compute nC$_r$ using recursive procedure. Assume that 'n' and 'r' are non negative integers.

b) Drive a stepper motor interface to rotate by N steps clockwise direction and N steps counter-clockwise direction. (N is specified by the examiner) Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student).

8. a) Generate the first 'n' Fibonacci numbers.

a) Generate a Sine wave form using the DAC interface. (The output of the DAC is to be displayed on the CRO).

9. a) Read the current time from the system and display it in the standard format on the screen.

a) Generate a Half Rectified Sine waveform using the DAC interface. (The output of the DAC is to be displayed on the CRO).

10. a) Write a program to create a file (input file) and to delete an existing file.

a) Generate the Fully Rectified Sine waveform using DAC interface (The output of the DAC is to be displayed on the CRO).

Course Outcomes:

On completion of this course, the students are able to :

- Discuss the microprocessor evolution, types and 8086 internal architecture.
- Construct the machine codes for 8086 instructions with the help of instruction templates.
- Describe functions of different types of 8086 assembly language instructions and use assembly language program to solve simple problems.
- Explain 8086 interrupt types and their applications.
- Describe the operations of peripheral devices.

Text Book:

1. Douglas V. Hall: "Microprocessors and Interfacing", (Chapter 2,3,5-9), TMH, New Delhi, Revised 2nd Edition, 2006, ISBN-13: 978-0070257429.

Reference Book:

1. Barry B. Brey: "The Intel Microprocessors", Pearson Education, New Delhi, 8th Edition, 2009, ISBN-13: 978-8131726228.

E-Resources:

1. http://www.nptel.ac.in/downloads/106108100/

2. https://www.google.co.in/search?tbo=pandtbm=bksandq=inauthor:%22Douglas+V.+Hall%22

3. https://www.google.co.in/search?tbo=pandtbm=bksandq=inauthor:%22Douglas+V.+Hall%22#tbm=bksandq=Bary+b+brey

4. http://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Microprocessors%20and%20Microcontrollers/pdf/Teacher_Slides/mod1/M1L3. pdf

5. http://www.nptel.ac.in/downloads/106108100/

6. https://www.google.co.in/search?tbo=pandtbm=bksandq=inauthor:%22Douglas+V.+Hall%22

7. https://www.google.co.in/search?tbo=pandtbm=bksandq=inauthor:%22Douglas+V.+Hall%22#tbm=bksandq=Bary+b+brey

8. http://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Microprocessors%20and%20Microcontrollers/pdf/Teacher_Slides/mod1/M1L3.pdf

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UNIX and Shell Programming (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSI451	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to **:**

- Understand the history, origin, features and architecture of UNIX Operating System.
- Learn basic commands to interact with UNIX System and VI editor.
- Understand UNIX file system.
- Learn shell scripting and Perl scripting.

Syllabus

Module - I

UNIX architecture: The operating system, the UNIX operating system, Linux and GNU. The UNIX architecture, features of UNIX, POSIX and Single UNIX specification, Internal and External commands, Command structure, man browsing and manual pages on-line.

The file system: The parent – child relationship, the HOME variable, pwd, cd, mkdir, absolute pathname, relative pathname.

editor: vi basics, input mod, saving text and quitting, searching for a pattern(| and ?), substitution- search and replace(:s).   **08 Hours**

Module - II

Basic file attributes: ls: listing directory contents, the UNIX file system, ls –l, -d option, file ownership, file permissions, chmod, directory permissions, changing file ownership.

More file attributes: File systems and inodes, hard links, symbolic links and ln, the directory, umask, modification and access times, find.

The Process: Process basics, ps: process status, system processes(-e or –a), mechanism of process creation, process states and zombies, running jobs in background, nice: job execution, job control, at and batch, cron, time.   **08 Hours**

Module - III

Simple filters: pr, head, tail, cut, paste, sort, uniq, tr.

Filters using regular expressions – grep and sed: grep, Basic Regular Expressions (BRE), Extended Regular Expressions (ERE) and egrep, sed: the stream editor, line addressing using multiple instructions (-E and -F) context addressing, writing selected lines to a file (w), text editing, substitution (s), basic regular expression revisited.

08 Hours

Module - IV

The shell: The shell's interpretive cycle, shell offerings, pattern matching, escaping and quoting, redirection, pipes, tee, command substitution, shell variables. **Essential shell programming:** Shell scripts, read using command line arguments, exit and exit status of command, the logical operators andand and ||, the if conditional, using test and {} to evaluate expression. The case conditional, expr, $0, while, for, debugging shell scripts with set –x.   **08 Hours**

Module - V

Perl – The master manipulator: Perl preliminaries, the chop function, variables and operators, the string handling functions, specifying file names in command line, $_, current line number ($.) and the range (..), list and arrays, foreach, split, join, dec2bin. pl, grep, associative arrays, regular expressions and substitutions, file handling, file tests, subroutines.

Networking Tools: TCP/IP basics, the applications.   **08 Hours**

Laboratory

1. Execute the following list of basic commands in UNix:

    (i) pwd   (ii) mkdir   (iii) cd   (iv) who   (v) echo

    (vi) cat   (vii) rm   (viii) mv   (ix) wc   (x) cp

2. Execute the basic file attributes with all possible options:

    (i) ls   (ii) chmod

3. Execute basic commands using vi editor:

    a.   input mode commands

    b.   saving text and quitting

    c.   navigation

    d.   editing text

    e.   searching pattern

4. Execute the following filters using regular expressions with all possible op-tions:

    (i) grep   (ii) sed

5. Write a shell script to display current date and calendar.

    1.   Write a shell script to search for a pattern using grep in an employee data-base using interactive way.

6. Write a shell script to search for a pattern in an employee database using command line argument.

   1. Write a shell script using test, $0 and $# in an if-elif-if construct.

   2. Write a shell script using case, to offer 5 item menu:

      a. List of files

      b. Process of user

      c. Today's date

      d. Users of system

      e. Quit to unix

7. Write a shell script for matching pattern in student list using for loop.

Course Outcomes:
On completion of this course, the students are able to :

- Describe history, origin, feature and architecture of UNIX operating system.
- Interact with UNIX system easily.
- Construct and edit files, search for any patterns using regular expressions.
- Solve complex jobs using tools and utilities available in UNIX.
- Design and develop various tasks by using Shell and Perl scripting.

Text Book:
1. Sumitabha Das: "UNIX – Concepts and Applications", (Chapters 1,2,4,6-9,11-14,17,19), Tata McGraw Hill, Noida, 4th Edition, 15th Reprint, 2011, ISBN-13: 978-0-07-063546-3.

Reference Books:
1. Behrouz A. Forouzan and Richard F. Gilberg: "UNIX and Shell programming", Cengage Learning, India, 1st Edition, 2005, ISBN: 81-35-0325-9.
2. M G Venkatesh Murthy: "UNIX and Shell programming", Pearson Education, Delhi, 1st Edition, 2005, ISBN: 81-7758-745-5.

E-Resources:
1. http://www.mhhe.com/das/uca
2. http://www.tutorialspoint.com/unix/unix_tutorials.pdf.
3. http://www.perldoc.perl.org/

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Fundamentals of Multimedia (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSI452	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives

This course will enable students to :

- Understand Multimedia hard ware and software.
- Understand Multimedia system architecture.
- Understand various compression techniques.
- Understand various file formats.
- Understand the basics of event based programming using Adobe Flash together with XML capabilities to render rich content in the browser.

Syllabus

Module - I

Multimedia System Design: An Introduction: Multimedia Elements, Multimedia Applications, Multimedia System Architecture, Evolving Technologies for Multimedia Systems, Multimedia Databases. **08 Hours**

Module - II

Compression and Decompression Techniques: Types of Compression, Binary Image Compression Schemes, Color, gray scale, still-video image compression, Discrete Cosine Transform, Video Image compression, MPEG Coding methodology, Audio Compression, Data and File format standards- RTF, TIFF,RIFF, MIDI, JPEG, AVI, JPEG, TWAIN Architecture. **08 Hours**

Module - III

Multimedia Input and Output Technologies: Key Technology Issues, Pen Input, Video and Image Display Systems, Print Output Technologies, Image Scanners, Digital Voice and Audio, Video Images and Animation, Full Motion Video. **08 Hours**

Module - IV

Introduction to Action Script in Flash: Programming Concepts – Variables, Data types, conditionals, loops, arrays, Functions, Custom objects - Properties, Methods and Events – Display List, Timeline Control. **08 Hours**

Module - V

Advance Concepts in Action Script using Flash Builder: OOP –Motion –Drawing with Vectors and Pixels –Text –Sound and video – Understanding XML. **08 Hours**

Laboratory

List of Experiments:

1. Design and create an animation to represent the growing moon.

2. Create an animation to indicate a ball bouncing on steps.

3. Create to simulate the movement of a cloud.

4. Design to draw the fan blades and to give proper animation.

5. Create to display the background given (filename: tulip.jpg) through your name.

6. Procedure to create an animation with the following features. Welcome

   • Letters should appear one by one.

   • The fill colour of the text should change to a different colour after the display of the full word.

Course Outcomes:

On completion of this course, the students are able to :

   • Discuss the technical details of common multimedia data formats, protocols, and compression techniques of digital images, video and audio content.

   • Write the technical details of JPEG and MPEG families of standards.

   • Explain the significance of "Quality of Service" in multimedia networking.

   • Describe the principles and technical details of several wired and wireless networking protocols.

   • Demonstrate the proper evaluation, development, and enhancement of multimedia applications.

Text Books:

1. Ze-Nian Li and Mark S. Drew. (2004). Fundamentals of Multimedia. (Chapters: 1,2,3,6,7) Upper Saddle River, NJ: Pearson Education, 2005, ISBN: 0-13-127 256-X.

2. Rich Shupe and Zevan Rosser, "Learning Action Script 3.0: A Beginner's Guide", (Chapter 1,2,3,4,5,6) Adobe Developer Library, 2nd Edition, 2010, ISBN: 9780596527877.

Reference Books:

1. Andleigh PK and Thakrar K, "Multimedia Systems", Addison Wesley Longman, 2005. ISBN: 0-201-57 168 -4.

2. Fred Halsall, "Multimedia Communications", Addison Wesley, 2005. ISBN-13: 978-0201398182.

E-Resources:

1. http://www.uen.org/general_learner/multimedia_resources.shtml

2. http://knox.libguides.com/Multimedia

Introduction to Programming using Python (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSI453	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- To get a clear understanding of Object Oriented Programming.
- To learn Python with a focus on regular expressions, exception handling, file handling, creating modules, interacting with database.

Syllabus

Module - I

Introduction and overview: What is Python, Origin, Comparison, Comments, Operators, Variables and Assignment, Numbers, Strings, Lists and Tuples, Dictionaries, if Statement, while Loop, for Loop and the range() built-in Function, Files and the open() Built-in Function, Errors and Exceptions, Functions, Classes, Modules.

Syntax and Style: Statements and Syntax, Variable Assignment, Identifiers, Basic Style Guidelines, Memory Management, Python Application Examples.   **08 Hours**

Module - II

Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types. Numbers and Strings Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions.

Sequences: Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings.   **08 Hours**

Module - III

Lists Operators, Built-in Functions, List Type Built-in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples. Conditionals and Loops if statement, else if Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement.

08 Hours

Module - IV

Files and Input/output File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules.

Exception handling: The dir Function, Errors, Runtime Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions, raise, assert.   **08 Hours**

Module - V

Regular Expressions: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python.

Programming Exercise: Check for data error in CSV files: Numeric Check, Alphanumeric Check, Email Check, Date Check.

Database Interactions: Database Connection, creating database tables, insert data into table, reading, updating data. **08 Hours**

List of Experiments:

1. Create a new program called hello world.py. You will use this file to write your very first 'Hello world!' program.

2. Write a program using print that, when run, prints out a tic-tac-toe board.

3. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3,1/4... 1/10.

4. Write a program using a for loop that calculates exponentials. Your program should ask the user for a base base and an exponent exp, and calculate baseexp.

5. Write a method fact that takes a number from the user and prints its factorial.

6. Write a function roots that computes the roots of a quadratic equation. Check for complex roots and print an error message saying that the roots are complex.

Course Outcomes:

On completion of this course, the students are able to :

• Describe basic of object oriented principles in Python.

• Explain type of operators and Built-in functions.

• Identify built-in libraries and conditional statements like loops.

• Interpret file handling and exception handling mechanisms.

• Use regular expressions and apply the same in solving specific problems.

Text Book:

1. Mark Lutz: "Learning Python", O'REILLY, 5th Edition, 2013, ISBN: 978-4493-5573-9.

Reference Books:

1. Barry, Paul: "Head First Python", O'REILLY, 2nd Edition, 2010,
   ISBN: 978-1-4493-8267-4.

2. David M. Beazley: "Python Essential Reference", Developer's Library, 4th edition, 2010, ISBN: 0672329786.

E-Resources:

1. http://www.tutorialspoint.com/python/

2. https://www.codementor.io/learn-python-online

3. https://www.youtube.com/playlist?list=PL9FAE4422FA13FDE4

Introduction to Cyber Security and Cyber Laws

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CST461	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Understand the area of cyber crime and forensics.
- Understand the motive and causes for cyber crime, detection and handling.
- Study the areas affected by cyber crime and investigation.
- Understand the tools used in cyber forensic.
- Know Legal Perspectives in cyber security.

Syllabus

Module -I

Introduction to Cyber crime: Cyber crime: Definition and Origins of the Word, Cyber crime and Information Security, Who are Cyber criminals?, Classifications of Cyber crimes.

Cyber Offenses: How Criminals Plan Them: How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cyber crimes, Bot nets: The Fuel for Cyber crime, Attack Vector, Cloud Computing. **08 Hours**

Module - II

Cyber crime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Authentication Service Security, Mobile Devices: Security Implications for organizations, Organizational Security Policies and Measures in Mobile Computing Era, Laptops. **08 Hours**

Module – III

Tools and Methods Used in Cyber crime: Introduction, Proxy Servers and Anonymizers, Password Cracking, Key loggers and Spy wares, Virus and Worms, Trojan Horses and Back doors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

08 Hours

Module-IV

Understanding Computer Forensics: Introduction, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory:

Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Special Tools and Techniques, Forensics Auditing, Anti forensics. **08 Hours**

Module-V

Cyber crimes and Cyber security: The Legal Perspectives, Introduction, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber crime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cyber crime and Punishment, Cyber law, Technology and Students: Indian Scenario. **08 Hours**

Course Outcomes:

On completion of this course, the students are able to :

- Acquire knowledge about the cyber security cyber crime and cyber offenses.
- Explain cyber crime on various mobile and wireless devices.
- Use of tools and methods in cyber crime and security.
- Interpret computer forensics.
- Understand legal issues in cyber crime.

Text Book:

1. Sunit Belapure and Nina Godbole: "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", (Chapter 1-7), Wiley India Pvt. Ltd., New Delhi, India, 2011, ISBN: 8126521791.

Reference Book:

1. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla, KLSI: "Introduction to information security and cyber laws", Dreamtech Press, New Delhi, India, 2014, ISBN 13: 789351194736.

E-Resources:

1. http://www.civilserviceindia.com/subject/General-Studies/notes/basics-of-cyber security.html
2. http://uttaminstitute.ac.in/CYBER.pdf
3. http://www.vssut.ac.in/lecture_notes/lecture1423183198.pdf
4. http://www.tutorialspoint.com/information_security_cyber_law/introduction.html

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Linear Integrated Circuits

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CST462	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Interpret the basic building blocks of linear integrated circuits.
- Learn the linear and non-linear applications of operational amplifiers.
- Acquire the knowledge about the theory and applications of analog multipliers and PLL.
- Understand the theory of ADC and DAC.
- Learn the concepts of waveform generation and introduce some special function ICs.

Syllabus

Module - I

IC Fabrication and Circuit Configuration for Linear IC: Advantages of ICs over discrete components, Manufacturing process of monolithic ICs , Construction of monolithic bipolar transistor, Monolithic diodes, Integrated resistors, Monolithic capacitors, Inductors, Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage references, BJT Differential amplifier with active loads, General operational amplifier stages, and internal circuit diagrams IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.   **08 Hours**

Module - II

Applications of Operational Amplifiers: Sign changer, Scale changer, Phase shift circuits, Voltage follower, V-to-I and I-to-V converters, Adder, Subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, Peak detector, Clipper and Clamper, Low-pass, High-pass and band-pass butter worth filters.   **08 Hours**

Module - III

Analog Multiplier and PLL: Analog multiplier using emitter coupled transistor pair, Gilbert multiplier cell, Variable trans conductance technique, Analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, Application of PLL for AM detection, FM detection, FSK modulation and demodulation and frequency synthesizing. **08 Hours**

Module - IV

Analog to Digital and Digital to Analog Converters: Analog and digital data conversions, D/A converter, specifications, weighted resistor type, R-2R ladder type, Voltage mode and current mode R – 2R ladder types, switches for D/A converters, high speed sample-and hold circuits, A/D converters, specifications, Flash type, Successive approximation type, Single slope type, Dual slope type, A/D converter using voltage-to-Time conversion, Over-sampling A/D converters. **08 Hours**

Module - V

Waveform Generators and Special Function ICs: Sine-wave generators, Multi vibrators and triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC voltage regulators – Three terminal fixed and adjustable voltage regulators – IC 723 general purpose regulator – Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to voltage and voltage to frequency converters, Audio power amplifier, Video amplifier, Isolation amplifier, Opto-couplers and fibre optic IC. **08 Hours**

Course Outcomes:

On completion of this course, the students are able to :

- Implement linear and non-linear applications of op-amps.
- Design applications using analog multiplier and PLL.
- Illustrate the working of ADC and DAC using op-amps.
- Generate waveforms using op-amps circuits.
- Analyze special function ICs.

Text Books:

1. Sergio Franco: "Design with operational amplifiers and analog integrated circuits", (Chapters 1-4,6,7,9-11), Tata McGraw-Hill, 4th Edition, 2015, ISBN: 978-0078028168.

2. D. Roy Choudhry, Shail Jain: "Linear Integrated Circuits", (Chapters 4-10), New Age International Pvt. Ltd., 4th Edition, 2010, ISBN 10: 8122430988 ISBN 13: 9788122430981.

Reference Books:

1. Gray and Meyer: " Analysis and Design of Analog Integrated Circuits", Wiley International, 5th edition, 2014, ISBN 10 : 8126521481, ISBN 13: 978-81-265-2148-7.

2. Ramakant A. Gayakwad: "OP-AMP and Linear ICs", Prentice Hall / Pearson Education, 4th Edition, 2002, ISBN: 8120320581, 9788120320581.

E-Resources:

1. https://books.google.co.in/books?isbn=0070530440

2. https://books.google.co.in/books?isbn=8122414702

Control Systems

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CST463	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Learn the concepts of block diagrams and transfer functions.
- Understand the characteristics of closed loop control systems including steady state and transient response.
- Acquire the knowledge about basic performance criteria for 1$_{st}$ and 2$_{nd}$ order systems.
- Understand the basic control system design methods including root-locus diagrams and frequency response methods.

Syllabus

Module - I

Modelling of Systems: Introduction to Control Systems, Types of Control Systems, Effect of Feedback Systems, Differential equation of Physical Systems -Mechanical systems, Friction, Translational systems (Mechanical accelerometer, systems excluded), Rotational systems, Gear trains, Electrical systems, Analogous systems.

08 Hours

Module - II

Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs (State variable formulation excluded). **08 Hours**

Module - III

Time Response of feed back control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, Steady – state errors and error constants. Introduction to PID Controllers (excluding design). **08 Hours**

Module - IV

Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh-stability criterion.

Root-Locus Techniques: Introduction, The root locus concepts. **08 Hours**

Module - V

Frequency domain analysis: Correlation between time and frequency response, Bode plots, Experimental determination of transfer functions, Assessment of relative stability using Bode Plots. Introduction to lead, Lag and lead-lag compensating networks (excluding design). **08 Hours**

Course Outcomes:

On completion of this course, the students are able to :

- • Describe the engineering fundamentals about block diagram and transfer functions.
- • Identify the characteristics of closed loop control systems.
- • Examine time response of 1st and 2nd order feedback control systems.
- • Estimate stability analysis using R-H criteria and root locus concepts.
- • Construct correlation between time and frequency responses

Text Book:

1. J. Nagrath and M. Gopal: "Control Systems Engineering", (Chapter 2,5-8, 10), New Age International (P) Limited Publishers, Delhi, 5th Edition, 2008, ISBN: 978-184-8290037.

Reference Books:

1. K. Ogata: "Modern Control Engineering", Pearson Education Asia/ PHI, Delhi, 5th Edition, 2002, ISBN 10: 0-13-615673-8, ISBN 13: 978-0-13-615673-4.

2. Benjamin C. Kuo, John: "Automatic Control Systems", Wiley India Pvt. Ltd., 8th Edition, 2008, ISBN-10: 0471134767, ISBN-13: 978-047113476.

3. Joseph J Distefano III et al.,: "Feedback and Control System", P Schaum's Outlines, TMH, McGraw-Hill, New York, 2nd Edition, 2007, ISBN: 0-07-017052-5.

E-Resources:

1. http://research.iaun.ac.ir/pd/mahmoodian/pdfs/UploadFile_9809.pdf

2. http://www2.nuu.edu.tw/emo/e-teaching%20materials/Automatic%20Control.pdf

3. https://murdercube.com/files/Miscellaneous/Feedback%20and%20Control%20System.PDF

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Design and Analysis of Algorithms Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSL47	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand and use asymptotic notations to analyze the performance of algorithms.
- Learn different sorting and searching techniques.
- Get exposed to various algorithm design techniques.

Design, develop and implement the specified algorithms for the following problems using C/C++ Language in LINUX / Windows environment.

1. a. Write a C/C++ program to sort the elements by using quick sort method.

   b. Simulation of the above program by using virtual lab.

2. a. Write a C/C++ program to sort the elements by using merge sort method.

   b. Simulation of the above program by using virtual lab.

3. Obtain the Topological ordering of vertices in a given digraph.

4. a. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

   b. Perform Dijkstra single source shortest path on a graph using virtual lab.

5. Implement 0/1 Knapsack problem using Dynamic Programming.

6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

7. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.

8. a. Compute the transitive closure of a given directed graph using Warshall's algorithm.

   b. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.

9. a. Print all the nodes reachable from a given starting node in a digraph using BFS method.

   b. Check whether a given graph is connected or not using DFS method.

10. Implement N Queen's problem using Back Tracking.

Course Outcomes:

On completion of this course, the students are able to :

- Solve problems by applying appropriate algorithms.
- Analyze the efficiency of various algorithms.
- Apply techniques of stacks and queues to solve problems.
- Develop a program that can be solved in many ways using different techniques.
- Identify and evaluate complex problems using principles of maths and engineering science.

Text Books:

1. Anany Levitin: "Introduction to the Design and Analysis of Algorithms", Pearson Education, Delhi, 2nd Edition, 2007, ISBN: 9780321358288.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: "Fundamentals of Computer Algorithms", Universities Press, Hyderabad, 2nd Edition, 2007, ISBN-10: 8173716129.

E-Resources:

1. http://cs.gmu.edu/~pwiegand/cs483-Spring06/lecturenotes/cs483-l1pf.pdf
2. http://www.cs.cornell.edu/~kozen/papers/daa.pdf

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Cloud Computing Foundations (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSI48	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Explain the phases of transition from classic data center to virtual data center and then to the Cloud
- Explain the key characteristics, services, and deployment models of Cloud
- Describe the Cloud infrastructure components and service management processes
- Describe the Cloud security concerns and solutions
- List the key considerations for migration to the Cloud

Syllabus

Module - I

Journey to the Cloud: Drivers for cloud computing, cloud definition and characteristics, building cloud infrastructure – a phased approach from Classic data center to virtual data center to Cloud, virtualization and its benefits.   **02 Hours**

Module - II

Cloud Computing Primer: Cloud computing characteristics, cloud deployment models private, public, hybrid and community cloud, cloud services – SaaS, PaaS, and IaaS, cloud economics and challenges.   **03 Hours**

Module - III

Cloud infrastructure and Management: Cloud infrastructure framework and components, infrastructure management and service creation tools, cloud service management processes asset and configuration management, service catalog management, financial management, capacity, performance and availability management, incident, problem and compliance management.   **04 Hours**

Module - IV

Cloud Security: Basic information security concepts, cloud security concerns and threats, security mechanisms in cloud at compute, storage, and network layer, Governance, Risk and compliance in Cloud.   **02 Hours**

Module - V

Cloud Migration Considerations: Considerations for choosing right application and cloud model, service provider specific considerations, cloud adoption phases, Financial and technical feasibility assessment, migration and optimization considerations.

03 Hours

Course Outcomes:

On completion of this course, the students are able to :

- Explain the phases of transition from classic data center to virtual data center and then to the Cloud.
- Explain the key characteristics, services, and deployment models of Cloud.
- Describe the Cloud infrastructure components and service management processes.
- Describe the Cloud security concerns and solutions.
- List the key considerations for migration to the Cloud.

Reference Books:

1. Thomas Erl: "Cloud Computing", Pearson Education, 1st Edition, 2014, ISBN-13: 978-9332535923.
2. Judith Hurwitz, Marcia Kaufman, Fern Halper: "Cloud Computing for dummies", Wiley, 1st Edition, 2009, ISBN-13: 978-0470484708.

E-Resources:

1. http://www.buyya.com/MasteringClouds/ToC-Preface-TMH.pdf

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Integrated Rural Development – Part 2

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17CSH49	0:2:0:0	1	CIE:50 SEE:50	2 Hours	HSS

Course Objectives:

This course is an extension of the Integrated Rural Development course which was introduced in Semester 3. This course will extend the previous semester's work and will enable the students to:

- Continue working on the problems and challenges identified in the village.
- Apply their academic knowledge, talents, and abilities to come up with innovative and practical solutions to the challenges in the village.
- Foster a sense of entrepreneurship towards addressing the problems in the village.

Syllabus

Module - I

Overview: Overview of the course; summary of the experiences from previous semester with assigned mentors and supervisors; discussion of the challenges faced in the village identified previously.   **03 Hours**

Module - II

Project Backlog Revision: Revisiting the challenges already identified in the previous semester and identifying possible project topics with the help of mentor and supervisor (this can be either continuation of the previous semester's project with a larger scope or a new project); student group discussion to finalize the new project definition; review of project definition with mentor and supervisor.   **06 Hours**

Module - III

Project Plan Finalization: Modification of the previous semester's project plan to accommodate the new objectives; review of new proposaland plan with mentor and supervisor to finalize plan of work; distribution of workand needed resources and logistics within the group.   **06 Hours**

Module - IV

Project Execution: Execution of the project as per the plan;conducting surveys to evaluate the impact of the project execution; collection ofproject deliverables; periodical review of the project execution status and collected artifacts (like aggregated data and survey reports) with mentor and supervisor.   **10 Hours**

Module - V

Project Presentation: Creation of a final project report and a high-quality project presentation; both the project report and presentation should clearly articulate the motivation, how the project was conceptualized and executed, impact of the project, futuredirections in the project, and lessons learned by the students during the project; final review and evaluation by mentor and supervisor. **03 Hours**

Course Outcomes:

On completion of this course, students will be able to:

• Further develop their social and communication skills by interacting with residents of the village and within their team.

• Conceptualize long term solution to challenges in villages, thus developing a sense of entrepreneurship.

• Make an impact to rural sections of society, thus building their self-confidence.

Text Books:

1. Bhagawan Sri Sathya Sai Baba: "Service to Village is Service to God", Sri Sathya Sai Publications.

Reference Books:

1. Bhagawan Sri Sathya Sai Baba: "Man Management: A Value-Based Management Perspective", Sri Sathya Sai Publications.

2. Lt. Gen. M.L.Chibber: "Sai Baba's Mahavakya on Leadership : Book for Youth, Parents and Teachers."

E-Resources:

1. http://rural.nic.in/netrural/rural/index.aspx

2. www.annapoorna.org.in

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Program Educational Objectives (PEOs)

The graduates of Computer Science and Engineering are expected to fulfill the following PEOs after a few years of their graduation.

PEO1	Graduates in Computer Science and Engineering will apply the technical knowledge of analysis and design of software used for sustainable societal growth.
PEO2	Graduates of Computer Science and Engineering will demonstrate logical thinking and programming skills.
PEO3	Graduates in Computer Science and Engineering will demonstrate good communication skills, dynamic leadership qualities with concern for environmental protection.
PEO4	Computer Science and Engineering graduates will be capable of pursuing higher studies, take up research and development work blended with ethics and human values.
PEO5	Computer Science and Engineering graduates will have the ability to become entrepreneurs there by switching over from responsive engineer to creative engineer.

Program Outcomes (POs)

PO1	**Engineering Knowledge:** Apply knowledge of mathematics and science, with fundamentals of Computer Science and Engineering to be able to solve complex engineering problems related to CSE.
PO2	**Problem Analysis:** Identify, Formulate, review research literature and analyze complex engineering problems related to CSE and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	**Design/ Development of solutions:** Design solutions for complex engineering problems related to CSE and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural societal and environmental considerations.
PO4	**Conduct Investigations of Complex problems:** Use research–based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to computer science related complex engineering activities with an understanding of the limitations.

PO6	**The Engineer and Society:** Apply Reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the CSE professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the CSE professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply Ethical Principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary Settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large such as able to comprehend and with write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.
PO12	**Life-Long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning the broadest context of technological change.

NAGARJUNA
COLLEGE OF ENGINEERING & TECHNOLOGY

An Autonomous College under VTU

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

VISION

Excellence in creating globally competent professionals and moulding them as leaders in Computer Science & Engineering education and research.

MISSION

M1: Maintaining excellence in Computer Science & Engineering education through academic professionalism, teaching, curricula which reflect the changing needs of the society.

M2: Establishing centre of excellence by creating knowledge through research and industrial exposure in the area of Computer Science & Engineering.

M3: Developing communication skill, leadership qualities, team work & skills for continuing education among the students.

M4: Inculcating ethics, human values and skills for solving societal problems and environmental protection.

M5: Validate engineering knowledge through innovative research projects to enhance their employability and entrepreneurship skills.

V to VIII Semesters

Scheme and Syllabus
With effect from Academic Year 2018-19

Fifth Semester B.E. – Scheme

Sl. No.	Course Code	Course Name	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	16CST51	Computer Networks	CS	3-0-0-0	3	100
2	16CSI52	Microcontrollers (IC)	CS/EC	3-0-2-0	4	100
3	16CST53	Operating Systems	CS	3-0-0-0	3	100
4	16CST54	Software Engineering and Testing	CS	3-0-0-0	3	100
5	16CSI55X	Foundation Elective-IV (IC)	CS	3-0-2-0	4	100
6	16CST56X	Engineering Elective-V /PBL	CS	3-0-0-0	3	100
7	16CSL57	Computer Networks Laboratory	CS	1-0-2-0	2	100
8	16CSL58	Operating Systems Laboratory	CS	1-0-2-0	2	100
9	16CSH59	General Aptitude	CS/BS&H	2-0-0-0	2	100
		Total		**22-0-8-0**	**26**	**900**

Foundation Elective-IV (IC)

Sl. No.	Course Code	Course Name
1	16CSI551	Advanced Algorithms
2	16CSI552	Object Oriented Programming with JAVA
3	16CSI553	Computer Graphics

Engineering Elective-V / PBL

Sl. No.	Course Code	Course Name
1	16CST561	Operations Research
2	16CST562	Computer Forensics (MOOCS)
3	16CST563	The Data Scientist's Toolbox (Certificate Course) Johns Hopkins University

Sixth Semester B.E. – Scheme

Sl. No.	Course Code	Course Name	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	16CST61	Unix System Programming	CS	3-0-0-0	3	100
2	16CST62	System Software	CS	3-0-0-0	3	100
3	16CSI63	Embedded Systems (IC)	CS	3-0-2-0	4	100
4	16CSI64X	Foundation Elective-VI (IC)	CS	3-0-2-0	4	100
5	16CST65X	Engineering Elective-VII /PBL	CS	3-0-0-0	3	100
6	16HOE66X	Open Elective-VIII	CS/BS&H	2-0-0-4	3	100
7	16CSL67	Unix System Programming Laboratory	CS	1-0-2-0	2	100
8	16CSH68	Technical Aptitude and GD	CS/BS&H	2-0-0-0	2	100
9	16CSP69	Mini Project and Seminar	CS	1-0-2-0	2	100
		Total		**21-0-8-4**	**26**	**900**

Foundation Elective-VI (IC)

Sl. No.	Course Code	Course Name
1	16CSI641	Data Mining
2	16CSI642	Database Concepts
3	16CSI643	Soft Computing

Engineering Elective-VII / PBL

Sl. No.	Course Code	Course Name
1	16CST651	Artificial Intelligence
2	16CST652	Network Security (MOOCS)
3	16CST653	Operations Analytics (Certificate Course) Wharton University of Business

Open Elective–VIII

Sl. No.	Course Code	Course
1	16HOE661	Lab View – Level 1
2	16HOE662	Yoga and Meditation
3	16HOE663	Martial Arts
4	16HOE664	Music (Carnatic Vocal / Instrumental)
5	16HOE665	Dance
6	16HOE666	Sports
7	16HOE667	Online Certification Courses from IITs / IISc / SWAYAM / EDX

Seventh Semester B.E. – Scheme

Sl. No.	Course Code	Course Name	Teaching Dept.	L-T-P-S (Hrs/ week)	Total Credits	Marks
1	16CSI71	Internet of Things (IoT) (IC)	CS	3-0-2-0	4	100
2	16CST72	Android Application Development	CS	2-0-0-0	2	100
3	16CSI73X	Foundation Elective-IX (IC)	CS	3-0-2-0	4	100
4	16CST74X	Engineering Elective-X /PBL	CS	3-0-0-0	3	100
5	16HOE75X	Open Elective-XI	CS/BS&H/ ME	2-0-0-4	3	100
6	16HOE76X	Open Elective-XII	CS/BS&H	2-0-0-4	3	100
7	16CSL77	Information and Network Security Laboratory	CS	1-0-2-0	2	100
8	16CSL78	Android Application Development Laboratory	CS	1-0-2-0	2	100
9	16CSP79	Project Phase-I and Seminar	CS	0-0-6-0	3	100
	Total			**17-0-14-8**	**26**	**900**

Foundation Elective - IX (IC)

Sl. No.	Course Code	Course Name
1	16CSI731	Object Oriented Modeling and Designing
2	16CSI732	Big Data
3	16CSI733	Web Technologies – Servlet, JSP

Engineering Elective - X / PBL

Sl. No.	Course Code	Course Name
1	16CST741	System Modeling and Simulation
2	16CST742	C# and .Net (MOOCS)
3	16CST743	Managing Big Data with MySQL (Certificate Course), Duke University

Open Elective - XI

Sl. No.	Course Code	Course Name
1	16HOE751	Tax Management
2	16HOE752	Assessment of Building Energy Performance (Offered by ASHRAE)
3	16HOE753	National Disaster Management and Mitigation
4	16HOE754	Certification Course (Online)

Open Elective - XII

Sl. No.	Course Code	Course Name
1	16HOE761	Small & Medium Enterprise Management
2	16HOE762	Occupational Safety and Health Administration
3	16HOE763	Animation and Multimedia Engineering
4	16HOE764	Certification Course (Online)

Eighth Semester B.E. – Scheme

Sl. No.	Course Code	Course Name	Teaching Dept.	Total Credits	Marks
1	16CSP81	Project Phase-II	CS	4	100
2	16CSP82	Project Phase-III	CS	4	100
3	16CSP83	Evaluation and Viva-voce (External)	CS	10	100
	Total			**18**	**300**

IC – Integrated Course   **L – Lecture**   **T-Tutorials**

              P-Practical   **S – Self Study**

Fifth Semester B.E. – Syllabus
Computer Networks

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST51	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Become familiar with the basics of data communications.
- Understand OSI and TCP/IP models.
- Understand the concepts of data link layer and network layer.
- Become familiar with the basics of packet switching.
- Understand the concepts of network security and network management and its applications.

Syllabus

Module – I

Introduction, Network model, Physical Layer & media: Data Communications, Networks, Protocols & Standards, Layered Tasks, The OSI model, Layers in OSI model, TCP/IP Protocol suite, Addressing, Transmission Impairment, Data Rate limits, Performance, Digital-digital conversion (Only Line coding: Polar, Bipolar and Manchester coding) **08 Hours**

Module – II

Switching & Data Link Layer: Introduction to switching, Datagram Networks, Virtual Circuit Networks, Error Detection & Correction: Introduction, Block coding, Cyclic codes, Checksum. **08 Hours**

Module – III

Data Link control, Network Layer: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy channels, HDLC, PPP (Framing, Transition phases only) Random access, Controlled Access, Channelization, Ethernet: IEEE standards. IPv4, IPv6. **08 Hours**

Module – IV

Packet Switching Networks, Network Security: Routing in Packet networks, Shortest path routing: Bellman-Ford algorithm, Overview of network security, secret key encryption protocol, public key encryption protocols. **08 Hours**

Module – V

Applications and Network Management, Mobile AdHoc Networks: Application layer overview, Domain Name System (DNS), Remote Login Protocols, E-mail, FTP, World Wide Web and HTTP, Network management. Overview of Wireless Ad-Hoc networks, Routing in AdHoc Networks, Routing protocols for AdHoc networks.   **08 Hours**

Course Outcomes

On completion of this course, students will be able to :

- Design and solve problems on shortest path routing algorithms.
- Analyze framing concepts, flow and error control algorithms.
- Explain concepts of cryptography algorithms.
- Design and apply application layer protocols.
- Analyze different networks.

Text Books:

1. Behrouz A. Forouzan: "Data Communication and Networking", 5th Edition, Tata McGraw-Hill, 2012, ISBN: 978-0-07-337622-6, (Chapters 1-4,8,10-13).

2. Alberto Leon-Garcia and Indra Widjaja: "Communication Networks -Fundamental Concepts and Key architectures," 2nd Edition, Tata McGraw-Hill, 2004, reprint 2007, ISBN-13: 978-0-07-059501-9, (Chapter 7).

3. Nader F. Mir: "Computer and Communication Networks", 2nd Edition, Pearson Education, 2015, ISBN: 0133814742, (Chapters 9,10,19).

Reference Books:

1. William Stallings: "Data and Computer Communication", 8th Edition, Pearson Education, 2007, ISBN-13: 978-0133506488.

2. Larry L. Peterson and Bruce S. Davie: "Computer Networks – A Systems Approach", 4th Edition, Elsevier, 2007, ISBN: 978-0-12-385059-1.

E-Resources:

1. https://archive.org/details/Data.Communications.and.Networking.5th.Edition

2. https://doc.lagout.org/network/Data%20Communications%20and%20Networking%20By%20Behrouz%20A.Forouzan.pdf

3. http://ptgmedia.pearsoncmg.com/images/9780133814743/samplepages/9780133814743.pdf

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Microcontrollers (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI52	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Gain knowledge about, microprocessors, microcontrollers and RISC & CISC CPU architectures.
- Learn the 8051 architecture and its assembly language programming.
- Familiarize with Embedded 'C' programming and counters & timers programming in 8051.
- Understand 8051 connections to RS-232 and Interrupts programming.
- Acquire knowledge about, interfacing of 8051 with LCD, Keyboard, DAC, ADC, Stepper motor.

Syllabus

Module – I

Introduction to Microcontrollers: Microprocessors and Microcontroller, Introduction, Difference between Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Embedded Electronic Systems and Microcontrollers, Comparison of different microcontrollers and applications.

The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input / Output Pins, Ports and Circuits, External Memory. **08 Hours**

Module – II

Assembly Language Programming in 8051: Addressing Modes and Instruction set: Introduction, Addressing modes, Data transfer instructions, Example Problems, Arithmetic instructions, Logical instructions, Example Problems, JUMP and CALL Program range, Jumps, calls and Subroutines, Returns, Example Problems. **08 Hours**

Module – III

Embedded 'C' Programming: 8051 programming in C: Data types and time delays in 8051 C, I/O programming, logic operations, data conversion programs, accessing code ROM space, data serialization. Timer / Counter Programming in 8051: Counters and timers programming 8051 Timers, Counter Programming, programming timers 0 and 1 in 8051 C. **08 Hours**

Module – IV

8051 Serial Communication: Basics of Serial Communication- Serial data input/ output, 8051 connections to RS-232, 8051 Serial Communication Programming

Interrupts Programming: 8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Interrupt programming in C **08 Hours**

Module – V

8051 Interfacing and Applications: Interfacing 8051 to LCD, Keyboard, DAC, ADC Stepper motor interfacing. **08 Hours**

Laboratory:

Programming for the 8051 Microcontroller:

1   a.   To perform the multiplication of two 16-bit numbers.

    b.   To implement (display) an eight bit UP/DOWN decimal counter on watch window.

2   a.   To sort block of data in ascending or descending order.

    b.   To interface a DAC & Generate a square wave with specified amplitude and frequency using DAC. Display the waveform on the CRO.

3   a.   To count number of ones and zeros in an eight bit number.

    b.   To interface an ADC and temperature Sensor to measure temperature.

4   a.   To convert an 8-bit BCD number into ASCII.

    b.   To Interface a stepper motor – and rotate it clock wise or anti clock wise through a given number of steps.

5   a.   To check whether given number is palindrome or not. If palindrome store FFh in accumulator else store 00h in accumulator.

    b.   To generate 1second delay continuously using on chip timer.

Course Outcomes:

On completion of this course, students will be able to :

- Explain the basic concepts of microprocessors, RISC & CISC CPU and architecture of 8051 microcontroller.
- Write assembly language programming in 8051.
- Develop assembly and embedded C Programming for 8051 microcontroller
- Discuss 8051 connections to RS-232 and Interrupts programming.

- Design and develop applications related to interfacing of 8051 to LCD, Keyboard, DAC, ADC, Stepper motor.

Text Books:

1. Muhammad Ali Mazidi, Rolin D. Mckinlay, Janice Gillispie Mazidi: "The 8051 Microcontroller: A Systems Approach", Pearson Education, Limited, 2013, ISBN: 1292027266, 9781292027265, (Chapters 1-3,5,7,8).

2. Kenneth J. Ayala: "The 8051 Microcontroller Architecture, Programming & Applications", 2nd Edition, Thomson Learning, 2005, ISBN: 0314772782, 9780314772787, (Chapters 1,4,5).

Reference Books:

1. Predko: "Programming and Customizing the 8051 Microcontroller", TMH, ISBN-10: 8131706974.

2. Raj Kamal: "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005, ISBN-13: 978-8131706978.

E-Resources:

1. https://yvuqarox.files.wordpress.com/2015/06/myke-predko-8051-pdf.pdf

2. https://books.google.co.in/books?id=pWlbvW0H3IAC&pg=PA663&lpg=PA663&dq=1.%09Rajkamal,+%E2%80%9CMicrocontrollers:+Architecture,

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Operating Systems

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST53	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to

- Learn various concepts of operating system
- Learn the concepts of Process synchronization
- Gain knowledge about deadlock's occurring in resource allocation.
- Understand the memory management function of operating system
- Realize the role of operating system in file management.

Syllabus   Module – I

Introduction to Operating Systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special-purpose systems; Computing environments. Operating System Services; Operating System structure; Virtual machines; Operating System generation; System boot. **08 Hours**

Module – II

Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication. Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Thread scheduling   **08 Hours**

Module – III

Process Synchronization: Synchronization: The critical section problem, semaphores, classical problems of synchronization.

Deadlocks: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.   **09 Hours**

Module – IV

Memory Management: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.

Virtual Memory Management: Background; Demand paging; Page replacement; Allocation of frames. **08 Hours**

Module – V

File System, Implementation of File System: File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. **07 Hours**

Course Outcomes

On completion of this course, students will be able to :

- Explain the concepts of Operating System Structure, Operations and Services.
- Design new techniques for Multithreaded Programming, Process Scheduling and Synchronization.
- Apply the skills of deal lock prevention and avoidance.
- Design and implement Memory management Algorithms.
- Explain the concept of file systems.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: "Operating System Principles", Wiley India, Chapters (1-12), 8th Edition, 2009. ISBN: 9781118063330.

Reference Books:

1. D.M Dhamdhere: "Operating systems - A concept based Approach", Tata McGraw-Hill, 2nd Edition, 2002. ISBN: 978–0–07–295769–3.

2. P.C.P. Bhatt: "Introduction to Operating Systems: Concepts and Practice", (Chapters: 1, 2, 31 to 3.4 , 4.1 to 4.4, 5.1 to 5.5, 6.1 to 6.7, 7, 8.1 to 8.6, 9.1 to 9.6, 10, 11.1 to 11.5, 12.1 to 12.6, 14.1 to 14.8, 21.1 to 21.9) , PHI, 4th Edition, 2008. ISBN: 978-81-203-4836-3.

3. Harvey M Deital: "Operating systems", Pearson Education, 3rd Edition, 1990, ISBN: 978-0131828278.

E-Resources:

1. http://nptel.ac.in/courses/106108101/

2. http://study.com/academy/lesson/computer-operating-systems-managing-hardware-and-software-resources.html

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Software Engineering and Testing

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST54	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the real world applications with the aid of software engineering techniques along with professional ethics and responsibilities.
- Understand the importance of SDLC life cycle in realtime.
- Learn Software and Hardware Testing.

Syllabus

Module – I

Introduction: FAQ's about software engineering, Professional and ethical responsibility. Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems. Critical Systems: A simple safety critical system; System dependability; Availability and reliability **08 Hours**

Module – II

Requirements and Project Management: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; The software requirements document. Project Management: Management activities; Project planning; Project scheduling. **08 Hours**

Module – III

Software Development and Verification and Validation: Agile methods; Extreme programming; Rapid application development. Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods.

08 Hours

Module – IV

A Perspective on Testing, Examples: Basic definitions, Test cases, Software testing: Component testing; Test case design; Test automation, Levels of testing.
Boundary Value Testing: Boundary value analysis, Robustness testing, Worst-case testing, Special value testing. **08 Hours**

Module – V

Equivalence Class Testing, Decision Table- Based Testing: Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.

Path Testing, Data Flow Testing: DD paths, Test coverage metrics, Basis path testing.

08 Hours

Course Outcomes:

On completion of this course, students will be able to :

- Apply the real world applications with the aid of software engineering techniques along with professional ethics and responsibilities.
- Explain the requirements engineering process, feasibility studies and its validation.
- Design software in structured, organized ways and demonstrate effective, practical ways to design and develop high quality software.
- Write Test cases , Test plan based on test scenario.
- Analyze using static analysis tools (Inspection, walk through and peer review) and automate high quality tests during unit and integration testing.

Text Book:

1. Ian Sommerville: "Software Engineering", 8th Edition, Pearson Education, 2007, ISBN-13: 978-0137035151.
2. Paul C. Jorgensen: "Software Testing, A Craftsman's Approach", 3rd Edition, Auerbach Publications, 2008, ISBN: 9781439889510.

Reference Books:

1 Roger S Pressman: "Software Engineering - A Practitioners approach", 7th Edition, McGraw Hill, 2007.
2. Pankaj Jalote: "An Integrated Approach to Software Engineering", Wiley India, 2009.
3. Myers GJ: "The Art of Software testing", Wiley-Dreantech India Pvt. Ltd., 2004.
4. Loise Tamres: "Introducing Software Testing", Pearson Education, 2003.

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Advanced Algorithms (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI551	3-0-2-0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Learn methods for solving recurrences, which are useful for describing the running times of recursive algorithms.
- Understand the graph search algorithms and network flow problems.
- Gain knowledge about number - theoretic algorithms
- Get exposed to string - matching algorithms.
- To introduce probabilistic analysis and randomized algorithms.

Syllabus

Module – I

Introduction: The role of algorithms in computing, Growth of Functions: Asymptotic notations; Standard notations and common functions; Methods for solving recurrences: The substitution method, The recurrence – tree method, The master method.

Amortized Analysis: Aggregate, Accounting and Potential Methods.   **09 Hours**

Module – II

Graph Algorithms: Introduction to Single – Source shortest paths: Variants, negative weight edges, Cycles, Representing Shortest paths, Relaxation, Bellman - Ford Algorithm; Single source shortest paths in a DAG; Dijkstra's algorithm, Johnson's algorithm.

Maximum Flow: Flow networks and Ford-Fulkerson method; Maximum bipartite matching   **09 Hours**

Module – III

Number - Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing.   **08 Hours**

Module – IV

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.   **07 Hours**

Module – V

Polynomials and the FFT: Representation of polynomials, The DFT and FFT, Efficient implementation of FFT. **07 Hours**

Laboratory

Note: The following programs can be executed on C/C++ .

1. Design, develop, and run a program to implement the Bellman-Ford algorithm
2. Design, develop, and run a program to implement a Monte Carlo algorithm to test the primality of a given integer.
3. Design, develop, and run a program to solve modular linear equations.
4. Design, develop, and run a program to solve string matching problem using naïve approach and the KMP algorithm.
5. Design, develop, and run a program to solve String matching problem using Finite Automata
6. Design, develop, and run a program to solve String matching problem using Robin Karp algorithm.

Course Outcomes

On completion of this course, students will be able to :

- Explain different asymptotic notations and their use in modern computing systems.
- Design and apply iterative and recursive algorithms.
- Design and implement graph and flow network algorithms.
- Design and analyze the algorithms for string matching.
- Describe the representation of polynomials, the DFT and also the implementation of FFT.

Text Books:

1. T. H Cormen, C E Leiserson, R L Rivest, C Stein: "Introduction to Algorithms", (Chapters 1,3,4,17,24-26,30,31,32), Prentice-Hall of India, 3rd Edition, 2010, ISBN: 9780262259460.
2. Kenneth A. Berman, Jerome L. Paul: "Algorithms", (Chapters 1,11,20), Cengage Delmar Learning, India, 2002, ISBN: 9788131505212.

Reference Book:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press, 2007, ISBN: 9788173716126

E-Resources:

1. http://staff.ustc.edu.cn/~csli/graduate/algorithms/book6/chap02.htm

2. http://www.cs.cornell.edu/courses/cs3110/2011sp/lectures/lec20-amortized/amortized.htm

3. http://staff.ustc.edu.cn/~csli/graduate/algorithms/book6/chap18.htm

4. https://en.wikipedia.org/wiki/Category:Graph_algorithms

5. http://staff.ustc.edu.cn/~csli/graduate/algorithms/book6/chap18.htm

6. http://staff.ustc.edu.cn/~csli/graduate/algorithms/book6/chap33.htm

7. https://en.wikipedia.org/wiki/String_searching_algorithm

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Object Oriented Programming with JAVA

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI552	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable the students to :

- Understand the basic concepts of Java Technology and its features.
- Understand the OOPs concepts.
- Learn methods for solving programs in Java.
- Effectively use data structures like Collections, Lists, etc.
- Write defensive programming using Exception Handling.

Syllabus

Module – I

Introduction to Java: Why Java, Flavors of Java, Java Designing Goal and Features, JVM / JDK / JRE / History of JDK / JDM, Usage of IDE (Eclipse, NetBeans)

Language Fundamentals: Data Types - Variables, keywords, operators; Selection / Iterative / Decision making statements

Introduction to OOPs Concepts: Inheritance - Polymorphism - Abstraction – Encapsulation **10 Hours**

Module – II

Arrays and Strings: Defining of an Array, Initializing and accessing an Array, Multi-Dimensional Array, String / StringBuffer / StringBuilder

OOPs in Java: Inheritance, Abstract class and interface, Abstract class Vs Interface

Packages and Wrapper Classes: Defining Package, Organizing Classes and interfaces in Packages, Package as Access Protection, Import and Static Import, Naming Convention for packages, What is Wrapper Class, Why Wrapper, How to handle wrapper Classes. **10 Hours**

Module – III

Exception Handling: What is Exception, Types of Exception, Exception Hierarchy, Custom excpetions.

The Collection Framework: Collection of objects, Collection Interfaces and Hierarchy, List and Map, Types of List, Types of Map, Iterator, Generics. **08 Hours**

Module – IV

Threads: Understanding Threads, Needs of Multi-Threaded Programming, Thread Life-cycle, Synchronizing Threads. **02 Hours**

Module – V

Project Work: To create a Contact Book application using the Core Java concepts learnt with special emphasis on OOPs concepts, Exception Handling, and Collections Framework. **10 Hours**

Laboratory

1. Programs covering Data Types and OOPs Concepts.
2. Programs covering Arrays and Strings, OOPS concepts in Java, Packages and Wrapper Classes.
3. Programs covering Exception Handling, The Collection Framework and Threads.

Course Outcomes:

On completion of this course, students will be able to :

- Explain the basic concepts of Java Technology and its features.
- Explain the OOPs concepts.
- Write programs in Java.
- Analyze data structures like Collections, Lists, etc.
- Write defensive programming using Exception Handling.

Text Books:

1. Herbert Schildt: "Java: The Complete Reference", McGraw Hill Education, 9th Edition, ISBN-10: 9339212096.
2. Dr. R. Nageswara Rao: "Core Java: An Integrated Approach", 1st Edition, Dreamtech Press, 2016, ISBN-10: 9351199258.

Reference Books:

1. Joshua Bloch: "Effective Java", Pearson Education, 2nd Edition, ISBN-10: 933257653X.
2. Cay S. Horstmann: "Core Java - Vol. I - Fundamentals", 10th Edition, Pearson Education, ISBN-10: 9332582718.

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Computer Graphics (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI553	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable the students to :

- Understand the basic principles of Computer graphics using OpenGL libraries.
- Learn methods to implement the algorithms and techniques necessary to produce basic 2D and 3D objects.
- Acquire knowledge on Graphical user interface.
- Study various operations on 2D and 3D objects like translation, scaling and rotation.
- Understand how to produce realistic images by position the camera coordinates, viewing angles, light and shade.

Syllabus

Module – I

Introduction to Computer Graphics: What is computer graphics?, Where computer graphics is used, Elements of pictures created in computer graphics, graphics display devices, graphics input primitives and devices. Initial steps in drawing figures: To get started making pictures, the OpenGL basic graphics primitives, line drawing in OpenGL, simple interaction with mouse and keyboard, designing menus. Additional drawing tool: Introduction, world windows and viewports. **10 Hours**

Module – II

From vertices to fragments: Basic Implementation Strategies; Four major tasks; Clipping; Line-segment clipping; Polygon clipping; Rasterization; Bresenham's algorithm; Polygon Rasterization; Hidden-surface removal; Antialiasing; Display considerations. **07 Hours**

Module – III

Transformation of Objects: Introduction to transformations, 3D affine transformations, how to change coordinate systems, affine transformations used in a program, to draw 3D scenes with OpenGL, Modelling shapes with polygonal meshes: Introduction to solid modelling with polygonal meshes. **08 Hours**

Module – IV

Three Dimensional Viewing: The camera revisited, to specify a camera in a program, perspective projection of 3D objects, to produce stereo views, taxonomy of projections. **07 Hours**

Module – V

Rendering faces for visual realism: Introduction, introduction to shading models, flat shading and smooth shading, adding hidden surface removal, to add texture to faces, to add shadows of objects, OpenGL 2.0 & the shading language(GLSL) **08 Hours**

Laboratory
Part-A
1. Plotting functions using dot plots.
2. Drawing the checkerboard.
3. Draw rubber rectangles: those that grow and shrink as the user moves the mouse.
4. Cohen Sutherland line clipping algorithm.
5. 3D scene rendered with shading.

Part-B

Develop a suitable graphics package to implement the skills learnt in the theory and the exercises indicated in Part-A. Use the OpenGL libraries

Course Outcomes:

On completion of this course, students will be able to :
- Design simple graphical user interface using OpenGL libraries.
- Implement basic 2D and 3D object using various rasterization and filling algorithms.
- Perform various transformation on 2D and 3D objects.
- Apply camera coordinate and decide the viewing angles for 2D and 3D objects.
- Apply light and shading to render faces for visual realism.

Text Books:
1. F.S. Hill, Jr, Stephen M. Kelley: "Computer Graphics Using OpenGL" (Chapters 1,2, 3.1,3.2,5,6.2,7,8), 3rd Edition, Pearson Education, 2009, ISBN: 978-81-317-2414-9.
2. Edward Angel: "Interactive Computer Graphics A Top-Down approach with OpenGL" (Chapter 7), 5th Edition, Pearson Education, 2009, ISBN: 978-81-317-2530-6.

Reference Books:
1. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes: "Computer Graphics", Pearson Education, 1997.
2. Donald Hearn and Pauline Baker: "Computer Graphics - OpenGL Version", 3rd Edition, Pearson Education, 2004.

E-Resources:
1. http://www.nptelvideos.in/2012/11/computer-graphics.html
2. https://www.tutorialspoint.com/computer_graphics/
3. www.graphics.cornell.edu/online/tutorial/

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Operations Research

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST561	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Understand quantitative methods and techniques for effective decision-making, model formulation and applications that are used in solving real world problems.
- Know the various techniques of OR, their applications and the relationship between a linear program and its dual.
- Learn different types of transportation and assignment models for optimization.
- Understand techniques that are used to plan, schedule and monitor large projects such as building construction, maintenance of computer system, research and development design etc.
- Acquire knowledge on decision making techniques under conflicting situations where there are one or more opponents.

Syllabus

Module – I

Introduction, Linear Programming: Introduction: The Origins, Nature and Impact of OR; Defining the Problem and Gathering Data; Formulating a Mathematical Model; Deriving Solutions from the Model; Testing the Model; Preparing to Apply the Model; Implementation.
Linear Programming: Prototype Example; The Linear Programming Model; Assumptions of Linear Programming; Additional Examples. **08 Hours**

Module – II

The Simplex Method: The Essence of the Simplex Method; Setting Up the Simplex Method; The Algebra of the Simplex Method; The Simplex Method in Tabular Form; Tie Breaking in the Simplex Method; Adapting to Other Model Forms.
Duality Theory: The Essence of Duality Theory; Primal-Dual Relationships; Adapting to Other Primal Forms; The Dual Simplex Method. **08 Hours**

Module – III

Transportation and Assignment Problems: The Transportation Problem; The Assignment Problem. **08 Hours**

Module – IV

Project Management with PERT/CPM: A Prototype Example- The Reliable Construction Co. Project; Using a Network to Visually Display a Project; Scheduling

a Project with PERT/CPM; Dealing with Uncertain Activity Durations; Considering Time-Cost Trade-Offs; Scheduling and Controlling Project Costs; An Evaluation of PERT/CPM. **08 Hours**

Module – V

Game Theory, Decision Analysis: Game Theory: The Formulation of Two-Person, Zero-Sum Games; Solving Simple Games--A Prototype Example; Games with Mixed Strategies; Graphical Solution Procedure; Solving by Linear Programming; Extensions. **Decision Analysis:** A Prototype Example; Decision Making without Experimentation; Decision Making with Experimentation; Decision Trees. **08 Hours**

Course Outcomes

On completion of this course, students will be able to :

- Develop Linear Programming models, interpret the models, solutions and infer solutions to the real-world problems.

- Solve the Linear problems by applying different techniques of Operations research.

- Build and solve Transportation models and Assignment models.

- Design new simple models like CPM to improve decision making and use critical path analysis, programming evaluation and review techniques for timely project scheduling and completion.

- Compare the characteristics of different types of decision making environments and the appropriate decision making approaches and tools to be used in each type.

Text Books:

1. Frederick S. Hillier, Gerald J. Lieberman: "Introduction to Operations Research: Concepts and Cases", 8th Edition, Tata McGraw Hill, 2005, ISBN-13: 978-0-07-060092-8, (Chapters: 1.1 to 1.3, 2, 3.1 to 3.4, 4.1 to 4.6, 6.1 to 6.4, 7.1, 8,10, 14.1 to 14.6, 15.1 to 15.4).

Reference Books:

1. S D Sharma: "Operations Research", KedarNath RamNath, 2007.

2. Hamdy A Taha: "Operations Research, An Introduction", 8th Edition, Pearson Education, 2007, ISBN: 81-203-2235-5.

3. Richard Bronson, Govindasami Naadimuthu: "Operations Research", SCHAUM'S Outlines, 2nd Edition, Tata Mcgraw-hill Edition, ISBN-13: 978-0-07-058400-6, ISBN-10: 0-07-058400-1.

E-Resources:

1. www.nptelvideos.in/2012/12/fundamentals-of-operations-research.html2.

2. www.freevideos.com/courses/2678/advanced-operations-research

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Computer Networks Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSL57	1-0-2-0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Become familiar with the working of network topology.
- Understand working of Ethernet LAN.
- Understand the concepts of mobile routing.
- Become familiar with the basics of TCP/IP.
- Understand the concepts of network security.

Part A

Simulation Exercises

The following experiments shall be conducted using either NS228/OPNET or any other suitable simulator.

1. Simulate a three nodes point - to - point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.

2. Simulate a four node point-to-point network with the links connected as follows: $n_0 - n_2$, $n_1 - n_2$ and $n_2 - n_3$. Apply TCP agent between $n_0 - n_3$ and UDP between $n_1 - n_3$. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.

3. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.

4. Simulate an Ethernet LAN using n nodes (6-10), change error rate and data rate and compare throughput.

5. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.

6. Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.

Part B

Implement the following in C/C++:

7. Write a program for error detecting code using CRC-CCITT (16- bits).

8. Write a program for distance vector algorithm to find suitable path for transmission.

9.   Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.

10. Implement the above program using as message queues or FIFOs as IPC channels.

11. Write a program for simple RSA algorithm to encrypt and decrypt the data.

12. Write a program for congestion control using leaky bucket algorithm.

Course Outcomes

On completion of this course, students will be able to :

- Analyse the working of network devices.

- Differentiate packet managements at different levels.

- Apply the knowledge of security algorithms.

- Discover shortest path using routing algorithms.

- Demonstrate the working of wireless networks.

Text Books:

1.   Behrouz A. Forouzan: "Data Communication and Networking", 5th Edition, Tata McGraw-Hill, 2012, ISBN: 978-0-07-337622-6.

2.   Alberto Leon-Garcia, Indra Widjaja: "Communication Networks -Fundamental Concepts and Key architectures", 2nd Edition, Tata McGraw-Hill, 2004, reprint 2007, ISBN-13: 978-0-07-059501-9.

3.   Nader F. Mir: "Computer and Communication Networks", 2nd Edition, Pearson Education, 2015, ISBN: 0133814742.

E- Resources:

1.   https://archive.org/details/Data.Communications.and.Networking.5th.Edition

2.   https://doc.lagout.org/network/Data%20Communications%20and%20 Networking%20By%20Behrouz%20A.Forouzan.pdf

3.   http://ptgmedia.pearsoncmg.com/images/9780133814743/samplepages /9780133814743.pdf

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Operating System Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSL58	1-0-2-0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Learn different types of operating systems.
- Learn the concept of CPU scheduling algorithms used in operating system.
- Understand Bankers algorithm used for deadlock avoidance and prevention.
- Learn the concept of Inter process Communication.
- Gain knowledge of Producer Consumer Problem.

Syllabus

Note: The following programs can be executed on C/C++ any equivalent language or tool with suitable platform.

1. Write a program to simulate the Round Robin Scheduling algorithm.
2. Write a program to implement the Shortest Job First algorithm.
3. Write a program to implement the First come First Serve algorithm.
4. Write a program to implement the Priority Scheduling algorithm.
5. Design and develop and run a program to implement Banker's algorithm.
6. Write a Program to implement Inter process Communication using Pipes.
7. Write a Program to implement Producer Consumer Problem.
8. Installation of Operating systems.

Course Outcomes

On completion of this course, students will be able to :

- Explain different types of operating systems and installation process.
- Implement CPU scheduling algorithms used in operating system.
- Implement Bankers algorithm used for deadlock avoidance and prevention.

- Design and implementation of Inter process Communication.
- Solve Producer Consumer Problem.

Reference Books:

1. D.M Dhamdhere: "Operating systems - A concept based Approach", Tata McGraw-Hill, 2nd Edition, 2002, ISBN: 978–0–07–295769–3.

2. P.C.P. Bhatt: "Introduction to Operating Systems: Concepts and Practice", PHI, 4th Edition, 2008, ISBN: 978-81-203-4836-3.

3. Harvey M Deital: "Operating systems", Pearson Education, 3rd Edition, 1990, ISBN: 978-0131828278.

E-Resources:

1. http://nptel.ac.in/courses/106108101/

2 http://study.com/academy/lesson/computer-operating-systems-managing-hardware-and-software-resources.html

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General Aptitude

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSH59	2:0:0:0	2	CIE:50 SEE:50	3 Hours	HSS

Course Objectives:

This course will enable students to :

- Understand different types of Numerical / Arithmetical problems.
- Understand the different Data interpretation problems.

Syllabus

Module – I

Numerical Ability-I: Numbers, HCF and LCM of numbers, Decimal Fractions, Average, Problems on Numbers, Problems on Ages. **06 Hours**

Module – II

Numerical Ability-II: Percentage, Profit and Loss, Ratio and Proportion, Partnership, Chain Rule, Time and Work. **05 Hours**

Module – III

Numerical Ability-III: Pipes and Cistern, Time and Distance, Problems on Trains, Alligation or Mixture, Simple Interest, Compound Interest. **05 Hours**

Module – IV

Numerical Ability-IV: Races and Games of Skill, Calender, Clocks, Permutations and Combinations, Probability, Odd man out and Series. **05 Hours**

Module-V

Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs. **05 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Solve and analyze different types of Numerical / Arithmetical problems.
- Solve and analyze different Data interpretation problems.

Text Books:

1. R S Aggarwal: "Quantitative Aptitude for competitive examinations", (Chapters 1-3,6-8,10-18,20-22,26-28,30,31,35-39), S. Chand Publishing, New Delhi, 2014, ISBN-13: 978-81-219-2498-6.

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Sixth Semester B.E. - Syllabus

Unix System Programming

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST61	3-0-0-0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Learn about the UNIX and POSIX standards.
- Become familiar with files and process.
- Understand the different APIs and details of Unix processes.
- Become familiar with handling fork function and race condition.
- Learn about inter process communication between client and server.

Syllabus

Module – I

Introduction: UNIX and ANSI Standards: The ANSI C Standard, The POSIX Standards, UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics. UNIX Files: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.   **08 Hours**

Module – II

UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs. UNIX Processes: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables.   **08 Hours**

Module – III

Process Control: UNIX Kernel Support for Processes. Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, Race Conditions, exec Functions, Interpreter Files, system Function, Process Accounting, User Identification, Process Times. Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control. **08 Hours**

Module – IV

Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, Kill, Alarm, Interval Timers, **Daemon Processes:** Introduction, Daemon Characteristics, Coding Rules, Error Logging.

Inter process Communication-1: Introduction, Pipes, popen, pclose Functions, Coprocesses, FIFOs. **08 Hours**

Module – V

Inter process Communication-2: System V IPC: Message Queues, Semaphores, Shared Memory. NETWORK IPC SOCKETS: Introduction; Socket Descriptors; Addressing; Connection establishment; Data transfer; Socket options; Out-of-band data; Nonblocking and asynchronous I/O. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Develop programs using UNIX/POSIX standards.
- Describe Unix APIs functions and Files.
- Analyse zombie process and job control.
- Explain UNIX kernel support for signals.
- Design and develop various IPC methods.

Text Books:

1. Terrence Chan: "UNIX System Programming Using C++", (Chapters 1.1, 1.4, 1.6, 5, 6, 7.1-7.6), Prentice Hall India, 1st Edition, 1999, ISBN: 9780133315622.

2. W. Richard Stevens, Stephen A. Rago: "Advanced Programming in the UNIX Environment", (Chapters 7, 8.1-8.6, 8.9, 8.10, 8.12-8.16, 9.1-9.8, 13.1-13.4,15.1-15.9, 16), Pearson Education / PHI, US, 2nd Edition, 2005, ISBN: 978-0321637734.

Reference Books:

1. Marc J. Rochkind: "Advanced UNIX Programming", Pearson Education, 2nd Edition, 2005.

2. Maurice J Bach,"The Design of the UNIX Operating System", Pearson Education,1st Edition, 1987.

3. Uresh Vahalia: "UNIX Internals: The New Frontiers", Pearson Education, 1st Edition, 2001.

E-Resources:

1. http://weshakucysysh.comunidades.net/unix-systems-programming-communication

2. https://www.pearson.com/us/higher-education/program/Rochkind-Advanced-UNIX-Programming-2nd-Edition/PGM155399.html

3. http://www.ewitedu.in/k_course/usp6/

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System Software

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST62	3-0-0-0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Learn fundamentals of system software.
- Gain knowledge about system software tool like assemblers.
- Understand the working of loaders and editors.
- Learn macroprocessors and its design.
- Study the concepts of Lex and Yacc programming.

Syllabus

Module – I

Machine Architecture: Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples.

Assemblers-1: Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures, Machine Dependent Assembler Features - Instruction Formats & Addressing Modes. **08 Hours**

Module – II

Assemblers-2: Program Relocation, Machine Independent Assembler Features – Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking, Assembler Design Operations - One-Pass Assembler, Multi-Pass Assembler. **08 Hours**

Module – III

Loaders and Linkers: Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader, Machine-Dependent Loader Features – Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader;

Editors and Debugging Systems: Text Editors - Overview of Editing Process, User Interface, Editor Structure, Interactive Debugging Systems - Debugging Functions and Capabilities. **08 Hours**

Module – IV

Macro Processor: Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine-Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion **08 Hours**

Module – V

Lex and Yacc: Lex and Yacc - The Simplest Lex Program, Recognizing Words With LEX, Symbol Tables, Grammars, Parser-Lexer Communication, The Parts of Speech Lexer, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written Lexers, Using LEX -Regular Expression, Examples of Regular Expressions, A Word Counting Program, Parsing a Command Line. **08 Hours**

Course Outcomes

On completion of this course, students will be able to :

- Acquire the basic concepts of system software.
- Acquire skills with the working principle of one pass and multi-pass assembler.
- Analyze the function of loaders and editors.
- Analyze the concepts of macroprocessors.
- Design and develop lex and yacc programming.

Text Books:

1. Leland.L.Beck: "System Software", 3rd Edition, Pearson Education, 1997, (Chapters 1.1 to 1.3, 2 (except 2.5.2 and 2.5.3), 3 (except 3.5.2 and 3.5.3), 4 (except 4.4.3)), ISBN-10: 817758555, ISBN-13: 9788177585551.
2. John.R.Levine, Tony Mason and Doug Brown: "Lex and Yacc," O'Reilly, SPD, 1998, (Chapters 1, 2 (Page 2-42), 3 (Page 51-65)), ISBN: 565920007, 9781565920002.

Reference Book:

1. D.M.Dhamdhere: "System Programming and Operating Systems", 2nd Edition, Tata McGraw - Hill, 1999, ISBN-13: 978-0072957693, ISBN-10: 0072957697.

E-Resources:

1. https://en.wikipedia.org/wiki/System_software
2. https://techterms.com/definition/systemsoftware
3. www.computerhope.com/jargon/s/systsoft.html
4. https://en.wikibooks.org/wiki/A...Program...Systems/System_software
5. https://www.techopedia.com/definition/5476/system-software

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Embedded Systems (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI63	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the embedded system technologies and applications of embedded systems
- Understand the communication buses for device networks of embedded systems.
- Learn the various issues involved in real-time operating systems.
- Know how these systems can handle the tasks and scheduling of the tasks
- Learn about embedded systems associated design and software development tools.

Syllabus

Module – I

Introduction to Embedded Systems: Embedded systems; Processor embedded into a system; Embedded hardware units and devices in a system; Embedded software in a system; Examples of embedded systems; Embedded System-on-Chip (SoC), Formalization of system design; Design process and design examples; Classification of embedded systems; Skills required for an embedded system designer.   **10 Hours**

Module – II

Communication Buses for Device Networks: Wireless devices; Timer and counting devices; Watchdog timer; Real time clock; Networked embedded systems; Serial bus communication protocols; Parallel bus device protocols; Internet enabled systems; Wireless and mobile system protocols.   **07 Hours**

Module – III

Real Time Operating Systems-1: Operating System services; Process management; Timer functions; Event functions; Memory management; Device, file and I/O sub-systems management; Interrupt routines in RTOS environment and handling of interrupt source calls.   **08 Hours**

Module – IV

Real Time Operating Systems-2: Real-Time Operating Systems; Basic design using an RTOS; RTOS task scheduling models, interrupt latency and response times of the tasks as performance metrics; OS security issues.   **08 Hours**

Module –V

Embedded Software Development Tools: Introduction; Host and target machines; Linking and locating software; Getting embedded software in to the target system;

Issues in hardware-software design and co-design; Testing on host machine; Simulators; Laboratory tools. **07 Hours**

List of Lab programs:

1. Intrusion detection in TCP/IP networks using immune systems paradigm and neural network detectors.

2. Network Tapping System Based on Customized Embedded Linux: Design and Implementation.

3. Network Intrusion Detection System Based on Embedded System - Off-line and On-line NIDS Based on Embedded System: Design and Implementation.

4. Packet Features Extractor for Network Security Systems: Design and Implementation.

5. Draft of Design and Implementation FSK Remote Control System Using ATmiga16 Microcontroller.

6. Text Code of Tx Rx remote control ATmiga16 Microcontroller.

Course Outcomes:

On completion of this course, students will be able to : :

• Describe the embedded system technologies and applications of embedded systems

• Differentiate communication buses for device networks of embedded systems

• Solve issues involved in real-time operating systems.

• Manage tasks scheduling of embedded systems.

• Design software development tools.

Text Book:

1. Raj Kamal: "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill Education, 2011, ISBN-10- 0-070-66764-0, ISBN-13: 978-0-070-66764-8, (Chapters 1-5,7-9,11,12).

Reference Book:

1. Shibu K V: "Introduction to Embedded Systems", Tata McGraw Hill, 2009, ISBN-10: 0070678790, (Chapters 1,2,4,6-10).

E-Resources:

1. http://info300.net/skhouri/sources.html

2. http://embedded-computing.com/articles/safety-security-and-source-code-for-industrial-embedded-systems-no-shortcuts/

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Data Mining (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI641	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable the students to :

- Understand the basic concepts, different types of data and data pre-processing methods.
- Understand the basic concepts and algorithms in association mining.
- Understand the different classification techniques.
- Identify the accuracy of diverse classifiers and predictors.
- Identify the appropriate clustering techniques for the given data sets.
- Familiarize with the various applications of Data Mining.

Syllabus

Module – I

Data Mining: Introduction, Challenges, Data Mining Tasks, Types of Data, Data Quality- Measurements and data collection errors, precision, bias, accuracy, missing value, inconsistent values, noise and artifacts, outliers, duplicate data, Data Preprocessing- aggregation, sampling, dimensionality reduction, discretization and binarization, Variable transformation. **08 Hours**

Module – II

Association Analysis: Association Analysis- Basic Concepts & Algorithms: Frequent Item set Generation. Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for generating Frequent Item sets, FP Growth Algorithm, Evaluation of Association Patterns–Objective Measures of Interestingness. **08 Hours**

Module – III

Classification: Basics, General approach to solve classification problem, Decision Trees Induction, Rule based classifiers, Nearest Neighbour Classifiers, Bayesian Classifiers, Artificial Neural Networks (ANN). **08 Hours**

Module – IV

Clustering Techniques: Overview, Features of cluster analysis, Types of Data & Computing Distance (Measures of Similarity &Dissimilarity), Different types of Clustering, Different types of clusters, K-means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation-Overview. **08 Hours**

Module – V

Mining different types of data: Text Mining-Text data analysis &informational retrieval, text mining approaches, Mining the world wide web-Mining web page

layout structure, Mining web's link structures, Web usage mining. Applications: Finance, Retail Industry, Intrusion detection. **08 Hours**

Laboratory

Part – A

1. Working with the Weka tool/ Rapid Miner Tool/R Tool

    Step 1: Dataset Creation

    Step 2: Preprocessing

    The preprocessing techniques that can be applied are as follows:

    a. Handling of Missing values for categorical and numerical values

    b. Redundancy Techniques.

    Step 3: Perform the following on the preprocessed dataset:

    a. Association mining

    b. Decision Tree Classification

    c. Naïve Bayes Classification

PART - B

1. Write a java/C++ program to perform aggregation and discretization on a given dataset.
2. Write a java/ C++ program to identify the frequent subsets from a frequent item set.
3. Write a java/ C++ program to identify strong rules from a set of rules given the confidence and support thresholds.
4. Write a java/ C++ program to implement the information gain and gini index measures to identify the best attribute to split.
5. Write a java/ C++ program to construct a Naïve Bayesian classifier for a given dataset.
6. Write a java/ C++ program to perform k-means clustering on numeric dataset.

Course Outcomes

On completion of this course, students will be able to : :

- Illustrate the data and various data reprocessing techniques.
- Design association mining approaches and analyze them.
- Design data classification methods and measures for evaluation.
- Generate clusters from the data using similarity measures.
- Apply data mining approaches in text and web and identify the applications of data mining.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: "Introduction to Data Mining", Pearson Education, 2005.

2. Jiawei Han and Micheline Kamber, (Chapters 1,2.1,2.2,2.3,4.1,5.1-5.4,6.1-6.7,8.1-8.5,10.3,10.4,10.5), Pearson Education, 2005, ISBN:032-132-1367.

3. Morgan Kaufmann: "Data Mining - Concepts and Techniques", 2nd Edition, Publisher, 2006, (Chapters 10.3,10.4,10.5), ISBN:978-81-312-0535-8.

Reference Book:

1. G. K. Gupta: "Introduction to Data Mining with Case Studies", 3rd Edition, PHI, New Delhi, 2009, ISBN: 978-8120330535.

E-Resources:

1. www-users.cs.umn.edu/~kumar/dmbook.

2. www.cs.ccsu.edu/~markov/ccsu_courses/datamining-1.html.

3. https://www.pearson.com/us/higher...Introduction-to-Data-Mining/PGM93748.html

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Database Concepts

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI642	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable the students to :

- Understand the basic concepts of database and Database Management System.
- Understand the difference between relational systems and non-relational systems.
- Get a clear understanding of how to maintain data (CRUD operations) in a relational database.
- Understand the working of a non-relational database.
- Get a clear understanding of how to maintain data (CRUD operations) in a non-relational database.
- Understand how Java programs can access database management systems using JDBC.

Syllabus

Module – I

Introduction to Database: Relational Database, Schemaless Database.

Introduction to SQL: DDL, DML, DQL, TCL, DCL.

Constraints: Not null, Unique, Primary key, foreign key.　　　　**08 Hours**

Module – II

Operators and Functions: Operators and Functions.

Joins, Inner queries, Co-related queries: Joins, Inner queries, Co-related queries.

　　　　07 Hours

Module – III

JDBC: JDBC API, Statement / Prepared Statements / Callable Statments, Result Set, CRUD operations.　　　　**05 Hour**s

Module – IV

MongoDB: Introduction and Installation, CRUD operations, Projections.　　**06 Hours**

Module – V

Project Work: To create a Banking application using the concepts of database management systems with special emphasis on Java, JDBC, and MySQL database.

　　　　14 Hours

Laboratory

1. Programs covering SQL, Constraints, Operators and Functions, Joins, Inner queries, Co-related queries.
2. Programs covering JDBC concepts.
3. Programs covering MongoDB concepts.

Course Outcomes

On completion of this course, students will be able to :

*   Explain the basic concepts of database and Database Management System.
*   Differentiate between relational systems and non-relational systems.
*   Describe how to maintain data (CRUD operations) in relational and non-relational database.
*   Manage Java programs to access database management systems using JDBC.
*   Save and retrieve data in a safe and consistent manner.

Text Books:

1. Rajiv Chopra: "Database Management Systems (DBMS)", 5th Edition, S Chand Publishing, ISBN-10: 9385676342.
2. Kristina Chodorow, Shroff: "MongoDB: The Definitive Guide", 2nd Edition, ISBN-10: 9351102696.

Reference Books:

1. Raghu Ramakrishnan: "Database Management Systems (Asia Higher Education Engineering/Computer Science)", 3rd Edition, McGraw Hill Education, ISBN-10: 007123151X.
2. Kyle Banker, Peter Bakkum, Shaun Verch: "MongoDB in Action: Covers MongoDB Version 3.0", 2nd Edition, Dreamtech Press, ISBN-10: 9351199355.

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Soft Computing (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI643	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Learn the fundamentals and major concept of Soft Computing and Neural Network.
- Study various architecture and phases of Neural Network.
- Extend the knowledge of Fuzzy Logic, Genetic Algorithms.
- Study the concepts of Hybrid Systems.
- Learn necessity in engineering field.

Syllabus

Module – I

Introduction: Introduction to Soft Computing, Historical Development, Definitions, advantages and disadvantages, solution of complex real life problems. **07 Hours**

Module – II

Neural Network: Introduction – Fundamental concept – Evolution of Neural Networks – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network. Supervised Learning Network: Perceptron Networks – Adaline – Multiple Adaptive Linear Neurons – Back-Propagation Network – Radial Basis Function Network. **09 Hours**

Module – III

Fuzzy Logic: Introduction to Classical Sets and Fuzzy sets – Classical Relations and Fuzzy Relations – Tolerance and Equivalence Relations – Noninteractive Fuzzy sets – Membership Functions: Fuzzification – Methods of Membership Value Assignments – Defuzzification – Lambda-Cuts for Fuzzy sets and Fuzzy Relations – Defuzzification Methods. **07 Hours**

Module – IV

Genetic Algorithms: Introduction – Basic Operators and Terminologies in GAs – Traditional Algorithm vs. Genetic Algorithm – Simple GA – General Genetic Algorithm – The Scheme Theorem – Classification of Genetic Algorithm – Holland Classifier Systems – Genetic Programming. Applications of Soft Computing: A Fusion Approach

of Multispectral Images with SAR Image for Flood Area Analysis – Optimization of Travelling Salesman Problem using Genetic Algorithm Approach- Genetic Algorithm based Internet Search Technique – Soft Computing based Hybrid Fuzzy Controllers – Soft Computing based Rocket Engine – Control. **09 Hours**

Module –V

Hybrid Systems: Genetic Algorithm based Backpropagation Network, Fuzzy – Backpropagation, Fuzzy Logic Controlled Genetic Algorithms. **07 Hours**

Laboratory

List of Experiments: (Work in Computation lab)

1. Problems based on GA and its applications in transportation.
2. Problems based on Fuzzy logic and its applications in transportation.
3. Problems based on ANN and its applications in transportation.
4. Problems based on hybrid systems and its application in transportation.

Design based Problems (DP)/Open Ended Problem:

1. Solving routing problem of mass transit system using GA
2. Developing trip generation relationship using ANN
3. Developing mode choice model using Fuzzy Logic
4. Obtaining optimal mix design of Bituminous Concrete using GA or Hybrid system

Course Outcomes:

On completion of this course, students will be able to :

- Implement the knowledge of Neural Network.
- Implement Fuzzy Sets, fuzzification, defuzzification.
- Design solutions for problems regarding probability, Mutation of crossover, convergence and Encoding.
- Use the soft computing techniques for daily problems.
- Implementation of soft computing and importance in engineering field.

Text Books:

1. S.N. Sivanandan, S.N. Deepa: "Principles of Soft Computing", (Chapters 1-15), Wiley India, 2007, ISBN-10: 81-265-1075-7.

2. S. Rajasekaran, G.A. Vijayalakshmi Pai: "Neural Network, Fuzzy Logic, and Genetic Algorithms - Synthesis and Applications", (Chapters 1-15), Prentice Hall, Page 1-435, 2005, ISBN: 8120321863.

3. Sinha, N.K., Gupta, M. M.: "Soft Computing and Intelligent Systems Theory and Applications", (Chapters 1-25), Academic Press, Page 1-625, 2000, ISBN-10: 0126464901, ISBN-13: 9780126464900.

Reference Books:

1. Fakhreddine karray, Clarence de Silva: "Soft Computing and Intelligent Systems Design - Theory, Tools and Applications", (Chapters 1-10), Addison Wesley, Page 1-533, 2004.

2. Klir, G. J. and Yuan, B.: "Fuzzy Sets and Fuzzy Logic: Theory and Applications", Prentice Hall, 1995.

E-Resources:

1. https://link.springer.com/referenceworkentry/10.1007/978-0-387-30440-3_15

2. http://www.faadooengineers.com/threads/9513-Soft-computing-full-notes-pdfs-ebooks

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Artificial Intelligence

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST651	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:
This course will enable students to

- Understand AI technique to a given concrete problem
- Study non-trivial AI techniques to handle complex problem
- Understand uncertainty and Problem-solving techniques.
- Learn various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent.
- Understand different logical systems for inference over formal domain

Syllabus

Module – I
Introduction: What is AI? Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents. Problem solving: Problem-solving agents; Example problems; Searching for solution; Uninformed search strategies.

09 Hours

Module – II
Informed Search, Exploration, Constraint Satisfaction, Adversial Search: Informed search strategies; Heuristic functions; On-line search agents and unknown environment. Constraint satisfaction problems; Backtracking search for CSPs. Adversial search: Games; Optimal decisions in games; Alpha-Beta pruning. **08 Hours**

Module – III
Logical Agents: Knowledge-based agents; The wumpus world as an example world; Logic; propositional logic Reasoning patterns in propositional logic; Effective propositional inference; Agents based on propositional logic. **07 Hours**

Module – IV
First-Order Logic, Inference in First-Order Logic-1: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic; Knowledge engineering in first-order logic. Propositional versus first-order inference; Unification and lifting

08 Hours

Module – V
Inference in First-Order Logic-2: Forward chaining; Backward chaining; Resolution.

08 Hours

Course Outcomes:

On completion of this course, students will be able to :

- Design intelligent agents for solving simple gaming problems.
- Apply non-trivial AI techniques to handle complex problems.
- Apply various symbolic knowledge representation to specific problems.
- Design Knowledge-based agents.
- Describe syntax and semantics of first-order logic.
- Explain inference in first order logic.

Text Book:

1. Stuart Russel, Peter Norvig: "Artificial Intelligence A Modern Approach", 2nd Edition, Pearson Education, 2003, (Chapters 1.1, 2, 3.1 - 3.4, 4.1, 4.2, 4.5, 5.1, 5.2, 6.1- 6.3, 7, 8, 9, 10, 11.1, 11.2, 11.4, 11.5, 13.1, 13.4, 13.5, 13.6,) ISBN:0-13-103805-2.

Reference Books:

1. Elaine Rich, Kevin Knight: "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009, ISBN-10: 0070087709

2. Nils J. Nilsson: "Principles of Artificial Intelligence", Elsevier, 1980, ISBN: 978-3-540-11340-9.

E-Resources:

1. http://stpk.cs.rtu.lv/sites/all/files/stpk/materiali/MI/Artificial%20Intelligence%20A%20Modern%20Approach.pdf.

2. http://www.getfreeebooks.com/16-sites-with-free-artificial-intelligence-ebooks/

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LabVIEW - Level I

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE661	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the fundamental of graphical coding system.
- Learn to develop basic level of LabVIEW coding.
- Study the different component of LabVIEW operating tools.
- Study and develop state machine for a specific problem.
- Develop integrated coding solution for analysis and presentation with MyRio hardware using accelerometer.

Syllabus

Module - I

LabVIEW programming concepts, environment and Software constructs: Data flow, Polymorphism, Front panel window, block diagram, and connector pane, Menus and palettes, Configuration options. Controls, indicators, IO controls, and refnums Terminals, constants, nodes, update modes, and legends of charts and graphs. Mechanical action of Boolean objects Property Nodes. Numeric, string, Boolean, and path data types. Array and cluster data types. Shift registers, Case, Sequence and Event structures. **10 Hours**

Module - II

Programming, Data communication and synchronization VIs and functions: Conversion, comparison, and manipulation, Timing and Timing functions related to Timed structures. Data storage and file I/O formats, Waveform and waveform file I/O, Dynamic and User events Local, global, and shared variables Data Socket TCP and UDP Notifiers Queues Semaphores Property Nodes, and Invoke Nodes. **08 Hours**

Module - III

Error handling VIs and functions: Error clusters Dialog and User Interface VIs Custom error codes.

Design patterns: Simple state machine, User interface event handler, Queued message handler, producer/consumer (data) and producer/consumer (events), Functional global variables. **06 Hours**

Module - IV

Sub VI design: SubVI creation methods, Connector panes and connection types, Polymorphic subVIs, Options related

Debugging tools and techniques: Debugging tools, Error list window, Execution highlighting, Breakpoints and single stepping, Generic and custom probes, Debugging practices and techniques for different situations.   **08 Hours**

Module - V

VI design and documentation (style) practices: Refer to the LabVIEW Style Checklist topic of the LabVIEW Help for information on the following items

   i.   User interface design and block diagram layout

   ii.   Modular and hierarchical design

   iii. SubVI icons and connector pane layout (standard)

   iv.   Properties

   v.   Documenting Vis

Memory, performance, and determination

   a.   Tools for identifying memory and performance issues

         Profile memory and performance, Show buffer allocations and VI metrics

   b.   Programming practices

Enforcing dataflow, User interface updates and response to user interface controls, Data type selection, coercion, and buffer allocation, Array, string, and loop operations   **08 Hours**

Course Outcomes:
On completion of this course, students will be able to :

   •   Formulate basic aspects of the graphical programming using LabVIEW 2016.

   •   Develop LabVIEW coding for a specific problem of datalogging, measurement and presentation.

   •   Handle the error function and errors in the LabVIEW coding.

   •   Develop coding for data handling and Analysis on the acquired data.

   •   Design a state machine LabVIEW coding for an applied problem.

Text Books:

1. "LabVIEW - Getting Started with LabVIEW", M/s National Instruments, 2013 373427J-01.

2. Jovitha Jerome: "Virtual instrumentation using labview", PHI Learning Pvt. Ltd., 2010.

3. Hans-Petter Halvorsen: "Introduction to LabVIEW," University College of Southeast, Norway.

4. S. Sumathi, P. Surekha, "LabVIEW based Advanced Instrumentation Systems", Springer.

5. Lab manual provided by Dept. of Civil Engg., NCET.

Reference Books:

1. Jeffrey Travis, Jim Kring: "Introduction to Graphical Programming with LabVIEW", Pearson, 2006.

2. Malan Shiralkar: "LabVIEW Graphical Programming Course Collection", National Instruments.

E-Resources:

1. http://cnx.org/content/col10241/1.4.

Yoga and Meditation

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE662	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Introduce the main principles of Yoga.
- Generate knowledge and skills of students to use the tools and techniques for using Yoga in day to day life for better health and well being.
- Improve communication and increase concentration through Yoga and Meditation.
- Equip the individual to handle stressful situations and manage day to day activities.

Syllabus

Module – I

Definition and meaning of yoga: Meaning of Asanas, Types of Asanas: standing, sitting and supine asanas. Standing Asanas (Trikon asan, padhastasan, ardhachakrasan, veerbhadrasan), Sitting Asanas (Vajrasan, padmasan, suptavajrasan, Ardhamaschendrasan, vakrasan), Supine Asanas (Sarvangasan, Matsyasan, Natarajasan, Shavasan) **08 Hours**

Module – II

Patanjali's Yoga Sutra: Eight limbs of yoga, Importance of discipline in Yoga, Stillness of mind, Five Modulations (vritti) of the mind, Practice and Dispassion, Obstacles in the path of Yoga, Overcoming distractions of the mind through Yoga. **08 Hours**

Module – III

Understanding physiological implications of Yoga, Three types of Gunas (Satva, Rajas and Tamas) and their effects on body and mind, Food Habits, Meaning of Prana, Pranayama and its advantages, Different types of Pranayama. **08 Hours**

Module – IV

Ayurveda: The science of life, Three types of doshas (Vata, Pitta and Kapha), Balancing the different doshas for a healthy life, Ayurvedic principles of food and activity, Advanced Asanas: Mayurasana, Sirsasana, Gomukh Asana, Vrkshasana, Baddha Konasana. **08 Hours**

Module – V

Meditation: Meaning of meditation, Meditation vs Concentration, Advantages of Meditation, Effects of Meditation on body and mind, Effect on health and general well being, Reducing stress through meditation, Increasing concentration, Improving communication, Effect on Environment   **08 Hours**

Course Outcomes:
On completion of this course, students will be able to :

- Know the basic principles of Yoga.

- Know and practice the basic asanas and their benefits.

- Use Pranayama and Meditation for improving health and mental peace.

- Know the difference between meditation and concentration.

- Apply the principles of Ayurveda and implement them for one's benefit.

Text Books:
1. Yoga Sutras of Patanjali (ancient text).
2. B K S Iyengar: "Light on Yoga".

Reference Books:
1. A traditional touch to Yogasanas for beginners and Sadhakas, Swami Vivekananda Yoga Prakashana (SVYP).
2. Dr. Vasant Lad: "Ayurveda: The Science of Self-Healing: A Practical Guide".

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Martial Arts

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE663	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

The following types of Martial arts are offered,

1. Karate
2. Taekwondo
3. Judo
4. Kung-fu

Expert Trainers will be provided during the academic year through experts in Martial Arts. Students who enroll for this elective should attend the regular Training classes and maintain a minimum of 85% attendance.

At the end of the training programme the performance Evaluation will be made by team of experts. Students who secure at least a satisfactory grade will be issued a certificate and deemed to have been completed the above said 3 Credit course. However, the students who have shortage of attendance will be consider for the award of 3 credits provided they undergo training at any of the training centers in the above said Martial Arts, complete the certification programme and give a demo along with viva in the presence of experts in the campus.

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Music (Carnatic Vocal/Instrumental)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE664	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Get familiarized with the conceptual understanding of Carnatic music.
- Gain knowledge about the basics of Swaravalis.
- Understand the use of different Talas.
- Gain understanding about various Raagas.
- Gain understanding about intricacies of Swaras.

Syllabus

Module – I

Theoretical Aspects: Father of Carnatic music, Famous personalities in Carnatic music, Concept of Sapta Swara, Taala, Melody, Pitch, Rhythm, Janaka Raaga, Janya Raaga. **03 Hours**

Module – II

Sarale Varase (Any 5), Janti Varase (Any 5), Daatu Varase, Tara Stayi, Mandra Stayi.

08 Hours

Module – III

Alankaras: Druva Taala, Matya Taala, Triputa Taala, Rupaka Taala, Jampe Taala, Atta Taala, Eka Taala. **08 Hours**

Module – IV

Geethagalu, Pillari Geethe (4), Sanchari Geethe (5), Lakshana Geethe (1). **10 Hours**

Module – V

Swarajatis (Any 2), Kalyani, Bilahari, Neelambari, Kamach.
Varna (Any 2), Shankarabarana, Kalyani, Hamsadwani , Mohana. **10 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Gain knowledge about the theoretical background of carnatic music
- Acquire practical knowledge on basics of Carnatic music.
- Practical demonstration of different Talas.
- Distinguish among various Raagas based on swara sthanas.
- To synchronize the Raaga and Taala.

Text books:

1.   Dr. Sachidevi: "Karnataka Sangeetha Darpana", Sreenivasa Prakashana, Bengaluru, 2014.

2.   Junior Carnatic Music – C Shiva Musicals, Malleshwaram, Bengaluru, 2013.

Dance (Bharatanatya)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE665	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :
- Gain theoretical knowledge about various types of Indian dances.
- Understand about various musical instruments used in Bharatanatya.
- Learn Practical demonstrations of Bharatanatya steps on Prarthane Namaskara and Shlokas.
- Learn the movements of head, neck, eyes, hands according to Bharatanatya steps.
- Learn the brisk movements in Bharatanatya with the help of ADAVUS.

Syllabus

Module – I

Indian Classical dance, It's history and Significance, Types of Classical Dance, Bharatanatya, Kathakali, Mohini Attam, Koochipudi, Katahak, Odissi, Manipuri.

04 Hours

Module – II

Musical Instuments used in Bharatanatya: Tabala, Mrudanga, Kamsale, Kolata, Taala vadya. Famous personalities in Bharatanatya, Composers of Natya Grantas.

03 Hours

Module – III

Practical exercises on Prarthane, Namaskara and Shloka, Vyayama Kriye for Bharatanatya (Two Shlokas and Two Prarthanes).   **10 Hours**

Module – IV

Abhinaya Steps (Chaturvidha) ShiroBedha, Drushti Bedha, Greeva Bedha, Brubedha, Hasta Bedha (Samyuta and Asamyuta).   **10 Hours**

Module – V

Adavugalu (DashaVidha) Tattu adavu, Mettu Adavu, Nat Adavu, Egaru Tattu Adavu, Egaru Mettu adavu, Jaaru Adavu, Mandi adavu, TattuMettu Adavu, Rangakarma Adavu, Teermana Adavu.   **12 Hours**

Course Outcomes:

On completion of this course, students will be able to :
- Get an insight into various types of Indian dances.
- Gain knowledge of different instruments used to perform dance.
- Perform exercises on prarthane, Namaskara according to Bharatanatya style.
- Perform basic steps in Abhinaya.
- Recognise and perform different Adavus.

Reference Book:

1. "Bharatanatya shastra", Department of Public Instruction, Karnataka State Government**.**

Sports

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE666	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Students who are selected by the University to represent the VTU teams and for participating at State level / National level Sports in the following sports are exempted from taking open elective (Code:16HOE666) and will be awarded 3 credits.

Outdoor games	Indoor games
Cricket	Carrom
Foot ball	Chess
Hockey	Shuttle Badminton
Basket Ball	Squash
Kabbadi	Table – Tennis
Kho – Kho	Gymnastics
Hand – Ball	
Athletics	
Swimming	
Lawn Tennis	

 The achievement in Sports as said above should have been made during the academic year during which the said open elective is offered.

After representing at VTU / State / National level in any of the above said sports, the students should produce the certificates from the competent authorities. Based on the certificates the institution will issue another certificate related to the achievement and awarding of three credits.

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Unix System Programming Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSL67	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Learn UNIX environment efficiently.
- Understand and dvelop program to know system configuration options.
- Learn inter process communication technique.
- Understand and use of UNIX APIs.
- Learn the race condition.

Syllabus

1. Write a C/C++ POSIX compliant program to check the following limits:
   (i) No. of clock ticks
   (ii) Max. no. of child processes
   (iii) Max. path length
   (iv) Max. no. of characters in a file name
   (v) Max. no. of open files/ process

2. Write a C/C++ POSIX compliant program that prints the POSIX defined configuration options supported on any given system using feature test macros.

3. Consider the last 100 bytes as a region. Write a C/C++ program to check whether the region is locked or not. If the region is locked, print pid of the process which has locked. If the region is not locked, lock the region with an exclusive lock, read the last 50 bytes and unlock the region.

4. Write a C/C++ program which demonstrates inter process communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIs in your program.

5. a) Write a C/C++ program that outputs the contents of its Environment list
   b) Write a C / C++ program to emulate the unix ln command

6. a) Write a C/C++ program to illustrate the race condition.
   b)Modify the above program to avoid the race condition

7. Write a C/C++ program that creates a zombie and then calls system to execute the ps command to verify that the process is zombie.

8. Write a C/C++ program to avoid zombie process by forking twice.

9.   Write a C/C++ program to implement the system function.

10. Write a C/C++ program to set up a real-time clock interval timer using the alarm API.

Course Outcomes:

On completion of this course, students will be able to :

- Implement POSIX feature test macros.

- Design system function.

- Examine emulation of ln command.

- Identify the zombie process.

- Design file and record locking concept.

E-Resources:

1.   http://weshakucysysh.comunidades.net/unix-systems-programming-commun ication

2.   https://www.pearson.com/us/higher-education/program/Rochkind-Advanced-UNIX-Programming-2nd-Edition/PGM155399.html

3.   http://www.ewitedu.in/k_course/usp6/

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Technical Aptitude and GD

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSH68	2:0:0:0	2	CIE:50 SEE:50	3 Hours	HSS

The respective branches shall conduct training programmes related to important and latest programming languages and other emerging technologies, such as Solar and Electric power based gadgets, IoT, ROBOT's, Environmental friendly and cost effective construction techniques, UAV's and technologies pertaining to the respective department.

Seventh Semester B.E. – Syllabus

Internet of Things (IoT) (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI71	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course objectives:

This course will enable students to :

- Study Vision and Introduction to IoT.
- Understand IoT Market perspective.
- Understand Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Learn Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Syllabus

Module – I

IoT and Web Technology: The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.   **08 Hours**

Module – II

M2M to IoT - A Basic Perspective: Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.   **06 Hours**

Module – III

M2M to IoT- An Architectural Overview: Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.   **06 Hours**

Module – IV

IoT Architecture - State of the Art: Introduction, State of the art.

Architecture Reference Model: Introduction, Reference Model and architecture, IoT reference Model.

IoT Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.　　**10 Hours**

Module – V

IoT Applications for Value Creations: Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.　　**10 Hours**

Laboratory

1. Sketch the architecture of IoT Toolkit and explain each entity in brief.
2. Demonstrate a smart object API gateway service reference implementation in IoT toolkit.
3. Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit.
4. Explain application framework and embedded software agents for IoT toolkit.
5. Explain working of Raspberry Pi.
6. Connect Raspberry Pi with your existing system components.
7. Give overview of Zetta.

Design based Problems (DP) / Open Ended Problem:

1. How do you connect and display your Raspberry Pi on a Monitor Or TV?
2. Create any circuitry project using Arduino.

Major Equipment:

1. Raspberry pi, Arduino

Course Outcomes:

On completion of this course, students will be able to :

- Explain the vision of IoT from a global context.
- Determine the Market perspective of IoT.

- Examine Devices, Gateways and Data Management.
- Describe the building state of the IoT architecture.
- Apply IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

Text Book:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle: "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, (Chapters 1-4,8-10), Academic Press, 2014, ISBN: 9780080994017.

Reference Books:

1. Vijay Madisetti, Arshdeep Bahga: "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.

2. Francis daCosta: "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

E-Resources:

1. https://github.com/connectIOT/iottoolkit
2. https://www.arduino.cc/
3. http://www.zettajs.org/
4. Contiki (Open source IoT operating system)
5. Arduino (Open source IoT project)

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Android Application Development

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST72	2:0:0:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:
This course will enable students to :
- Learn Android SDK features and the Development Framework and understanding activities.
- Study adaptive, responsive user interfaces that work across a wide range of devices.
- Understand background work and long-running tasks in Android applications.
- Know the concepts of Storing, sharing and retrieving data in Android applications.
- Learn how permissions, security and performance affect application. Finally, make sure your app is ready to share with the world, and publish it.

Syllabus

Module – I
What Is Android?, Android Versions, Features of Android, Architecture of Android, Android Devices in the Market, The Android Market, Obtaining the Required Tools, Eclipse, Android SDK, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs), Creating Your First Android Application, Anatomy of an Android Application. Understanding Activities, Applying Styles and Themes to Activity, Hiding the Activity Title, Displaying a Dialog Window, Displaying a Progress Dialog, Linking Activities Using Intents, Resolving Intent Filter Collision, Returning Results from an Intent.   **05 Hours**

Module – II
Understanding the Components of a Screen, Views and View Groups, Linear Layout, Absolute Layout, Table Layout, Relative Layout, Frame Layout, Scroll View, Adapting to Display Orientation, Anchoring Views, Resizing and Repositioning, Managing Changes to Screen Orientation, Persisting State Information during Changes in Configuration, Detecting Orientation Changes, Controlling the Orientation of the Activity, Creating the User Interface Programmatically, Basic Views .   **05 Hours**

Module – III
Using Image Views to Display Pictures - Gallery and Image View Views, Image Switcher, Grid View, Using Menus with Views - Creating the Helper Methods, Options Menu, Context Menu, Saving and Loading User Preferences - Using get Shared Preferences(), Using get Preferences(), Persisting Data to Files - Saving to Internal Storage, Saving to External Storage (SD Card), Choosing the Best Storage Option, Using Static Resources, Creating and Using Databases.   **05 Hours**

Module – IV
Sharing Data in Android, Using a Content Provider - Predefined Query String Constants, Projections, Filtering, Sorting, Creating Your Own Content Providers - Using

the Content Provider. SMS Messaging - Sending SMS Messages Programmatically, Getting Feedback After Sending the Message, Sending SMS Messages Using Intent, Receiving SMS Messages, Updating an Activity from a Broadcast Receiver, Invoking an Activity from a Broadcast Receiver.   **06 Hours**

Module – V

Creating Your Own Services - Performing Long-Running Tasks in a Service, Performing Repeated Tasks in a Service, Executing Asynchronous Tasks on, Separate Threads Using IntentService, Communicating between a Service and an Activity, Binding Activities to Services. Preparing for Publishing, Versioning, Digitally Signing Your Android Applications, Deploying APK Files - Using the adb.exe Tool, Using a Web Server, Publishing on the Android Market, Creating a Developer Profile, Submitting Your Apps.   **05 Hours**

Course Outcomes:

On completion of this course, students will be able to :
* Comprehend the basic features of Android Platform and Create Activities in Android.
* Demonstrate the design concepts of user interface using components, views and menus in Android.
* Create and use databases for Android Application.
* Implement messaging services in Android.
* Deploy mobile applications in various marketplaces for distribution.

Text Books:

1. Wei – Meng Lee: "Beginning Android Application Development", Wiley Publications, (Chapters 1-8,10,11),
2. Reto Meier: "Professional Android for Application Development", Wiley Publications.

Reference Books:

1. Mark Murphy: "Beginning Android 3"; Apress Springer India Pvt Ltd, 1st Edition, 2011, ISBN-13: 978-1-4302-3297-1.
2. Sayed Hashimi, Satya Komatineni, Dave MacLean: "Pro Android 4", Apress Springer India Pvt Ltd., 1st Edition, 2012, ISBN: 978-1-4302-3930-7.
3. Reto Meier: "Professional Android 2 Application Development", Wiley India Pvt. Ltd., 1st Edition, 2012, ISBN: 9788126525898.
4. James Steele: "The Android Developer's Cookbook Building Applications with the Android SDK", Addison-Wesley Professional, 2010.

E-Resources:

1. https://developers.google.com/training/adf
2. https://goo.gl/ADKvq8
3. https://innovator.samsungmobile.com

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Object Oriented Modeling and Design (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI731	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand the concepts of object oriented approach to perform systems analysis and design.
- Learn the importance and limitations of object-oriented analysis and design.
- Show how object oriented analysis and design is applied in development of software.
- Point out the importance of UML model throughout the process of object oriented modeling and design.
- Gain the necessary knowledge and skills in using object-oriented CASE tools

Syllabus

Module-I

Introduction, Modeling Concepts, class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history

Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models.   **08 Hours**

Module-II

Advanced Class Modeling, State Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages.

State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; examples.   **08 Hours**

Module-III

Advanced State Modeling, Interaction Modeling: Advanced State: Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models.

Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.

08 Hours

Module-IV

Process Overview, System Conception, Application Analysis: Process Overview: Development stages; Development life cycle.

System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.

Application Analysis: Application interaction model, Application class model, application state model, adding operations.   **08 Hours**

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Module-V

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System Design: Application Design and implementation modeling: Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.   **08 Hours**

Laboratory

Develop a mini-project for the following 12 exercises listed below,

1. To develop a problem statement.
2. Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt chart).
3. Identify Use Cases and develop the Use Case model.
4. Identify the business activities and develop an UML Activity diagram.
5. Identity the conceptual classes and develop a domain model with UML Class diagram.
6. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
7. Draw the State Chart diagram.
8. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
9. Implement the Technical services layer.
10. Implement the Domain objects layer.
11. Implement the User Interface layer.
12. Draw Component and Deployment diagrams.

Suggested domains for Mini-project.

1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. 5.Online course reservation system
6. E-ticketing

7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference Management System

Course Outcomes:

On completion of this course, the students are able to :

- Construct models to Show the importance of systems analysis and design in solving complex problems
- Recognize the difference between various object relationships: inheritance, association, and dependency relationships.
- Represent an object-oriented system using a number of modeling views.
- Apply the role and function of each UML model in developing object-oriented software.
- Estimate System performance and construction of UML models and expressing the appropriate notation associated with each model.

Text Book:

1. Michael Blaha, James Rumbaugh: "Object-Oriented Modeling and Design with UML", 2nd Edition, Pearson Education, 2005, (Chapters 1,2,4-7,10,11,13,14,17), ISBN: 978-81317-1106-4.

Reference Books:

1. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: "UML 2 Toolkit", Wiley - Dreamtech India, 2004, ISBN: 978-0-471-46361-0.
2. Grady Booch: "Object-Oriented Analysis and Design with Applications", 3rd Edition, Pearson Education, 2007, ISBN-13: 978-0201895513.

E-Resources:

1. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_functional_modeling.htm
2. https://en.wikipedia.org/wiki/Object-oriented_analysis_and_design

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Big Data (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI732	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand big data, types, benefits, industry examples for business intelligence.
- Understand NoSQL data models.
- Learn how to manage Nosql data with multiple databases.
- Understand Hadoop, map-reduce architecture and Fundamentals.
- Learn HBase, Cassandra, Cassandra Query language, data replication.

Syllabus

Module – I

Overview of Big Data: Defining Big Data, Big Data Types, Analytics, Industry Examples of Big Data, Benefits of Big Data, Crowd Sourcing Analytics, Indian Big Data companies. **07 Hours**

Module – II

NoSQL Data Management-1: Introduction to NoSQL, aggregate data models, aggregates, key, value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, version, Map reduce, partitioning and combining, composing map-reduce calculations.

08 Hours

Module – III

NoSQL Data Management-2: Key Value Databases, Document Databases, Column Family Stores, Graph Databases. **08 Hours**

Module – IV

Basics of Hadoop: Understanding Hadoop features, Learning the HDFS and MapReduce architecture, Introducing Hadoop MapReduce, Understanding the Hadoop MapReduce fundamentals. **08 Hours**

Module – V

HBase and Cassandra: Introduction to HBase, Row-Oriented vs Column-Oriented data stores, HBase Architecture, Understanding HBase Data Model, Casandra: Introduction, Features of Cassandra, Data Replication in Cassandra, Cassandra Query language(CQL), Cassandra Data Model. **09 Hours**

Laboratory:

Exercise 1 --- HDFS

Start by reviewing HDFS. You will find that its composition is similar to your local Linux file system.

You will use the hadoop fs command when interacting with HDFS,

1. Review the commands available for the Hadoop Distributed File System:
2. Copy file foo.txt from local disk to the user's directory in HDFS
3. Get a directory listing of the user's home directory in HDFS
4. Get a directory listing of the HDFS root directory
5. Display the contents of the HDFS file user/fred/bar.txt
6. Move that file to the local disk, named as baz.txt
7. Create a directory called input under the user's home directory
8. Delete the directory input old and all its contents
9. Verify the copy by listing the directory contents in HDFS:

Exercise 2 --- MapReduce

1. Create a JOB and submit to cluster
2. Track the job information
3. Terminate the job
4. Counters in MR Jobs with example
5. Map only Jobs and generic map examples
6. Distributed cache example
7. Combiners, Secondary sorting and Job chain examples

Exercise 3 --- MapReduce (Programs)

Using movie lens data

1. List all the movies and the number of ratings
2. List all the users and the number of ratings they have done for a movie
3. List all the Movie IDs which have been rated (Movie Id with at least one user rating it)
4. List all the Users who have rated the movies (Users who have rated at least one movie)
5. List of all the User with the max, min, average ratings they have given against any movie
6. List all the Movies with the max, min, average ratings given by any user.

Course Outcomes:

On completion of this course, the students are able to :

- Describe big data, types, and benefits and used cases from selected business domains.
- Explain NoSQL big data using data models.
- Use various databases like Key value, documents, etc.
- Explain Hadoop, perform map-reduce analytics using Hadoop
- Use Hadoop related tools such as HBase, Cassandra.

Text Books:

1. V K Jain: "BIG DATA and HADOOP", 2017 Edition, Khanna Book Publishing, ISBN: 978-93-82609-13-1, (Chapters 1.2, 1.4, 1.5, 1.6, 1.16, 1.19, 1.20 and 6.1, 6.2, 6.4, 6.6, 6.8, 6.9, 6.11, 6.13, 6.14).
2. Pramod J. Sadalage, Martin Fowler: "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley, ISBN: 9780133036121, (Chapters 2-4,8-11).
3. Vignesh Prajapati: "Big data analytics with R and Hadoop", 2013, SPD, ISBN-13: 978-93-5110-410-0, (Chapters 1,2).

Reference Books:

1. Tom White: "Hadoop: The Definitive Guide", 3rd Edition, O'Reilley, 2012.
2. Lars George: "HBase: The Definitive Guide", O'Reilley, 2011.

E-Resources:

1. http://www.tutorialspoint.com/hadoop/
2. http://www.sas.com/en_us/insights/big-data/what-is-big-data.html

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Web Technologies – Servlet, JSP (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI733	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand the concepts of Web Technologies.
- Understand what are Web Servers and App Servers, and their differences.
- Understand Request and Response models.
- Understand how to build e-commerce applications using Servlets and JSP.
- Understand what EL and EL Tags are, and their usage in developing dynamic web pages.

Syllabus

Module – I

Introduction to Web Technologies: JEE, PHP, ASP and .Net

Introduction Web Dev environment: App Server, Web Server, 2-Tier and 3 -Tier Architecture.

Introduction to Servlet: Introduction to JEE containers, Application directory structure, Servlet Interface / Generic Servlet / HttpServlet, Servlet life cycle, Request and Response objects, Building sample application. **08 Hours**

Module – II

Inter Servlet Communication: RequestDispatcher, Include / Forword / Redirect, Building sample application.

Session Management: Creating & invalidating session, Different ways to handle session, Session time out configuration. **08 Hours**

Module – III

Introduction to JSP: Need for JSP, JSP life cycle. **06 Hours**

Module – IV

Introduction to EL: Need for EL and its advantages, Fundametals of EL.

EL Tags: Core Tags, Introduction to MVC, Building sample application. **08 Hours**

Module – V

Project Work: Create an e-commerce application using the client-side languages, such as Bootstrap3, HTML5, CSS3, JavaScript and jQuery, along with the server-side Java language - Servlets and JSP. **10 Hours**

Laboratory

1. Programs covering Web Technologies, Web Dev environment, Servlet.
2. Programs covering Inter Servlet Communication, Session Management.
3. Programs covering JSP, Introduction to EL, EL Tags.

Course Outcomes:

On completion of this course, the students are able to :

- Analyze the concepts of Web Technologies.
- Compare Web Servers and App Servers.
- Implement Request and Response models.
- Demonstrate how to build e-commerce applications using Servlets and JSP.
- Design dynamic web pages using EL Tags.

Text Books:

1. Basham, Bryan, Sierra Kathy, Bates, Bert: "Head First Servlets and JSP", 2nd Edition, Shroff, ISBN-10: 8184044976.
2. Santosh Kumar K: "JDBC 4.2, Servlet 3.1, and JSP 2.3 includes JSF 2.2 and Design Patterns, Black Book", 2nd Edition, Dreamtech Press, ISBN-10: 9351199088.

Reference Book:

1. Budi Kurniawan: "Servlet & JSP: A Tutorial", 2nd Edition, Brainy Software, ISBN-10: 1771970278.

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System Modeling and Simulation

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST741	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Study the basic system concept and definitions of system.
- Understand the techniques to model and to simulate various systems.
- Acquire knowledge to analyze a system and to make use of the information to improve the performance.
- Understand the value of rapid prototyping for: requirements, potential design issues, modelling inputs.
- Understand the need for quantification and understand the limits of quantification.

Syllabus   **Module – I**

Introduction: When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study. The basics of Spreadsheet simulation, Simulation example: Simulation of queuing systems in a spreadsheet. **08 Hours**

Module – II

General Principles, Simulation Software: Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; **08 Hours**

Module – III

Random-Number Generation, Random-Variate Generation: Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers Random-Variate Generation: Inverse transform technique; Acceptance-Rejection technique; Special properties. **08 Hours**

Module – IV

Input Modeling: Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate and Time-Series input models. **08 Hours**

Module – V

Verification, Calibration, and Validation; Optimization: Model building, verification and validation; Verification of simulation models; Calibration and validation of models, Optimization via Simulation. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to : :

- Explain the system concept and apply functional modelling method to model the activities of a static system;
- Apply the behaviour of a dynamic system and create an analogous model for a dynamic system;
- Assess and select a model for an engineering system taking into consideration its suitability to facilitate engineering decision making and predicted advantages over alternative models.
- Explain the simulation results of an engineering system model, within the context of its capabilities and limitations, to address critical issues in an engineering project.
- Manage expectation level of different stakeholders

Text Book:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: "Discrete-Event System Simulation", (Chapters, 1-12), 5th Edition, Pearson Education, 2010, ISBN: 9789332518759.

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: "Discrete – Event Simulation: A First Course", Pearson Education, 2006, ISBN: 9780132020565.
2. Averill M. Law: "Simulation Modeling and Analysis", 4th Edition, Tata McGraw-Hill, 2007, ISBN: 9780070667334.

E-Resources:

1. http://home.ubalt.edu/ntsbarsh/simulation/sim.htm
2. http://searchworks.stanford.edu/view/10091706

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Tax Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE751	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Familiarise the students with the significance of taxation system.
- Understand the structure of Indian Taxation system.
- Gain knowledge about the practical aspects of Indian taxation.
- Understand the system of computation of tax from Salaries.
- Sketch the recent trends in Indian taxation system.

Syllabus

Module – I

Introduction to taxation system, Objectives of taxation, Factors to be considered for tax planning Canons of taxation, Types of taxation, Direct tax, Indirect tax (Broad perspective only). **07 Hours**

Module – II

Taxation system in India, Types of taxes levied in India, Various heads of income tax (Broad outline only} Basic concepts in taxation, Assessment year, Financial year, assessee, Residential status, Tax liability **08 Hours**

Module – III

Income tax authorities in India, Constitution, Powers, Functions specimen of Form 16, Filing of returns, tax evasion, Penalties for contravening the provisions of income tax. **08 Hours**

Module – IV

System of computation of tax from salaries, Taxable income, Permissible deductions from 80C to 80U Fringe benefits exempted from tax, exempted income under section 10 of Income tax act. **10 Hours**

Module – V

Trends in Indian taxation system, Self assessment, PAN card, Budgetary provisions of the financial year 2017-18 on taxation, GST, Advantages, Problems in implementing GST, Measures to overcome the limitations of GST. **06 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Gain knowledge about the system of taxation prevailing in the country.
- Compute tax under different heads.
- Gain practical knowledge on filing returns.
- Calculate the payable tax for salaried individuals.
- Gain insight into recent practices on taxation.

Reference Books:

1. Dr. Vinod K. Singhania: "Direct taxes-Law and Practice", Taxmann Publication.

2. Dr. Mehrotra, Dr. Goyal: "Direct taxes- Law and Practice", Sahitya Bhavan Publication.

3. "7 lectures-Income tax-I ", VBH.

4. Swaminathan: "Income Tax", KPH.

5. T.N.Manoharan: "Income tax including VAT".

6. R.G.Saha, Ushadevi: "Taxation", HPH.

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Assessment of Building Energy Performance

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE752	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Provide a foundation for performing a building energy audit
- Perform assessment tasks on building energy performance
- Submit a Building EQ rating
- Understand the methods and processes to be performed in the field
- Know the process of certifying professionals in energy assessment

Syllabus

Module – I

Introduction, global energy consumption characteristics and the role of commercial and residential buildings, building energy end use consumption characteristics, impact of time variations in building energy consumption, Building mechanical, electrical, and lighting systems. **08 Hours**

Module – II

Anatomy of typical HVAC systems in commercial buildings , typical primary and secondary HVAC equipment and their role in meeting system requirements , basics of electrical distribution systems and their equipment in commercial buildings, basics of lighting system in buildings, including performance terminology, lighting technologies, energy performance, and the role of day lighting. **08 Hours**

Module – III

Introduction to building energy benchmarking and assessment , differences between benchmarking, labeling programs, and energy and environmental auditing, role of building type and climate zone on energy use, key aspects of ENERGY STAR® Portfolio Manager and other tools for benchmarking, ASHRAE Building EQ As Designed and In Operation ratings, differences between Building EQ and Portfolio Manager, Preliminary Energy Use Analysis (PEA). **08 Hours**

Module – IV

Measuring and monitoring building performance, instrumentation for measuring indoor environmental quality and building energy flows, Perform measurements of indoor environmental quality and building energy flows, accuracy of building

measurements, Identify the components of an ASHRAE Level 1 walk through survey and the differences between Level 1, 2, and 3 surveys, Indoor Environment Quality.

08 Hours

Module – V

Energy Efficiency Measures – Building Envelope and Lighting, role of building envelope characteristics on energy use, energy conservation and energy efficiency measures related to envelope and lighting characteristics, Energy Efficiency Measures – HVAC Systems, energy conservation and energy efficiency measures related to HVAC systems, financial analysis of expected improvements to HVAC systems. **08 Hours**

Course Outcomes:

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

- Produce an ASHRAE Building EQ In Operation rating for the buildings provided in the class.
- Produce a listing of potential Energy Efficiency Measures (EEM) including financial payback analysis.
- Perform measurements of indoor environmental quality and HVAC system performance.
- Identify different building types and determine the impact of climate on energy use.
- Analyze raw energy consumption data from measured-meter readings.

Text Books:

1. ASHRAE Building Energy Quotient Program website.
2. ASHRAE BEAP certification study guide.
3. ASHRAE Standard 105-2014 Standard Methods of Determining, Expressing, and Comparing Building Energy Performance and Greenhouse Gas Emission.

Reference Books:

1. ASHRAE Performance Measurement Protocols for Commercial Buildings: Best Practices Guide.
2. ENERGY STAR® Portfolio Manager website.

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Natural Disaster Mitigation and Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE753	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the types of natural and environmental disasters.
- Develop skills in various stages of disaster preparedness, mitigation and management.
- Understand the methodologies for disaster risk assessment.

Syllabus

Module – I

Natural Disasters – Overview: Introduction- Natural Disasters around the world- Natural Disaster Risk Assessment- Earth and its characteristics Human Dimensions of Global environment Change – Disaster mitigation, preparedness, response and recovery comprehensive emergency management Early warning systems and Disaster Preparedness– Rehabilitation, Vulnerable Populations - Logistics and Services, Food, Nutrition and Shelter -Role of UN Red cross and NGOs. **08 Hours**

Module – II

Natural Hazards: Introduction and Review - Natural Disasters -Principles, Elements, and Systems - Geological-Geomorphological aspects, - Earthquake-Geology, Seismology, Characteristics and dimensions– Landslides- Human impact on the mountainous terrain and its relationship with Rainfall, liquefaction etc- Tsunami - Nature and characteristics. **08 Hours**

Module – III

Climate system aspects and Processes: Oceanic, Atmospheric and Hydrologic cycles - Severe Weather & Tornadoes , Cyclones, Floods and Droughts - Global Patterns - Mitigation & Preparation – Drought – Famine- nature and dimensions – Drought Assessment and Monitoring. **08 Hours**

Module – IV

Natural Disaster Communication: Mapping - Modeling, risk analysis and loss estimation – Natural disaster risk analysis - prevention and mitigation - Applications of Space Technology (Satellite Communications, GPS, GIS and Remote Sensing and Information / Communication Technologies (ICT) in Early warning Systems - Disaster Monitoring and Support Centre– Information Dissemination, mobile communication – etc. **08 Hours**

Module – V

Administrative mechanisms: Community and Social organizations – Education and Training – Establishment of capacity building among various stake holders – Government - Educational institutions – Use of Multi-media knowledge products for self education. **08 Hours**

Course Outcomes:

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

- Learn about the types of natural and environmental disasters and its causes.
- Learn about organizational and Administrative strategies for managing disasters.
- Learn about the early warning systems, monitoring of disasters effect and necessity of rehabilitation.
- Learn about the engineering and non-engineering controls of mitigating various natural disasters.
- Understand the key roles of capacity building to face disaster among government bodies, institutions, NGO's, etc.
- Learn methodologies for disaster risk assessment with the help of latest tools like GPS, GIS, Remote sensing, information technologies, etc.

Text Books:

1. Kovach, Robert L :"Earth's Fury: An Introduction to Natural Hazards and Disasters", Englewood Cliffs, N.J., Prentice Hall, 1995.
2. Siddhartha Gautam, K Leelakrishna Rao: "Natural disaster Management", 3rd Edition, 2012, ISBN: 9381604320.

Reference Books:

1. Arul Jothi, D L Balaji: "Safety And Disaster Management Education in Schools", 1st Edition, Anmol Publications, 2009, ISBN: 9380252609.

E-Resources:

1. https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr/bt-dsstr-mtgtn-en.aspx
2. www.nrdms.gov.in/natural_disaster.asp
3. https://www.ncbi.nlm.nih.gov › NCBI › Literature › Bookshelf

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Small and Medium Enterprise Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE761	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the various concepts of Entrepreneurship and familiarize them with the understanding of contemporary environment of MSMEs.
- Understand the business Environment to MSMEs.
- Understand the process of Enterprise Creation.
- Understand the effective Business Plan and Institutional Support Mechanism.
- Understand the concepts of marketing management in the MSMEs.

Syllabus

Module – I

Basic Aspects: Concept, nature of Entrepreneur and Entrepreneurship, Distinction between Entrepreneur and Manager, Entrepreneurship, Medium, Small and Tiny Business : Definition, Role in the economy and significance, Changing scenario of MSMEs in the era of Liberalization and Globalization, Competitiveness.   **08 Hours**

Module-II

Environment assessment: Political, Legal, Economic, Social, Technological, Global environment, Assessment of business opportunities, Government initiatives and private sector opportunity.   **08 Hours**

Module-III

Enterprise Creation: Starting a small industry, Entrepreneurial function or process of starting a new venture based on personal competencies, requirements to start a business venture, Feasibility of the project, Business incubators .   **08 Hours**

Module-IV

Business Plan: Developing effective business plan-meaning, benefits of business plan, Timing of the business plan, Length of the business plan, composition of the business plan or detailed project report. Institutional Support Mechanism: District Industries Centre, State Directorate of Industries, SIDBI, NSIC, SISI, KSFC, KIADB, TECSOK.   **08 Hours**

Module-V

Small Business Marketing: Concept of Marketing, Scope of Marketing, Marketing Mix, Product Mix, Channels of Distribution, Market Segmentation, Role of Middlemen, Distribution Strategies, Sales Promotion, Advertising and Publicity, Packaging Strategies, Branding Strategies.   **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- • Visualize the various concepts of Entrepreneurship and understand of current environment of MSMEs.
- • Know the Business Environment with respect to MSMEs.
- • Know the Process of Enterprise Creation.
- • Prepare Business Plan and Understand the Institutional Support Mechanism.
- • Know the marketing management with reference to MSMEs.

Text Books:

1. Shukla. M.B: "Entrepreneurship and Small Business Management", Kitab Mahal, Allahabad, 2011.
2. Sahay A., V. Sharma: "Entrepreneurship and New Venture Creation", Excel Books, New Delhi, 2008.
3. Lall, Sahai: "Entrepreneurship", Excel Books, New Delhi, 2006.
4. S. Anil Kumar: "Small Business and Entrepreneurship", I.K.International Publishing House Pvt. Ltd., 2008.
5. Kotler, Keller, Koshy, Jha: "Marketing Management", 13th Edition, Pearson Education.

Reference Book:

1. Wickham, Phillip A: "Strategic Entrepreneurship", Pitman, UK, 1998.

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Occupational Safety and Health Administration

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE762	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the occupational health and safety and sector specific occupational health and safety issues.
- Understand the socio-economic aspects of occupational health and safety.
- Understand the health screening measures.
- Understand the legal Provisions on Occupational Health and Safety.
- Understand the participatory Research and Occupational Health.

Syllabus

Module – I

Introduction to Occupational Health and Safety: Definition and Context of OHS, Objectives and Principles of OHS, Workplace and Health Occupational Health, Hygiene and Ergonomics.

Sector Specific Occupational Health and Safety Issues: Health and Safety Risks in Mining, Health Hazards in Electronic Industry, Health Hazards in Food Processing Industry, Health Hazards in Other Industries.   **07 Hours**

Module – II

Socio-Economic aspects of Occupational Health and Safety: Women's occupational and health safety, Child labour issues in occupational health and safety, Health issues in the unorganized sector.

Basics of Preventive Techniques: Definition of Accident, Accident Analysis, Monitoring of Hazards, Reporting and Investigation of Accidents.   **08 Hours**

Module – III

Health Screening Measures: Stages of Medical Examination, Occupational History, Pulmonary Function Test (PFT), Noise Induced Hearing Loss (NIHL).   **07 Hours**

Module – IV

Legal Provisions on Occupational Health and Safety: Overview of existing OHS Legislations in India, The Factories Act, The Mines Act, The Workmen's Compensation Act, The Employee's State Insurance Act.   **07 Hours**

Module-V

Participatory Research and Occupational Health: Philosophy of Participatory Research (PR) Analysis based on PR Methodologies Conducting Participatory Research for OHS.   **07 Hours**

Course Outcomes:
On completion of this course, students will be able to :

- Develop the ability to know the occupational health and safety.
- Have the knowledge of the socio-economic aspects of occupational health and safety.
- Demonstrate purpose of health screening measures.
- Know the legal Provisions on Occupational Health and Safety.
- Participate in Research and Occupational Health.

References:

1. International Labour Organinization. Mining: a hazardous work [Internet]. ; 2015 ([cited 2015 Feb 2]. Available from: http://www.ilo.org/safework/areasofwork/hazardous-work/WCMS_124598/lang--en/index.htm

2. Gyekye, S.A. Workers' perceptions of workplace safety: an African perspective. Int J Occup Saf Ergon. 2006;12:31–42.Crossref | PubMed| Scopus (4)

3. Amponsah-Tawiah, K., Jain, A., Leka, S., Hollis, D., Cox, T. Examining psychosocial and physical hazards in the Ghanaian mining industry and their implications for employees' safety experience. J Safety Res. 2013;45:75–84.Crossref PubMed| Scopus (5)

4. Owiredu D. Annual chamber of mines presidential review. 83rd Annual General Meeting of the Ghana Chamber of Mines [Internet]. 2011 [cited 2014 Mar 1]. Available from:http://www.ghanachamberofmines.org.

5. Helliwell, J.F., Putnam, R.D. The social context of wellbeing. Philos Trans R Soc Lond B Biol Sci. 2004;35:1435–1446.Crossref| Scopus (550)

6. Bhagawati, B. Basics of occupational safety and health. IOSR J Environ Sci Toxicol Food Technol. 2015;9:91–94.

7. Amponsah-Tawiah, K., Dartey-Baah, K. Occupational health and safety: key issues and concerns in Ghana. Int J Bus Soc Sci. 2011;14:120–126.

    National Safety Council. Injury facts. NSC, Itasca (IL); 2004.

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Animation and Multimedia Engineering

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE763	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to:

- Understand the basics of Animation.
- Understand computer animation using characters.
- Learn how to create quality animation characters.
- Learn about volume construction and action made from face, gestures.
- Understand Acting and Sketching techniques.

Syllabus

Module – I

Introduction to Animation: History of Animation, The Origins of Animation, Types of Animation, Terms used in Animation, Basic Principles of Animation.

Introduction to equipment required for Animation: Animator's Drawing Tools, Rapid Sketching and Drawing, Developing Animation Character. **07 Hours**

Module – II

Developing the characters with computer animation: Anatomy and Body Language, 2-D virtual drawing for animation.

Motion studies: : Thumbnails, sequential movement drawing, drawing for motion.

08 Hours

Module – III

Essentials and qualities of good animation characters: Three dimensional drawings of characters.

Skills and Basic proportions: Visual and creative development of an artist, how to draw gestures, Heads, Rotation in Arcs, Key Lines, Perspective. **08 Hours**

Module – IV

Volume Construction: Balance, Muscles, Light and shade.

Shape and Action: Hands and Legs, Foreshortening, Facial expressions. **08 Hours**

Module – V

Acting and Sketching techniques: Introduction to Acting, Modeling, Sketching from Acting, Sketching from live models, Introduction to Rapid Sketching Techniques, Sketching from Memory, live action.   **09 Hours**

Course Outcomes:
On completion of this course, students will be able to :
- Recognize the basics of animation along the tools.
- Develop characters with computer animation.
- Develop 3D drawings of characters and acquire skills regarding basic level of sketching.
- Explain Foreshortening, Facial expressions.
- Develop small animation characters by using acting and sketching techniques.

Text Book:
1. Chris Patmore: "The Complete Animation course: The Principles, Practice and Techniques of Successful Animation", (Chapters 1-10), Barons Educational Series New York, 2003, ISBN-13: 978-0764123993.

Reference Books:
1. Frank Thomas, Ollie Johnston: "The Illusion of Life by Walt Disney", Abbeville Press, 1981.
2. Daniel Carter, Michael Courtney: "Anatomy for the Artist: A Comprehensive Guide to Drawing the Human Body, A Complete Guide", 2011.

E-Resources:
1. http:// www.animationmentor.com/
2. https://www.bloopanimation.com/animation-for-beginners/
3. https://robots.thoughtbot.com/css-animation-for-beginners

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Information and Network Security Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSL77	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Work on Open Source cutting edge tools to find solutions for the problems in the field of Information and network security,

- Understand what are the foundational theory behind information security,

- Analyze basic principles and techniques when designing a secure system,

- Study how today's attacks and defenses work in practice,

- Assess threats for their significance, and how to gauge the protections and limitations provided by today's technology.

Laboratory

1. Perform an experiment to grab a banner with telnet and perform the task using Netcat.

2. Using nmap,

   1) Find Open ports on a system

   2) Find machines which are active

   3) Find the version of remote OS on other systems

   4) Find the version of s/w installed on other system

      (using nmap or any othe software)

3. Perform an experiment to demonstrate how to sniff for router traffic by using the tool Cain and Abel / Wireshark / tcpdump

4. Perform an experiment to demonstrate the use of DumpSec.

5. Perform a wireless audit of an access point / router and decrypt WEP and WPA. (Using NetStumbler or airsniff)

6. Perform an experiment to sniff traffic using ARP poisoning

7. Demonstrate Intrusion Detection System (IDS) using any tool such as Snort or any other Software.

8. Install RootKit and study variety of options

9. Generate minimum 10 passwords of length 12 characters using OpenSSL command.

10. Setup a honey pot and monitor the honey pot on network.

11. Install JCrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital/PKI signatures studied in theory Network Security and Management.

12. Install IPCop on a linux system and learn all the functions available on the software.

Course Outcomes

On completion of this course, students will be able to : :

• Work on Open Source cutting edge tools to find solutions for the problems in the field of Information and network security

• Know which application runs on specific port, scan for open ports

• Able to capture and analyze network traffic

• Perform audit settings, detect intruders in the network

• Implement standard algorithms used to provide data confidentiality, integrity and Authentication.

Text Books:

1. William Stallings: "Network Security Essentials: Applications and Standards", 3rd Edition, Pearson Education, 2007.

2. Michael E. Whiteman and Herbert J. Mattord: "Principles of Information Security", 2nd Edition, Cengage Learning, 2005.

Reference Book:

1. Behrouz A. Forouzan, "Cryptography and Network Security", Special Indian Edition, Tata McGraw-Hill, 2007.

E-Resources:

1. https://www.nmap.org

2. https://www.advanced-port-scanner.com

3. https://www.openssl.org

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Android Application Development Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSL78	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Describe the Android SDK features and the Development Framework and understanding Activities.
- Create adaptive, responsive user interfaces that work across a wide range of devices.
- Perform background work and long-running tasks in Android applications.
- Know the concepts of Storing, sharing and retrieving data in Android applications.
- Learn how permissions, security and performance affect application. Finally, make sure your app is ready to share with the world, and publish it.

Part-A

Programs supplement the lecture concepts will be based on the latest version of Android SDK.

1. Install Android Studio and Run Hello World
2. Create and Start Activity Lifecycle and Instance State
3. Create Implicit Intents
4. Make Your First Interactive UI Using Layouts and TextView Elements
5. Using An Options Menu
6. Create a RecyclerView
7. Drawables, Themes and Styles
8. Create an AsyncTask
9. Connect to the Internet
10. BroadcastReceiver
11. Set and retrieve shared preferences
12. Implement a simple content provider

Part-B

Develop a suitable application to implement the skills learnt in the theory and the exercises indicated in Part-A.

Course Outcomes

On completion of this course, students will be able to : :

- Comprehend the basic features of Android Platform and Create Activities in Android.

- Demonstrate the design concepts of user interface using components, views and menus in Android.

- Create and use databases for Android Application.

- Implement messaging services in Android.

- Deploy mobile applications in various marketplaces for distribution.

Text Books:

1. Wei Meng Lee: "Beginning Android Application Development", Wiley Publications.
2. Reto Meier: "Professional Android 4 Application Development", Wiley Publications.

Reference Books:

1 . Mark Murphy: "Beginning Android 3", 1st Edition, Apress Springer India Pvt. Ltd., 2011, ISBN-13: 978-1-4302-3297-1.

2 . Sayed Hashimi , Satya Komatineni, Dave MacLean; "Pro Android 4", 1st Edition, Apress Springer India Pvt. Ltd., 2012, ISBN: 978-1-4302-3930-7.

3 . Reto Meier: "Professional Android 2 Application Development", 1st Edition, Wiley India Pvt.Ltd., 2012, ISBN: 9788126525898.

4. James Steele: "The Android Developer's Cookbook: Building Applications with the Android SDK", Addison-Wesley Professional, 2010.

E-Resources:

1. https://developers.google.com/training/adf
2. https://goo.gl/ADKvq8
3. https://innovator.samsungmobile.com

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Project Phase-I and Seminar

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSP79	0:0:6:0	3	100	3 Hours	FC

Phase	Activity	Credits
I	Batch formation, project identification, literature survey, finalization of problem statement with objectives and outcomes, Synopsis submission, Preliminary seminar for the approval of selected topic and objectives.	**3**

Eighth Semester B.E. Syllabus

Phase	Activity	Credits
II	Design, Theoretical/experimental investigation and Mid-term seminar to review the progress of the work and documentation(Mid term report).	4
III	Completion of the project work, participation in the project exhibition, Submission of project report Final Internal seminar and demonstration, Publications.	4
	Evaluation and Viva-voce	**5 + 5**

Program Educational Objectives (PEOs)

The graduates of Computer Science and Engineering are expected to fulfill the following PEOs after a few years of their graduation.

PEO1	Graduates in Computer Science and Engineering will apply the technical knowledge of analysis and design of software used for sustainable societal growth.
PEO2	Graduates of Computer Science and Engineering will demonstrate logical thinking and programming skills.
PEO3	Graduates in Computer Science and Engineering will demonstrate good communication skills, dynamic leadership qualities with concern for environmental protection.
PEO4	Computer Science and Engineering graduates will be capable of pursuing higher studies, take up research and development work blended with ethics and human values.
PEO5	Computer Science and Engineering graduates will have the ability to become entrepreneurs there by switching over from responsive engineer to creative engineer.

Program Outcomes (POs)

PO1	**Engineering Knowledge:** Apply knowledge of mathematics and science, with fundamentals of Computer Science and Engineering to be able to solve complex engineering problems related to CSE.
PO2	**Problem Analysis:** Identify, Formulate, review research literature and analyze complex engineering problems related to CSE and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	**Design/ Development of solutions:** Design solutions for complex engineering problems related to CSE and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural societal and environmental considerations.

PO4	**Conduct Investigations of Complex problems:** Use research–based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to computer science related complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply Reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the CSE professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the CSE professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply Ethical Principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary Settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large such as able to comprehend and with write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.
PO12	**Life-Long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning the broadest context of technological change.

Fifth Semester B.E. – Syllabus
Computer Networks

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST51	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Become familiar with the basics of data communications.
- Understand OSI and TCP/IP models.
- Understand the concepts of data link layer and network layer.
- Become familiar with the basics of packet switching.
- Understand the concepts of network security and network management and its applications.

Syllabus

Module – I

Introduction, Network model, Physical Layer & media: Data Communications, Networks, Protocols & Standards, Layered Tasks, The OSI model, Layers in OSI model, TCP/IP Protocol suite, Addressing, Transmission Impairment, Data Rate limits, Performance, Digital-digital conversion (Only Line coding: Polar, Bipolar and Manchester coding) **08 Hours**

Module – II

Switching & Data Link Layer: Introduction to switching, Datagram Networks, Virtual Circuit Networks, Error Detection & Correction: Introduction, Block coding, Cyclic codes, Checksum. **08 Hours**

Module – III

Data Link control, Network Layer: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy channels, HDLC, PPP (Framing, Transition phases only) Random access, Controlled Access, Channelization, Ethernet: IEEE standards. IPv4, IPv6. **08 Hours**

Module – IV

Packet Switching Networks, Network Security: Routing in Packet networks, Shortest path routing: Bellman-Ford algorithm, Overview of network security, secret key encryption protocol, public key encryption protocols. **08 Hours**

Module – V

Applications and Network Management, Mobile AdHoc Networks: Application layer overview, Domain Name System (DNS), Remote Login Protocols, E-mail, FTP, World Wide Web and HTTP, Network management. Overview of Wireless Ad-Hoc networks, Routing in AdHoc Networks, Routing protocols for AdHoc networks.   **08 Hours**

Course Outcomes

On completion of this course, students will be able to :

- Design and solve problems on shortest path routing algorithms.
- Analyze framing concepts, flow and error control algorithms.
- Explain concepts of cryptography algorithms.
- Design and apply application layer protocols.
- Analyze different networks.

Text Books:

1. Behrouz A. Forouzan: "Data Communication and Networking", 5th Edition, Tata McGraw-Hill, 2012, ISBN: 978-0-07-337622-6, (Chapters 1-4,8,10-13).
2. Alberto Leon-Garcia and Indra Widjaja: "Communication Networks -Fundamental Concepts and Key architectures," 2nd Edition, Tata McGraw-Hill, 2004, reprint 2007, ISBN-13: 978-0-07-059501-9, (Chapter 7).
3. Nader F. Mir: "Computer and Communication Networks", 2nd Edition, Pearson Education, 2015, ISBN: 0133814742, (Chapters 9,10,19).

Reference Books:

1. William Stallings: "Data and Computer Communication", 8th Edition, Pearson Education, 2007, ISBN-13: 978-0133506488.
2. Larry L. Peterson and Bruce S. Davie: "Computer Networks – A Systems Approach", 4th Edition, Elsevier, 2007, ISBN: 978-0-12-385059-1.

E-Resources:

1. https://archive.org/details/Data.Communications.and.Networking.5th.Edition
2. https://doc.lagout.org/network/Data%20Communications%20and%20 Networking%20By%20Behrouz%20A.Forouzan.pdf
3. http://ptgmedia.pearsoncmg.com/images/9780133814743/samplepages/ 9780133814743.pdf

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Microcontrollers (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI52	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Gain knowledge about, microprocessors, microcontrollers and RISC & CISC CPU architectures.
- Learn the 8051 architecture and its assembly language programming.
- Familiarize with Embedded 'C' programming and counters & timers programming in 8051.
- Understand 8051 connections to RS-232 and Interrupts programming.
- Acquire knowledge about, interfacing of 8051 with LCD, Keyboard, DAC, ADC, Stepper motor.

Syllabus

Module – I

Introduction to Microcontrollers: Microprocessors and Microcontroller, Introduction, Difference between Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Embedded Electronic Systems and Microcontrollers, Comparison of different microcontrollers and applications.

The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input / Output Pins, Ports and Circuits, External Memory. **08 Hours**

Module – II

Assembly Language Programming in 8051: Addressing Modes and Instruction set: Introduction, Addressing modes, Data transfer instructions, Example Problems, Arithmetic instructions, Logical instructions, Example Problems, JUMP and CALL Program range, Jumps, calls and Subroutines, Returns, Example Problems. **08 Hours**

Module – III

Embedded 'C' Programming: 8051 programming in C: Data types and time delays in 8051 C, I/O programming, logic operations, data conversion programs, accessing code ROM space, data serialization. Timer / Counter Programming in 8051: Counters and timers programming 8051 Timers, Counter Programming, programming timers 0 and 1 in 8051 C. **08 Hours**

Module – IV

8051 Serial Communication: Basics of Serial Communication- Serial data input/ output, 8051 connections to RS-232, 8051 Serial Communication Programming

Interrupts Programming: 8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Interrupt programming in C   **08 Hours**

Module – V

8051 Interfacing and Applications: Interfacing 8051 to LCD, Keyboard, DAC, ADC Stepper motor interfacing.   **08 Hours**

Laboratory:

Programming for the 8051 Microcontroller:

1   a.   To perform the multiplication of two 16-bit numbers.

b.   To implement (display) an eight bit UP/DOWN decimal counter on watch window.

2   a.   To sort block of data in ascending or descending order.

b.   To interface a DAC & Generate a square wave with specified amplitude and frequency using DAC. Display the waveform on the CRO.

3   a.   To count number of ones and zeros in an eight bit number.

b.   To interface an ADC and temperature Sensor to measure temperature.

4   a.   To convert an 8-bit BCD number into ASCII.

b.   To Interface a stepper motor – and rotate it clock wise or anti clock wise through a given number of steps.

5   a.   To check whether given number is palindrome or not. If palindrome store FFh in accumulator else store 00h in accumulator.

b.   To generate 1second delay continuously using on chip timer.

Course Outcomes:

On completion of this course, students will be able to :

- Explain the basic concepts of microprocessors, RISC & CISC CPU and architecture of 8051 microcontroller.
- Write assembly language programming in 8051.
- Develop assembly and embedded C Programming for 8051 microcontroller
- Discuss 8051 connections to RS-232 and Interrupts programming.

- Design and develop applications related to interfacing of 8051 to LCD, Keyboard, DAC, ADC, Stepper motor.

Text Books:

1. Muhammad Ali Mazidi, Rolin D. Mckinlay, Janice Gillispie Mazidi: "The 8051 Microcontroller: A Systems Approach", Pearson Education, Limited, 2013, ISBN: 1292027266, 9781292027265, (Chapters 1-3,5,7,8).

2. Kenneth J. Ayala: "The 8051 Microcontroller Architecture, Programming & Applications", 2nd Edition, Thomson Learning, 2005, ISBN: 0314772782, 9780314772787, (Chapters 1,4,5).

Reference Books:

1. Predko: "Programming and Customizing the 8051 Microcontroller", TMH, ISBN-10: 8131706974.

2. Raj Kamal: "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005, ISBN-13: 978-8131706978.

E-Resources:

1. https://yvuqarox.files.wordpress.com/2015/06/myke-predko-8051-pdf.pdf

2. https://books.google.co.in/books?id=pWlbvW0H3IAC&pg=PA663&lpg=PA663&dq=1.%09Rajkamal,+%E2%80%9CMicrocontrollers:+Architecture,

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Operating Systems

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST53	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to

- Learn various concepts of operating system
- Learn the concepts of Process synchronization
- Gain knowledge about deadlock's occurring in resource allocation.
- Understand the memory management function of operating system
- Realize the role of operating system in file management.

Syllabus   **Module – I**

Introduction to Operating Systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special-purpose systems; Computing environments. Operating System Services; Operating System structure; Virtual machines; Operating System generation; System boot. **08 Hours**

Module – II

Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication. Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Thread scheduling   **08 Hours**

Module – III

Process Synchronization: Synchronization: The critical section problem, semaphores, classical problems of synchronization.
Deadlocks: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.   **09 Hours**

Module – IV

Memory Management: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.

Virtual Memory Management: Background; Demand paging; Page replacement; Allocation of frames. **08 Hours**

Module – V

File System, Implementation of File System: File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. **07 Hours**

Course Outcomes

On completion of this course, students will be able to :

- Explain the concepts of Operating System Structure, Operations and Services.
- Design new techniques for Multithreaded Programming, Process Scheduling and Synchronization.
- Apply the skills of deal lock prevention and avoidance.
- Design and implement Memory management Algorithms.
- Explain the concept of file systems.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: "Operating System Principles", Wiley India, Chapters (1-12), 8th Edition, 2009. ISBN: 9781118063330.

Reference Books:

1. D.M Dhamdhere: "Operating systems - A concept based Approach", Tata McGraw-Hill, 2nd Edition, 2002. ISBN: 978–0–07–295769–3.

2. P.C.P. Bhatt: "Introduction to Operating Systems: Concepts and Practice", (Chapters: 1, 2, 31 to 3.4 , 4.1 to 4.4, 5.1 to 5.5, 6.1 to 6.7, 7, 8.1 to 8.6, 9.1 to 9.6, 10, 11.1 to 11.5, 12.1 to 12.6, 14.1 to 14.8, 21.1 to 21.9) , PHI, 4th Edition, 2008. ISBN: 978-81-203-4836-3.

3. Harvey M Deital: "Operating systems", Pearson Education, 3rd Edition, 1990, ISBN: 978-0131828278.

E-Resources:

1. http://nptel.ac.in/courses/106108101/

2. http://study.com/academy/lesson/computer-operating-systems-managing-hardware-and-software-resources.html

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Software Engineering and Testing

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST54	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the real world applications with the aid of software engineering techniques along with professional ethics and responsibilities.
- Understand the importance of SDLC life cycle in realtime.
- Learn Software and Hardware Testing.

Syllabus

Module – I

Introduction: FAQ's about software engineering, Professional and ethical responsibility. Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems. Critical Systems: A simple safety critical system; System dependability; Availability and reliability **08 Hours**

Module – II

Requirements and Project Management: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; The software requirements document. Project Management: Management activities; Project planning; Project scheduling. **08 Hours**

Module – III

Software Development and Verification and Validation: Agile methods; Extreme programming; Rapid application development. Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods.

08 Hours

Module – IV

A Perspective on Testing, Examples: Basic definitions, Test cases, Software testing: Component testing; Test case design; Test automation, Levels of testing.
Boundary Value Testing: Boundary value analysis, Robustness testing, Worst-case testing, Special value testing. **08 Hours**

Module – V

Equivalence Class Testing, Decision Table- Based Testing: Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.

Path Testing, Data Flow Testing: DD paths, Test coverage metrics, Basis path testing.

08 Hours

Course Outcomes:

On completion of this course, students will be able to :

- Apply the real world applications with the aid of software engineering techniques along with professional ethics and responsibilities.
- Explain the requirements engineering process, feasibility studies and its validation.
- Design software in structured, organized ways and demonstrate effective, practical ways to design and develop high quality software.
- Write Test cases , Test plan based on test scenario.
- Analyze using static analysis tools (Inspection, walk through and peer review) and automate high quality tests during unit and integration testing.

Text Book:

1. Ian Sommerville: "Software Engineering", 8th Edition, Pearson Education, 2007, ISBN-13: 978-0137035151.
2. Paul C. Jorgensen: "Software Testing, A Craftsman's Approach", 3rd Edition, Auerbach Publications, 2008, ISBN: 9781439889510.

Reference Books:

1. Roger S Pressman: "Software Engineering - A Practitioners approach", 7th Edition, McGraw Hill, 2007.
2. Pankaj Jalote: "An Integrated Approach to Software Engineering", Wiley India, 2009.
3. Myers GJ: "The Art of Software testing", Wiley-Dreantech India Pvt. Ltd., 2004.
4. Loise Tamres: "Introducing Software Testing", Pearson Education, 2003.

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Advanced Algorithms (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI551	3-0-2-0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Learn methods for solving recurrences, which are useful for describing the running times of recursive algorithms.
- Understand the graph search algorithms and network flow problems.
- Gain knowledge about number - theoretic algorithms
- Get exposed to string - matching algorithms.
- To introduce probabilistic analysis and randomized algorithms.

Syllabus

Module – I

Introduction: The role of algorithms in computing, Growth of Functions: Asymptotic notations; Standard notations and common functions; Methods for solving recurrences: The substitution method, The recurrence – tree method, The master method.

Amortized Analysis: Aggregate, Accounting and Potential Methods.   **09 Hours**

Module – II

Graph Algorithms: Introduction to Single – Source shortest paths: Variants, negative weight edges, Cycles, Representing Shortest paths, Relaxation, Bellman - Ford Algorithm; Single source shortest paths in a DAG; Dijkstra's algorithm, Johnson's algorithm.

Maximum Flow: Flow networks and Ford-Fulkerson method; Maximum bipartite matching   **09 Hours**

Module – III

Number - Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing.   **08 Hours**

Module – IV

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.   **07 Hours**

Module – V

Polynomials and the FFT: Representation of polynomials, The DFT and FFT, Efficient implementation of FFT.   **07 Hours**

Laboratory

Note: The following programs can be executed on C/C++ .

1. Design, develop, and run a program to implement the Bellman-Ford algorithm

2. Design, develop, and run a program to implement a Monte Carlo algorithm to test the primality of a given integer.

3. Design, develop, and run a program to solve modular linear equations.

4. Design, develop, and run a program to solve string matching problem using naïve approach and the KMP algorithm.

5. Design, develop, and run a program to solve String matching problem using Finite Automata

6. Design, develop, and run a program to solve String matching problem using Robin Karp algorithm.

Course Outcomes

On completion of this course, students will be able to :

- Explain different asymptotic notations and their use in modern computing systems.

- Design and apply iterative and recursive algorithms.

- Design and implement graph and flow network algorithms.

- Design and analyze the algorithms for string matching.

- Describe the representation of polynomials, the DFT and also the implementation of FFT.

Text Books:

1. T. H Cormen, C E Leiserson, R L Rivest, C Stein: "Introduction to Algorithms", (Chapters 1,3,4,17,24-26,30,31,32), Prentice-Hall of India, 3rd Edition, 2010, ISBN: 9780262259460.

2. Kenneth A. Berman, Jerome L. Paul: "Algorithms", (Chapters 1,11,20), Cengage Delmar Learning, India, 2002, ISBN: 9788131505212.

Reference Book:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press, 2007, ISBN: 9788173716126

E-Resources:

1. http://staff.ustc.edu.cn/~csli/graduate/algorithms/book6/chap02.htm
2. http://www.cs.cornell.edu/courses/cs3110/2011sp/lectures/lec20-amortized/amortized.htm
3. http://staff.ustc.edu.cn/~csli/graduate/algorithms/book6/chap18.htm
4. https://en.wikipedia.org/wiki/Category:Graph_algorithms
5. http://staff.ustc.edu.cn/~csli/graduate/algorithms/book6/chap18.htm
6. http://staff.ustc.edu.cn/~csli/graduate/algorithms/book6/chap33.htm
7. https://en.wikipedia.org/wiki/String_searching_algorithm

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Object Oriented Programming with JAVA

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI552	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable the students to :

- Understand the basic concepts of Java Technology and its features.
- Understand the OOPs concepts.
- Learn methods for solving programs in Java.
- Effectively use data structures like Collections, Lists, etc.
- Write defensive programming using Exception Handling.

Syllabus

Module – I

Introduction to Java: Why Java, Flavors of Java, Java Designing Goal and Features, JVM / JDK / JRE / History of JDK / JDM, Usage of IDE (Eclipse, NetBeans)

Language Fundamentals: Data Types - Variables, keywords, operators; Selection / Iterative / Decision making statements

Introduction to OOPs Concepts: Inheritance - Polymorphism - Abstraction – Encapsulation **10 Hours**

Module – II

Arrays and Strings: Defining of an Array, Initializing and accessing an Array, Multi-Dimensional Array, String / StringBuffer / StringBuilder

OOPs in Java: Inheritance, Abstract class and interface, Abstract class Vs Interface

Packages and Wrapper Classes: Defining Package, Organizing Classes and interfaces in Packages, Package as Access Protection, Import and Static Import, Naming Convention for packages, What is Wrapper Class, Why Wrapper, How to handle wrapper Classes. **10 Hours**

Module – III

Exception Handling: What is Exception, Types of Exception, Exception Hierarchy, Custom excpetions.

The Collection Framework: Collection of objects, Collection Interfaces and Hierarchy, List and Map, Types of List, Types of Map, Iterator, Generics. **08 Hours**

Module – IV

Threads: Understanding Threads, Needs of Multi-Threaded Programming, Thread Life-cycle, Synchronizing Threads. **02 Hours**

Module – V

Project Work: To create a Contact Book application using the Core Java concepts learnt with special emphasis on OOPs concepts, Exception Handling, and Collections Framework.   **10 Hours**

Laboratory

1. Programs covering Data Types and OOPs Concepts.
2. Programs covering Arrays and Strings, OOPS concepts in Java, Packages and Wrapper Classes.
3. Programs covering Exception Handling, The Collection Framework and Threads.

Course Outcomes:

On completion of this course, students will be able to :
   •   Explain the basic concepts of Java Technology and its features.
   •   Explain the OOPs concepts.
   •   Write programs in Java.
   •   Analyze data structures like Collections, Lists, etc.
   •   Write defensive programming using Exception Handling.

Text Books:

1. Herbert Schildt: "Java: The Complete Reference", McGraw Hill Education, 9th Edition, ISBN-10: 9339212096.
2. Dr. R. Nageswara Rao: "Core Java: An Integrated Approach", 1st Edition, Dreamtech Press, 2016, ISBN-10: 9351199258.

Reference Books:

1. Joshua Bloch: "Effective Java", Pearson Education, 2nd Edition, ISBN-10: 933257653X.
2. Cay S. Horstmann: "Core Java - Vol. I - Fundamentals", 10th Edition, Pearson Education, ISBN-10: 9332582718.

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Computer Graphics (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI553	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable the students to :

- Understand the basic principles of Computer graphics using OpenGL libraries.
- Learn methods to implement the algorithms and techniques necessary to produce basic 2D and 3D objects.
- Acquire knowledge on Graphical user interface.
- Study various operations on 2D and 3D objects like translation, scaling and rotation.
- Understand how to produce realistic images by position the camera coordinates, viewing angles, light and shade.

Syllabus

Module – I

Introduction to Computer Graphics: What is computer graphics?, Where computer graphics is used, Elements of pictures created in computer graphics, graphics display devices, graphics input primitives and devices. Initial steps in drawing figures: To get started making pictures, the OpenGL basic graphics primitives, line drawing in OpenGL, simple interaction with mouse and keyboard, designing menus. Additional drawing tool: Introduction, world windows and viewports. **10 Hours**

Module – II

From vertices to fragments: Basic Implementation Strategies; Four major tasks; Clipping; Line-segment clipping; Polygon clipping; Rasterization; Bresenham's algorithm; Polygon Rasterization; Hidden-surface removal; Antialiasing; Display considerations. **07 Hours**

Module – III

Transformation of Objects: Introduction to transformations, 3D affine transformations, how to change coordinate systems, affine transformations used in a program, to draw 3D scenes with OpenGL, Modelling shapes with polygonal meshes: Introduction to solid modelling with polygonal meshes. **08 Hours**

Module – IV

Three Dimensional Viewing: The camera revisited, to specify a camera in a program, perspective projection of 3D objects, to produce stereo views, taxonomy of projections. **07 Hours**

Module – V

Rendering faces for visual realism: Introduction, introduction to shading models, flat shading and smooth shading, adding hidden surface removal, to add texture to faces, to add shadows of objects, OpenGL 2.0 & the shading language(GLSL) **08 Hours**

Laboratory
Part-A
1. Plotting functions using dot plots.
2. Drawing the checkerboard.
3. Draw rubber rectangles: those that grow and shrink as the user moves the mouse.
4. Cohen Sutherland line clipping algorithm.
5. 3D scene rendered with shading.

Part-B
Develop a suitable graphics package to implement the skills learnt in the theory and the exercises indicated in Part-A. Use the OpenGL libraries

Course Outcomes:

On completion of this course, students will be able to :
- Design simple graphical user interface using OpenGL libraries.
- Implement basic 2D and 3D object using various rasterization and filling algorithms.
- Perform various transformation on 2D and 3D objects.
- Apply camera coordinate and decide the viewing angles for 2D and 3D objects.
- Apply light and shading to render faces for visual realism.

Text Books:
1. F.S. Hill, Jr, Stephen M. Kelley: "Computer Graphics Using OpenGL" (Chapters 1,2, 3.1,3.2,5,6.2,7,8), 3rd Edition, Pearson Education, 2009, ISBN: 978-81-317-2414-9.
2. Edward Angel: "Interactive Computer Graphics A Top-Down approach with OpenGL" (Chapter 7), 5th Edition, Pearson Education, 2009, ISBN: 978-81-317-2530-6.

Reference Books:
1. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes: "Computer Graphics", Pearson Education, 1997.
2. Donald Hearn and Pauline Baker: "Computer Graphics - OpenGL Version", 3rd Edition, Pearson Education, 2004.

E-Resources:
1. http://www.nptelvideos.in/2012/11/computer-graphics.html
2. https://www.tutorialspoint.com/computer_graphics/
3. www.graphics.cornell.edu/online/tutorial/

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Operations Research

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST561	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Understand quantitative methods and techniques for effective decision-making, model formulation and applications that are used in solving real world problems.
- Know the various techniques of OR, their applications and the relationship between a linear program and its dual.
- Learn different types of transportation and assignment models for optimization.
- Understand techniques that are used to plan, schedule and monitor large projects such as building construction, maintenance of computer system, research and development design etc.
- Acquire knowledge on decision making techniques under conflicting situations where there are one or more opponents.

Syllabus

Module – I

Introduction, Linear Programming: Introduction: The Origins, Nature and Impact of OR; Defining the Problem and Gathering Data; Formulating a Mathematical Model; Deriving Solutions from the Model; Testing the Model; Preparing to Apply the Model; Implementation.

Linear Programming: Prototype Example; The Linear Programming Model; Assumptions of Linear Programming; Additional Examples. **08 Hours**

Module – II

The Simplex Method: The Essence of the Simplex Method; Setting Up the Simplex Method; The Algebra of the Simplex Method; The Simplex Method in Tabular Form; Tie Breaking in the Simplex Method; Adapting to Other Model Forms.

Duality Theory: The Essence of Duality Theory; Primal-Dual Relationships; Adapting to Other Primal Forms; The Dual Simplex Method. **08 Hours**

Module – III

Transportation and Assignment Problems: The Transportation Problem; The Assignment Problem. **08 Hours**

Module – IV

Project Management with PERT/CPM: A Prototype Example- The Reliable Construction Co. Project; Using a Network to Visually Display a Project; Scheduling

a Project with PERT/CPM; Dealing with Uncertain Activity Durations; Considering Time-Cost Trade-Offs; Scheduling and Controlling Project Costs; An Evaluation of PERT/CPM. **08 Hours**

Module – V

Game Theory, Decision Analysis: Game Theory: The Formulation of Two-Person, Zero-Sum Games; Solving Simple Games--A Prototype Example; Games with Mixed Strategies; Graphical Solution Procedure; Solving by Linear Programming; Extensions. **Decision Analysis:** A Prototype Example; Decision Making without Experimentation; Decision Making with Experimentation; Decision Trees. **08 Hours**

Course Outcomes

On completion of this course, students will be able to :

- Develop Linear Programming models, interpret the models, solutions and infer solutions to the real-world problems.
- Solve the Linear problems by applying different techniques of Operations research.
- Build and solve Transportation models and Assignment models.
- Design new simple models like CPM to improve decision making and use critical path analysis, programming evaluation and review techniques for timely project scheduling and completion.
- Compare the characteristics of different types of decision making environments and the appropriate decision making approaches and tools to be used in each type.

Text Books:

1. Frederick S. Hillier, Gerald J. Lieberman: "Introduction to Operations Research: Concepts and Cases", 8th Edition, Tata McGraw Hill, 2005, ISBN-13: 978-0-07-060092-8, (Chapters: 1.1 to 1.3, 2, 3.1 to 3.4, 4.1 to 4.6, 6.1 to 6.4, 7.1, 8,10, 14.1 to 14.6, 15.1 to 15.4).

Reference Books:

1. S D Sharma: "Operations Research", KedarNath RamNath, 2007.
2. Hamdy A Taha: "Operations Research, An Introduction", 8th Edition, Pearson Education, 2007, ISBN: 81-203-2235-5.
3. Richard Bronson, Govindasami Naadimuthu: "Operations Research", SCHAUM'S Outlines, 2nd Edition, Tata Mcgraw-hill Edition, ISBN-13: 978-0-07-058400-6, ISBN-10: 0-07-058400-1.

E-Resources:

1. www.nptelvideos.in/2012/12/fundamentals-of-operations-research.html2.
2. www.freevideos.com/courses/2678/advanced-operations-research

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Computer Networks Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSL57	1-0-2-0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Become familiar with the working of network topology.
- Understand working of Ethernet LAN.
- Understand the concepts of mobile routing.
- Become familiar with the basics of TCP/IP.
- Understand the concepts of network security.

Part A

Simulation Exercises

The following experiments shall be conducted using either NS228/OPNET or any other suitable simulator.

1. Simulate a three nodes point - to - point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.

2. Simulate a four node point-to-point network with the links connected as follows: $n_0 - n_2$, $n_1 - n_2$ and $n_2 - n_3$. Apply TCP agent between $n_0 - n_3$ and UDP between $n_1 - n_3$. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.

3. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.

4. Simulate an Ethernet LAN using n nodes (6-10), change error rate and data rate and compare throughput.

5. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.

6. Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.

Part B

Implement the following in C/C++:

7. Write a program for error detecting code using CRC-CCITT (16- bits).

8. Write a program for distance vector algorithm to find suitable path for transmission.

9. Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.

10. Implement the above program using as message queues or FIFOs as IPC channels.

11. Write a program for simple RSA algorithm to encrypt and decrypt the data.

12. Write a program for congestion control using leaky bucket algorithm.

Course Outcomes

On completion of this course, students will be able to :

- Analyse the working of network devices.

- Differentiate packet managements at different levels.

- Apply the knowledge of security algorithms.

- Discover shortest path using routing algorithms.

- Demonstrate the working of wireless networks.

Text Books:

1. Behrouz A. Forouzan: "Data Communication and Networking", 5th Edition, Tata McGraw-Hill, 2012, ISBN: 978-0-07-337622-6.

2. Alberto Leon-Garcia, Indra Widjaja: "Communication Networks -Fundamental Concepts and Key architectures", 2nd Edition, Tata McGraw-Hill, 2004, reprint 2007, ISBN-13: 978-0-07-059501-9.

3. Nader F. Mir: "Computer and Communication Networks", 2nd Edition, Pearson Education, 2015, ISBN: 0133814742.

E- Resources:

1. https://archive.org/details/Data.Communications.and.Networking.5th.Edition

2. https://doc.lagout.org/network/Data%20Communications%20and%20 Networking%20By%20Behrouz%20A.Forouzan.pdf

3. http://ptgmedia.pearsoncmg.com/images/9780133814743/samplepages /9780133814743.pdf

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Operating System Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSL58	1-0-2-0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Learn different types of operating systems.
- Learn the concept of CPU scheduling algorithms used in operating system.
- Understand Bankers algorithm used for deadlock avoidance and prevention.
- Learn the concept of Inter process Communication.
- Gain knowledge of Producer Consumer Problem.

Syllabus

Note: The following programs can be executed on C/C++ any equivalent language or tool with suitable platform.

1. Write a program to simulate the Round Robin Scheduling algorithm.
2. Write a program to implement the Shortest Job First algorithm.
3. Write a program to implement the First come First Serve algorithm.
4. Write a program to implement the Priority Scheduling algorithm.
5. Design and develop and run a program to implement Banker's algorithm.
6. Write a Program to implement Inter process Communication using Pipes.
7. Write a Program to implement Producer Consumer Problem.
8. Installation of Operating systems.

Course Outcomes

On completion of this course, students will be able to :

- Explain different types of operating systems and installation process.
- Implement CPU scheduling algorithms used in operating system.
- Implement Bankers algorithm used for deadlock avoidance and prevention.

- Design and implementation of Inter process Communication.
- Solve Producer Consumer Problem.

Reference Books:

1. D.M Dhamdhere: "Operating systems - A concept based Approach", Tata McGraw-Hill, 2nd Edition, 2002, ISBN: 978–0–07–295769–3.

2. P.C.P. Bhatt: "Introduction to Operating Systems: Concepts and Practice", PHI, 4th Edition, 2008, ISBN: 978-81-203-4836-3.

3. Harvey M Deital: "Operating systems", Pearson Education, 3rd Edition, 1990, ISBN: 978-0131828278.

E-Resources:

1. http://nptel.ac.in/courses/106108101/
2 http://study.com/academy/lesson/computer-operating-systems-managing-hardware-and-software-resources.html

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General Aptitude

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSH59	2:0:0:0	2	CIE:50 SEE:50	3 Hours	HSS

Course Objectives:

This course will enable students to :

- Understand different types of Numerical / Arithmetical problems.
- Understand the different Data interpretation problems.

Syllabus

Module – I

Numerical Ability-I: Numbers, HCF and LCM of numbers, Decimal Fractions, Average, Problems on Numbers, Problems on Ages.   **06 Hours**

Module – II

Numerical Ability-II: Percentage, Profit and Loss, Ratio and Proportion, Partnership, Chain Rule, Time and Work.   **05 Hours**

Module – III

Numerical Ability-III: Pipes and Cistern, Time and Distance, Problems on Trains, Alligation or Mixture, Simple Interest, Compound Interest.   **05 Hours**

Module – IV

Numerical Ability-IV: Races and Games of Skill, Calender, Clocks, Permutations and Combinations, Probability, Odd man out and Series.   **05 Hours**

Module-V

Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs.   **05 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Solve and analyze different types of Numerical / Arithmetical problems.
- Solve and analyze different Data interpretation problems.

Text Books:

1. R S Aggarwal: "Quantitative Aptitude for competitive examinations", (Chapters 1-3,6-8,10-18,20-22,26-28,30,31,35-39), S. Chand Publishing, New Delhi, 2014, ISBN-13: 978-81-219-2498-6.

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Sixth Semester B.E. - Syllabus

Unix System Programming

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST61	3-0-0-0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Learn about the UNIX and POSIX standards.
- Become familiar with files and process.
- Understand the different APIs and details of Unix processes.
- Become familiar with handling fork function and race condition.
- Learn about inter process communication between client and server.

Syllabus

Module – I

Introduction: UNIX and ANSI Standards: The ANSI C Standard, The POSIX Standards, UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics. UNIX Files: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.   **08 Hours**

Module – II

UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs. UNIX Processes: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables.   **08 Hours**

Module – III

Process Control: UNIX Kernel Support for Processes. Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, Race Conditions, exec Functions, Interpreter Files, system Function, Process Accounting, User Identification, Process Times. Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control. **08 Hours**

Module – IV

Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, Kill, Alarm, Interval Timers, **Daemon Processes:** Introduction, Daemon Characteristics, Coding Rules, Error Logging.

Inter process Communication-1: Introduction, Pipes, popen, pclose Functions, Coprocesses, FIFOs. **08 Hours**

Module – V

Inter process Communication-2: System V IPC: Message Queues, Semaphores, Shared Memory. NETWORK IPC SOCKETS: Introduction; Socket Descriptors; Addressing; Connection establishment; Data transfer; Socket options; Out-of-band data; Nonblocking and asynchronous I/O. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Develop programs using UNIX/POSIX standards.
- Describe Unix APIs functions and Files.
- Analyse zombie process and job control.
- Explain UNIX kernel support for signals.
- Design and develop various IPC methods.

Text Books:

1. Terrence Chan: "UNIX System Programming Using C++", (Chapters 1.1, 1.4, 1.6, 5, 6, 7.1-7.6), Prentice Hall India, 1st Edition, 1999, ISBN: 9780133315622.

2. W. Richard Stevens, Stephen A. Rago: "Advanced Programming in the UNIX Environment", (Chapters 7, 8.1-8.6, 8.9, 8.10, 8.12-8.16, 9.1-9.8, 13.1-13.4,15.1-15.9, 16), Pearson Education / PHI, US, 2nd Edition, 2005, ISBN: 978-0321637734.

Reference Books:

1. Marc J. Rochkind: "Advanced UNIX Programming", Pearson Education, 2nd Edition, 2005.

2. Maurice J Bach,"The Design of the UNIX Operating System", Pearson Education,1st Edition, 1987.

3. Uresh Vahalia: "UNIX Internals: The New Frontiers", Pearson Education, 1st Edition, 2001.

E-Resources:

1. http://weshakucysysh.comunidades.net/unix-systems-programming-communication

2. https://www.pearson.com/us/higher-education/program/Rochkind-Advanced-UNIX-Programming-2nd-Edition/PGM155399.html

3. http://www.ewitedu.in/k_course/usp6/

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System Software

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST62	3-0-0-0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Learn fundamentals of system software.
- Gain knowledge about system software tool like assemblers.
- Understand the working of loaders and editors.
- Learn macroprocessors and its design.
- Study the concepts of Lex and Yacc programming.

Syllabus

Module – I

Machine Architecture: Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples.

Assemblers-1: Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures, Machine Dependent Assembler Features - Instruction Formats & Addressing Modes. **08 Hours**

Module – II

Assemblers-2: Program Relocation, Machine Independent Assembler Features – Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking, Assembler Design Operations - One-Pass Assembler, Multi-Pass Assembler. **08 Hours**

Module – III

Loaders and Linkers: Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader, Machine-Dependent Loader Features – Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader;

Editors and Debugging Systems: Text Editors - Overview of Editing Process, User Interface, Editor Structure, Interactive Debugging Systems - Debugging Functions and Capabilities. **08 Hours**

Module – IV

Macro Processor: Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine-Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion **08 Hours**

Module – V

Lex and Yacc: Lex and Yacc - The Simplest Lex Program, Recognizing Words With LEX, Symbol Tables, Grammars, Parser-Lexer Communication, The Parts of Speech Lexer, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written Lexers, Using LEX -Regular Expression, Examples of Regular Expressions, A Word Counting Program, Parsing a Command Line.   **08 Hours**

Course Outcomes

On completion of this course, students will be able to :

- Acquire the basic concepts of system software.
- Acquire skills with the working principle of one pass and multi-pass assembler.
- Analyze the function of loaders and editors.
- Analyze the concepts of macroprocessors.
- Design and develop lex and yacc programming.

Text Books:

1. Leland.L.Beck: "System Software", 3rd Edition, Pearson Education, 1997, (Chapters 1.1 to 1.3, 2 (except 2.5.2 and 2.5.3), 3 (except 3.5.2 and 3.5.3), 4 (except 4.4.3)), ISBN-10: 817758555, ISBN-13: 9788177585551.

2. John.R.Levine, Tony Mason and Doug Brown: "Lex and Yacc," O'Reilly, SPD, 1998, (Chapters 1, 2 (Page 2-42), 3 (Page 51-65)), ISBN: 565920007, 9781565920002.

Reference Book:

1. D.M.Dhamdhere: "System Programming and Operating Systems", 2nd Edition, Tata McGraw - Hill, 1999, ISBN-13: 978-0072957693, ISBN-10: 0072957697.

E-Resources:

1. https://en.wikipedia.org/wiki/System_software
2. https://techterms.com/definition/systemsoftware
3. www.computerhope.com/jargon/s/systsoft.html
4. https://en.wikibooks.org/wiki/A...Program...Systems/System_software
5. https://www.techopedia.com/definition/5476/system-software

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Embedded Systems (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI63	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the embedded system technologies and applications of embedded systems
- Understand the communication buses for device networks of embedded systems.
- Learn the various issues involved in real-time operating systems.
- Know how these systems can handle the tasks and scheduling of the tasks
- Learn about embedded systems associated design and software development tools.

Syllabus

Module – I

Introduction to Embedded Systems: Embedded systems; Processor embedded into a system; Embedded hardware units and devices in a system; Embedded software in a system; Examples of embedded systems; Embedded System-on-Chip (SoC), Formalization of system design; Design process and design examples; Classification of embedded systems; Skills required for an embedded system designer. **10 Hours**

Module – II

Communication Buses for Device Networks: Wireless devices; Timer and counting devices; Watchdog timer; Real time clock; Networked embedded systems; Serial bus communication protocols; Parallel bus device protocols; Internet enabled systems; Wireless and mobile system protocols. **07 Hours**

Module – III

Real Time Operating Systems-1: Operating System services; Process management; Timer functions; Event functions; Memory management; Device, file and I/O sub-systems management; Interrupt routines in RTOS environment and handling of interrupt source calls. **08 Hours**

Module – IV

Real Time Operating Systems-2: Real-Time Operating Systems; Basic design using an RTOS; RTOS task scheduling models, interrupt latency and response times of the tasks as performance metrics; OS security issues. **08 Hours**

Module –V

Embedded Software Development Tools: Introduction; Host and target machines; Linking and locating software; Getting embedded software in to the target system;

Issues in hardware-software design and co-design; Testing on host machine; Simulators; Laboratory tools. **07 Hours**

List of Lab programs:

1. Intrusion detection in TCP/IP networks using immune systems paradigm and neural network detectors.

2. Network Tapping System Based on Customized Embedded Linux: Design and Implementation.

3. Network Intrusion Detection System Based on Embedded System - Off-line and On-line NIDS Based on Embedded System: Design and Implementation.

4. Packet Features Extractor for Network Security Systems: Design and Implementation.

5. Draft of Design and Implementation FSK Remote Control System Using ATmiga16 Microcontroller.

6. Text Code of Tx Rx remote control ATmiga16 Microcontroller.

Course Outcomes:

On completion of this course, students will be able to : :

- Describe the embedded system technologies and applications of embedded systems
- Differentiate communication buses for device networks of embedded systems
- Solve issues involved in real-time operating systems.
- Manage tasks scheduling of embedded systems.
- Design software development tools.

Text Book:

1. Raj Kamal: "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill Education, 2011, ISBN-10- 0-070-66764-0, ISBN-13: 978-0-070-66764-8, (Chapters 1-5,7-9,11,12).

Reference Book:

1. Shibu K V: "Introduction to Embedded Systems", Tata McGraw Hill, 2009, ISBN-10: 0070678790, (Chapters 1,2,4,6-10).

E-Resources:

1. http://info300.net/skhouri/sources.html

2. http://embedded-computing.com/articles/safety-security-and-source-code-for-industrial-embedded-systems-no-shortcuts/

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Data Mining (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI641	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable the students to :

- Understand the basic concepts, different types of data and data pre-processing methods.
- Understand the basic concepts and algorithms in association mining.
- Understand the different classification techniques.
- Identify the accuracy of diverse classifiers and predictors.
- Identify the appropriate clustering techniques for the given data sets.
- Familiarize with the various applications of Data Mining.

Syllabus

Module – I

Data Mining: Introduction, Challenges, Data Mining Tasks, Types of Data, Data Quality- Measurements and data collection errors, precision, bias, accuracy, missing value, inconsistent values, noise and artifacts, outliers, duplicate data, Data Preprocessing- aggregation, sampling, dimensionality reduction, discretization and binarization, Variable transformation.   **08 Hours**

Module – II

Association Analysis: Association Analysis- Basic Concepts & Algorithms: Frequent Item set Generation. Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for generating Frequent Item sets, FP Growth Algorithm, Evaluation of Association Patterns–Objective Measures of Interestingness. **08 Hours**

Module – III

Classification: Basics, General approach to solve classification problem, Decision Trees Induction, Rule based classifiers, Nearest Neighbour Classifiers, Bayesian Classifiers, Artificial Neural Networks (ANN).   **08 Hours**

Module – IV

Clustering Techniques: Overview, Features of cluster analysis, Types of Data & Computing Distance (Measures of Similarity &Dissimilarity), Different types of Clustering, Different types of clusters, K-means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation-Overview.   **08 Hours**

Module – V

Mining different types of data: Text Mining-Text data analysis &informational retrieval, text mining approaches, Mining the world wide web-Mining web page

layout structure, Mining web's link structures, Web usage mining. Applications: Finance, Retail Industry, Intrusion detection. **08 Hours**

Laboratory

Part – A

1. Working with the Weka tool/ Rapid Miner Tool/R Tool

    Step 1: Dataset Creation

    Step 2: Preprocessing

    The preprocessing techniques that can be applied are as follows:

    a. Handling of Missing values for categorical and numerical values

    b. Redundancy Techniques.

    Step 3: Perform the following on the preprocessed dataset:

    a. Association mining

    b. Decision Tree Classification

    c. Naïve Bayes Classification

PART - B

1. Write a java/C++ program to perform aggregation and discretization on a given dataset.
2. Write a java/ C++ program to identify the frequent subsets from a frequent item set.
3. Write a java/ C++ program to identify strong rules from a set of rules given the confidence and support thresholds.
4. Write a java/ C++ program to implement the information gain and gini index measures to identify the best attribute to split.
5. Write a java/ C++ program to construct a Naïve Bayesian classifier for a given dataset.
6. Write a java/ C++ program to perform k-means clustering on numeric dataset.

Course Outcomes

On completion of this course, students will be able to : :

- Illustrate the data and various data reprocessing techniques.
- Design association mining approaches and analyze them.
- Design data classification methods and measures for evaluation.
- Generate clusters from the data using similarity measures.
- Apply data mining approaches in text and web and identify the applications of data mining.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: "Introduction to Data Mining", Pearson Education, 2005.

2. Jiawei Han and Micheline Kamber, (Chapters 1,2.1,2.2,2.3,4.1,5.1-5.4,6.1-6.7,8.1-8.5,10.3,10.4,10.5), Pearson Education, 2005, ISBN:032-132-1367.

3. Morgan Kaufmann: "Data Mining - Concepts and Techniques", 2nd Edition, Publisher, 2006, (Chapters 10.3,10.4,10.5), ISBN:978-81-312-0535-8.

Reference Book:

1. G. K. Gupta: "Introduction to Data Mining with Case Studies", 3rd Edition, PHI, New Delhi, 2009, ISBN: 978-8120330535.

E-Resources:

1. www-users.cs.umn.edu/~kumar/dmbook.

2. www.cs.ccsu.edu/~markov/ccsu_courses/datamining-1.html.

3. https://www.pearson.com/us/higher...Introduction-to-Data-Mining/PGM93748.html

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Database Concepts

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI642	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable the students to :

- Understand the basic concepts of database and Database Management System.
- Understand the difference between relational systems and non-relational systems.
- Get a clear understanding of how to maintain data (CRUD operations) in a relational database.
- Understand the working of a non-relational database.
- Get a clear understanding of how to maintain data (CRUD operations) in a non-relational database.
- Understand how Java programs can access database management systems using JDBC.

Syllabus

Module – I

Introduction to Database: Relational Database, Schemaless Database.

Introduction to SQL: DDL, DML, DQL, TCL, DCL.

Constraints: Not null, Unique, Primary key, foreign key.   **08 Hours**

Module – II

Operators and Functions: Operators and Functions.

Joins, Inner queries, Co-related queries: Joins, Inner queries, Co-related queries.

07 Hours

Module – III

JDBC: JDBC API, Statement / Prepared Statements / Callable Statments, Result Set, CRUD operations.   **05 Hour**s

Module – IV

MongoDB: Introduction and Installation, CRUD operations, Projections.   **06 Hours**

Module – V

Project Work: To create a Banking application using the concepts of database management systems with special emphasis on Java, JDBC, and MySQL database.

14 Hours

Laboratory

1. Programs covering SQL, Constraints, Operators and Functions, Joins, Inner queries, Co-related queries.
2. Programs covering JDBC concepts.
3. Programs covering MongoDB concepts.

Course Outcomes

On completion of this course, students will be able to :

- Explain the basic concepts of database and Database Management System.
- Differentiate between relational systems and non-relational systems.
- Describe how to maintain data (CRUD operations) in relational and non-relational database.
- Manage Java programs to access database management systems using JDBC.
- Save and retrieve data in a safe and consistent manner.

Text Books:

1. Rajiv Chopra: "Database Management Systems (DBMS)", 5th Edition, S Chand Publishing, ISBN-10: 9385676342.
2. Kristina Chodorow, Shroff: "MongoDB: The Definitive Guide", 2nd Edition, ISBN-10: 9351102696.

Reference Books:

1. Raghu Ramakrishnan: "Database Management Systems (Asia Higher Education Engineering/Computer Science)", 3rd Edition, McGraw Hill Education, ISBN-10: 007123151X.
2. Kyle Banker, Peter Bakkum, Shaun Verch: "MongoDB in Action: Covers MongoDB Version 3.0", 2nd Edition, Dreamtech Press, ISBN-10: 9351199355.

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Soft Computing (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI643	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Learn the fundamentals and major concept of Soft Computing and Neural Network.
- Study various architecture and phases of Neural Network.
- Extend the knowledge of Fuzzy Logic, Genetic Algorithms.
- Study the concepts of Hybrid Systems.
- Learn necessity in engineering field.

Syllabus

Module – I

Introduction: Introduction to Soft Computing, Historical Development, Definitions, advantages and disadvantages, solution of complex real life problems.　　**07 Hours**

Module – II

Neural Network: Introduction – Fundamental concept – Evolution of Neural Networks – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network. Supervised Learning Network: Perceptron Networks – Adaline – Multiple Adaptive Linear Neurons – Back-Propagation Network – Radial Basis Function Network.　　**09 Hours**

Module – III

Fuzzy Logic: Introduction to Classical Sets and Fuzzy sets – Classical Relations and Fuzzy Relations – Tolerance and Equivalence Relations – Noninteractive Fuzzy sets – Membership Functions: Fuzzification – Methods of Membership Value Assignments – Defuzzification – Lambda-Cuts for Fuzzy sets and Fuzzy Relations – Defuzzification Methods.　　**07 Hours**

Module – IV

Genetic Algorithms: Introduction – Basic Operators and Terminologies in GAs – Traditional Algorithm vs. Genetic Algorithm – Simple GA – General Genetic Algorithm – The Scheme Theorem – Classification of Genetic Algorithm – Holland Classifier Systems – Genetic Programming. Applications of Soft Computing: A Fusion Approach

of Multispectral Images with SAR Image for Flood Area Analysis – Optimization of Travelling Salesman Problem using Genetic Algorithm Approach- Genetic Algorithm based Internet Search Technique – Soft Computing based Hybrid Fuzzy Controllers – Soft Computing based Rocket Engine – Control. **09 Hours**

Module –V

Hybrid Systems: Genetic Algorithm based Backpropagation Network, Fuzzy – Backpropagation, Fuzzy Logic Controlled Genetic Algorithms. **07 Hours**

Laboratory

List of Experiments: (Work in Computation lab)

1. Problems based on GA and its applications in transportation.
2. Problems based on Fuzzy logic and its applications in transportation.
3. Problems based on ANN and its applications in transportation.
4. Problems based on hybrid systems and its application in transportation.

Design based Problems (DP)/Open Ended Problem:

1. Solving routing problem of mass transit system using GA
2. Developing trip generation relationship using ANN
3. Developing mode choice model using Fuzzy Logic
4. Obtaining optimal mix design of Bituminous Concrete using GA or Hybrid system

Course Outcomes:

On completion of this course, students will be able to :

- Implement the knowledge of Neural Network.
- Implement Fuzzy Sets, fuzzification, defuzzification.
- Design solutions for problems regarding probability, Mutation of crossover, convergence and Encoding.
- Use the soft computing techniques for daily problems.
- Implementation of soft computing and importance in engineering field.

Text Books:

1. S.N. Sivanandan, S.N. Deepa: "Principles of Soft Computing", (Chapters 1-15), Wiley India, 2007, ISBN-10: 81-265-1075-7.

2. S. Rajasekaran, G.A. Vijayalakshmi Pai: "Neural Network, Fuzzy Logic, and Genetic Algorithms - Synthesis and Applications", (Chapters 1-15), Prentice Hall, Page 1-435, 2005, ISBN: 8120321863.

3. Sinha, N.K., Gupta, M. M.: "Soft Computing and Intelligent Systems Theory and Applications", (Chapters 1-25), Academic Press, Page 1-625, 2000, ISBN-10: 0126464901, ISBN-13: 9780126464900.

Reference Books:

1. Fakhreddine karray, Clarence de Silva: "Soft Computing and Intelligent Systems Design - Theory, Tools and Applications", (Chapters 1-10), Addison Wesley, Page 1-533, 2004.

2. Klir, G. J. and Yuan, B.: "Fuzzy Sets and Fuzzy Logic: Theory and Applications", Prentice Hall, 1995.

E-Resources:

1. https://link.springer.com/referenceworkentry/10.1007/978-0-387-30440-3_15

2. http://www.faadooengineers.com/threads/9513-Soft-computing-full-notes-pdfs-ebooks

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Artificial Intelligence

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST651	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to

- Understand AI technique to a given concrete problem
- Study non-trivial AI techniques to handle complex problem
- Understand uncertainty and Problem-solving techniques.
- Learn various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent.
- Understand different logical systems for inference over formal domain

Syllabus

Module – I

Introduction: What is AI? Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents. Problem solving: Problem-solving agents; Example problems; Searching for solution; Uninformed search strategies.

09 Hours

Module – II

Informed Search, Exploration, Constraint Satisfaction, Adversial Search: Informed search strategies; Heuristic functions; On-line search agents and unknown environment. Constraint satisfaction problems; Backtracking search for CSPs. Adversial search: Games; Optimal decisions in games; Alpha-Beta pruning. **08 Hours**

Module – III

Logical Agents: Knowledge-based agents; The wumpus world as an example world; Logic; propositional logic Reasoning patterns in propositional logic; Effective propositional inference; Agents based on propositional logic. **07 Hours**

Module – IV

First-Order Logic, Inference in First-Order Logic-1: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic; Knowledge engineering in first-order logic. Propositional versus first-order inference; Unification and lifting

08 Hours

Module – V

Inference in First-Order Logic-2: Forward chaining; Backward chaining; Resolution.

08 Hours

Course Outcomes:

On completion of this course, students will be able to :

- • Design intelligent agents for solving simple gaming problems.
- • Apply non-trivial AI techniques to handle complex problems.
- • Apply various symbolic knowledge representation to specific problems.
- • Design Knowledge-based agents.
- • Describe syntax and semantics of first-order logic.
- • Explain inference in first order logic.

Text Book:

1. Stuart Russel, Peter Norvig: "Artificial Intelligence A Modern Approach", 2nd Edition, Pearson Education, 2003, (Chapters 1.1, 2, 3.1 - 3.4, 4.1, 4.2, 4.5, 5.1, 5.2, 6.1- 6.3, 7, 8, 9, 10, 11.1, 11.2, 11.4, 11.5, 13.1, 13.4, 13.5, 13.6,) ISBN:0-13-103805-2.

Reference Books:

1. Elaine Rich, Kevin Knight: "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009, ISBN-10: 0070087709
2. Nils J. Nilsson: "Principles of Artificial Intelligence", Elsevier, 1980, ISBN: 978-3-540-11340-9.

E-Resources:

1. http://stpk.cs.rtu.lv/sites/all/files/stpk/materiali/MI/Artificial%20Intelligence%20A%20Modern%20Approach.pdf.
2. http://www.getfreeebooks.com/16-sites-with-free-artificial-intelligence-ebooks/

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LabVIEW - Level I

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE661	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the fundamental of graphical coding system.
- Learn to develop basic level of LabVIEW coding.
- Study the different component of LabVIEW operating tools.
- Study and develop state machine for a specific problem.
- Develop integrated coding solution for analysis and presentation with MyRio hardware using accelerometer.

Syllabus

Module - I

LabVIEW programming concepts, environment and Software constructs: Data flow, Polymorphism, Front panel window, block diagram, and connector pane, Menus and palettes, Configuration options. Controls, indicators, IO controls, and refnums Terminals, constants, nodes, update modes, and legends of charts and graphs. Mechanical action of Boolean objects Property Nodes. Numeric, string, Boolean, and path data types. Array and cluster data types. Shift registers, Case, Sequence and Event structures. **10 Hours**

Module - II

Programming, Data communication and synchronization VIs and functions: Conversion, comparison, and manipulation, Timing and Timing functions related to Timed structures. Data storage and file I/O formats, Waveform and waveform file I/O, Dynamic and User events Local, global, and shared variables Data Socket TCP and UDP Notifiers Queues Semaphores Property Nodes, and Invoke Nodes. **08 Hours**

Module - III

Error handling VIs and functions: Error clusters Dialog and User Interface VIs Custom error codes.

Design patterns: Simple state machine, User interface event handler, Queued message handler, producer/consumer (data) and producer/consumer (events), Functional global variables. **06 Hours**

Module - IV

Sub VI design: SubVI creation methods, Connector panes and connection types, Polymorphic subVIs, Options related

Debugging tools and techniques: Debugging tools, Error list window, Execution highlighting, Breakpoints and single stepping, Generic and custom probes, Debugging practices and techniques for different situations. **08 Hours**

Module - V

VI design and documentation (style) practices: Refer to the LabVIEW Style Checklist topic of the LabVIEW Help for information on the following items

i.   User interface design and block diagram layout

ii.   Modular and hierarchical design

iii. SubVI icons and connector pane layout (standard)

iv.   Properties

v.   Documenting Vis

Memory, performance, and determination

a.   Tools for identifying memory and performance issues

Profile memory and performance, Show buffer allocations and VI metrics

b.   Programming practices

Enforcing dataflow, User interface updates and response to user interface controls, Data type selection, coercion, and buffer allocation, Array, string, and loop operations **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

• Formulate basic aspects of the graphical programming using LabVIEW 2016.

• Develop LabVIEW coding for a specific problem of datalogging, measurement and presentation.

• Handle the error function and errors in the LabVIEW coding.

• Develop coding for data handling and Analysis on the acquired data.

• Design a state machine LabVIEW coding for an applied problem.

Text Books:

1. "LabVIEW - Getting Started with LabVIEW", M/s National Instruments, 2013 373427J-01.

2. Jovitha Jerome: "Virtual instrumentation using labview", PHI Learning Pvt. Ltd., 2010.

3. Hans-Petter Halvorsen: "Introduction to LabVIEW," University College of Southeast, Norway.

4. S. Sumathi, P. Surekha, "LabVIEW based Advanced Instrumentation Systems", Springer.

5. Lab manual provided by Dept. of Civil Engg., NCET.

Reference Books:

1. Jeffrey Travis, Jim Kring: "Introduction to Graphical Programming with LabVIEW", Pearson, 2006.

2. Malan Shiralkar: "LabVIEW Graphical Programming Course Collection", National Instruments.

E-Resources:

1. http://cnx.org/content/col10241/1.4.

Yoga and Meditation

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE662	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Introduce the main principles of Yoga.
- Generate knowledge and skills of students to use the tools and techniques for using Yoga in day to day life for better health and well being.
- Improve communication and increase concentration through Yoga and Meditation.
- Equip the individual to handle stressful situations and manage day to day activities.

Syllabus

Module – I

Definition and meaning of yoga: Meaning of Asanas, Types of Asanas: standing, sitting and supine asanas. Standing Asanas (Trikon asan, padhastasan, ardhachakrasan, veerbhadrasan), Sitting Asanas (Vajrasan, padmasan, suptavajrasan, Ardhamaschendrasan, vakrasan), Supine Asanas (Sarvangasan, Matsyasan, Natarajasan, Shavasan)   **08 Hours**

Module – II

Patanjali's Yoga Sutra: Eight limbs of yoga, Importance of discipline in Yoga, Stillness of mind, Five Modulations (vritti) of the mind, Practice and Dispassion, Obstacles in the path of Yoga, Overcoming distractions of the mind through Yoga.   **08 Hours**

Module – III

Understanding physiological implications of Yoga, Three types of Gunas (Satva, Rajas and Tamas) and their effects on body and mind, Food Habits, Meaning of Prana, Pranayama and its advantages, Different types of Pranayama.   **08 Hours**

Module – IV

Ayurveda: The science of life, Three types of doshas (Vata, Pitta and Kapha), Balancing the different doshas for a healthy life, Ayurvedic principles of food and activity, Advanced Asanas: Mayurasana, Sirsasana, Gomukh Asana, Vrkshasana, Baddha Konasana.   **08 Hours**

Module – V

Meditation: Meaning of meditation, Meditation vs Concentration, Advantages of Meditation, Effects of Meditation on body and mind, Effect on health and general well being, Reducing stress through meditation, Increasing concentration, Improving communication, Effect on Environment **08 Hours**

Course Outcomes:
On completion of this course, students will be able to :

- Know the basic principles of Yoga.

- Know and practice the basic asanas and their benefits.

- Use Pranayama and Meditation for improving health and mental peace.

- Know the difference between meditation and concentration.

- Apply the principles of Ayurveda and implement them for one's benefit.

Text Books:
1. Yoga Sutras of Patanjali (ancient text).
2. B K S Iyengar: "Light on Yoga".

Reference Books:
1. A traditional touch to Yogasanas for beginners and Sadhakas, Swami Vivekananda Yoga Prakashana (SVYP).
2. Dr. Vasant Lad: "Ayurveda: The Science of Self-Healing: A Practical Guide".

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Martial Arts

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE663	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

The following types of Martial arts are offered,

1. Karate
2. Taekwondo
3. Judo
4. Kung-fu

Expert Trainers will be provided during the academic year through experts in Martial Arts. Students who enroll for this elective should attend the regular Training classes and maintain a minimum of 85% attendance.

At the end of the training programme the performance Evaluation will be made by team of experts. Students who secure at least a satisfactory grade will be issued a certificate and deemed to have been completed the above said 3 Credit course. However, the students who have shortage of attendance will be consider for the award of 3 credits provided they undergo training at any of the training centers in the above said Martial Arts, complete the certification programme and give a demo along with viva in the presence of experts in the campus.

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Music (Carnatic Vocal/Instrumental)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE664	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Get familiarized with the conceptual understanding of Carnatic music.
- Gain knowledge about the basics of Swaravalis.
- Understand the use of different Talas.
- Gain understanding about various Raagas.
- Gain understanding about intricacies of Swaras.

Syllabus

Module – I

Theoretical Aspects: Father of Carnatic music, Famous personalities in Carnatic music, Concept of Sapta Swara, Taala, Melody, Pitch, Rhythm, Janaka Raaga, Janya Raaga. **03 Hours**

Module – II

Sarale Varase (Any 5), Janti Varase (Any 5), Daatu Varase, Tara Stayi, Mandra Stayi.

08 Hours

Module – III

Alankaras: Druva Taala, Matya Taala, Triputa Taala, Rupaka Taala, Jampe Taala, Atta Taala, Eka Taala. **08 Hours**

Module – IV

Geethagalu, Pillari Geethe (4), Sanchari Geethe (5), Lakshana Geethe (1). **10 Hours**

Module – V

Swarajatis (Any 2), Kalyani, Bilahari, Neelambari, Kamach.
Varna (Any 2), Shankarabarana, Kalyani, Hamsadwani , Mohana. **10 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Gain knowledge about the theoretical background of carnatic music
- Acquire practical knowledge on basics of Carnatic music.
- Practical demonstration of different Talas.
- Distinguish among various Raagas based on swara sthanas.
- To synchronize the Raaga and Taala.

Text books:

1. Dr. Sachidevi: "Karnataka Sangeetha Darpana", Sreenivasa Prakashana, Bengaluru, 2014.

2. Junior Carnatic Music – C Shiva Musicals, Malleshwaram, Bengaluru, 2013.

Dance (Bharatanatya)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE665	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :
- Gain theoretical knowledge about various types of Indian dances.
- Understand about various musical instruments used in Bharatanatya.
- Learn Practical demonstrations of Bharatanatya steps on Prarthane Namaskara and Shlokas.
- Learn the movements of head, neck, eyes, hands according to Bharatanatya steps.
- Learn the brisk movements in Bharatanatya with the help of ADAVUS.

Syllabus

Module – I

Indian Classical dance, It's history and Significance, Types of Classical Dance, Bharatanatya, Kathakali, Mohini Attam, Koochipudi, Katahak, Odissi, Manipuri.

04 Hours

Module – II

Musical Instuments used in Bharatanatya: Tabala, Mrudanga, Kamsale, Kolata, Taala vadya. Famous personalities in Bharatanatya, Composers of Natya Grantas.

03 Hours

Module – III

Practical exercises on Prarthane, Namaskara and Shloka, Vyayama Kriye for Bharatanatya (Two Shlokas and Two Prarthanes). **10 Hours**

Module – IV

Abhinaya Steps (Chaturvidha) ShiroBedha, Drushti Bedha, Greeva Bedha, Brubedha, Hasta Bedha (Samyuta and Asamyuta). **10 Hours**

Module – V

Adavugalu (DashaVidha) Tattu adavu, Mettu Adavu, Nat Adavu, Egaru Tattu Adavu, Egaru Mettu adavu, Jaaru Adavu, Mandi adavu, TattuMettu Adavu, Rangakarma Adavu, Teermana Adavu. **12 Hours**

Course Outcomes:

On completion of this course, students will be able to :
- Get an insight into various types of Indian dances.
- Gain knowledge of different instruments used to perform dance.
- Perform exercises on prarthane, Namaskara according to Bharatanatya style.
- Perform basic steps in Abhinaya.
- Recognise and perform different Adavus.

Reference Book:

1. "Bharatanatya shastra", Department of Public Instruction, Karnataka State Government**.**

Sports

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE666	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Students who are selected by the University to represent the VTU teams and for participating at State level / National level Sports in the following sports are exempted from taking open elective (Code:16HOE666) and will be awarded 3 credits.

Outdoor games	Indoor games
Cricket	Carrom
Foot ball	Chess
Hockey	Shuttle Badminton
Basket Ball	Squash
Kabbadi	Table – Tennis
Kho – Kho	Gymnastics
Hand – Ball	
Athletics	
Swimming	
Lawn Tennis	

The achievement in Sports as said above should have been made during the academic year during which the said open elective is offered.

After representing at VTU / State / National level in any of the above said sports, the students should produce the certificates from the competent authorities. Based on the certificates the institution will issue another certificate related to the achievement and awarding of three credits.

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Unix System Programming Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSL67	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Learn UNIX environment efficiently.
- Understand and dvelop program to know system configuration options.
- Learn inter process communication technique.
- Understand and use of UNIX APIs.
- Learn the race condition.

Syllabus

1. Write a C/C++ POSIX compliant program to check the following limits:
    - (i) No. of clock ticks
    - (ii) Max. no. of child processes
    - (iii) Max. path length
    - (iv) Max. no. of characters in a file name
    - (v) Max. no. of open files/ process

2. Write a C/C++ POSIX compliant program that prints the POSIX defined configuration options supported on any given system using feature test macros.

3. Consider the last 100 bytes as a region. Write a C/C++ program to check whether the region is locked or not. If the region is locked, print pid of the process which has locked. If the region is not locked, lock the region with an exclusive lock, read the last 50 bytes and unlock the region.

4. Write a C/C++ program which demonstrates inter process communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIs in your program.

5. a) Write a C/C++ program that outputs the contents of its Environment list

    b) Write a C / C++ program to emulate the unix ln command

6. a) Write a C/C++ program to illustrate the race condition.

    b)Modify the above program to avoid the race condition

7. Write a C/C++ program that creates a zombie and then calls system to execute the ps command to verify that the process is zombie.

8. Write a C/C++ program to avoid zombie process by forking twice.

9.   Write a C/C++ program to implement the system function.

10. Write a C/C++ program to set up a real-time clock interval timer using the alarm API.

Course Outcomes:

On completion of this course, students will be able to :

- Implement POSIX feature test macros.

- Design system function.

- Examine emulation of ln command.

- Identify the zombie process.

- Design file and record locking concept.

E-Resources:

1.   http://weshakucysysh.comunidades.net/unix-systems-programming-commun ication

2.   https://www.pearson.com/us/higher-education/program/Rochkind-Advanced-UNIX-Programming-2nd-Edition/PGM155399.html

3.   http://www.ewitedu.in/k_course/usp6/

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Technical Aptitude and GD

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSH68	2:0:0:0	2	CIE:50 SEE:50	3 Hours	HSS

The respective branches shall conduct training programmes related to important and latest programming languages and other emerging technologies, such as Solar and Electric power based gadgets, IoT, ROBOT's, Environmental friendly and cost effective construction techniques, UAV's and technologies pertaining to the respective department.

Seventh Semester B.E. – Syllabus

Internet of Things (IoT) (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI71	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course objectives:

This course will enable students to :

- Study Vision and Introduction to IoT.
- Understand IoT Market perspective.
- Understand Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Learn Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Syllabus

Module – I

IoT and Web Technology: The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics. **08 Hours**

Module – II

M2M to IoT - A Basic Perspective: Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. **06 Hours**

Module – III

M2M to IoT- An Architectural Overview: Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. **06 Hours**

Module – IV

IoT Architecture - State of the Art: Introduction, State of the art.

Architecture Reference Model: Introduction, Reference Model and architecture, IoT reference Model.

IoT Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.   **10 Hours**

Module – V

IoT Applications for Value Creations: Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.   **10 Hours**

Laboratory

1. Sketch the architecture of IoT Toolkit and explain each entity in brief.
2. Demonstrate a smart object API gateway service reference implementation in IoT toolkit.
3. Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit.
4. Explain application framework and embedded software agents for IoT toolkit.
5. Explain working of Raspberry Pi.
6. Connect Raspberry Pi with your existing system components.
7. Give overview of Zetta.

Design based Problems (DP) / Open Ended Problem:

1. How do you connect and display your Raspberry Pi on a Monitor Or TV?
2. Create any circuitry project using Arduino.

Major Equipment:

1. Raspberry pi, Arduino

Course Outcomes:

On completion of this course, students will be able to :

- Explain the vision of IoT from a global context.
- Determine the Market perspective of IoT.

- Examine Devices, Gateways and Data Management.

- Describe the building state of the IoT architecture.

- Apply IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

Text Book:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle: "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, (Chapters 1-4,8-10), Academic Press, 2014, ISBN: 9780080994017.

Reference Books:

1. Vijay Madisetti, Arshdeep Bahga: "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.

2. Francis daCosta: "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

E-Resources:

1. https://github.com/connectIOT/iottoolkit

2. https://www.arduino.cc/

3. http://www.zettajs.org/

4. Contiki (Open source IoT operating system)

5. Arduino (Open source IoT project)

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Android Application Development

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST72	2:0:0:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Learn Android SDK features and the Development Framework and understanding activities.
- Study adaptive, responsive user interfaces that work across a wide range of devices.
- Understand background work and long-running tasks in Android applications.
- Know the concepts of Storing, sharing and retrieving data in Android applications.
- Learn how permissions, security and performance affect application. Finally, make sure your app is ready to share with the world, and publish it.

Syllabus

Module – I

What Is Android?, Android Versions, Features of Android, Architecture of Android, Android Devices in the Market, The Android Market, Obtaining the Required Tools, Eclipse, Android SDK, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs), Creating Your First Android Application, Anatomy of an Android Application. Understanding Activities, Applying Styles and Themes to Activity, Hiding the Activity Title, Displaying a Dialog Window, Displaying a Progress Dialog, Linking Activities Using Intents, Resolving Intent Filter Collision, Returning Results from an Intent.   **05 Hours**

Module – II

Understanding the Components of a Screen, Views and View Groups, Linear Layout, Absolute Layout, Table Layout, Relative Layout, Frame Layout, Scroll View, Adapting to Display Orientation, Anchoring Views, Resizing and Repositioning, Managing Changes to Screen Orientation, Persisting State Information during Changes in Configuration, Detecting Orientation Changes, Controlling the Orientation of the Activity, Creating the User Interface Programmatically, Basic Views .   **05 Hours**

Module – III

Using Image Views to Display Pictures - Gallery and Image View Views, Image Switcher, Grid View, Using Menus with Views - Creating the Helper Methods, Options Menu, Context Menu, Saving and Loading User Preferences - Using get Shared Preferences(), Using get Preferences(), Persisting Data to Files - Saving to Internal Storage, Saving to External Storage (SD Card), Choosing the Best Storage Option, Using Static Resources, Creating and Using Databases.   **05 Hours**

Module – IV

Sharing Data in Android, Using a Content Provider - Predefined Query String Constants, Projections, Filtering, Sorting, Creating Your Own Content Providers - Using

the Content Provider. SMS Messaging - Sending SMS Messages Programmatically, Getting Feedback After Sending the Message, Sending SMS Messages Using Intent, Receiving SMS Messages, Updating an Activity from a Broadcast Receiver, Invoking an Activity from a Broadcast Receiver.   **06 Hours**

Module – V

Creating Your Own Services - Performing Long-Running Tasks in a Service, Performing Repeated Tasks in a Service, Executing Asynchronous Tasks on, Separate Threads Using IntentService, Communicating between a Service and an Activity, Binding Activities to Services. Preparing for Publishing, Versioning, Digitally Signing Your Android Applications, Deploying APK Files - Using the adb.exe Tool, Using a Web Server, Publishing on the Android Market, Creating a Developer Profile, Submitting Your Apps.   **05 Hours**

Course Outcomes:

On completion of this course, students will be able to :
- Comprehend the basic features of Android Platform and Create Activities in Android.
- Demonstrate the design concepts of user interface using components, views and menus in Android.
- Create and use databases for Android Application.
- Implement messaging services in Android.
- Deploy mobile applications in various marketplaces for distribution.

Text Books:

1. Wei – Meng Lee: "Beginning Android Application Development", Wiley Publications, (Chapters 1-8,10,11),
2. Reto Meier: "Professional Android for Application Development", Wiley Publications.

Reference Books:

1. Mark Murphy: "Beginning Android 3"; Apress Springer India Pvt Ltd, 1st Edition, 2011, ISBN-13: 978-1-4302-3297-1.
2. Sayed Hashimi, Satya Komatineni, Dave MacLean: "Pro Android 4", Apress Springer India Pvt Ltd., 1st Edition, 2012, ISBN: 978-1-4302-3930-7.
3. Reto Meier: "Professional Android 2 Application Development", Wiley India Pvt. Ltd., 1st Edition, 2012, ISBN: 9788126525898.
4. James Steele: "The Android Developer's Cookbook Building Applications with the Android SDK", Addison-Wesley Professional, 2010.

E-Resources:

1. https://developers.google.com/training/adf
2. https://goo.gl/ADKvq8
3. https://innovator.samsungmobile.com

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Object Oriented Modeling and Design (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI731	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand the concepts of object oriented approach to perform systems analysis and design.
- Learn the importance and limitations of object-oriented analysis and design.
- Show how object oriented analysis and design is applied in development of software.
- Point out the importance of UML model throughout the process of object oriented modeling and design.
- Gain the necessary knowledge and skills in using object-oriented CASE tools

Syllabus

Module-I

Introduction, Modeling Concepts, class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history

Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models.   **08 Hours**

Module-II

Advanced Class Modeling, State Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages.

State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; examples.   **08 Hours**

Module-III

Advanced State Modeling, Interaction Modeling: Advanced State: Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models.

Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.

08 Hours

Module-IV

Process Overview, System Conception, Application Analysis: Process Overview: Development stages; Development life cycle.

System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.

Application Analysis: Application interaction model, Application class model, application state model, adding operations.   **08 Hours**

Module-V

System Design: Application Design and implementation modeling: Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.   **08 Hours**

Laboratory

Develop a mini-project for the following 12 exercises listed below,

1. To develop a problem statement.
2. Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt chart).
3. Identify Use Cases and develop the Use Case model.
4. Identify the business activities and develop an UML Activity diagram.
5. Identity the conceptual classes and develop a domain model with UML Class diagram.
6. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
7. Draw the State Chart diagram.
8. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
9. Implement the Technical services layer.
10. Implement the Domain objects layer.
11. Implement the User Interface layer.
12. Draw Component and Deployment diagrams.

Suggested domains for Mini-project.

1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. 5.Online course reservation system
6. E-ticketing

7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference Management System

Course Outcomes:

On completion of this course, the students are able to :

- Construct models to Show the importance of systems analysis and design in solving complex problems
- Recognize the difference between various object relationships: inheritance, association, and dependency relationships.
- Represent an object-oriented system using a number of modeling views.
- Apply the role and function of each UML model in developing object-oriented software.
- Estimate System performance and construction of UML models and expressing the appropriate notation associated with each model.

Text Book:

1. Michael Blaha, James Rumbaugh: "Object-Oriented Modeling and Design with UML", 2nd Edition, Pearson Education, 2005, (Chapters 1,2,4-7,10,11,13,14,17), ISBN: 978-81317-1106-4.

Reference Books:

1. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: "UML 2 Toolkit", Wiley - Dreamtech India, 2004, ISBN: 978-0-471-46361-0.
2. Grady Booch: "Object-Oriented Analysis and Design with Applications", 3rd Edition, Pearson Education, 2007, ISBN-13: 978-0201895513.

E-Resources:

1. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_functional_modeling.htm
2. https://en.wikipedia.org/wiki/Object-oriented_analysis_and_design

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Big Data (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI732	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand big data, types, benefits, industry examples for business intelligence.
- Understand NoSQL data models.
- Learn how to manage Nosql data with multiple databases.
- Understand Hadoop, map-reduce architecture and Fundamentals.
- Learn HBase, Cassandra, Cassandra Query language, data replication.

Syllabus

Module – I

Overview of Big Data: Defining Big Data, Big Data Types, Analytics, Industry Examples of Big Data, Benefits of Big Data, Crowd Sourcing Analytics, Indian Big Data companies. **07 Hours**

Module – II

NoSQL Data Management-1: Introduction to NoSQL, aggregate data models, aggregates, key, value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, version, Map reduce, partitioning and combining, composing map-reduce calculations.

08 Hours

Module – III

NoSQL Data Management-2: Key Value Databases, Document Databases, Column Family Stores, Graph Databases. **08 Hours**

Module – IV

Basics of Hadoop: Understanding Hadoop features, Learning the HDFS and MapReduce architecture, Introducing Hadoop MapReduce, Understanding the Hadoop MapReduce fundamentals. **08 Hours**

Module – V

HBase and Cassandra: Introduction to HBase, Row-Oriented vs Column-Oriented data stores, HBase Architecture, Understanding HBase Data Model, Casandra: Introduction, Features of Cassandra, Data Replication in Cassandra, Cassandra Query language(CQL), Cassandra Data Model. **09 Hours**

Laboratory:

Exercise 1 --- HDFS

Start by reviewing HDFS. You will find that its composition is similar to your local Linux file system.

You will use the hadoop fs command when interacting with HDFS,

1. Review the commands available for the Hadoop Distributed File System:
2. Copy file foo.txt from local disk to the user's directory in HDFS
3. Get a directory listing of the user's home directory in HDFS
4. Get a directory listing of the HDFS root directory
5. Display the contents of the HDFS file user/fred/bar.txt
6. Move that file to the local disk, named as baz.txt
7. Create a directory called input under the user's home directory
8. Delete the directory input old and all its contents
9. Verify the copy by listing the directory contents in HDFS:

Exercise 2 --- MapReduce

1. Create a JOB and submit to cluster
2. Track the job information
3. Terminate the job
4. Counters in MR Jobs with example
5. Map only Jobs and generic map examples
6. Distributed cache example
7. Combiners, Secondary sorting and Job chain examples

Exercise 3 --- MapReduce (Programs)

Using movie lens data

1. List all the movies and the number of ratings
2. List all the users and the number of ratings they have done for a movie
3. List all the Movie IDs which have been rated (Movie Id with at least one user rating it)
4. List all the Users who have rated the movies (Users who have rated at least one movie)
5. List of all the User with the max, min, average ratings they have given against any movie
6. List all the Movies with the max, min, average ratings given by any user.

Course Outcomes:

On completion of this course, the students are able to :

- • Describe big data, types, and benefits and used cases from selected business domains.
- • Explain NoSQL big data using data models.
- • Use various databases like Key value, documents, etc.
- • Explain Hadoop, perform map-reduce analytics using Hadoop
- • Use Hadoop related tools such as HBase, Cassandra.

Text Books:

1. V K Jain: "BIG DATA and HADOOP", 2017 Edition, Khanna Book Publishing, ISBN: 978-93-82609-13-1, (Chapters 1.2, 1.4, 1.5, 1.6, 1.16, 1.19, 1.20 and 6.1, 6.2, 6.4, 6.6, 6.8, 6.9, 6.11, 6.13, 6.14).

2. Pramod J. Sadalage, Martin Fowler: "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley, ISBN: 9780133036121, (Chapters 2-4,8-11).

3. Vignesh Prajapati: "Big data analytics with R and Hadoop", 2013, SPD, ISBN-13: 978-93-5110-410-0, (Chapters 1,2).

Reference Books:

1. Tom White: "Hadoop: The Definitive Guide", 3rd Edition, O'Reilley, 2012.

2. Lars George: "HBase: The Definitive Guide", O'Reilley, 2011.

E-Resources:

1. http://www.tutorialspoint.com/hadoop/

2. http://www.sas.com/en_us/insights/big-data/what-is-big-data.html

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Web Technologies – Servlet, JSP (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSI733	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

This course will enable students to :

- Understand the concepts of Web Technologies.
- Understand what are Web Servers and App Servers, and their differences.
- Understand Request and Response models.
- Understand how to build e-commerce applications using Servlets and JSP.
- Understand what EL and EL Tags are, and their usage in developing dynamic web pages.

Syllabus

Module – I

Introduction to Web Technologies: JEE, PHP, ASP and .Net

Introduction Web Dev environment: App Server, Web Server, 2-Tier and 3 -Tier Architecture.

Introduction to Servlet: Introduction to JEE containers, Application directory structure, Servlet Interface / Generic Servlet / HttpServlet, Servlet life cycle, Request and Response objects, Building sample application.   **08 Hours**

Module – II

Inter Servlet Communication: RequestDispatcher, Include / Forword / Redirect, Building sample application.

Session Management: Creating & invalidating session, Different ways to handle session, Session time out configuration.   **08 Hours**

Module – III

Introduction to JSP: Need for JSP, JSP life cycle.   **06 Hours**

Module – IV

Introduction to EL: Need for EL and its advantages, Fundametals of EL.

EL Tags: Core Tags, Introduction to MVC, Building sample application.   **08 Hours**

Module – V

Project Work: Create an e-commerce application using the client-side languages, such as Bootstrap3, HTML5, CSS3, JavaScript and jQuery, along with the server-side Java language - Servlets and JSP.   **10 Hours**

Laboratory

1. Programs covering Web Technologies, Web Dev environment, Servlet.
2. Programs covering Inter Servlet Communication, Session Management.
3. Programs covering JSP, Introduction to EL, EL Tags.

Course Outcomes:

On completion of this course, the students are able to :

- Analyze the concepts of Web Technologies.
- Compare Web Servers and App Servers.
- Implement Request and Response models.
- Demonstrate how to build e-commerce applications using Servlets and JSP.
- Design dynamic web pages using EL Tags.

Text Books:

1. Basham, Bryan, Sierra Kathy, Bates, Bert: "Head First Servlets and JSP", 2nd Edition, Shroff, ISBN-10: 8184044976.
2. Santosh Kumar K: "JDBC 4.2, Servlet 3.1, and JSP 2.3 includes JSF 2.2 and Design Patterns, Black Book", 2nd Edition, Dreamtech Press, ISBN-10: 9351199088.

Reference Book:

1. Budi Kurniawan: "Servlet & JSP: A Tutorial", 2nd Edition, Brainy Software, ISBN-10: 1771970278.

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System Modeling and Simulation

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CST741	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Study the basic system concept and definitions of system.
- Understand the techniques to model and to simulate various systems.
- Acquire knowledge to analyze a system and to make use of the information to improve the performance.
- Understand the value of rapid prototyping for: requirements, potential design issues, modelling inputs.
- Understand the need for quantification and understand the limits of quantification.

Syllabus   **Module – I**

Introduction: When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study. The basics of Spreadsheet simulation, Simulation example: Simulation of queuing systems in a spreadsheet. **08 Hours**

Module – II

General Principles, Simulation Software: Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; **08 Hours**

Module – III

Random-Number Generation, Random-Variate Generation: Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers Random-Variate Generation: Inverse transform technique; Acceptance-Rejection technique; Special properties. **08 Hours**

Module – IV

Input Modeling: Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate and Time-Series input models. **08 Hours**

Module – V

Verification, Calibration, and Validation; Optimization: Model building, verification and validation; Verification of simulation models; Calibration and validation of models, Optimization via Simulation.   **08 Hours**

Course Outcomes:

On completion of this course, students will be able to : :

- Explain the system concept and apply functional modelling method to model the activities of a static system;
- Apply the behaviour of a dynamic system and create an analogous model for a dynamic system;
- Assess and select a model for an engineering system taking into consideration its suitability to facilitate engineering decision making and predicted advantages over alternative models.
- Explain the simulation results of an engineering system model, within the context of its capabilities and limitations, to address critical issues in an engineering project.
- Manage expectation level of different stakeholders

Text Book:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: "Discrete-Event System Simulation", (Chapters, 1-12), 5th Edition, Pearson Education, 2010, ISBN: 9789332518759.

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: "Discrete – Event Simulation: A First Course", Pearson Education, 2006, ISBN: 9780132020565.
2. Averill M. Law: "Simulation Modeling and Analysis", 4th Edition, Tata McGraw-Hill, 2007, ISBN: 9780070667334.

E-Resources:

1. http://home.ubalt.edu/ntsbarsh/simulation/sim.htm
2. http://searchworks.stanford.edu/view/10091706

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Tax Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE751	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Familiarise the students with the significance of taxation system.
- Understand the structure of Indian Taxation system.
- Gain knowledge about the practical aspects of Indian taxation.
- Understand the system of computation of tax from Salaries.
- Sketch the recent trends in Indian taxation system.

Syllabus

Module – I

Introduction to taxation system, Objectives of taxation, Factors to be considered for tax planning Canons of taxation, Types of taxation, Direct tax, Indirect tax (Broad perspective only). **07 Hours**

Module – II

Taxation system in India, Types of taxes levied in India, Various heads of income tax (Broad outline only} Basic concepts in taxation, Assessment year, Financial year, assessee, Residential status, Tax liability **08 Hours**

Module – III

Income tax authorities in India, Constitution, Powers, Functions specimen of Form 16, Filing of returns, tax evasion, Penalties for contravening the provisions of income tax. **08 Hours**

Module – IV

System of computation of tax from salaries, Taxable income, Permissible deductions from 80C to 80U Fringe benefits exempted from tax, exempted income under section 10 of Income tax act. **10 Hours**

Module – V

Trends in Indian taxation system, Self assessment, PAN card, Budgetary provisions of the financial year 2017-18 on taxation, GST, Advantages, Problems in implementing GST, Measures to overcome the limitations of GST. **06 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- • Gain knowledge about the system of taxation prevailing in the country.
- • Compute tax under different heads.
- • Gain practical knowledge on filing returns.
- • Calculate the payable tax for salaried individuals.
- • Gain insight into recent practices on taxation.

Reference Books:

1. Dr. Vinod K. Singhania: "Direct taxes-Law and Practice", Taxmann Publication.

2. Dr. Mehrotra, Dr. Goyal: "Direct taxes- Law and Practice", Sahitya Bhavan Publication.

3. "7 lectures-Income tax-I ", VBH.

4. Swaminathan: "Income Tax", KPH.

5. T.N.Manoharan: "Income tax including VAT".

6. R.G.Saha, Ushadevi: "Taxation", HPH.

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Assessment of Building Energy Performance

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE752	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Provide a foundation for performing a building energy audit
- Perform assessment tasks on building energy performance
- Submit a Building EQ rating
- Understand the methods and processes to be performed in the field
- Know the process of certifying professionals in energy assessment

Syllabus

Module – I

Introduction, global energy consumption characteristics and the role of commercial and residential buildings, building energy end use consumption characteristics, impact of time variations in building energy consumption, Building mechanical, electrical, and lighting systems. **08 Hours**

Module – II

Anatomy of typical HVAC systems in commercial buildings , typical primary and secondary HVAC equipment and their role in meeting system requirements , basics of electrical distribution systems and their equipment in commercial buildings, basics of lighting system in buildings, including performance terminology, lighting technologies, energy performance, and the role of day lighting. **08 Hours**

Module – III

Introduction to building energy benchmarking and assessment , differences between benchmarking, labeling programs, and energy and environmental auditing, role of building type and climate zone on energy use, key aspects of ENERGY STAR® Portfolio Manager and other tools for benchmarking, ASHRAE Building EQ As Designed and In Operation ratings, differences between Building EQ and Portfolio Manager, Preliminary Energy Use Analysis (PEA). **08 Hours**

Module – IV

Measuring and monitoring building performance, instrumentation for measuring indoor environmental quality and building energy flows, Perform measurements of indoor environmental quality and building energy flows, accuracy of building

measurements, Identify the components of an ASHRAE Level 1 walk through survey and the differences between Level 1, 2, and 3 surveys, Indoor Environment Quality.

08 Hours

Module – V

Energy Efficiency Measures – Building Envelope and Lighting, role of building envelope characteristics on energy use, energy conservation and energy efficiency measures related to envelope and lighting characteristics, Energy Efficiency Measures – HVAC Systems, energy conservation and energy efficiency measures related to HVAC systems, financial analysis of expected improvements to HVAC systems.   **08 Hours**

Course Outcomes:

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

- Produce an ASHRAE Building EQ In Operation rating for the buildings provided in the class.
- Produce a listing of potential Energy Efficiency Measures (EEM) including financial payback analysis.
- Perform measurements of indoor environmental quality and HVAC system performance.
- Identify different building types and determine the impact of climate on energy use.
- Analyze raw energy consumption data from measured-meter readings.

Text Books:

1. ASHRAE Building Energy Quotient Program website.
2. ASHRAE BEAP certification study guide.
3. ASHRAE Standard 105-2014 Standard Methods of Determining, Expressing, and Comparing Building Energy Performance and Greenhouse Gas Emission.

Reference Books:

1. ASHRAE Performance Measurement Protocols for Commercial Buildings: Best Practices Guide.
2. ENERGY STAR® Portfolio Manager website.

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Natural Disaster Mitigation and Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE753	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the types of natural and environmental disasters.
- Develop skills in various stages of disaster preparedness, mitigation and management.
- Understand the methodologies for disaster risk assessment.

Syllabus

Module – I

Natural Disasters – Overview: Introduction- Natural Disasters around the world- Natural Disaster Risk Assessment- Earth and its characteristics Human Dimensions of Global environment Change – Disaster mitigation, preparedness, response and recovery comprehensive emergency management Early warning systems and Disaster Preparedness– Rehabilitation, Vulnerable Populations - Logistics and Services, Food, Nutrition and Shelter -Role of UN Red cross and NGOs.   **08 Hours**

Module – II

Natural Hazards: Introduction and Review - Natural Disasters -Principles, Elements, and Systems - Geological-Geomorphological aspects, - Earthquake-Geology, Seismology, Characteristics and dimensions– Landslides- Human impact on the mountainous terrain and its relationship with Rainfall, liquefaction etc- Tsunami - Nature and characteristics.   **08 Hours**

Module – III

Climate system aspects and Processes: Oceanic, Atmospheric and Hydrologic cycles - Severe Weather & Tornadoes , Cyclones, Floods and Droughts - Global Patterns - Mitigation & Preparation – Drought – Famine- nature and dimensions – Drought Assessment and Monitoring.   **08 Hours**

Module – IV

Natural Disaster Communication: Mapping - Modeling, risk analysis and loss estimation – Natural disaster risk analysis - prevention and mitigation - Applications of Space Technology (Satellite Communications, GPS, GIS and Remote Sensing and Information / Communication Technologies (ICT) in Early warning Systems - Disaster Monitoring and Support Centre– Information Dissemination, mobile communication – etc.   **08 Hours**

Module – V

Administrative mechanisms: Community and Social organizations – Education and Training – Establishment of capacity building among various stake holders – Government - Educational institutions – Use of Multi-media knowledge products for self education.   **08 Hours**

Course Outcomes:

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

- Learn about the types of natural and environmental disasters and its causes.
- Learn about organizational and Administrative strategies for managing disasters.
- Learn about the early warning systems, monitoring of disasters effect and necessity of rehabilitation.
- Learn about the engineering and non-engineering controls of mitigating various natural disasters.
- Understand the key roles of capacity building to face disaster among government bodies, institutions, NGO's, etc.
- Learn methodologies for disaster risk assessment with the help of latest tools like GPS, GIS, Remote sensing, information technologies, etc.

Text Books:

1. Kovach, Robert L :"Earth's Fury: An Introduction to Natural Hazards and Disasters", Englewood Cliffs, N.J., Prentice Hall, 1995.

2. Siddhartha Gautam, K Leelakrishna Rao: "Natural disaster Management", 3rd Edition, 2012, ISBN: 9381604320.

Reference Books:

1. Arul Jothi, D L Balaji: "Safety And Disaster Management Education in Schools", 1st Edition, Anmol Publications, 2009, ISBN: 9380252609.

E-Resources:

1. https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr/bt-dsstr-mtgtn-en.aspx

2. www.nrdms.gov.in/natural_disaster.asp

3. https://www.ncbi.nlm.nih.gov › NCBI › Literature › Bookshelf

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Small and Medium Enterprise Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE761	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the various concepts of Entrepreneurship and familiarize them with the understanding of contemporary environment of MSMEs.
- Understand the business Environment to MSMEs.
- Understand the process of Enterprise Creation.
- Understand the effective Business Plan and Institutional Support Mechanism.
- Understand the concepts of marketing management in the MSMEs.

Syllabus

Module – I

Basic Aspects: Concept, nature of Entrepreneur and Entrepreneurship, Distinction between Entrepreneur and Manager, Entrepreneurship, Medium, Small and Tiny Business : Definition, Role in the economy and significance, Changing scenario of MSMEs in the era of Liberalization and Globalization, Competitiveness.   **08 Hours**

Module-II

Environment assessment: Political, Legal, Economic, Social, Technological, Global environment, Assessment of business opportunities, Government initiatives and private sector opportunity.   **08 Hours**

Module-III

Enterprise Creation: Starting a small industry, Entrepreneurial function or process of starting a new venture based on personal competencies, requirements to start a business venture, Feasibility of the project, Business incubators .   **08 Hours**

Module-IV

Business Plan: Developing effective business plan-meaning, benefits of business plan, Timing of the business plan, Length of the business plan, composition of the business plan or detailed project report. Institutional Support Mechanism: District Industries Centre, State Directorate of Industries, SIDBI, NSIC, SISI, KSFC, KIADB, TECSOK.
08 Hours

Module-V

Small Business Marketing: Concept of Marketing, Scope of Marketing, Marketing Mix, Product Mix, Channels of Distribution, Market Segmentation, Role of Middlemen, Distribution Strategies, Sales Promotion, Advertising and Publicity, Packaging Strategies, Branding Strategies. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Visualize the various concepts of Entrepreneurship and understand of current environment of MSMEs.
- Know the Business Environment with respect to MSMEs.
- Know the Process of Enterprise Creation.
- Prepare Business Plan and Understand the Institutional Support Mechanism.
- Know the marketing management with reference to MSMEs.

Text Books:

1. Shukla. M.B: "Entrepreneurship and Small Business Management", Kitab Mahal, Allahabad, 2011.
2. Sahay A., V. Sharma: "Entrepreneurship and New Venture Creation", Excel Books, New Delhi, 2008.
3. Lall, Sahai: "Entrepreneurship", Excel Books, New Delhi, 2006.
4. S. Anil Kumar: "Small Business and Entrepreneurship", I.K.International Publishing House Pvt. Ltd., 2008.
5. Kotler, Keller, Koshy, Jha: "Marketing Management", 13th Edition, Pearson Education.

Reference Book:

1. Wickham, Phillip A: "Strategic Entrepreneurship", Pitman, UK, 1998.

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Occupational Safety and Health Administration

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE762	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the occupational health and safety and sector specific occupational health and safety issues.
- Understand the socio-economic aspects of occupational health and safety.
- Understand the health screening measures.
- Understand the legal Provisions on Occupational Health and Safety.
- Understand the participatory Research and Occupational Health.

Syllabus

Module – I

Introduction to Occupational Health and Safety: Definition and Context of OHS, Objectives and Principles of OHS, Workplace and Health Occupational Health, Hygiene and Ergonomics.

Sector Specific Occupational Health and Safety Issues: Health and Safety Risks in Mining, Health Hazards in Electronic Industry, Health Hazards in Food Processing Industry, Health Hazards in Other Industries. **07 Hours**

Module – II

Socio-Economic aspects of Occupational Health and Safety: Women's occupational and health safety, Child labour issues in occupational health and safety, Health issues in the unorganized sector.

Basics of Preventive Techniques: Definition of Accident, Accident Analysis, Monitoring of Hazards, Reporting and Investigation of Accidents. **08 Hours**

Module – III

Health Screening Measures: Stages of Medical Examination, Occupational History, Pulmonary Function Test (PFT), Noise Induced Hearing Loss (NIHL). **07 Hours**

Module – IV

Legal Provisions on Occupational Health and Safety: Overview of existing OHS Legislations in India, The Factories Act, The Mines Act, The Workmen's Compensation Act, The Employee's State Insurance Act. **07 Hours**

Module-V

Participatory Research and Occupational Health: Philosophy of Participatory Research (PR) Analysis based on PR Methodologies Conducting Participatory Research for OHS.   **07 Hours**

Course Outcomes:
On completion of this course, students will be able to :

- Develop the ability to know the occupational health and safety.
- Have the knowledge of the socio-economic aspects of occupational health and safety.
- Demonstrate purpose of health screening measures.
- Know the legal Provisions on Occupational Health and Safety.
- Participate in Research and Occupational Health.

References:

1. International Labour Organinization. Mining: a hazardous work [Internet]. ; 2015 ([cited 2015 Feb 2]. Available from: http://www.ilo.org/safework/areasofwork/hazardous-work/WCMS_124598/lang--en/index.htm

2. Gyekye, S.A. Workers' perceptions of workplace safety: an African perspective. Int J Occup Saf Ergon. 2006;12:31–42.Crossref | PubMed| Scopus (4)

3. Amponsah-Tawiah, K., Jain, A., Leka, S., Hollis, D., Cox, T. Examining psychosocial and physical hazards in the Ghanaian mining industry and their implications for employees' safety experience. J Safety Res. 2013;45:75–84.Crossref PubMed| Scopus (5)

4. Owiredu D. Annual chamber of mines presidential review. 83rd Annual General Meeting of the Ghana Chamber of Mines [Internet]. 2011 [cited 2014 Mar 1]. Available from:http://www.ghanachamberofmines.org.

5. Helliwell, J.F., Putnam, R.D. The social context of wellbeing. Philos Trans R Soc Lond B Biol Sci. 2004;35:1435–1446.Crossref| Scopus (550)

6. Bhagawati, B. Basics of occupational safety and health. IOSR J Environ Sci Toxicol Food Technol. 2015;9:91–94.

7. Amponsah-Tawiah, K., Dartey-Baah, K. Occupational health and safety: key issues and concerns in Ghana. Int J Bus Soc Sci. 2011;14:120–126.

   National Safety Council. Injury facts. NSC, Itasca (IL); 2004.

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Animation and Multimedia Engineering

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16HOE763	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to:

- Understand the basics of Animation.
- Understand computer animation using characters.
- Learn how to create quality animation characters.
- Learn about volume construction and action made from face, gestures.
- Understand Acting and Sketching techniques.

Syllabus

Module – I

Introduction to Animation: History of Animation, The Origins of Animation, Types of Animation, Terms used in Animation, Basic Principles of Animation.

Introduction to equipment required for Animation: Animator's Drawing Tools, Rapid Sketching and Drawing, Developing Animation Character.   **07 Hours**

Module – II

Developing the characters with computer animation: Anatomy and Body Language, 2-D virtual drawing for animation.

Motion studies: : Thumbnails, sequential movement drawing, drawing for motion.

08 Hours

Module – III

Essentials and qualities of good animation characters: Three dimensional drawings of characters.

Skills and Basic proportions: Visual and creative development of an artist, how to draw gestures, Heads, Rotation in Arcs, Key Lines, Perspective.   **08 Hours**

Module – IV

Volume Construction: Balance, Muscles, Light and shade.

Shape and Action: Hands and Legs, Foreshortening, Facial expressions.   **08 Hours**

Module – V

Acting and Sketching techniques: Introduction to Acting, Modeling, Sketching from Acting, Sketching from live models, Introduction to Rapid Sketching Techniques, Sketching from Memory, live action.   **09 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Recognize the basics of animation along the tools.
- Develop characters with computer animation.
- Develop 3D drawings of characters and acquire skills regarding basic level of sketching.
- Explain Foreshortening, Facial expressions.
- Develop small animation characters by using acting and sketching techniques.

Text Book:

1. Chris Patmore: "The Complete Animation course: The Principles, Practice and Techniques of Successful Animation", (Chapters 1-10), Barons Educational Series New York, 2003, ISBN-13: 978-0764123993.

Reference Books:

1. Frank Thomas, Ollie Johnston: "The Illusion of Life by Walt Disney", Abbeville Press, 1981.
2. Daniel Carter, Michael Courtney: "Anatomy for the Artist: A Comprehensive Guide to Drawing the Human Body, A Complete Guide", 2011.

E-Resources:

1. http:// www.animationmentor.com/
2. https://www.bloopanimation.com/animation-for-beginners/
3. https://robots.thoughtbot.com/css-animation-for-beginners

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Information and Network Security Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSL77	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Work on Open Source cutting edge tools to find solutions for the problems in the field of Information and network security,

- Understand what are the foundational theory behind information security,

- Analyze basic principles and techniques when designing a secure system,

- Study how today's attacks and defenses work in practice,

- Assess threats for their significance, and how to gauge the protections and limitations provided by today's technology.

Laboratory

1. Perform an experiment to grab a banner with telnet and perform the task using Netcat.

2. Using nmap,

    1) Find Open ports on a system

    2) Find machines which are active

    3) Find the version of remote OS on other systems

    4) Find the version of s/w installed on other system

       (using nmap or any othe software)

3. Perform an experiment to demonstrate how to sniff for router traffic by using the tool Cain and Abel / Wireshark / tcpdump

4. Perform an experiment to demonstrate the use of DumpSec.

5. Perform a wireless audit of an access point / router and decrypt WEP and WPA. (Using NetStumbler or airsniff)

6. Perform an experiment to sniff traffic using ARP poisoning

7. Demonstrate Intrusion Detection System (IDS) using any tool such as Snort or any other Software.

8. Install RootKit and study variety of options

9. Generate minimum 10 passwords of length 12 characters using OpenSSL command.

10. Setup a honey pot and monitor the honey pot on network.

11. Install JCrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital/PKI signatures studied in theory Network Security and Management.

12. Install IPCop on a linux system and learn all the functions available on the software.

Course Outcomes

On completion of this course, students will be able to : :

• Work on Open Source cutting edge tools to find solutions for the problems in the field of Information and network security

• Know which application runs on specific port, scan for open ports

• Able to capture and analyze network traffic

• Perform audit settings, detect intruders in the network

• Implement standard algorithms used to provide data confidentiality, integrity and Authentication.

Text Books:

1. William Stallings: "Network Security Essentials: Applications and Standards", 3rd Edition, Pearson Education, 2007.

2. Michael E. Whiteman and Herbert J. Mattord: "Principles of Information Security", 2nd Edition, Cengage Learning, 2005.

Reference Book:

1. Behrouz A. Forouzan, "Cryptography and Network Security", Special Indian Edition, Tata McGraw-Hill, 2007.

E-Resources:

1. https://www.nmap.org

2. https://www.advanced-port-scanner.com

3. https://www.openssl.org

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Android Application Development Laboratory

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSL78	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Describe the Android SDK features and the Development Framework and understanding Activities.
- Create adaptive, responsive user interfaces that work across a wide range of devices.
- Perform background work and long-running tasks in Android applications.
- Know the concepts of Storing, sharing and retrieving data in Android applications.
- Learn how permissions, security and performance affect application. Finally, make sure your app is ready to share with the world, and publish it.

Part-A

Programs supplement the lecture concepts will be based on the latest version of Android SDK.

1. Install Android Studio and Run Hello World
2. Create and Start Activity Lifecycle and Instance State
3. Create Implicit Intents
4. Make Your First Interactive UI Using Layouts and TextView Elements
5. Using An Options Menu
6. Create a RecyclerView
7. Drawables, Themes and Styles
8. Create an AsyncTask
9. Connect to the Internet
10. BroadcastReceiver
11. Set and retrieve shared preferences
12. Implement a simple content provider

Part-B

Develop a suitable application to implement the skills learnt in the theory and the exercises indicated in Part-A.

Course Outcomes

On completion of this course, students will be able to : :

- Comprehend the basic features of Android Platform and Create Activities in Android.
- Demonstrate the design concepts of user interface using components, views and menus in Android.
- Create and use databases for Android Application.
- Implement messaging services in Android.
- Deploy mobile applications in various marketplaces for distribution.

Text Books:

1. Wei Meng Lee: "Beginning Android Application Development", Wiley Publications.
2. Reto Meier: "Professional Android 4 Application Development", Wiley Publications.

Reference Books:

1. Mark Murphy: "Beginning Android 3", 1st Edition, Apress Springer India Pvt. Ltd., 2011, ISBN-13: 978-1-4302-3297-1.
2. Sayed Hashimi , Satya Komatineni, Dave MacLean; "Pro Android 4", 1st Edition, Apress Springer India Pvt. Ltd., 2012, ISBN: 978-1-4302-3930-7.
3. Reto Meier: "Professional Android 2 Application Development", 1st Edition, Wiley India Pvt.Ltd., 2012, ISBN: 9788126525898.
4. James Steele: "The Android Developer's Cookbook: Building Applications with the Android SDK", Addison-Wesley Professional, 2010.

E-Resources:

1. https://developers.google.com/training/adf
2. https://goo.gl/ADKvq8
3. https://innovator.samsungmobile.com

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Project Phase-I and Seminar

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
16CSP79	0:0:6:0	3	100	3 Hours	FC

Phase	Activity	Credits
I	Batch formation, project identification, literature survey, finalization of problem statement with objectives and outcomes, Synopsis submission, Preliminary seminar for the approval of selected topic and objectives.	3

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Phase	Activity	Credits
II	Design, Theoretical/experimental investigation and Mid-term seminar to review the progress of the work and documentation(Mid term report).	4
III	Completion of the project work, participation in the project exhibition, Submission of project report Final Internal seminar and demonstration, Publications.	4
	Evaluation and Viva-voce	**5 + 5**

Program Educational Objectives (PEOs)

The graduates of Computer Science and Engineering are expected to fulfill the following PEOs after a few years of their graduation.

PEO1	Graduates in Computer Science and Engineering will apply the technical knowledge of analysis and design of software used for sustainable societal growth.
PEO2	Graduates of Computer Science and Engineering will demonstrate logical thinking and programming skills.
PEO3	Graduates in Computer Science and Engineering will demonstrate good communication skills, dynamic leadership qualities with concern for environmental protection.
PEO4	Computer Science and Engineering graduates will be capable of pursuing higher studies, take up research and development work blended with ethics and human values.
PEO5	Computer Science and Engineering graduates will have the ability to become entrepreneurs there by switching over from responsive engineer to creative engineer.

Program Outcomes (POs)

PO1	**Engineering Knowledge:** Apply knowledge of mathematics and science, with fundamentals of Computer Science and Engineering to be able to solve complex engineering problems related to CSE.
PO2	**Problem Analysis:** Identify, Formulate, review research literature and analyze complex engineering problems related to CSE and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	**Design/ Development of solutions:** Design solutions for complex engineering problems related to CSE and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural societal and environmental considerations.

PO4	**Conduct Investigations of Complex problems:** Use research–based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to computer science related complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply Reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the CSE professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the CSE professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply Ethical Principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary Settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large such as able to comprehend and with write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.
PO12	**Life-Long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning the broadest context of technological change.