



NAGARJUNA

COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous College under VTU)

Department of Computer Science and Engineering

&

Department of Information Science and Engineering

III to VIII Semesters

Scheme and Syllabus

With effect from Academic Year 2021-22

Third Semester B.E. – Scheme

SL. No	Course Code	Course Name	Total Credits	L:T:P:S (Hrs/Week)	Marks
1	19MAT31	Fourier Series, Transforms and Numerical Techniques	4	3 : 2 : 0 : 0	100
2	19CSI32	Data Structures using C(IC)	4	2 : 0 : 4 : 0	100
3	19CSI33	Web Programming (IC)	3	2 : 0 : 4 : 0	100
4	19CSI34	Python Programming (IC)	4	2 : 0 : 4 : 0	100
5	19CST35	Analog and Digital Electronics	3	2 : 2 : 0 : 0	100
6	19CST36	Computer Organization & Architecture	3	2 : 2 : 0 : 0	100
7	19CPH37	Constitution of India and Professional Ethics and Human Rights	1	0 : 2 : 0 : 0	100
8	19KAK38	Kannada	1	0 : 2 : 0 : 0	100
9	19CSH39	Elements of Communication	2	1 : 0 : 2 : 0	100
		Total	25	14: 10: 14:0	900

Fourth Semester B.E. – Scheme

SL. No	Course Code	Course Name	Total Credits	L:T:P:S (Hrs/Week)	Marks
1	19MAT41	Applied Calculus and Probability Distribution	4	3 : 2 : 0 : 0	100
2	19CSI42	Design and Analysis of Algorithms (IC)	4	2 : 0 : 4 : 0	100
3	19CSI43	Object Oriented Programming with Java (IC)	4	2 : 0 : 4 : 0	100
4	19CSI44	Database Concepts through MySQL (IC)	3	2 : 0 : 2 : 0	100
5	19CST45	Operating Systems	3	2 : 2 : 0 : 0	100
6	19CST46	Introduction to Microprocessors & Microcontrollers	3	2 : 2 : 0 : 0	100
7	19UHV47	Universal Human Values- 2	3	3 : 0 : 0 : 0	100
8	19CSH48	Professional Development of Engineers	2	1 : 0 : 2 : 0	100
		Total	26	17 : 6 : 12 : 0	800

Fifth Semester B.E. – Scheme

SL. No	Course Code	Course Name	Total Credits	L:T:P:S (Hrs/Week)	Marks
1	19CST51	Software Engineering	3	3 : 0 : 0 : 0	100
2	19CSI52	Advanced Java (IC)	4	2 : 0 : 4 : 0	100
3	19CSI53	Computer Networks (IC)	4	2 : 0 : 4 : 0	100
4	19CST54	Data Warehousing & Data Mining	3	3 : 0 : 0 : 0	100
5	19CST55X	Professional Elective-I	3	3 : 0 : 0 : 0	100
6	19CSH56	Accountancy and Taxation	3	3 : 0 : 0 : 0	100
7	19EVN57	Environmental Science	1	0 : 2 : 0 : 0	100
8	19CSP58	Mini Project	2	0 : 0 : 0 : 8	100
9	19CSH59	Employability Skills and Aptitude Development	2	1 : 0 : 2 : 0	100
		Total	25	17 : 2 : 10 : 8	900

Professional Elective-I

SL. No.	Course Code	Course Name	Total Credits	Marks
1	19CST551	Artificial Intelligence	3	100
2	19CST552	Image Processing	3	100
3	19CST553	Soft Computing	3	100

Sixth Semester B.E. – Scheme

SL. No	Course Code	Course Name	Total Credits	L:T:P:S (Hrs/Week)	Marks
1	19CSI61	Cloud Computing (IC)	4	2 : 0 : 4 : 0	100
2	19CSI62	Android Application Development(IC)	4	2 : 0 : 4 : 0	100
3	19CST63	Big Data Analytics	3	3 : 0 : 0 : 0	100
4	19CST64	Angular & React JavaScript	3	3 : 0 : 0 : 0	100
5	19CST65X	Professional Elective –II	3	3 : 0 : 0 : 0	100
6	19CST66X	Professional Elective–III	3	3 : 0 : 0 : 0	100
7	19CSH67	Employability Skills and Technical Aptitude	2	1 : 0 : 2 : 0	100
		Total	22	17: 0: 10: 0	700

Professional Elective-II

SL. No.	Course Code	Course Name	Total Credits	Marks
1	19CST651	Cyber Security and Ethical Hacking	3	100
2	19CST652	Information & Network Security	3	100
3	19CST653	Block Chain & Crypto Currencies	3	100

Professional Elective-III

SL. No	Course Code	Course Name	Total Credits	Marks
1	19CST661	Animation & Game Development	3	100
2	19CST662	Devops	3	100
3	19CST663	Machine Learning	3	100

Seventh Semester B.E. – Scheme

SL. No	Course Code	Course Name	Total Credits	L:T:P:S (Hrs/Week)	Marks
1	19CST71X	Professional Elective -IV	3	3 : 0 : 0 : 0	100
2	19CST72X	Professional Elective –V	3	3 : 0 : 0 : 0	100
3	19CST73X	Professional Elective -VI	3	3 : 0 : 0 : 0	100
4	19CST74X	Industrial Elective-I	3	3 : 0 : 0 : 0	100
5	19CST75X	Industrial Elective-II	3	3 : 0 : 0 : 0	100
6	19CST76	Technical Seminar	2	0 : 0 : 0 : 8	100
7	19CSP77	Project Seminar Presentation-I	2	0 : 0 : 4 : 0	100
		Total	19	15: 0: 4: 8	700

Professional Elective-IV

SL. No	Course Code	Course Name	Total Credits	Marks
1	19CST711	UML& AGILE PRACTICES	3	100
2	19CST712	Internet of Things	3	100
3	19CST713	AWS	3	100

Professional Elective-V

SL. No.	Course Code	Course Name	Total Credits	Marks
1	19CST721	Storage Area Network	3	100
2	19CST722	Adhoc Network	3	100
3	19CST723	Management Information System(MIS)	3	100

Professional Elective-VI

SL. No.	Course Code	Course Name	Total Credits	Marks
1	19CST731	Robotics	3	100
2	19CST732	Advanced Algorithms	3	100
3	19CSI734	Pattern Recognition and Anomaly Detection	3	100

Industrial Elective-I

SL. No.	Course Code	Course Name	Total Credits	Marks
1	19CST741	Decision Support Systems(DSS)	3	100
2	19CST742	Enterprise Resource Planning(ERP)	3	100
3	19CST743	Supply Chain Management	3	100

Industrial Elective-II

SL. No.	Course Code	Course Name	Total Credits	Marks
1	19CST751	Digital Marketing	3	100
2	19CST752	Operation Research	3	100
3	19CST753	Management Entrepreneurship	3	100

Eighth Semester BE – Scheme

SL. No.	Course Code	Course Name	Total Credits	Marks
1	19CSP81	Internship	3	100
2	19CSP82	Project Phase-I	3	100
3	19CSP83	Project Phase-II	3	100
4	19CSP84	Project Phase-III	3	100
5	19CSP85	Evaluation and Viva voce (External)	6	100
		Total	18	500

FOURIER SERIES, TRANSFORMS AND NUMERICAL TECHNIQUES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19MAT31	3 : 2 : 0 : 0	4	CIE:50 SEE:50	3 Hours	BS

Course Objectives:

This course will enable students to:

- Have the efficiency in expressing a periodic function in terms of infinite trigonometric series.
- Obtain the knowledge of Laplace Transforms.
- Acquire the skill in solving the engineering applications problem using Laplace Transforms.
- Get the ability to solve the engineering problem using Fourier Transforms.
- Develop the proficiency in solving algebraic and transcendental equations and interpolation using numerical methods

Syllabus

Module – I

Fourier Series: Periodic functions, Dirichlet's conditions, Euler's Formulae (without proof), Fourier series of periodic functions of period $2l$ and 2π , Half range Fourier series, Practical harmonic analysis problems.

08 Hours

Module – II

Laplace Transform: Definition, Laplace Transform of elementary functions. Properties, transform of derivatives, multiplication by t^n and division by t - Problems. Laplace transforms of periodic functions, unit step functions and unit impulse function - Problems.

08 Hours

Module – III

Inverse Laplace Transforms: Inverse Laplace Transforms of standard functions. (Formulae only). Inverse Laplace transform by using completing the squares, partial fractions, shifting property and differentiation - problems. Convolution theorem - problems. Applications - solution of linear differential equations with initial conditions - problems.

08 Hours

Module – IV

Fourier Transforms and Z - Transforms: Complex Fourier transforms, Fourier Sine and Cosine transforms and their inverse transforms problems. Z - Transforms of some standard functions, Damping and shifting rules - problems. Inverse Z - Transforms by partial fraction method.

08 Hours

Module – V

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

07 Hours

Course Outcomes:

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

- Demonstrate Fourier series to study the behavior of periodic functions and their applications in engineering problem.
- Find the Laplace transform of different types of functions.
- Use the Laplace transform and inverse Laplace Transform in solving various types engineering application problems.
- Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising

in Engineering applications.

- Determine the roots of Algebraic and Transcendental equations and Interpolation arising in engineering applications, using numerical methods

Text Books:

- Dr. B.S. Grewal: “Higher Engineering Mathematics”, (Chapters 10, 21, 22, 28, 29, 30), Khanna Publishers, New Delhi, 42nd Edition, 2012, ISBN:9788174 091955.
- N.P. Bali and Dr. Manish Goyal: “A Text Book of Engineering Mathematics”, (Chapters 10, 18, 20, 22, 24), Laxmi Publications (P) Ltd., New Delhi, 9th Edition, 2014, ISBN: 9788131808320.

Reference Books:

1. Erwin Kreyszig: “Advanced Engineering Mathematics”, Wiley Pvt. Ltd. India, New Delhi, 9th Edition, 2011, ISBN 13: 9788126531356.
2. B.V. Ramana: “Higher Engineering Mathematics”, Tata Mc Graw –Hill Publishing Company Limited, New Delhi, 2nd Reprint, 2007, ISBN 13: 978-0-07063417-0.

E-Resources:

1. <http://bookboon.com/en/essential-engineering-mathematics-ebook>
2. <https://www.free-ebooks.net/ebook/essential-engineering-mathematics>
3. <https://archive.org/details/AdvancedEngineeringMathematics10thEdition>

DATA STRUCTURES USING C(IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSI32	3:0:2:0	4	CIE:50 SEE:50	3 Hours	IC

Course Objectives:

This course will enable the students to:

- Understand the dynamic memory by pointers.
- Understand the difference between structure and self referential structure
- Study linear data structures viz. stack, queue and linked list.
- Get knowledge on non-linear data structures viz. BST, AVL and B-Trees.
- Study and choose appropriate data structure to solve problems in real world

Syllabus

Module – I

Pointers : Introduction, Accessing the variable and its address through the pointer, Declaring & 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

Structures: Introduction, Defining a structure, Declaring structure variables, Accessing structure members, Structure initialization, Size of structures, Copying & comparing structure variables, Array of structures, Arrays within structures, Structures within structures. Self referential structure. **08 hours**

Module – III

Linked Lists: Introduction, Inserting and removing nodes from a list, Lists in C - Array implementation of lists, Circular lists, Doubly linked lists: Inserting and removing nodes from a list. **08 hours**

Module – IV

Stack: Definition, Stack operations: PUSH, POP, DISPLAY, Array implementation of stacks in C, Linked list implementation of stacks. **Queue:** Queue and its sequential representation, Queue operations: INSERTION, DELETION, DISPLAY, Array implementation of queues in C, Linked list implementation of queues. **08 hours**

Module – V

Trees : Introduction, Binary search trees: Insertion and deletion of a node, searching a key element in Binary search tree, Binary tree traversals: preorder, inorder and postorder. Introduction to Balanced trees- AVL, B-Tree, Splay and Redblack. **08 hours**

Laboratory:

12 hours

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 demonstrate Stack data structure using an array. Provide the following operations: a. Push b. Pop c. Display.
3. Design, develop and execute a program in C, to demonstrate Queue data structure 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. 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 & binary arithmetic operators. The arithmetic operators are +, -, * and/.
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 & delete a key element of the list, if exists & 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 BST that represents a Binary Search Tree, with functions to perform inorder, preorder and postorder traversals & demonstrate the traversals. 1. AVL 2. B-Tree

Course Outcomes

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

- Use pointers and heterogeneous data types
- Apply linear data structures for processing of ordered or unordered data.
- Explore various operations on dynamic data structures
- Implement the concept of non linear data structures such as trees.
- Solve the real world problems using Data Structures.

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed : “Fundamentals of Data Structures in C”, (Chapters 1-6,9,10), Universities Press-India, 2nd Edition, 2008, ISBN-13:978-8173716058.
2. Brian W Kernighan and Dennis M Ritchie : “The C Programming Language”, (Chapters 1-6,9,10), Prentice Hall, Englewood Cliffs, New Jersey, 2nd Edition, 1988, ISBN:0131103628.
3. 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://www.cs-fundamentals.com/data-structures/introduction-to-datastructures.php>
5. <https://www.cprogramming.com/algorithms-and-data-structures.html>
6. <https://online-learning.harvard.edu/course/data-structures-and-algorithms>

WEB PROGRAMMING (IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSI33	2 : 0 : 4 : 0	3	CIE:50 SEE:50	3 Hours	IC

Course Objectives:

This course will enable students to:

- Recollect the evolution of World Wide Web and its relevance to today's technological revolution and also, to comprehend HTML, CSS scripts to design web layouts.
- Acquire Java Script skills for developing client side web applications.
- Interpret the use of jQuery libraries to simplify complicated JavaScript applications and also, to perform DOM manipulation using jQuery constructs.
- Cognize Bootstrap framework with a focus on creating interactive and responsive web pages faster and easier.
- Assimilate XML fundamentals for developing applications over web.

Syllabus

Module - I

HTML 5 and CSS: Introduction to Hyper Text Markup Language, HTML Elements and Attributes, Headers, Colors, Formatting Elements, Links, Images, Tables, Divs, Lists, Forms, Frames, iframes, HTML Media. **CSS:** Introduction to CSS, CSS selector, CSS formatting, positioning, layouts, debugging.

08 Hours

Module - II

JavaScript: Introduction, Scripts and HTML Document, JS Output Statements, Variables, Data Types and Conversions, Operators, Expressions, Control Structure, Decisions and Loops, Functions, Document Object Model, Forms and Form Handling Elements, Scripting, Event Handling, Regular Expressions.

08 Hours

Module-III

JQuery: Introduction, Selectors, Events, jQuery DOM Manipulation: jQuery HTML, jQuery CSS, jQuery Event Model, jQuery Effects and Animations, jQuery Plugins.

08 Hours

Module - IV

Bootstrap: Bootstrap Scaffolding, Bootstrap CSS, Bootstrap Layout Components, Bootstrap JavaScript Plugins, Using Bootstrap.

08 Hours

Module – V

XML: Introduction, Syntax, Document Type Definitions, Namespaces, XML Schemas, Displaying Raw XML Documents, Displaying XML Documents with CSS.

08 Hours

Laboratory:

I. HTML and CSS

1. Write a HTML script to display employee details like name, address, mobile number, email id etc similar to a telephone directory.
2. Write a HTML program to display a nested list to list down all the elements serviced by an event management company. The list should be a nested list with main events and subevents.
3. Write a HTML and CSS script to create a webpage with table structure containing alternative backgrounds using class selector functionalities.
4. Write a HTML and CSS program to design the coverage which displays the events taking place in and around the state.

II. JavaScript

5. Write a HTML and javascript program to implement a simple banking application. The application should provide features like withdraw, deposit, balance enquiry etc.
6. Write a HTML and javascript program to create a registration page having fields name, username, email Id, password & re-enter password and apply validation using match & equal functions.

III. jQuery

7. Write a HTML and jQuery program to create a webpage to fetch the details of the event and display the invitation.
8. Write a HTML and jQuery program to design a webpage to accept event organizer name from the user and display it on the webpage.

IV. Bootstrap

9. Write a HTML and bootstrap program to display glyphs like envelope, print, search etc. Also, create buttons having glyphs as links to carry out specific tasks.

V. XML

10. Write a XML program to store book details like title, author, publication year, price etc.

Course Outcomes

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

- Design attractive web layouts using HTML5 and style sheets in a presentable form.
- Develop interactive UI for client side web applications using JavaScript.
- Integrate jQuery libraries to accelerate UI development for client side web applications.
- Construct responsive web pages by integrating bootstrap framework.
- Develop applications by using XML to use, store, transmit and display data over web.

Text Books:

1. Robert W. Sebesta: "Programming the World Wide Web", Pearson, 4th Edition, 2012, ISBN: 978-81-317-6458-9.
2. Jon Duckett: "Web Design with HTML, CSS, JavaScript and jQuery Set", Wiley, 1st Edition, 2014, ISBN 13: 978-1118907443.
3. Silvio Moreto, Matt Lambert, Benjamin Jakobus, Jason Marah: "Bootstrap 4 - Responsive Web Design", Packt Publishing, 2016, ISBN 978-1-78839-731-5

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://www.tutorialspoint.com/>
3. <https://www.javascript.com/learn/>
4. <https://learn.jquery.com>

PYTHON PROGRAMMING (IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSI34	2-0-4-0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to

- Master the fundamentals of writing Python programming.
- Study the concepts of Strings and Lists in python.
- Understand the concept of core data structures.
- Acquire the knowledge of Object Oriented Concepts in python.
- Learn the use of Multi Threading and handling Files.

Syllabus

Module – I

Why should you learn Python Programming, Introduction to Python, Python Interpreter and its working, Syntax and Semantics, Variables, Expressions and Statements, Conditional execution, Functions, User Input and Output.

08 hours

Module – II

Iteration, Strings, Arrays, Recursion, Introduction to Lists.

08 hours

Module – III

Lists, Dictionaries, Tuples, Modules, Regular Expressions.

08 hours

Module – IV

Classes and objects, Classes and functions, Classes and methods, Types of methods, Inner class, Inheritance, Constructor, Method Overloading, Method Overriding.

08 hours

Module – V

Exception Handling, MultiThreading, File handling.

08 hours

Laboratory

- 1) Write a Python program to find GCD of two numbers.
- 2) Write a Python Program to find the square root of a number by Newton's Method.
- 3) Write a Python program to find the exponentiation of a number.
- 4) Write a Python Program to find the maximum from a list of numbers.
- 5) write a Python Program to perform Linear Search.
- 6) write a Python Program to perform Binary Search.
- 7) Write a Python Program to perform selection sort.
- 8) Write a Python Program to perform insertion sort.
- 9) Write a Python Program to perform Merge sort.
- 10) Write a Python program to find first n prime numbers.

Course Outcomes

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

- Use Python syntax and semantics in developing simple programs.
- Demonstrate proficiency in handling Strings and Lists.
- Implement Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Develop exemplary applications using files in Python

Text Books:

1. Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1st Edition, CreateSpace Independent Publishing Platform, 2016, *ISBN 13: 9781530051120*, (Chapters 1 – 13, 15).
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015, *ISBN 13: 9781491939369*, (Chapters 15, 16, 17).

Reference Books:

1. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd, 2013. *ISBN-13: 978-8126556014*.
2. Mark Lutz, "Programming Python", 4th Edition, O'Reilly Media, 2011. *ISBN-13: 978-9350232873*.
3. Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015. *ISBN-13: 978-9332555365*.
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data Structures and Algorithms in Python", 1st Edition, Wiley India Pvt Ltd, 2016. *ISBN-13: 978-8126562176*.

E-Resources:

1. <https://www.youtube.com/watch?v=hEgO047GxaQ>
2. <https://www.tutorialspoint.com/python/index.htm>.

ANALOG AND DIGITAL ELECTRONICS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST35	2:2:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable the students to:

- Understand applications of diode as clippers, Limiters and clampers
- Learn the different types of amplifiers constructed from BJTs and MOSFETs.
- Acquire the knowledge about Boolean laws and theorems.
- Know the working of flip flops and Registers.
- Gain the knowledge of various counters.

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 Biasing: Fixed Bias, Collector to base Bias, voltage divider bias, Operational Amplifier Application Circuits: Multivibrators using IC-555, Peak Detector, Schmitt trigger, Active Filters, Non-Linear Amplifier, Relaxation Oscillator. **09 hours**

Module – II

Current-to-Voltage and Voltage-to-Current Converter, Regulated Power Supply Parameters, adjustable voltage regulator, D to A and A to D converter.

MOSFETs: The Depletion-mode MOSFET, D-MOSFET curves, Depletion-mode MOSFET amplifiers, The enhancement-mode MOSFET, CMOS, E-MOSFET amplifiers **07 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. **08 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 synthesis problem. **08 hours**

Course Outcomes:

After studying this course, students will be able to

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

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.

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 & ARCHITECTURE

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST36	2:2:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Make students understand the basic structure and operation of digital computer.
- Expose the students with different ways of communicating with I/O devices and standard I/O interfaces.
- Learn the hierarchical memory system including cache memories and virtual memory.
- Acquire the knowledge of arithmetic, logic unit and implementation of fixed-point and floating-point arithmetic operations.
- Understand the two types of control unit techniques and the concept of pipelining.

Syllabus

Module – I

Basic Structure of Computers:

Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement.

Machine Instructions and Programs:

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.

08Hours

Module – II

Input/Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB.

08 Hours

Module – III

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

08 Hours

Module – IV

Arithmetic: Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division.

08 Hours

Module – V

Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, Micro programmed Control.

Pipelining: Basic concepts of pipelining,

08Hours

Course Outcomes:

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

- Explain the basic organization of a computer system.
- Demonstrate the functioning of different sub systems such as processor, Input/output.
- Evaluate performance of memory systems.

- Design and analyze simple arithmetic and logical units.
- Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.

Text Books:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, Tata McGraw Hill, 2011. ISBN: 9781259005275 (Listed topics only from Chapters 1, 2, 4, 5, 6, 7, 8, 9 and 12).
2. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015. ISBN-13: 9780132936330

Reference Books:

1. Hennessey and Patterson: “Computer Architecture A Quantitative Approach”, 5th Edition, Elsevier, 2017. *ISBN: 9780128119051*.

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>

CONSTITUTION OF INDIA, PROFESSIONAL ETHICS & HUMAN RIGHTS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CPH37	1:0::0:0	1	CIE:50 SEE:50	2 Hours	-

COURSE OBJECTIVE:

This course will enable students to:

- Learn about the preamble of the Indian constitution.
- Fundamental rights & duties of citizen.
- Special privileges of society and economically weaker section of the society.
- Individual role & ethical responsibility towards society.

Syllabus:

Module-I

introduction to constitution: Introduction, making of constitution, Salient features of the constitution, preamble of the Indian constitution. Fundamental rights & limitations. **03 Hours**

Module-II

DPSP, Union Executives: Directive principles of state policy, Fundamental duties, union executives- President, Prime minister, Parliament, supreme court of India. **03Hours**

Module-III

State executives, Electoral process, Amendments: State executives- Governor, CM, state legislature, High courts, Electoral process. Amendment Procedures, Amendments -42nd, 44th, 74th, 76th, 86th and 91st. **02 Hours**

Module-IV

Special provisions, Municipalities, co-operative society: Provisions for SC & ST, Women, Children & backward classes. Emergency provisions, Human rights. Municipalities, Panchayats and Co-operative societies. **03 Hours**

Module-V

Scope & aim of Engineering ethics: Ethics, Responsibility of engineers, impediments to responsibility, Risks, Safety and Liability of engineers, Honesty, Integrity and reliability in engineering. **02 Hours**

Course Outcomes:

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

- Familiarize with fundamental rights and duties.
- Recognize the electoral process.
- Get exposed to legislature and judiciary.
- Realize special provisions given for women, children and weaker section of the society.
- Exhibit engineering ethics and responsibilities of engineers.

Text Book:

1. D. Srinivasan, "Constitution of India, professional ethics", Himalaya Publishing House, 2006, 1st Edition.

2. Dr. Umapati K L, Ramesh L. Chakrasali, “Constitution of India, professional ethics”, elite publishers, 2006, 2nd Edition.

Reference Books:

1. M. Raja Ram, Constitution of India, professional ethics. New Age International (P) Limited, Publishers, 2015, 3rd Edition

ELEMENTS OF COMMUNICATION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSH39	0:0:4:0	2	CIE:50 SEE:50	3 Hours	

Course Objectives:

This course will enable students to:

- Implement English vocabulary at command and ensure language proficiency.
- Pronunciation skills to enhance with English vocabulary and language proficiency Language Lab.
- Augment LSRW and GV skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred
- Achieve better Technical writing and Presentation skills Identify the common errors in speaking and writing English and acquire Employment and Workplace communication skills.
- Define non-verbal communication

Syllabus

Module – I

Introduction to Communication Skills : What is communication? The importance of communication skills in Engineering, Key concepts in communication, Kinds of communication, The communication process, Barriers & filters in communication, Feedback in communication, Traits of a good and poor communicator, The communication pie.

03Hours

Module – II

Listening Skills– Its importance, Difference between hearing & listening, Active Listening, Traits of good listeners, The Listening Cycle, Listening for Pronunciation Practice.

03Hours

Reading Skills: Importance of Reading Skills in Communication, Building confidence in reading, Countering common errors in reading, Reading rate & reading comprehension, Jigsaw reading.

06Hours

Module – III

Speaking skills: Importance of Speaking, Purpose of Speaking, Secrets to Speaking, Importance of Pronunciation in speaking, Improving pronunciation through cluster ,Sounds, Pronunciation clarity & Cluster sounds, JAM Sessions, Pick and Speak.

06Hours

Module – IV

Writing skills: Importance of Written Communication, The importance of good sentence and paragraph construction, Hallmarks of good writing, Accuracy, Ambiguity & Brevity in written communication, One word for many, 7 C's of written communication, Proofing your document, Activities on Written Communication.

Body Language: Importance of Body Language, Body Language Do's & Don'ts, Body Language speaks volumes – the fine print, Body Language behavior & their Interpretation.

06Hours

Module – V

Presentation Skills: How to be an effective presenter, Establishing specific purpose and desired outcomes of a presentation, Organizing, writing and editing content in a presentation, Preparation of effective visuals to guide and support a presentation, Effective use of verbal and non-verbal presentation techniques.

Group presentations : Group presentations by the participants, Presentations would be followed by question & answer sessions, Extensive feedback would be given by the trainer on the strengths & areas of improvement, Action plan for improvement for each individual student.

05 Hours

APPLIED CALCULUS AND PROBABILITY DISTRIBUTIONS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	CourseNType
19MAT41	3:2:0:0	4	CIE:50 SEE:50	3 Hours	BS

Course Objectives:

This course will enable students to:

- Acquire the knowledge of calculus of complex functions.
- Develop the proficiency in solving Numerical integral and Initial value problems.
- Obtain the knowledge of probability distributions.
- Learn concept of the Joint distributions and Markov's chains.

Known the importance of statistical inference in engineering.

Syllabus

Module – I

Complex Variables: Functions of a complex variable, derivative of complex functions. Analytic functions, (No problems by using limits). Cauchy's-Riemann equations in Cartesian and polar forms, Harmonic functions – problems (No problems by using limits). Construction of analytic functions by using Milne-Thomson method -problems.

Complex integration: Line integrals -problems. Cauchy Theorem (no problems on verification of the theorem) and Cauchy's integral formula -problems. **08 Hours**

Module – II

Numerical Methods: 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 Euler's Method, Runge-Kutta Method of 4th order and Milne's Predictor Corrector Method (without proof) –Problems. **08 Hours**

Module – III

Random Variables and Probability Distribution: Discrete and continuous Random Variables, Probability density function and distributions. Binomial, Poisson, Exponential and Normal distributions. **08 Hours**

Module – IV

Joint Probability and Markov's Chain: Joint Probability distribution of two discrete random variables. Expectations, correlation and covariation. Probability vectors, stochastic matrices, fixed point matrices, regular stochastic matrices, Markov's Chains, higher transition probabilities, stationary distribution of regular Markov's Chains. **08 Hours**

Module – V

Sampling and inference: Sampling Distribution, Testing of hypothesis, level of significance, confidence limits, test of significance of large samples, sampling of variables, central limit theorem, confidence limits for unknown means, Students t-distribution and Chi-square test. **08 Hours**

Course Outcomes:

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

- Use the concepts of analytical functions and complex integration in engineering application problems.
- Solve the Numerical integral and Initial value problems arising in engineering applications, using numerical methods.
- Apply probability distributions in analyzing the probability models arising in engineering field.
- Apply Joint probability distributions and Markov's chains in analyzing the probability models arising in engineering field.
- Use the concept of sampling analysis in analyzing the statistical models arising in engineering field

Text Books:

1. Dr. B.S. Grewal: "Higher Engineering Mathematics", (Chapters 20,26,27,30,32),

Khanna Publishers, New Delhi, 42nd Edition, 2012, ISBN: 9788174091955.

2. N.P. Bali and Dr. Manish Goyal: “A Text Book of Engineering Mathematics”, (Chapters: 19,21), Laxmi Publications (P) Ltd., New Delhi, 9th Edition, 2014, ISBN: 9788131808320.
3. Seymour Lipschutz and Marc Lars Lipson: “Probability”, (Chapters: 5 and 8), McGraw Hill Education (India) Private Limited, Chennai, Special Indian Edition, 2010, ISBN: 978-0-07-014622-8.

Reference Books:

1. Erwin Kreyszig: “Advanced Engineering Mathematics”, Wiley Pvt. Ltd., India, New Delhi, 9th Edition, 2011, ISBN 13: 9788126531356.
2. B.V. Ramana: “Higher Engineering Mathematics”, Tata McGraw – Hill Publishing Company Limited, New Delhi, 2nd Reprint, 2007, ISBN 13: 978-0-07063417-0.

E-Resources:

1. <http://bookboon.com/en/essential-engineering-mathematics-ebook>
2. <https://www.free-ebooks.net/ebook/essential-engineering-mathematics>
3. <https://archive.org/details/AdvancedEngineeringMathematics10thEdition>
4. <http://www.zums.ac.ir/ebooks/mathematics/essential-engineering-mathematic>.

DESIGN AND ANALYSIS OF ALGORITHMS (IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSI42	2:0:4:0	4	CIE:50 SEE:50	3 Hours	IC

Course Objectives:

This course will enable the students to:

- Assess how the choice of algorithm design methods impacts the performance of programs.
- Solve problems using Divide and Conquer methods and writing programs for these solutions.
- Solve problems using algorithm design methods such as the greedy method.
- Choose the appropriate algorithm design method to find the shortest path for a specified application.
- Solve problems using algorithm design methods such as the, pattern matching, backtracking.

Syllabus

Module – I

Introduction Algorithms: Performance analysis , space and time complexity ,Growth of function - big Oh ,Omega , Theta notation , Mathematical background for algorithm analysis , Analysis of selection sort, insertion sort , Randomized algorithms , Recursive algorithms , The substitution method , Recursion tree method , Master method.

08 hours

Module – II

Divide and Conquer : General method, Binary search , Finding minimum and maximum , Merge sort analysis , Quick sort analysis, Shassen's matrix multiplication ,The problem of multiplying long integers,

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

08 hours

Module – III

General Method: Knapsack problem , Job sequencing with deadlines, Minimum cost spanning trees- Kruskal and prim's algorithm ,Optimal storage on tapes, Single source shortest path, **Transfer and conquer :** Introduction, Balanced search trees, Heap and Heap sort

08 hours

Module – IV

General Method: Multistage graphs, all pair shortest path, single source shortest path . 0/1 knapsack , Travelling salesman problem , Flow shop scheduling.

08hours

Module – V

General Method : 8 queen problem(N-queen problem) ,Sum of subsets, Graph colouring. **String Matching Algorithms :**The naive string matching Algorithms, The Rabin Karp algorithm, String matching with finite automata, The knuth-Morris-Pratt algorithm , Longest common subsequence algorithm

08 hours

Laboratory:

12 hours

1. Write a C/C++ program to sort the elements by using quick sort method.
2. Write a C/C++ program to sort the elements by using merge sort method.
3. Obtain the Topological ordering of vertices in a given digraph.
4. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
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 will be able to:

- Understand the concept of pseudo code for writing an algorithm and acquire ability to analyze the asymptotic performance of various algorithms
- Explore the concept of divide and conquer and graphs and get familiarity of analysis of various graph algorithms.
- Understand algorithm designing techniques such as Greedy approach and explore to various related application problems.
- Use different algorithms to solve dynamic programming problems.
- Apply the pattern matching techniques in the real world problems.

Text Books:

1. Anany Levitin: "Introduction to The Design and Analysis of Algorithms", (Chapters 1-5,7,9,11), Pearson Education, Delhi, 3rd Edition, 2012.ISBN-13: 978-0-13-231681-1 ISBN-10: 0-13-231681-1 .
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.citc.ui.ac.ir/zemoni/cls.pdf>
3. <http://cs.gmu.edu/~pwiegand/cs483-Spring06/lecturenotes/cs483-11pf.pdf>
4. <http://www.cs.cornell.edu/~kozen/papers/daa.pdf>

OBJECT ORIENTED PROGRAMMING WITH JAVA(IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSI43	2:0:4:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Learn the basic concepts of object-oriented programming.
- Understand the basics of JAVA Programming using classes and objects.
- Gain the knowledge of Inheritance and packages.
- Expose to the concepts of exceptions that occur while programming in JAVA.
- Acquire the knowledge of multi-threaded programming in JAVA.

Syllabus

Module – I

Introduction to Object Oriented Concepts: Procedure–Oriented Programming system, Object Oriented Programming System, Comparison of Object Oriented Language with C.

Introduction to Java: Java's magic, The Byte code, Java Development Kit (JDK), Java Buzzwords, Object- oriented programming, IO Streams, Data types, variables and arrays, reference variables, Operators, Control Statements. Simple Java programs.

08Hours

Module – II

Classes: Classes fundamentals, Declaring objects, this keyword, garbage collection.

Methods: Method Prototyping, Member functions and data members, Constructors, Objects and methods, Method Overloading, Objects and arrays, Access modifiers, Setters and getters, Nested classes, Console I/O.

08 Hours

Module – III

Inheritance: Inheritance basics, using super, creating multi-level hierarchy, method overriding, using Abstract classes, using final. **Packages:** Packages: Access Protection, Importing Packages.

08Hours

Module – IV

Interfaces, Exceptions, Applets: Interfaces, Exception handling fundamentals, exception types, uncaught exceptions, using try and catch, using multiple catch clauses, nested try statements, throw, throws, finally, Exception handling in Java, Applets, Types of Applets, Applet basics and class, Applet Architecture.

08 Hours

Module – V

Event Handling and Multi-Threaded Programming : Two event handling mechanisms, The delegation event model, Event classes, Sources of events, Event listener interfaces, Using the delegation event model, Adapter classes, Inner classes. Multi-Threaded Programming: What are threads? How to make the classes threadable, Extending threads, Implementing runnable, Synchronization, Changing state of the thread, Bounded buffer problems, read-write problem.

08 Hours

Laboratory

1. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
2. Write a Java program that prints the following pattern type

**
*
3. Write a java program to calculate gross salary & net salary taking the following data.
Input: empno, empname, basic Process: DA=50% of basic HRA=25% of basic CCA=Rs240/-
PF=10% of basic PT=Rs100/-
4. Write a Java program that displays area of different Figures(Rectangle, Square, Triangle) using the method overloading.
5. Write a Java program that displays the time in different formats in the form of HH,MM,SS using constructor Overloading.
6. Write a Java program that counts the number of objects created by using static variable.
7. Write a java program that implements educational hierarchy using inheritance.
8. Write a java program that implements Array Index out of bound Exception using built-in-Exception.
9. Write a java program that implements bank transactions using user defined exception.
10. Write a java program to identify the significance of finally block in handling exception.

Course Outcomes

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

- Explain the difference between Procedure and Object Oriented Programming.
- Develop basic JAVA programs.
- Apply Inheritance properties and packages in solving real world problems.
- Use exception handling methods efficiently.
- Demonstrate the programs by using multithreaded concepts.

Text Books:

1. Herbert Schildt, "Java The Complete Reference", 7th Edition, Tata McGraw Hill, 2013, ISBN-13: 978-0072263855, (Chapters 1-11).

Reference Books:

1. Herbert Schildt, "The Complete Reference C++", 4th Edition, Tata McGraw Hill, 2013, ISBN-13: 978-0072226805.
2. E Balagurusamy, "Programming with Java-A primer", 2nd Edition, Tata McGraw Hill companies, 2009, ISBN-13: 978-9351343202.

E-Resources:

1. www.geeksforgeeks.org/java/
2. www.tutorialspoint.com/java/index.htm

DATABASE CONCEPTS THROUGH MYSQL (IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSI44	2:0:2:0	3	CIE:50 SEE:50	3 Hours	IC

Course Objectives:

This course will enable students to:

- Understand the basic concepts of database and Database Management System and difference between relational systems and non-relational systems.
- Get a clear understanding of how to create and maintain data in a relational database using SQL.
- Understand the working of advanced queries in SQL.
- Understand how data can be manipulated using indexing.
- Get a clear understanding of how to design and develop applications using JDBC and SQL.

Syllabus

Module – I

Introduction to Database: Introduction, Characteristics of database approach, Advantages of using the DBMS approach. Database System concepts and architecture: Data Models, Schemas, and Instances, Three schema architecture and Data independence. Data Modelling using Entities and Relationships Model: Entity types, Entity sets, attributes and keys, relationship, constraints, ER diagrams. **08 Hours**

Module – II

Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas. **SQL:** SQL data definition and data types, specifying constraints in SQL, schema change statements in SQL, INSERT, DELETE, and UPDATE statements in SQL, assertions, views, queries. **08 Hours**

Module – III

More complex SQL retrieval queries: Nested queries, Correlated nested queries, The EXISTS and UNIQUE function in SQL, Joins, Aggregate functions in SQL, Grouping: Group by and Having clauses. **08 hours**

Module – IV

Index Structure: Index Structures, Indexes on Sequential Files-Secondary Indexes-B-Trees-Hash Tables- Bitmap Indexes. **08 hours**

Module – V

Project Work: To design and implement current trends and new challenges of database applications using the concepts of database management systems with special emphasis on JDBC and MySQL database. **08 hours**

Laboratory

1. Programs covering SQL, Constraints, Operators and Functions, Nested queries and Joins etc.
Project Work.

Course Outcomes

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

- Describe the basic concepts of database and Database Management System, enforce integrity constraints on a database using RDBMS.
- Implement Structured Query Language (SQL) queries for database manipulation.
- Create complex sql queries and use them for databasemanipulation.
- Apply indexing structures for file handling.
- Design database systems for current trend applications to interact with databases using JDBC

and database to save and retrieve data in a safe and consistent manner.

Text Books:

1. Fundamentals of Database Systems; RamezElmasri and Shamkant B. Navathe;Pearson; 5thEdition; ISBN 978-81-317-1625-0.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill, ISBN-13: 978-0072465631, ISBN-10: 0072465638
3. Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom, “Database Systems:The Complete Book”,

Pearson Education, Second Edition, ISBN-13: 978-0131873254, ISBN-10: 0131873253

Reference Books:

1. SilberschatzKorth and Sudharshan, Database System Concepts, 6th Edition, Mc- GrawHill, 2013, ISBN 0-07-352332-1

E-resources:

1. <https://www.db-book.com/db6/>.
2. <https://www.pdfdrive.com/database-management-systems-3rd-editionpdf-e16674103.html>.
<https://github.com/pforpallav/school/blob/master/CPSC404/Ramakrishnan%20-%20Database%20Management%20Systems%203rd%20Edition.pdf>.

OPERATING SYSTEMS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST45	2:2:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Learn the basic concepts of operating system, services and process handling.
- Impart adequate knowledge on the need of parallel programming using multi threading concepts.
- Identify and handling deadlocks.
- Enable effective usage of the memory management techniques.
- Know about various file systems and understand the working of Linux platform.

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: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.

08Hours

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.

Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors. **08Hours**

Module – III

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

08Hours

Module – IV

Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. **Virtual Memory Management:** Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

08Hours

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. **Case Study:** The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.

08Hours

Course Outcomes:

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

- Demonstrate functional architecture of an operating system.
- Describe process scheduling, multithreading and synchronization Concepts.
- Use suitable techniques for handling the deadlocks.
- Apply various memory management techniques.
- Realize the different concepts of OS in platform of usage through case studies

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, “Operating System Concepts” 9th edition, Wiley-India, 2016. ISBN-13: 978-8126554270.

Reference Books:

1. Andrew S. Tanenbaum, Herbert Bos, "Modern Operating Systems " , 4th edition, Pearson, India, 2014. ISBN-13: 978-0133591620.
2. D.M Dhamdhare, “Operating Systems: A Concept Based Approach “, 3rd Ed, McGraw-Hill, 2013. ISBN: 9781259005589.

E-Resources:

1. https://www.tutorialspoint.com/operating_system/index.htm.
2. <https://www.studytonight.com/operating-system/>.

INTRODUCTION TO MICROPROCESSORS & MICROCONTROLLERS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST46	2:2:0:0	3	CIE:100 SEE:100	3 hours	Theory

Course Objectives:

This course will enable students to:

- Understand differences between Microprocessors and Microcontrollers.
- Analyze the properties of Microprocessors and Microcontrollers
- Apply the knowledge of data transfer information through serial and parallel ports.
- Create real world applications using assembly language.
- Analyze their practical knowledge through experiments

Syllabus

Module-I

Introduction to Microprocessor: The x86 microprocessor: Brief history of the x86 family, Inside the 8088/86, Introduction to assembly programming, Introduction to Program Segments, The Stack, Flag register, x86 Addressing Modes. Assembly language programming: Directives & a Sample Program, Assemble, Link & Run a program, More Sample programs, Control Transfer Instructions, Data Types and Data Definition, Full Segment Definition, Flowcharts and Pseudo code. **08 Hours**

Module-II

Instruction Set: Instructions sets description, Arithmetic and logic instructions and programs: Unsigned Addition and Subtraction, Unsigned Multiplication and Division, Logic Instructions, BCD and ASCII conversion, Rotate Instructions. INT 21H and INT 10H Programming : Bios INT 10H Programming , DOS Interrupt 21H. 8088/86 Interrupts, x86 PC and Interrupt Assignment. **08 Hours**

Module-III

Assembly Language Programming : Introduction to 8051 and instruction set, addressing modes, data transfer instructions, example programs, arithmetic instruction, logical instructions, jump and call subroutines, example programs. **08 Hours**

Module-IV

ARM Embedded Systems: Microprocessors versus Microcontrollers, ARM Embedded Systems :The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, ARM Processor Fundamentals : Registers , Current Program Status Register , Pipeline, Exceptions, Interrupts, and the Vector Table . **08 Hours**

Module-V

Introduction to the ARM Instruction Set: Introduction to the ARM Instruction Set : Data Processing Instructions , Branch Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants, Simple programming. **08 Hours**

Course Outcomes:

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

- Describe the Intel 8085/8086 architecture with explanation of internal organization of some popular microprocessors/microcontrollers.
- Construction of a maintainable assembly language program for an algorithm.
- Conclude the Intel 8085/8086 real mode memory addressing.
- Describe the functioning of peripheral ICs.
- Designing of microprocessor and microcontroller based system.

Text Books :

1. Muhammad Ali Mazidi, "The 8051 Microcontroller; A Systems approach", Pearson Education 2013, ISBN 129207266, Chapters 1,2,3,5,7,8.
2. Kenneth J. "The 8051 Microcontroller architecture; Programming and applications", ISBN 0314772782.

Reference Books :

1. Predko, "Programming and Customizing the 8051 microcontroller, ISBN: 8131706974
2. Raj Kamal, Microcontrollers, architecture, programming, interfacing and system design, Pearson, education, 2005, ISBN: 9788131706978.

UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19UHV47	3-0-0-0	3	100	3 Hours	Theory

Universal Human Values 2: Understanding Harmony

Human Values Courses

This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as “H-102 Universal Human Values 2: Understanding Harmony” is designed which may be covered in their III or IV semester.

During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

Universal Human Values 2: Understanding Harmony

Pre-requisites: None. Universal Human Values 1 (desirable)

1. **Objective:** The objective of the course is fourfold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

2. **Course Topics:** The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration– what is it? - Its content and process; „Natural Acceptance’ and Experiential Validation- as the process for self-exploration

Continuous Happiness and Prosperity- A look at basic Human Aspirations

Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority

Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module 2

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient „I and the material „Body’ Understanding the needs of Self („I) and „Body’ - happiness and physical facility Understanding the Body as an instrument of „I (I being the doer, seer and enjoyer) Understanding the characteristics and activities of „I and harmony in „I

Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3:

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

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.

Understanding the meaning of Trust; Difference between intention and competence

Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.

Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals.

Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4:

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature.

Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and selfregulation in nature.

Understanding Existence as Co-existence of mutually interacting units in all-pervasive space Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.

Module 5:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of peoplefriendly and eco- friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems

Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.

3. Readings: 3.1

Text Book 1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books-3.2

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).The Story of My Experiments with Truth - by Mohandas Karamchand.
4. Gandhi Small is Beautiful - E. F Schumacher.
5. Slow is Beautiful - Cecile Andrews
6. Economy of Permanence - J C Kumarappa
7. Bharat Mein Angreji Raj - PanditSunderlal
8. Rediscovering India - by Dharampal
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
10. India Wins Freedom - Maulana Abdul Kalam Azad
11. Vivekananda - Romain Rolland (English)
12. Gandhi - Romain Rolland (English)

4. Mode Of Conduct (L-T-P-C 2-1-0-3 or 2L:1T:0P 3 credits)

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions. While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements. In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self- observation, self- reflection and self- exploration. Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than "extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting. Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values. It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, including HSS faculty. Teacher preparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemed essential.

Assessment: This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation.

Example: Assessment by faculty mentor: 10 marks Self-assessment: 10 marks Assessment by peers: 10 marks Socially relevant project/Group Activities/Assignments: 20 marks.

Semester End Examination: 50 marks The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

6. Outcome of the Course:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to- day settings in real life, at least a beginning would be made in this direction. This is only an introductory foundational input. It would be desirable to follow it up by a) faculty-student or mentor-mentee programs throughout their time with the institution b) Higher level courses on human values in every aspect of living. E.g. as a professional.

PROFESSIONAL DEVELOPMENT OF ENGINEERS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSH48	1:0:2:0	2	CIE:50 SEE:50	3 Hours	

Course Objectives:

This course will enable students to:

- Explain instances when sending email is necessary and appropriate.
- Create an email subject line that accurately describes the content of the message.
- Clarify and prioritize one's objectives and goals, by creating more planning time.
- Set and accomplish goals by self-reflection and self-monitoring
- Identify, prevent, and manage stress to improve academic success.
- Distinguishing between management and leadership and Sharpening interpersonal and communication Skills.

Syllabus

Module – I

Team Building: Defining team and its important elements, Clarifying the advantages and challenges of team work, Understanding bargains in team building, Defining behavior to sync with team work, Team building activities.

Email etiquette: Before you start typing: what to send by Email, “What I’m trying to say”: creating an accurate subject line It’s still business writing: 12 common errors to avoid, Before clicking „send”: checking, proofing and copying, Damage control: Rx for bad email moments. **06Hours**

Module – II

Time Management: Assessing time management strengths and weaknesses, Removing the barriers of productivity Overcoming the procrastination habit Focusing and staying in the zone Learning to be present: the power of now Managing tasks, projects, goals and Ideas Determining and managing priorities.

Module – III

Stress Management: Achieving work-life balance by becoming better at stress management, Approaching stress management in a scientific manner, Enhancing personal effectiveness through managing stress, Learning stress management techniques, Responding resourcefully to stress situations. **03Hours**

Goal Setting Developing a mission statement, Creating goal, Establishing specific, measurable, achievable, realistic and time-targeted (S.M.A.R.T) goals, Constructing action Steps, Making

Module – IV

Business Etiquettes: Importance of Business Etiquettes, Difference between Social and Business Etiquettes, Types of Business Etiquettes – Dining, Telephone, Office, Meeting, Dressing, Cubicle and Networking an action plan presentation. **06 Hours**

Leadership Skills: What is Leadership?, Leaders V/s Followers, Managers V/s Leaders, Testing your Leadership Potential, Your Personality – Conduit of Leadership, Team Leadership, Leadership & Conflict Resolution, Assertiveness and Leadership. **06Hours**

Module – V

SWOT: Understanding SWOT, SWOT analysis, Understand the concept behind SWOT analysis, Understand the value of SWOT analysis on an individual, Successfully perform a SWOT analysis

Individual Presentations: Individual presentations by the Participants, Presentations would be followed by question & answer sessions, Extensive feedback would be given by the trainer on the strengths & areas of improvement, Review of performance when compared with previous semesters, Action plan for improvement for each individual student. **05 Hours**

SOFTWARE ENGINEERING

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
19CST51	3:0:0:0	3	CIE:50 SEE:50	3 hours	FC

Course Objectives:

This course will enable students to,

- Software process models and compare their applicability
- Identify the key activities in managing a software project
- Concepts of requirements engineering and Analysis Modeling
- Apply systematic procedure for software design and deployment
- Compare and contrast the various testing and maintenance

Syllabus

Module – I

Software Process and Project Management: The evolving role of software – the changing nature of software- Life cycle models - Water fall - Incremental - Spiral - Evolutionary - Prototyping – Concurrent development – Specialized process models - Verification - Validation - Life cycle process - Development process - System engineering hierarchy - Introduction to CMM - Levels of CMM.

08 Hours

Module – II

Requirement Analysis and Specifications: Functional and Non-Functional - User - System - Requirement Engineering Process - Feasibility Studies –communication practices- Requirements - Elicitation - Validation and management - Fundamental of requirement analysis – Analysis principles – Structured System Analysis - Software prototyping - Prototyping in the Software Process - Data - Functional and Behavioral Models - Structured Analysis and Data Dictionary.

08 Hours

Module – III

Software Design: Design process - Modular design - Design heuristic - Design model and document - Architectural design - Software architecture - Data design - Architecture data - Transform and transaction mapping - User interface design - User interface design principles.

08 Hours

Module – IV

Testing and Implementation: Levels - Software Testing Fundamentals - Types of s/w test - White box testing- Basis path testing - Black box testing - Control Structure testing- Regression testing strategies - Strategic approach and issues - UNIT testing - Integration testing - Validation testing - System testing and debugging. Case studies - Writing black box and white box testing-Coding Practices Refactoring.

08 Hours

Module – V

Project Management and Estimation : Software cost estimation - COCOMO model - Quality management - Quality concepts- SQA - Software reviews - Formal technical reviews - Formal approaches of SQA and software reliability - Software maintenance - SCM - Need for SCM - Version control - Introduction to SCM process - Software configuration items. Re-Engineering - Software

Course Outcomes:

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

- Identify and apply software lifecycle model for a given problem and will know the criteria for each level of CMM
- Comprehend types of requirements and summarize Requirement Engineering Process
- Design data, functional and behavioral model for any given software requirement
- Identify and analyze levels of testing and perform white box testing and black box testing for a given problem
- Describe concepts of software quality assurance and software configuration management

Text Books:

1. Rogar Pressman, “Software Engineering and Application”, 7th Edition, McGraw Hill Education Publication, 2009, ISBN-13: 9789339212087.
2. Ian Sommerville, “Software Engineering”, 8th Edition, ISBN-10-9332582696, ISBN-13- 978-9332582699, Pearson Education (24 May 2017).
3. Stephan Schach, “Software Engineering”, Tata McGraw Hill, 2007.
4. Rajib Mall, “Fundamentals of Software Engineering”, 3 rd Edition, PHI Learning Private Limited, 2009, .ISBN-10-9788120338197, ISBN-13-978-8120338197.
5. Kelkar S.A., “Software Engineering”, ISBN 10: 8120332725, ISBN 13: 9788120332720, Publisher: Prentice-Hall of India Pvt.Ltd, 2007.

REFERENCES

1. Pankaj Jalote, “Software Engineering, A Precise Approach”, Wiley India, 2010, ISBN: 9788126523115
2. Pfleeger and Lawrance, “Software Engineering: Theory and Practice” Pearson Education, 2 nd Edition, 200.1

E-Resources:

1. <https://www.pearson.com/us/higher-education/product/Sommerville-Software-Engineering-9th-Edition/9780137035151.html>.
2. <https://www.abebooks.com/9788120332720/Software-Engineering-Kelkar-S-A-8120332725/plp>
3. <https://www.wileyindia.com/pankaj-jalote-s-software-engineering-a-precise-approach.html>

ADVANCED JAVA (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
19CSI52	2:0:4:0	4	CIE:50 SEE:50	3 Hours	IC

Course Objectives:

This course will enable students to,

- Learn String handling techniques of JAVA programming.
- Learn the concepts of Collection Frameworks through Collection class and Collection interface.
- Gain knowledge of Collection algorithms and Legacy classes and interfaces.
- Understand the file concepts and Streams in JAVA programming.
- Acquire knowledge of JAVA Database Connectivity.

Syllabus

Module – I

String Handling and Wrapper classes: The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion Using valueOf(), Changing the Case of Characters Within a String, Additional String Methods, String Buffer, String Builder, Primitive Type Wrappers. **08 Hours**

Module – II

Collections Framework-1: Collections Overview, Recent changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a Collection via an Iterator, Storing User-Defined Classes in Collections, The Random Access Interface. **08 Hours**

Module – III

Collections Framework-2: Working with Maps, Comparators, The Collection Algorithms, Why Generic Collections, The Legacy Classes and Interfaces, Parting Thoughts on Collections. **08 Hours**

Module – IV

Files I/O: Files, The Closeable and Flushable Interfaces, The Stream Classes, The Byte Streams, The Character Streams, The Console Class, UsingStream I/O. **08 Hours**

Module – V

JDBC: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Datatypes, Exceptions. **08 Hours**

List of Lab Experiments:

1. Write a Java program to use String/Wrapper class and its methods.
2. Write a Java program to implement interface through Collection.
3. Write a Java program to access a collection through an iterator.
4. Write a Java program to print word count of a file using Stream I/O.

5. Write a Java program to execute select query using JDBC.
6. Write a Java program to update customer information.

Course Outcomes:

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

- Implement String handling techniques in JAVA programming effectively.
- Access Collection class and Collection interface for JAVA programming.
- Interpret Collection algorithms and use Legacy classes and interfaces.
- Interpret concepts of Input/Output Streams in Files.
- Implement the concepts of connectivity of Database through JDBC

Text Books:

1. Herbert Schildt, “JAVA the Complete Reference”, 9th Edition, Tata McGraw Hill, 2011, ISBN-13: 9781259 002465.
2. Jim Keogh, “J2EE - The Complete Reference”, 1st Edition, McGraw Hill, 2017, ISBN-13: 9780070529120.

Reference Book:

1. Y. Daniel Liang, “Introduction to JAVA Programming”, 10th Edition, Pearson Education, 2013, ISBN-13: 978-0133761313

E-Resources:

1. <https://www.udemy.com/course/advanced-java-programming/>

COMPUTER NETWORKS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSI53	4:0:2:0	4	CIE:50 SEE:100	3 hours	IC

Course Objectives:

This course will enable students to:

- Understand the basics of data flow, network categories, models and different types of switched networks used in communication.
- Know different types of error detection and correction techniques and also, error control protocols applied in the data link layer.
- Compare the design, working and implementation of Internet protocols as well as routing protocols responsible for network layer communication.
- Gain Knowledge about TCP, UDP protocols and also, network security concepts.
- Learn the use of various application layer protocols.

Syllabus

Module – I

Introduction, Network Models & Switching:

Data Communications, Networks, Network Types. Network Models: TCP/IP Protocol Suite, The OSI Model Switching: Circuit-Switched Networks, Packet Switching. **08 hours**

Module – II

Error Detection and Correction & Data Link Control (DLC):

Error Detection and Correction: Introduction, Block Coding, Cyclic Codes, Checksum, Forward Error Correction. Data Link Control: DLC Services, Data-Link Layer Protocols, HDLC, PPP (Framing, Transition phases only). **08 hours**

Module – III

Network Layer Protocols & Routing: Network Layer Protocols: IPv4 addressing, Internet Protocol (IP), Mobile IP. Routing: Introduction, Routing Algorithms, Unicast Routing Protocols. Next Generation IP: IPv6 addressing, IPv6 protocol. **08 hours**

Module – IV

Transport and End-to-End protocols: User Datagram Protocols (UDP), Transmission Control Protocol (TCP), TCP Congestion Control. Overview of Network Security: Symmetric-Key Cryptography, Public-Key Cryptography. **08 hours**

Module – V

Applications, Network Security: Overview of the Application Layer, Domain Name System (DNS), Electronic Mail (E-Mail), World Wide Web (WWW), Remote Login Protocols, File Transfer and FTP. **08 hours**

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Course Outcomes

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

- Establish appropriate switched networks based on the network models and use them for communication.
- Resolve errors that occur during communication and also, to analyze DLC protocols.
- Assign/map internet (logical) addresses to PDUs as well as, they can implement

different routing algorithms

- Implement network applications choosing either TCP or UDP depending on the requirements and also, can integrate security measures for the applications
- Use application level protocols in the current technology trends.

Text Books:

1. Behrouz A. Forouzan,: Data Communication and Networking, 5th Edition, Tata McGraw-Hill, July 2013, ISBN : 978-0-07-131586-9(Chapters 1, 2, 8, 10, 11,18,19, 20).ISBN:12-786-3452156432
2. Nader F. Mir: Computer and Communication Networks, 2nd Edition, Pearson Education, 2015,ISBN : 0133814742,(Chapters 8, 9, 10).

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>

DATA WAREHOUSING & DATA MINING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST54	3:0:0:0	3	CIE:50 SEE:50	3 hours	FC

Course Objectives:

This course will enable students to,

- Identify the scope and necessity of Data Mining and Warehousing for the society
- Describe various Data Models and Design Methodologies of Data Warehousing destined to solve the root problems
- Understand various Tools of Data Mining and their Techniques to solve the real time problems
- Learn how to analyze the data, identify the problems, and choose the relevant algorithms to apply.
- Assess the Pros and Cons of various algorithms and analyze their behavior on real datasets

Syllabus

Module – I

Data Mining: Introduction - Steps in KDD - System Architecture – Types of data -Data mining functionalities - Classification of data mining systems - Integration of a data mining system with a data warehouse - Issues - Data Preprocessing - Data Mining Application. **08 Hours**

Module – II

Data Warehousing: Data warehousing components - Building a data warehouse - Multi Dimensional Data Model - OLAP Operation in the Multi- Dimensional Model - Three Tier Data Warehouse Architecture - Schemas for Multi-dimensional data Model - Online Analytical Processing (OLAP) - OLAP Vs OLTP Integrated OLAP and OLAP Architecture. **08 Hours**

Module – III

Association Rule Mining: Mining frequent patterns - Associations and correlations - Mining methods - Finding Frequent itemset using Candidate Generation - Generating Association Rules from Frequent Itemsets - Mining Frequent itemset without Candidate Generation - Mining various kinds of association rules - Mining Multi-Level Association Rule-Mining MultiDimensional Association Rule- Mining Correlation analysis - Constraint based association mining. **08 Hours**

Module – IV

Classification and Prediction: Classification and prediction - Issues Regarding Classification and Prediction - Classification by Decision Tree Induction - Bayesian classification - Baye's Theorem - Naïve Bayesian Classification - Bayesian Belief Network - Rule based classification - Classification by Back propagation - Support vector machines - Prediction -Linear Regression. **08 Hours**

Module – V

Clustering, Applications and Trends In Data Mining: Cluster analysis - Types of data in Cluster Analysis - Categorization of major clustering methods -Partitioning methods - Hierarchical methods - Density-based methods - Grid-based methods - Model based clustering methods -Constraint Based cluster analysis - Outlier analysis - Social Impacts of Data Mining- Case Studies: Mining WWW- Mining Text Database- Mining Spatial Databases. **08 Hours**

Course Outcomes:

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

- Assess Raw Input Data and process it to provide suitable input for a range of data mining algorithm
- Design and Modeling of Data Warehouse
- Discover interesting pattern from large amount of data
- Design and Deploy appropriate Classification Techniques
- Able to cluster high dimensional data

Text Books:

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 2nd Edition, Elsevier, 2007, ISBN-10 -9789380931913, ISBN-13-978-9380931913.
2. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Published by Tata McGraw-Hill Education Pvt. Ltd., 2004, ISBN 10: 0070587418 / ISBN 13: 9780070587410.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction To Data Mining", Person Education, 2007, ISBN-13-9788131714720, ISBN-10-8131714720.
4. G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006, ISBN-13:9788120350021, ISBN - 10 :8120350022.
5. Daniel T. Larose, "Data Mining Methods and Models", Publisher-John Wiley & Sons, 2006, ISBN 8126507764, 9788126507764.

References:

1. Pieter Adriagus, Dolf Zantinge-"Data Mining", Addison-Wesley Publisher, Pearson education, 2007, ISBN 978-81-317-0717-3.
2. Sam Anahory, Dennis Murray "Data Warehousing in the Real World", Pearson education, ISBN 978-81-317-0459-2, 2009.

E-Resources:

1. <https://study.com/academy/lesson/data-warehousing-and-data-mining-information-for-business-intelligence.html>
2. <http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf>
3. <https://www-users.cs.umn.edu/~kumar001/dmbook/index.php>

ARTIFICIAL INTELLIGENCE

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST551	3:0:0:0	3	CIE:50 SEE:50	3 hours	P. Elective I

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 representations to specify domains and reasoning tasks of a situated software agent.
- Gain knowledge on 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. **08 Hours**

Module-II

Informed Search, Exploration, Constraint Satisfaction, Adversarial Search: Informed search strategies; Heuristic functions; On-line search agents and unknown environment. Constraint satisfaction problems; Backtracking search for CSPs. Adversarial 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. **08 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.

Text Books :

1. [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. [1]. Elaine Rich, Kevin Knight: “Artificial Intelligence”, 3rd Edition, Tata McGraw Hill, 2009, ISBN-10: 0070087709.
2. [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>
2. [http://www.getfreebooks.com/16-sites-with-free-artificial-intelligence-e book](http://www.getfreebooks.com/16-sites-with-free-artificial-intelligence-e-book)

IMAGE PROCESSING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST552	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PE-1

Course Objectives:

This course will enable the students to:

- Study the fundamental concepts of a digital image processing system.
- Understand spatial domain for image enhancement.
- Gain the knowledge of image filtering in frequency domain.
- Learn the noise models and restoration concepts.
- Expose to color image processing and different transformation techniques.

Syllabus

Module – I

Introduction: Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relationships Between Pixels- Neighbors and Connectivity of pixels in image, Applications of Image Processing: Medical imaging, Robot vision, Character recognition, Remote Sensing. **08 hours**

Module – II

Image Enhancement In The Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods. **08 hours**

Module – III

Image Enhancement In Frequency Domain : Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT, Discrete Cosine Transform (DCT), Image filtering in frequency domain. **08 hours**

Module – IV

Image Restoration: Image enhancement versus Image restoration, Image degradation/restoration model, Inverse filter, Noise models, Restoration using spatial filtering: Arithmetic Mean filters, Geometric mean filters, Harmonic mean filters, Order Statistics filters: Median filter, Max & min filters, Midpoint filter, Adaptive filters, Wiener filter, Constrained Least squares filter. **10 hours**

Module – V

Color Image Processing: Fundamentals of color image processing, Color models, Conversion of color models from one form to other form, Pseudo color image processing, Full color image Processing, Color Image Quantization, Histogram of color Image.

Basic Image Transforms: Discrete Cosine and Sine transform, Z-transform, Fourier transform, Laplacian transform, Two-dimensional orthogonal unitary transforms, Properties of Unitary Transforms, K-L Transform, Introduction to Wavelet Transform. **08 hours**

Course Outcomes:

After studying this course, students will be able to

- Review the fundamental concepts of a digital image processing system.
- Apply spatial domain for image enhancement.

- Develop frequency domain for image enhancement
- Use various noise models and apply appropriate filtering techniques.
- Perform color image processing and various transformations on images.

Text Books:

1. Digital Image Processing by Rafael C. Gonzalez & Richard E. Woods, 4th Edition, Pearson Education, 2018. (ISBN: 9780133356779)
2. Fundamentals of Digital Image Processing by Anil.K.Jain, Prentice Hall, 4th Edition, 2014 (ISBN: 9780133361650)

Reference Books:

1. S. Sridhar, Digital Image Processing, Oxford University Press, 2nd Ed, 2016. (ISBN: 9780199459353)

E-Resources :

1. <http://www.nptelvideos.in/2012/12/digital-image-processing.html>
2. http://in.mathworks.com/discovery/digital-image-processing.html?s_tid=srchtitle

SOFT COMPUTING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST553	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable students to:

- Learn the basic concepts of soft computing techniques and their roles in building intelligent machines.
- Understand how to apply a neural network for a particular problem.
- Gain the knowledge of fuzzy logic in solving engineering problems.
- Study the various computational methods .
- Acquire the knowledge of genetic algorithm.

Syllabus

Module – I

Introduction: What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

Neural Networks-1(Introduction & Architecture) Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks.

08 Hours

Module – II

Neural Networks-1(Introduction & Architecture): Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.

Neural Networks-II (Back propagation networks) Architecture: perceptron model, solution, single layer artificial neural network, multilayer perceptron model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.

08 Hours

Module – III

Fuzzy Logic-I (Introduction): Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

08Hours

Module – IV

Fuzzy Logic –II (Fuzzy Membership, Rules): Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications. **08 Hours**

Module – V

Genetic Algorithm(GA): Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications. **08Hours**

Course Outcomes

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

- Describe soft computing techniques and their roles in building intelligent machines.
- Apply soft computing methodology for a particular problem.
- Deploy fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
- Use various soft computing approaches for a given problem.
- Develop genetic algorithms to combinatorial optimization problems.

Text Books:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India, 2nd edition, 2013, **ISBN-13:** 9788120353343.
2. S.N. Sivanandam & S.N. Deepa, "Principles of Soft Computing", Wiley Publications, 2nd Edition, 2011, ISBN-13: 978-8126527410.

Reference Books:

1. Simon Haykin, "Neural Networks" Prentice Hall of India, Pearson publications, 2nd Edition, 2016, ISBN-13: 978-0-13-147139-9.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India, 3rd Edition, 2013, ISBN: 978-0-470-74376-8.

E-Resources:

1. www.igi-global.com/book/soft-computing-applications-database-technologies/37327
2. www.tandfonline.com/doi/abs/10.1080/02564602.2001.11416974

ACCOUNTANCY & TAXATION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSH56	4:0:2:0	3	CIE:SEE	03	-

Course Objectives:

- To develop a greater insight into the importance of Accounting and accounting terms
- To make the students capable of recording business transaction under double entry system.
- To introduce the students about financial statements
- To facilitate a clear perspective of Indian taxation system in terms of various types of taxes prevailing in India
- To help students to understand the concepts of tax management through deductions & exemptions available under Income taxact.

Syllabus

Module 1

Introduction to accounting –Introduction: History and Development of Accounting –Meaning Objectives and functions of Accounting-Book-keeping V/s Accounting –Users of accounting data – systems of bookkeeping and accounting – branches of accounting –advantages and limitations of accounting. Accounting Concepts and conventions: Meaning need and classification, Accounting standards –meaning, need and classification of Indian accounting standards. Accounting principles V/s Accounting standards, Classification of accounting transaction and accounts, rules of debit and credit as per Double Entry System. **08 hours**

Module 2

Accounting Process: Journalizing and Ledger position, Preparation of different subsidiary books: Purchase Day Book, Sales Day Book, Purchase Returns Day Books, Sales Returns Day Book, Cash Book. Bank Reconciliation Statement: Meaning, Need, Definition, reason of differences between cash book & pass book., Preparation of Trial Balance: Rectification of errors (Concept only)**08 hours**

Module 3

Preparation of Final Statement: Meaning and objectives of Financial statements, Preparation of Income statement & Balance sheet. (sole proprietor) **08 hours**

Module 4

Introduction to Tax: Definition of Tax, Types of Tax, Assessment year, Previous year, Person, Assesse, Residential Status & Tax Liability, Canons of taxation, Heads of income, Gross Total Income Exempted Income u/s. 10, Tax slabs for Individual, PAN card, (Problems on residential Status of Individual Assesse and Incidence of Tax). **08 hours**

Module 5

Computation of Tax Liability: Heads of Income (Concepts only)- Income from salary, Income from house property, Income from Business & Profession, Capital Gains, Income from other Sources, Gross Total Income Deductions U/s 80 C-80 U, Set Off & Carry Forward of Losses(Concepts only), Computation of Total Income and Determination of Tax Liability (individual only) **08 hours**

Total Hours: 40 Hours

Practical Components:

1. Analyzing financial statement of various business organizations and comparing the accounting methods used.
2. Using online Income tax calculator to assess income of various individuals on the basis of different tax slabs.
3. Collecting Form -16 & statement of return of Income in terms of salaried individual.

Course Outcomes:

Students will be able to:

- Understand basic accounting principles and accounting standards
- Analyze Business transaction as per double entry system of book keeping
- Acquire the ability to understand the importance of maintaining various subsidiary books
- Evaluate the Financial statements in terms of Profitability & financial position of Business
- Classify incomes in terms of different heads of income under Income tax act
- Interpret the various provision and exemptions of direct Tax Act relating to computation of Gross Total Income.
- Assess income and compute tax liability in terms of an individual tax payee.

Text Book:

1. T.S. Grewal: Accountancy, Sultan Chand & Sons(P) Ltd., New Delhi, Latest Edition
2. 7 Author series: Fundamental of Accounting, Vision Publishing House, Bangalore, Latest Edition

Reference Books:

1. Singhanian & Singhanian: Taxman's Direct taxes- law & practice, Taxman Publications; New Delhi, 63rd edition
2. S.N. Maheshwari: Management Accounting and Financial Control, Sultan Chand & Sons(P) Ltd., New Delhi, Latest Edition
3. R.L. Gupta: Advanced Accountancy, Sultan Chand & Sons(P) Ltd., New Delhi, Latest Edition

ENVIRONMENTAL STUDIES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19EVN57	0:2:0:0	1	CIE:50 SEE:50	1 Hours	HSS

Course Objectives: To recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment. The industrial revolution and development have led to the stress on environment in the form of pollution. Checking of the pollution in all fronts at local and global level encompassing the issues of carbon credit, ozone level depletion, global warming, desertification and polar ice cap melting. The main objectives of the course is to expose to students to the problems and mitigation measures concerned to the environmental components like resources, air, water and land.

Syllabus

Module I

Ecosystems (Structure and Function): Forest, Desert, Wetlands, Riverine, Oceanic and Lake.
Biodiversity: Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation. **03 Hour**

Module II

Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind.
Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining, Cloud Seeding, and Carbon Trading. **04 Hour**

Module III

Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution.
Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge. **04 Hour**

Module IV

Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology. **03 Hour**

Module IV

Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications): G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs.
Field work: Visit to an Environmental Engineering Laboratory or Green Building; Visit to a local area to document environment assets river / forest / grassland / hill / mountain. Visit to a local polluted site-urban/rural/industrial/agricultural/Water Treatment Plant/ Waste water treatment Plant. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills slopes; etc (field work equal to 2 lecture works) ought to be Followed by understanding of process and its brief documentation. **04 Hour**

Course outcomes: At the end of the course, students will be able to: ·

CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale, ·

CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.

CO3: Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components.

CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

Text Books:

1. Benny Joseph: Environmental Studies, Tata Mc Graw – Hill, 2nd Edition, 2012
2. S M Prakash: Environmental Studies, Pristine Publishing House, Mangalore, 3rd Edition, 2018,
3. R Rajagopalan: Environmental Studies –From Crisis to Cure, Oxford Publisher, 2005
4. R. Geetha Balakrishna, K. G. Lakshminarayana Bhatta: Environmental Studies, SM Publications. 2016

Reference Books

1. Raman Sivakumar: Principles of Environmental Science and Engineering, Cengage learning, Singapur. 2nd Edition, 2005
2. G. Tyler Miller Jr.: Environmental Science working with the Earth, Acme Learning Pvt. Ltd. New Delhi. 1st Edition.

EMPLOYABILITY SKILLS AND APTITUDE DEVELOPMENT

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
18CSH58	0:0:4:0	2	CIE:50 SEE:50	3 Hours	

Course Objectives:

This course will enable students to:

- Understand different types of Numerical / Arithmetical problems.
- Understand the different Data interpretation problems.
- To enhance interpersonal and soft skills for professional development.
- Enables students to develop their ability to reason by introducing them to elements of formal reasoning.
- To develop Problem Solving, confidence building, organizational, team working skills.

Syllabus

Module – I

Quantitative Aptitude I: Number System, Ratio Proportion and Partnership, Average.

06 Hours

Module – II

Quantitative Aptitude II: Percentage, Profit and Loss, Time and Work

06 Hours

Module – III

Logical Reasoning I: Number Series, Letter Series, Blood Relations ,

04 Hours

Module – IV

Logical Reasoning II: Analogy, Seating Arrangement, Data Arrangement

04 Hours

Module – V

Verbal Ability: Comprehension, Sentence Correction, Sentence Completion.

05 Hours

CLOUD COMPUTING (IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSI61	2:0:4:0	4	CIE:50 SEE:50	3 hours	FC

Course Objectives:

This course will enable students to :

- Understand the difference between classic data center and virtual data center.
- Understand the different deployment models used in cloud.
- Gain knowledge on cloud infrastructure components.
- Understand the cloud security terminologies.
- List the key considerations for migration to the cloudserver.

Syllabus

Module-I

Journey to the Cloud : Drivers for cloud computing, cloud definition and characteristics, NIST model, cloud cube model, building cloud infrastructure – a phased approach from Classic data center to virtual data center to Cloud, virtualization and its benefits,disadvantages of cloud computing, assessing the role of open standards.

08 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.

08 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.

08 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.

08 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.

08 Hours

List of Lab Programs :

12 Hours

- Program to create a file called emp.record, store and retrieve the information to and from the cloud about a person in terms of his name, age and salary.
- Program to list file in directory in cloudserver.
- Program to delete a specific line from a file and store back the file into cloudserver.
- Program to copy a file into another file and store back file into cloud.

- Program to append the text content into an already existing file in a cloud.
- Program to develop the ATM transaction application on cloud server.

Course Outcomes :

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

- Explain the concepts and terminologies of cloud computing.
- Demonstrate cloud frameworks and technologies.
- Define data intensive computing.
- Demonstrate cloud applications.
- Describe cloud migration issues

Text 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.

Reference Books :

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, Mastering Cloud. Computing McGraw Hill Education.
2. Ray J. Rafaels, Cloud Computing : From Beginning to End, Createspace Independent Publishing Platform, 2015, ISBN 1511404582.
3. Barrie Sosinsky, Cloud Computing Bible, First Edition Wiley Publication, ISBN-13: 978-0470903568.

E-Resources :

1. <http://www.buyya.com/MasteringClouds/ToC-Preface-TMH.pdf>
2. <https://azure.microsoft.com/en-in/overview/what-is-cloud-computing/>

ANDROID APPLICATION DEVELOPMENT(IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSI62	2:0:4:0	4	CIE:50 SEE:50	3 hours	IC

Course Objectives:

This course will enable students to:

- Outline the Android SDK features and the Development Framework and understanding Activities.
- Learn adaptive, responsive user interfaces that work across a wide range of devices.
- Identify background work and long-running tasks in Android applications
- Describe the concepts of Storing, sharing and retrieving data in Android applications
- Learn how permissions, security and performance affect application.

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.

08 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 .

08Hours

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.

08 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.

08 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 Intent Service, 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.

08 Hours

List of Experiments

10 Hours

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 Text View 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. Broadcast Receiver
11. Set and retrieve shared preferences
12. Implement a simple content provider 33

Course Outcomes:

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

- Comprehend the basic features of Android Platform and Create Activities inAndroid.
- Demonstrate the design concepts of user interface using components and views inAndroid.
- Create and use databases for Android Application.
- Implement messaging services in Android.
- Deploy mobile applications in various market place for distribution

Text Books:

1. Wei – Meng Lee: “Beginning Android Application Development”, Wiley publications, ISBN: 978-1-118-01711-1, (Chapters 1-8,10,11).
2. Reto Meier: “Professional Android 4 Application Development”, Wiley publications Publisher, 2012, ISBN-10: 812653608X

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>

BIG DATA ANALYTICS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST63	3 : 0 : 0 : 0	3	CIE : 50 SEE : 50	3 Hours	FC

Course Objectives:

This course will enable students to

- Understand Hadoop Distributed File system and examine MapReduce Programming
- Explore Hadoop tools and manage Hadoop with Ambari
- Appraise the role of Business intelligence and its applications across industries
- Assess core data mining techniques for data analytics
- Identify various Text Mining techniques

Syllabus

Module-I

Introduction To Big Data Introduction– distributed file system–Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using mapreduce.

Introduction To Hadoop And Hadoop Architecture Big Data – Apache Hadoop & Hadoop EcoSystem, Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce -, Data Serialization.

08 Hours

Module-II

HDFS, HIVE AND HIVEQL, HBASE HDFS-Overview, Installation and Shell, Java API; Hive Architecture and Installation, Comparison with Traditional Database, HiveQL Querying Data, Sorting And Aggregating, Map Reduce Scripts, Joins & Sub queries, HBase concepts, Advanced Usage, Schema Design, Advance Indexing, PIG, Zookeeper , how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

08 Hours

Module-III

SPARK : Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs, Machine Learning with MLlib.

08 Hours

Module-IV

NoSQL: What is it?, Where It is Used Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NewSQL.

08 Hours

Module-V

Data Base for the Modern Web: Introduction to MongoDB key features, Core Server tools, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document-Oriented, principles of schema design, Constructing queries on Databases, collections and Documents , MongoDB Query Language.

08 Hours

Course Outcomes:

This course will enable students to

- Build and maintain reliable, scalable, distributed systems with Apache Hadoop.
- Write Map-Reduce based Applications Learning with MLlib.
- Design and build MongoDB based Big data Applications and learn MongoDB query language

- Differentiate between conventional SQL query language and NoSQL basic concepts.
- Explore tips and tricks for Big Data use cases and solutions.

Text Books:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015
2. Chris Eaton, Dirk de Roos et al. , “Understanding Big data ”, McGraw Hill, 2012, 1 edition (October 19, 2011), ISBN-13: 978-0071790536.
3. MongoDB in Action, Kyle Banker, Peter Bakum , Shaun Verch, Dreamtech Press; Second edition (2016) ISBN-13: 978-9351199359.

Reference Books:

1. Tom White, “HADOOP: The definitive Guide”, O Reilly publication 3rd edition 2012. ISBN-13: 978-1449311520.
2. Vignesh Prajapati, “Big Data Analytics with R and Hadoop”, Packet Publishing publications 2013. ISBN-13: 978-1782163282

E-Resources:

1. <http://in.reuters.com/tools/rss>
2. <http://www.altova.com/xmlspy.html>
3. <https://www.w3.org/RDF/>

ANGULAR & REACT JAVASCRIPT

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST64	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to,

- Use HTML, CSS and Javascript in web page design.
- Access the DOM objects, filters, forms in Javascriptsquery.
- Write programs using directives, filter, events in AngularJS.
- Design interactive web pages.
- Understand with the database connectivity and reactive forms using javascripts

Syllabus

Module – I

AngularJS Core Concepts: What is AngularJS?, Advantages of Angular, AngularJS MVC, Introduction to SPA, Setting up the environment, First App using MVC architecture, Understanding ng attributes, Expression and Data Binding, Working with directives, Angular Modules, Controller, Scope and View, Create Controller and Module, \$scope hierarchy.

08 Hours

Module – II

Filter, Forms and Ajax: Filters - Built-in filters - upper case and lower case filters, date, currency and number formatting, orderBy, filter, custom filter, Angular JS Forms – Working with AngularJS forms, model binding, form controller, Using CSS classes, form events, custom model update triggers, custom validation, \$http service, Ajax implementation using \$http.

08 Hours

Module – III

Dependency Injection, Services, Routing and Navigation: What is dependency injection?, Using dependency injection, Angular JS service – Understanding services , Using built-in service, Creating custom service, Injecting dependency in service, Routing – What is Routing?, Routing using ngRoute and UIRouter, ngView Directive, Configuring \$routeProvider, \$stateProvider, Animating Angular App.

08 Hours

Module – IV

Introduction to Node.js: What is Node.js?, Features of Node.js, Setup Development Environment- Installing Node.js, Working with REPL, Node.js Console, Node.js Module, Node Package Manager, Node.js Basics, File System, HTTP and HTTPS, Creating Web Server- Handling http request, Node.js Callbacks, Node.js Events.

08 Hours

Module – V

Database Connectivity and Reactive Forms: Promises, Express.js, Database Connectivity – Connecting to RDBMS and NoSQL database, Performing CRUD operations, What is Reactive Forms, Syncing of HTML and Form, Form Control Arrays, Relative Forms, Value changes and Reacting to status, Create Reactive form through code, Adding Validation, Adding Validation, Grouping, Custom Validators.

08 Hours

Course Outcomes:

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

- Develop programs in HTML, JavaScript and JQuery.
- Test and deploy web pages containing JavaScript.

- Design programs using AngularJS expressions, filters and directives.
- Manipulate page content using DOM and utilize event handlers to respond to useerevents.
- Design programs using React JS with database connectivity.

Text Book:

1. Brad Dayley, “Node.js, MongoDB, and AngularJS Web Development, 2018, ISBN-13: 9789352865505.

Reference Book:

1. Adam Freeman, “Pro Angular JS”, Apress Publications, 2nd Edition, 2017, ISBN-13: 9781484223062.
- 2.

E-Resources:

1. <https://riptutorial.com/Download/angularjs.pdf>
2. <https://docs.angularjs.org/guide/concepts>

CYBER SECURITY AND ETHICAL HACKING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST651	3:0:0:0	3	CIE:50 SEE:100	3 hours	PE

Course Objectives:

This course will enable students to,

- Understand the fundamental concepts of cybersecurity and Information security.
- Describe the motive and attacker Techniques.
- Analyse various techniques and measures in Malicious code.
- Understand ethics behind cracking and ethical hacking.
- Identify hacking Techniques for web and wireless networks.

Syllabus

Module – I

Cyber Security Fundamentals: Network and Security Concepts, Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS), Firewalls, Virtualization, Radio-Frequency Identification. **08 Hours**

Module – II

Attacker Techniques and Motivations: Anti-forensics, Fraud Techniques, code, Threat Infrastructure. Malicious Code: Self-Replicating Malicious Code, Stealing Information and Exploitation, Form Grabbing, Man-in-the-Middle Attacks, DLL Injection, Browser Helper Objects. **08 Hours**

Module – III

Defense and Analysis Techniques: Memory Forensics, Honeypots, Malicious Code Naming, Automated Malicious Code Analysis System, Passive Analysis, Active Analysis, Physical or Virtual Machines, Intrusion Detection Systems. **08 Hours**

Module – IV

Ethical Hacking 9

Introduction to Ethical Hacking - Footprinting and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats– Sniffing. **08 Hours**

Module – V

ETHICAL HACKING IN WEB 9 - Hacking Web servers - Hacking Web Applications – SQL Injection - understand Hacking Wireless Networks - cryptography. **08 Hours**

Course Outcomes:

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

- Apply the cryptographic concepts underlying Cyber Security.
- Analyze the techniques used by hackers to create frauds.
- Compare and analyze various types of malicious code.
- Identify the vulnerabilities in a given network infrastructure.
- Demonstrate through use of proper tools knowledge on the real-world hacking techniques to test system security

Text Books:

1. James Graham, Richard Howard, Ryan Olson- Cyber Security Essentials CRC Press,ISBN 9780815351429, Published December 14, 2010 by Auerbach Publications.
2. Kimberly Graves "Official Certified Ethical Hacker Review Guide",ISBN-13: 978-0-7821-4437-6, Wiley Publishing, Inc.2015.

References

1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81-265-21791, Publish Date 2013.
2. Thomas J. Mowbray, "Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions", Copyright © 2014 by John Wiley & Sons, Inc, ISBN: 978 -1-118 - 84965 -1.
3. Rafay Baloch, Ethical hacking and penetration testing guide, CRC Press, Taylor & Francis Group, 2015

E-Resources:

1. <https://www.hacker101.com/>
2. <https://blog.elearnsecurity.com/free-resources-to-legally-practice-ethical-hacking.html>
3. <https://www.routledge.com/Cyber-Security-Essentials/Graham-Olson-Howard/p/book/9781439851234>
4. <https://doc.lagout.org/security/ceh-official-certified-ethical-hacker-review-guide-exam-312-50.9780782144376.27422.pdf>
5. <https://www.pdfdrive.com/ethical-hacking-and-penetration-testing-guide-e18776556.html>
6. https://heimdalsecurity.com/pdf/cyber_security_for_beginners_ebook.pdf

INFORMATION AND NETWORK SECURITY (PE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST652	3:0:0:0	3	CIE:50 SEE:50	3 hours	PE

Course Objectives:

This course will enable students to:

- Comprehend various block cipher and stream cipher models.
- Learn the concepts of Firewall, Remote connections, IDS and Honeypots.
- Acquire the knowledge of hash functions and random numbers.
- Become familiar with the basics of public key management and certification.
- Understand the concepts of cryptographic applications.

Syllabus

Module– I

Introduction, How to Speak Crypto, Classic Crypto, Simple Substitution Cipher, Cryptanalysis of a Simple Substitution, Definition of Secure, Double Transposition Cipher, One-time Pad, Project VENONA, Codebook Cipher, Ciphers of the Election of 1876, Modern Crypto History, Taxonomy of Cryptography, Taxonomy of Cryptanalysis. **08 Hours**

Module– II

Security Technology-1: Introduction, Physical design, Firewalls, Protecting Remote Connections.

Security Technology – 2: Intrusion Detection Systems (IDS), Honey Pots, Honey Nets. **08 Hours**

Module– III

What is a Hash Function? The Birthday Problem, Non-cryptographic Hashes, Tiger Hash, HMAC, Uses of Hash Functions, Online Bids, Spam Reduction, Other Crypto-Related Topics, Secret Sharing, Key Escrow, Random Numbers, Texas Hold 'em Poker, Generating Random Bits, Information Hiding.

08 Hours

Module– IV

Key management fundamentals, key lengths and lifetimes key generation, key establishment, key storage, key usage, governing key management, public key management, certification of public keys, the certificate lifecycle, public key management models alternative approaches. **08Hours**

Module – V

Cryptographic applications, cryptography on the internet, cryptography for wireless local area networks, cryptography for mobile telecommunications, cryptography for secure payment card transactions, cryptography for video broadcasting, cryptography for identity cards, cryptography for home users. **08 Hours**

Course Outcomes

- On completion of this course, students will be able to:
- Describe the history and taxonomy of cryptography.
- Demonstrate the working of intrusion detection systems and honey pots.
- Apply and integrate hash functions, random numbers in Cryptography.
- Illustrate the need of key management and to generate unbreakable keys for secure communication.
- Evaluate different applications related to cryptography.

Text Book:

1. Behrouz A. Forouzan: Cryptography and Network Security, Special Indian Edition, Tata McGraw-Hill, 2007, ISBN: 978-0071263610.
2. Bruce Schneier, "Applied Cryptography: Protocols, Algorithms and Source Code in C", 2nd edition, Wiley, 2008, ISBN:978-0471117094.

Reference Books:

1. Douglas Stinson, "Cryptography Theory and Practice", 2nd Edition, Chapman & Hall/CRC,2005, ISBN: 978-1584885085.
2. William Stallings: Network Security Essentials: Applications and Standards, 3rd edition, Pearson Education, 2007, ISBN: 978-0132380331.

E-Resources:

1. <https://nptel.ac.in/courses/106/105/106105031/>
2. <https://www.nmap.org>
3. <https://www.advanced-port-scanner.com>

BLOCK CHAIN AND CRYPTO CURRENCIES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST653	3:0:0:0	3	CIE:50 SEE:100	3 hours	PE-II

Course Objectives:

This course will enable students to:

- Understand how blockchain systems work.
- Study Secured Payment Verification protocol.
- Acquire knowledge to build, and deploy smart contracts and distributed applications
- Integrate ideas from blockchain technology into their own projects
- Understand Security, privacy, and efficiency of a given blockchain system

Syllabus

Module – I

Basics: Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. • Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof. **08 Hours**

Module – II

Blockchain: Introduction, Advantages over conventional distributed databases, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain. **08 Hours**

Module – III

Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate. **08 Hours**

Module – IV

Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin. **08 Hours**

Module – V

Cryptocurrency Regulation: Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain. **08 Hours**

Course Outcomes

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

- Explain design principles of Bitcoin and Ethereum.
- Compare proof-of-work and proof-of-stake consensus.
- Interact with a blockchain system by sending and reading transactions.
- Design, build, and deploy a distributed application.
- Evaluate security, privacy, and efficiency of a given blockchain system

Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016). ISBN-13 9780691171692

Reference Books:

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies .ISBN:15-1456333444
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System.ISBN:15-2346783355
3. DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger,”Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts.

E-Resources:

1. <https://developers.google.com/training/adf>
2. <https://goo.gl/ADKvq8>

ANIMATION AND GAME DEVELOPMENT

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST661	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable students to,

- Get familiarize with the animation principles and theories.
- Explore both contemporary and historical animation techniques together with the fundamental principles.
- Understand the Scripting language and its uses.
- Familiarize with issues, types and techniques of computer games design.
- Understand with the phases in game development from idea to final finishedgame.

Syllabus

Module – I

Introduction to 2D Graphics and Animation: Introduction to 2D graphics: Coordinate systems, pixels, bitmaps raster and vector, Introduction to animation, Animation Techniques, Live model study, Basic factors affecting the illusion of motion, Difference between “looking at the drawing” and “seeing the drawing”, Improving the observation skills, File format standards, Frame rate, resolution, symbols, instances, size and other compatibility issues, Future trends of computer animation. Introduction to 2D animation software interface: Basic drawing and painting tools, Shading techniques: Working with colors, strokes and fills, drawing for animation based on observation, memory and imagination, creating and modifyingvector objects. **08 Hours**

Module – II

Principles and Styles in Animation: Introduction to the equipment required for animators: The animator's drawing tools, the animation table (light box, Field charts, Line tests, the exposure sheet: “X” sheet), Perspective in animation, Principles of animation, color theory, Styles in Animation: Visual Styles: Indian, Disney, American, Russian and Japanese Style, Storytelling style. Animal Study, Basic Human Anatomy: body, motion and posing, laws of Physics for animation: law of motion, body mechanics, particles, rigid body, waves, electrostatics, Electromagnetics, thermodynamics. Frame-sequencing features: Frame by Frame Animation, Tween Animation. Creating human and animalwalk cycle. **08 Hours**

Module – III

Interactive Animations: Action Scripting: variables, data types, statements and expressions, operators, decisions making statements, loping statements, functions, user interaction, text, styles and fonts, events and event handlers: Interactivity with the mouse and keyboard, Timers and Time Driven Programming, Multi-touch and Accelerometer Input. Error Handling. **08 Hours**

Module – IV

Game Development Process: Game Design, teams and Development Processes: Game Identification, Terminology, Storyboards, concepts, level design, modeling, interface design, development, Play testing. **08 Hours**

Module – V

Game Scripting: Human-computer interaction (HCI), Computer graphics, collision detection, lighting, and animation, Game scripting and programming, Game data structuresand algorithms. **08 Hours**

Course Outcomes:

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

- Define and apply design principles and theories to animation production.
- Develop the production of animation film starting from concept to final output.
- Incorporate interactivity using scripting language.
- Demonstrate an understanding of the overall game design process.
- Design and implement basic levels, models, and scripts for games.

Text Books:

1. Richard Williams, "The Animator's Survival Kit: A Manual of Methods, Principles, and Formulas for Classical, Computer, Games, Stop Motion, and Internet Animators", Farrar, Straus and Giroux Publisher, 4th Edition, Revised Edition, 2012, ISBN 13: 9780865478978.
2. Steve Rabin, "Introduction to Game Development", Charles River Media Publisher, Hardcover Edition, 2005, ISBN-13: 9781584503774

Reference Book:

1. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", New Riders Publications, 2003, ISBN-13: 9781592730018

E-Resources:

1. <https://web.cse.ohio-state.edu/~wang.3602/courses/cse3541-2017-fall/>

DEVOPS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST662	3:0:2:0	4	CIE:50 SEE:50	3 hours	FE

Course objectives:

This course will enable students to:

- understand the DevOps Concepts and DevOps Tool.
- Expose to the evolving Applications and advance features of Jenkins and Docker.
- Understand the importance of testing using Jenkins, AWS EC2.
- Identify and understand security in Jenkins and monitor the azure Applications.

Syllabus

Module – I

Introduction to DevOps Concepts: Understanding DevOps movement, DevOps with changing times, The waterfall model, Agile Model, Why DevOps?, DevOps lifecycle, Benefits of DevOps. **08 Hours**

Module II

Continuous Integration with Jenkins 2: Introduction, Installing Jenkins, Jenkins dashboard, Configuration Java, Maven/Ant in Jenkins, Creating and Configuring build job for Java application with Maven, Managing Nodes, Email notifications based on build status. **08 Hours**

Module III

Containers: Overview of Docker containers, Understanding the difference between virtual machines and containers, Installing and configuring Docker, Creating a Tomcat container.

Cloud Computing and Configuration Management: An overview of the Chef configuration management tool, Installing and configuring a Chef workstation, Installing knife plugins for Amazon Web Services and Microsoft Azure. **08 Hours**

Module IV

Automated Testing (Functional and Load Testing): Functional testing using Selenium, Functional test execution in Jenkins, Load test execution using Jenkins.

Orchestration - End-to-End Automation: End-to-end automation of application life cycle management using Jenkins, End-to-end automation using Jenkins, Chef, and AWS EC2, End-to-end automation using Jenkins and AWS Elastic Beanstalk, End-to-end automation using Jenkins and Microsoft Azure app services, End-to-end automation orchestration of application life cycle management using VSTS. **08Hours**

Module V

Security and Monitoring: Security in Jenkins and VSTS, Security in Jenkins and VSTS, Monitoring Jenkins and Microsoft Azure, Monitoring Jenkins, Azure Web Apps troubleshooting and monitoring, Azure App Services - CPU and memory consumption, Azure App Services - Activity log, Azure Application Insights for application monitoring, Azure web application monitoring, Diagnostics logs. **08Hours**

Handson

10 Hours

1. Download and install Jenkins CI on GCP.
2. Configuration. Change language interface and Create the first Jenkins job
3. Build Triggers, cron syntax, Artifacts.
4. Create and run Jenkins pipeline.
5. Create parameterized jobs in Jenkins.

6. Install and configure Docker.

Course outcomes:

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

- Understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements
- Build jobs and configurations in Jenkins
- Master in docker , Continuous Delivery and chef Configuration Management.
- Create tomcat container and work on Dockers and chef workstation.
- Analyse, design and evaluate automation scripts & systems.
- Use Azure application services and monitor the security issues in Jenkins and microsoft Azure.

Text Books:

1. Mitesh Soni: DevOps for Web Development,Packet Publishing,ISBN:9781786465702, Released October 2016
2. Mitesh Soni: DevOps Bootcamp-A fast-paced guide to implement DevOps with ease, May 2017(Chapters: 3,4,6,7,8),ISBN 978-1-78728-596-5.

Reference Books

1. Len Bass, Ingo Weber, Liming Zhu, Devops Software Architect's perspective,first edition,ISBN 978-0-13-404984-7,2015 Pearson Education, Inc.
2. Trevor Roberts, Jr.,Josh Atwell, Egle Sigler, Yvo van Doorn, Devops for Vmware Administrator, First Printing: April 2015, ISBN-10: 0-13-384647-4, ISBN-13: 978-0-13-384647-8,Pearson Education, Inc.
3. Sanjeev Sharma "The DevOps Adoption Playbook: A Guide to Adopting DevOps in a Multi-Speed IT Enterprise"Published by John Wiley & Sons, Inc. ISBN: 978-1-119-30874-4, ISBN: 978-1-119-31052-5 (ebk) ,ISBN: 978-1-119-31076-1 (ebk)

E-Resources

1. <https://resources.collab.net/devops-101/what-is-devops>.
2. <https://www.ibm.com/cloud/learn/devops-a-complete-guide>.
3. <https://newrelic.com/devops/what-is-devops>
4. <https://www.oreilly.com/library/view/devops-for-web/9781786465702/>

MACHINE LEARNING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST663	3:0:0:0	3	CIE:50 SEE:50	3 hours	PE

Course Objectives :

This course will enable students to:

- Understand the basic concepts and techniques of Machine Learning.
- Understand decision tree algorithms and classify supervised, unsupervised and reinforcement learning algorithms.
- Learn Artificial Neural Networks with multilayer perceptron's.
- Understand algorithms for learning Bayesian networks.
- Gain knowledge on probability learning theory.

Syllabus

Module I

Introduction to Machine Learning: What is Machine Learning? Real time applications of machine learning. Why machine learning is important? Major domains which influences machine learning, A learning problem, Concept learning with examples. **08 Hours**

Module II

Decision Tree Learning : Introduction, Decision Tree representation, Problems and examples for decision learning, The basic decision tree algorithm, Hypothesis space search in decision tree algorithms, Inductive bias in decision tree learning, Issues in decision tree learning **08 Hours**

Module III

Artificial Neural Networks: Introduction, Neural network representation, Problems for neural network learning, Perceptrons, Multiple layer networks and back propagation algorithm. An illustrative example: Face recognition. **08 Hours**

Module IV

Hypothesis evaluation and Bayesian Learning : Motivation, Estimating hypothesis accuracy, Basics of sampling theory, Bayes theorem and concept learning, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, An example: Learning classify text. **08 Hours**

Module V

Computational Learning Theory: Introduction, Probably learning an approximately correct hypothesis, The mistake bound model of learning.

08 Hours

Course Outcomes :

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

- Recognize the characteristics of machine learning that make it useful to real-world problems.
- Characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
- Effectively use machine learning toolboxes.
- Analyze the concept behind neural networks for learning non-linear functions.
- Apply unsupervised algorithms for clustering.

Text Books :

1. Ethem Alpaydın, Introduction to Machine Learning, MIT press 4th edition ISBN:9780262043793.
2. C Agarwal, Machine Learning for Text, Pearson Education - 2006 (2 & 4). ISBN – 15: 34519801.

Reference Books :

1. Aaron Courville, Ian Goodfellow, and Yoshua Bengio, Deep Learning, MIT Press, 2015, ISBN: 9780262035613
2. Christopher Bishop, Pattern recognition and machine learning. Himalaya Publishing House. ISBN: 98345789
3. Course material available on Swayam platform and NPTEL, for the course on Introduction to Machine Learning, conducted by Prof. Sudeshna Sarkar, IIT Kharagpur.

EMPLOYABILITY SKILLS AND TECHNICAL APTITUDE

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSH67	1:0:2:0	2	CIE:50 SEE:50	3 Hours	

Course Objectives:

This course will enable students to:

- Understand C, C++ Java and Data Structure.
- Improves program abilities to think on a particular given topic
- Anticipate interview questions according to job requirement.

Syllabus

Module – I

C Programming: C Introduction - Decision and Loops - C Functions - Arrays and Strings - C Pointers - Structure & Union - C Files I/O - C Programs

12 Hours

Module – II

C++: C++ Overview - Functions and Variables - Classes in C++ - Input and Output in C++ Programs

06 Hours

Module – III

Data Structures: Basic Concepts - Arrays and Structures - Stacks and Queues - Linked Lists – Trees - Priority Queues

06 Hours

Module – IV

JAVA Basics: OOPS - Java Language Fundamentals - Java Virtual Machine - Java Run Time Environment - SQL Queries - Basics of Designing - Web Programming.

Operating Systems - Introduction to OS - Process Management – Deadlocks - File System - Secondary Storage Structures.

09 Hours

Module – V

DBMS: Introduction - Entity Relationship Model- Relational Model and Relational Algebra - Database Design - Transaction Management . **Networking** - Network concepts - Network architectures - The OSI model - Wired Network Connections - Network Interface cards and modems -LAN wiring - The TCP/IP protocol suite.

06 Hours

UML & AGILE PRACTICES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST711	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PE-1V

Course Objectives:

This course will enable students to:

- Understand the basic concepts of Object Orientation and UML.
- Get a clear understanding of how to use UML and design diagrams.
- Know iterative, incremental and development process.
- Study the principles and practices of extreme programming.
- Understand the essence of agile development methods and develop prototyping in the software process.

Syllabus

Module – I

UML Diagrams: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history. UML diagrams – Use Case – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams. **08 hours**

Module – II

Advanced Modeling And Design: System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams derived data; Packages; Practical tips. State Modeling, Advanced: Events, States, Transitions and Conditions; State diagrams; State diagram behavior nested states signal generalization concurrency; Relation of class and state models. **08 hours**

Module – III

The Agile Movement - A Five Minute Primer, What is Agile Development? The Agile Methodologies Agile Values, Agile Practices, Agile Principles.

Agile Characteristics-The Characteristics of an Agile Project, The Development Team Project Management, The Customer, Processes and Tools The Contract, What Projects Can Benefit from Agile Development. **08 hours**

Module – IV

The Agile Methodologies: Common Themes, Methodology Descriptions, Extreme Programming, Scrum, Feature Driven Development, The Crystal Methodologies, Adaptive Software Development, Dynamic Systems Development Method, Lean Software Development, Starting Monday: Investigate Further.

Selecting an Approach that Fits: Choosing between an Agile or Traditional Approach, Selecting the Right Agile Approach. **08 hours**

Module – V

Agile Practices and Testing: Getting Started, Agile Practices Explained, Selecting the Next Practice, Rejecting a Practice, Adopt Practices before Tools Learn Programming Practices in Pairs, Agile Practices in this Book Agile Practices Explained, Why these Practices were Chosen, An Agile Approach to Testing, The Good Enough Approach Testing as the Best Defense. **08 hours**

Course Outcomes

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

- Use the basic concepts of object orientation, analyse and design object oriented system using UML.
- Describe the advanced UML analysis and design diagrams.
- Apply the common characteristics of an agile development process.
- Analyze agile software development process models and plan driven process models.
- Determine software project characteristics that would be suitable for an agile process

Text Books:

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005. (module 1 and 2). , ISBN-13: 9781584509876
2. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. (module 1 and 2), ISBN-13: 9781584509876
3. Ken Schwaber And Mike Beedle, Agile Software Development With Scrum, Pearson Education, 2015. ISBN-13: 9780132074896
4. Peter Schuh, Integrating Agile Development In The Real World (Charles River Media Programming), 2004 Cengage Learning, ISBN-13: 9781584503644

Reference Books:

1. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
2. Alistair Cockburn, Agile Software Development: The Cooperative Game, Pearson Education, 2015. ISBN-13: 9780321482754
3. Mike Cohn, Succeeding With Agile : Software Development Using Scrum, Pearson Education Limited, 2016, ISBN-13: 9789332547964

E Resources:

1. <https://www.gurock.com/testrail/agile-testing?>
2. https://cucumber.io/tools/cucumberstudio/?utm_source

INTERNET OF THINGS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST712	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable the students to:

- Gain the knowledge about IoT concepts.
- Know different Application protocols for IoT .
- Understand methods of deploying smart objects and connect them to network.
- Know the diverse methods of deploying smart objects and connect them tonetwork.
- Learn about genesis and impact of IoT applications

Syllabus

Module – I

Introduction To Internet Of Things: Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates. Overview of Microprocessor and Microcontroller, Basics of Sensors and actuators.

08 hours

Module – II

Prototyping IoT Objects Using Microprocessor/Microcontroller: Working principles of sensors and actuators – Setting up the board - Programming for IOT – Reading from Sensors, Communication: Connecting microcontroller with mobile devices – communication through Bluetooth, Wi-Fi, Ethernet, Zigbee, RFID, NFC.

08 hours

Module – III

Iot Architecture And Protocols: Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model. Protocols- 6LowPAN, RPL,CoAP, MQTT.

08 hours

Module – IV

Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria.

08 hours

Module – V

Cloud Services For IoT: Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework designing a RESTful web API, Amazon Web services for IoT.

08 hours

Course Outcomes:

After studying this course, students will be able to

- Analyze IoT architectural components.
- Interfacing Sensor and Actuator with Arduino development board.
- Describe protocols of resource constraint network.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Design and develop IoT applications.

Text Books:

1. “Internet of Things (A Hands-on-Approach)” by Vijay Madisetti and Arshdeep Bahga, 1st Edition, VPT, 2014. ISBN 13: 9780996025515
2. Srinivasa K G, “Internet of Things”, CENGAGE Learning India, 2017 ISBN: 9789386858955
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)

Reference Books:

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014. (ISBN: 978-8173719547)
2. Raj Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)
3. “The Internet of Things – Key applications and Protocols” by Olivier Hersent, David Boswarthick, Omar Elloumi, , Wiley, 2012 ISBN: 978-1-119-99435-0

E-resources

1. www.coursera.org/specializations/iot
2. www.futurelearn.com/courses/internet-of-things

AWS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST713	3:0:0:0	3	CIE:50 SEE:50	3 hours	PE-IV

Course Objectives:

This course will enable students to:

- Identify the security and compliance benefits of by using the AWS Cloud.
- Understand the access control and management features of AWS.
- Learn about data encryption methods to secure all types of sensitive data.
- Get knowledge about the important steps for managing various AWS resources.
- Study the AWS services to protect networksecurity.

Syllabus

Module-I

Introduction to AWS: AWS history, AWS Infrastructure, AWS services, AWS ecosystem
Programming, management console and storage on AWS: Basic Understanding APIs - AWS programming interfaces, Web services, AWS URL naming, Matching interfaces and services, Elastic block store - Simple storage service(S3), Glacier - Contentdelivery platforms. **08 Hours**

Module-II

AWS identity services, security and compliance: Users, groups, and roles - Understanding credentials, Security policies, IAM abilities and limitations, AWS physical security - AWS compliance initiatives, Understanding public/private keys, Other AWSsecurity capabilities. **08 Hours**

Module-III

AWS computing and marketplace: Elastic cloud compute(EC2) - Introduction to servers, Imaging computers, Auto scaling, Elastic load balancing, Cataloging the marketplace, AMIs, Selling on the marketplace

AWS networking and databases: Virtual private clouds, Cloud models, Private DNS servers (Route 53), Relational database service – DynamoDB,ElastiCache, Redshift. **08 Hours**

Module-IV

Other AWS services and management services: Analytics services, Application services, Cloud security, CloudWatch, CloudFormation, CloudTrail, OpsWorks,

Configuration management: Introduction. **08 Hours**

Module-V

AWS billing and Dealing with disaster: Managing costs, Utilization and tracking, Bottom line impact, Geographic and other concerns, Failure plans, Examining logs. **08 Hours**

Course Outcomes

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

- Discuss system virtualization and outline its role in enabling the cloud computing system model.
- Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.
- Design various management and other distinguish services of AWS.
- Develop security and compliances for AWS.
- Analyse the billing of resources and other paradigm: how to deal withdisasters.

Text Books:

1. Barrie Sosinsky. John Wiley & Sons. Cloud Computing Bible.. First Edition January 2011. ISBN-13: 978-0470903568.
2. Bernard Golden Amazon Web Services For Dummies. For Dummies publication; 1 edition (9 August 2013)ISBN-13: 978- 1118571835
3. Rajkumar Buyya, Cloud Computing: Principles and Paradigms, John Wiley & Sons, First Edition(3 January 2011).ISBN: 9780470887998

Reference Books:

1. Amazon.com Mashups by Francis Shanahan, Wrox, Wiley Publishing Inc., ISBN-13: 978-0470097779, ISBN-10: 0470097779
2. Amazon Web Services in Action by Michael Wittig and Andreas Wittig, Dreamtech Press, ISBN: 9789351198758
3. Building Applications in the Cloud: Concepts, Patterns and Projects by Christopher M. Moyer, Pearson Addison-Wesley Professional, ISBN-10: 0321720202, ISBN-13: 978-0321720207
4. Cloud Computing Design Patterns by Thomas Erl, Prentice Hall, ISBN-10: 0133858561, ISBN-13: 978-0133858563

E-Resources

1. Amazon Security overview whitepaper-<https://aws.amazon.com/whitepapers>
2. IAM Getting started Guide <http://docs.aws.amazon.com/IAM/latest/UserGuide/getting-started.html>

STORAGE AREA NETWORK

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST721	3-0-0-0	3	CIE : 50 SEE : 50	3 Hours	PE-V

Course Objectives

This course will enable students to:

- Understand the fundamentals of Storage Area Networks.
- Understand the metrics used for designing storage areanetworks.
- Understand RAID concepts.
- Understand the various storage technologies like NAS, SAN.
- Enable the students to understand how data centers' maintain data with the concepts of backup.

Syllabus

Module I

Introduction: Server Centric IT Architecture and its Limitations, Storage-Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks The Data Storage and Data Access problem, The Battle for size and access. Intelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems, Hard disks and Internal I/O Channels, JBOD, Storage virtualization using RAID and different RAID levels, Caching, Acceleration of Hard Disk Access, Intelligent disk subsystems, Availability of disk subsystems.

08 Hours

Module II

I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel andNAS.

08 Hours

Module III

Storage Virtualization: Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization inthe Network.

08 Hours

Module IV

SAN Architecture and Hardware devices: Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective.

Software Components of SAN: The switch's Operating system; Device Drivers; Supporting the switch's components; Configuration optionsfor SANs.

08 Hours

Module V

Management: System Management, Requirement of Management System ,Support by Management System Management Interface, Standardized Mechanisms, Property Mechanisms, In-band Management, Use of SNMP, CIM and WBEM, Storage Management Initiative Specification(SMI-I), CMIP and DMI, Optional Aspects of the Management of Storage Networks, Summary.

08 Hours

Course outcomes:

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

- Identify the need for performance evaluation and the metrics used for it.
- Apply the techniques used for data maintenance.
- Realize storage virtualization concept
- Develop techniques for policies for LUN masking, file systems
- Analyze System management.

Text Book:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2013. ISBN: 9780-470-741-346
2. Robert Spalding: "Storage Networks The Complete Reference", Tata McGraw-Hill, 2011 ISBN: 8580-780-651-643

Reference Books:

1. Marc Farley: Storage Networking Fundamentals – An Introduction to Storage devices, Subsystems, Applications, Management, and File Systems, Cisco Press, 2005.
2. Richard Barker and Paul Massiglia: "Storage Area Network Essentials A Complete Guide to understanding and Implementing SANs", Wiley India, 2006.

E Resources:

1. <http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470741430,subjectCd-EE25.html>
2. <https://www.kobo.com/us/en/ebook/storage-networks-explained>

AD HOC NETWORKS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST722	3:0:0:0	3	CIE:50 SEE:50	3 hours	PE-V

Course objectives:

This course will enable students to:

- Learn the mathematical models and network protocol designs in wireless multihop-networks.
- Understand exposition of network protocols and their cross layer interactions.
- Learn the active research areas in wireless multihop networks.
- Gain knowledge on network protocols.
- Understand the importance of network security.

Syllabus

Module-I

Introduction Ad hoc Networks: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet. **08 hours**

Module-II

MAC Protocols for Ad hoc wireless Networks: Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks, Classification of MAC protocols, Contention based protocols with reservation mechanisms. **08 hours**

Module-III

Routing -Routing protocols for Ad hoc wireless Networks: Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Table drive routing protocol, On-demand routing protocol. Hybrid routing protocol, routing protocols with effective flooding mechanisms. **08 hours**

Module-IV

Transport layer protocols for Ad hoc wireless Networks: Introduction, Issues in designing a transport layer protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks, Classification of transport layer solutions, TCP over Ad hoc wireless Networks, Other transport layer protocols for Ad hoc wireless Networks. **08 hours**

Module-V

Security: Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning, Network security attacks, Key management, Secure routing in Ad hoc wireless Networks. **08 hours**

Course Outcomes:

At the end of the course the student will be able to:

- Design their own wireless network.
- Evaluate the existing network and improve its quality of service.
- Choose appropriate protocol for various applications.
- Examine security measures present at different level.
- Analyze energy consumption and management.

Text Book:

1. C Shiva Rama Murthy and B. S Manoj: Ad Hoc Wireless networks, 2nd Edition, Pearson Education, 2005. *ISBN*0-13-147023-X.
2. Jyoti Prakash Singh, Paramartha Dutta, Amlan Chakrabarti; Ad Hoc Networks: A Statistical Perspective Hardcover Springer; 1st ed. 2018 edition (13 April 2018) –ISBN-13: 978-9811087691.

Reference Book:

1. Rahim Hekmat, Ad-hoc Networks: Fundamental Properties and Network Topologies Paperback, Springer; Softcover reprint of the original 1st ed. 2006 edition (30 April 2017) ISBN-10: 940177661X.
2. Prasant Mohapatra, Srikanth Krishnamurthy; AD HOC NETWORKS: Technologies and Protocols 2005th Edition, Springer; 2005 edition (September 23, 2004), ISBN-10: 9780387226897.

E-Resources:

1. https://www.webopedia.com/TERM/H/hybrid_routing_protocol.html
2. <https://www.cynet.com/cyber-attacks/network-attacks-and-network-security-threats/>

MANAGEMENT INFORMATION SYSTEM(MIS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST723	3:0:0:0	3	CIE:50 SEE:50	3 hours	PE

Course objectives:

This course will enable students to:

- Understand the role of Information Technology and Strategies to manage system implementation process.
- Analyze the principles of Transaction Processing Systems.
- Evaluate the roles of various types of Information system in business environment and Customer relationship and supply chain management system.
- Understand the trends and issues in e-commerce Applications.
- Effectively communicate strategic alternatives to facilitate decision making.

Syllabus

Module – I

Foundations of information systems in business: Information Systems in Business : Introduction, The real world of Information Systems, Networks, What you need to know, The fundamental role of IS in business, Trends in IS, Managerial challenges of IT. System Concepts: Components of an Information System, Information System Resources and activities, Recognizing Information Systems. Fundamentals of strategic advantages: Competitive strategy concepts, The competitive advantage of IT, Strategic uses of IT, Building a customer-focused business, The value chain and strategic IS, Reengineering in business processes, Becoming an agile company Creating a virtual company, Building a knowledge-creating ccompany. **10 Hours**

Module II

Enterprise Business Systems: Introduction, Cross-functional enterprise applications, Enterprise application integration, Transaction processing systems, Enterprise collaboration systems. Functional Business Systems: Introduction, Marketing systems, Manufacturing systems, Human resource systems, Accounting systems, Financial management systems. **07 Hours**

Module III

Customer relationship management: Introduction, What is CRM? The three phases of CRM, Benefits and challenges of CRM, Trends in CRM Enterprise resource planning: Introduction, What is ERP? Benefits and challenges of ERP, Trends in ERP. Supply chain Management: Introduction, What is SCM? The role of SCM, Benefits and challenges of SCM, Trends in SCM. **08 Hours**

Module IV

Electronic commerce fundamentals: Introduction, The scope of ecommerce, Essential e-commerce, processes, Electronic payment processes. e-Commerce applications and issues: E-commerce application trends, Business-to- Consumer e-commerce, Web store requirements, Business-to- Business e-commerce, e-commerce marketplaces, Clicks and bricks in ecommerce. **07Hours**

Module V

Decision support in business: Introduction, Decision support trends, Decision support systems (DSS), Management Information Systems, Online analytical processing, Using DSS, Executive information systems, Enterprise portals and decision support, Knowledge management systems, Business and Artificial Intelligence (AI), An overview of AI, Expert systems. **08 Hours**

Course outcomes:

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

- Describe the role of information technology and information systems in business
- Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives.
- Apply a framework and process for aligning organization's IT objectives with business strategy.
- Analyze the various solutions for business Applications.
- Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making.

Text Books:

1. James A.O'Brien, George M Marakas, Ramesh Behl, Management Information Systems, 10th Edition, 2013, Tata Mc Graw Hill Education, ISBN:13-978-1-25-902671-3, ISBN:10-1-25-902671-X Chapter: 1, 7,8,10.

Reference Books

1. Kenneth C. Laudon and Jane P. Laudon, Management Information System, Managing the Digital Firm, Pearson Education, 12th Edition, ISBN: 9780136078463.
2. Steven Alter, Information Systems the Foundation of E-Business, 4th Edition, Pearson Education, ISBN-10-8129702533, ISBN-13-978-8129702531.
3. W.S. Jawadekar, Management Information System, Tata McGraw-Hill Publishing Company Limited, 1998, ISBN 0074631977, 9780074631973
4. Goyal, D.P.: "Management Information System", MACMILLAN India Limited, New Delhi, 2008. Ref no 9788171006054.

E-Resources

1. https://books.google.co.in/books/about/Management_Information_System.
2. html. <http://www.pearsoned.co.uk/bookshop>
3. <https://www.pearson.com/us/higher-education/product/Laudon-Management-Information-Systems-Managing-the-Digital-Firm-9th-Edition/9780131538412.html> <https://www.amazon.com/Information-Systems-Foundations-Business-4th/dp/8129702533>
4. https://books.google.co.in/books/about/Management_Information_Systems.html?id=5JupAAACAAJ

ROBOTICS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST731	3:0:0:0	3	CIE:50 SEE:50	3 hours	PE

Course objectives:

This course will enable students to:

- Understand the basics of robotics & its simulation.
- Study working of actuators & encoders.
- Learn ability to use software tools for working with sensors.
- Exposed to Robot Operating System.
- Acquire the knowledge of automation in various sources.

Syllabus

Module-I

BASICS OF ROBOTICS: History – Definition – Components – Building a robot – The Robot drive mechanism. **ROBOT SIMULATION:** Mathematical modeling of the robot - Robot kinematics – Concepts of ROS and Gazebo. **08 Hours**

Module-II

DESIGNING CHEFBOT HARDWARE: Specifications - Block diagram - Working with Robotic Actuators and Wheel Encoders - Interfacing DC geared motor with Tiva C LaunchPad - Interfacing quadrature encoder with Tiva C Launchpad - Working with Dynamixel actuators. **08 Hours**

Module-III

WORKING WITH ROBOTIC SENSORS: Working with ultrasonic distance sensors - Working with the IR proximity sensor - Working with Inertial Measurement Unit. **08 Hours**

Module-IV

PYTHON AND ROS: Introduction to OpenCV, OpenNI, and PCL - Programming Kinect with Python using ROS, OpenCV, and OpenNI - Working with Point Clouds using Kinect, ROS, OpenNI, and PCL. **08 Hours**

Module-V

INTERFACING IT INTO ROS, USING PYTHON: Building ChefBot hardware - Writing a ROS Python driver for ChefBot - Understanding ChefBot ROS launch files - Working with ChefBot Python nodes and launch files - The Calibration and Testing of ChefBot - The Calibration of Xbox Kinect using ROS - Wheel odometry calibration - Testing of the robot using GUI. **08 Hours**

Course Outcomes:

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

- Explain the concept of robotics & simulating it.
- Develop simple robot models.
- Deploy various sensors for effective use.
- Use Robot Operating system effectively.
- Demonstrate some simple robotic applications.

Text Books:

1. Lentin Joseph, "Learning Robotics using Python", PACKT Publishing, 2015, ISBN: 978-1783287536.

2. Aaron Martinez and Enrique Fernandez, "Learning ROS for Robotics Programmin", PACKT Publishing, 2013, ISBN: 9781782161455.

Reference Books :

1. Bill Smart, Brian Gerkey, Morgan Quigley,"Programming Robots with ROS: A Practical Introduction to the Robot Operating System", O,,Reilly Publishers, 2015,ISBN:978-1449323899.

E-Resources :

1. <https://blog.oureducation.in/best-available-robotics-reference-books/>
2. <https://www.robotics.org/Robotic-Resources>

ADVANCED ALGORITHMS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST732	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable students to:

- Learn the different amortized analysis.
- Know the modular arithmetic for solving problems.
- Explore the knowledge of different graph algorithms.
- Understand familiarity with major algorithms and datastructures.
- Synthesize efficient algorithms in common engineering design situations.

Syllabus

Module – I

Analysis Techniques: Growth functions, Recurrences and solution of recurrence equations; Amortized analysis: Aggregate, Accounting, and Potential methods, String Matching Algorithms: Naive Algorithm; Robin-Karp Algorithm, String matching with Finite Automata, Knuth-Morris-Pratt and Boyer-Moore Algorithms. **08 Hours**

Module – II

Number Theoretic Algorithms: Elementary notions, GCD, Modular arithmetic, Solving modular linear equations, The Chinese remainder theorem, Powers of an element RSA Cryptosystem, Primarily testing, Integer factorization, - Huffman Codes, Polynomials. FFT-Huffman codes: Concepts, construction, Proof correctness of Huffman's algorithm; Representation of polynomials. **08 Hours**

Module – III

DFT and FFT efficient implementation of FFT, Graph Algorithms, Bellman-Ford Algorithm Shortest paths in a DAG, Johnson's Algorithm for sparse graphs, Flow networks and the Ford-Fulkerson Algorithm, Maximum bipartite matching. **08 Hours**

Module – IV

Computational Geometry-I: Geometric data structures using, C, Vectors, Points, Polygons, Edges Geometric objects in space; Finding the intersection of a line and a triangle, Finding star-shaped polygons using incremental insertion. **08 Hours**

Module – V

Computational Geometry-II: Clipping: Cyrus-Beck and Sutherland-Hodman Algorithms; Triangulating, monotonic polygons; Convex hulls, Gift wrapping and Graham Scan; Removing hidden surfaces. **08 Hours**

Course Outcomes

After studying this course, students will be able to

- Explain the principles of algorithms analysis approaches.
- Apply different theoretic based strategies to solve problems.
- Illustrate the complex signals and data flow in networks with usage of tools.

- Compare between different data structures algorithms.
- Describe the computational geometry criteria.

Text Books:

1. Thomas H. Cormen et al: Introduction to Algorithms, third edition Prentice Hall India, 1990 ISBN-10: 9780262033848
2. Michael J. Laszlo: Computational Geometry and Computer Graphics in C' Prentice Hall India, 1996 ISBN-13: 978-0132908429.

Reference Books:

1. E. Horowitz, S. Sahni and S. Rajasekaran, Fundamentals of Computer Algorithms, University Press, Second edition, 2007 ISBN: 9788173716126
2. Kenneth A Berman & Jerome L Paul, Algorithms, Cengage Learning, First Indian reprint, 2008 ISBN-13: 978-8131505212.

E-resources

1. <https://www.coursera.org/learn/advanced-algorithms-and-complexity>
2. <https://www.freecodecamp.org/news/these-are-the-best-free-courses-to-learn-data-structures-and-algorithms-in-depth-4d52f0d6b35a/>

PATTERN RECOGNITION AND ANOMALY DETECTION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSI733	3-0-0-0	3	CIE : 50 SEE : 50	3 Hours	PE-VI

Course Objectives:

This course will enable students to:

- Understand the mathematical morphology necessary for Pattern recognition.
- Introduce the student to various Pattern recognition techniques.
- Learn the Representation and description and feature extraction.
- Comprehend various anomaly detection approaches
- Cognize real world problems and applications related to pattern recognition & anomaly detection

Syllabus

MODULE I

Introduction to Pattern Recognition and Anomaly Detection: Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems. **10Hours**

MODULE II

Statistical Approaches for Pattern Recognition: Data structures for PR, Representation of clusters, proximity measures, size of patterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation. **08 Hours**

MODULE III

Machine Learning Approaches for Pattern Recognition: Nearest neighbor algorithm, variants of NN algorithms, use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Bayesian belief network. **10Hours**

MODULE IV

Anomaly Detection & Anomaly Detection Approaches: The different aspects of anomalies, Classification- based approaches, **Unsupervised Approaches:** Clustering, Nearest-neighbour, other statistical techniques, **Non-Standard Approaches:** Information-theoretic methods, Spectral techniques. **06 Hours**

MODULE V

Real-world problems: Network intrusion detection: Types of cyber-attacks on networks, Network Anomaly Detection techniques, Anomaly Detection in BIG DATA: The nature of big data, Key challenges, relevant technologies, relevant approaches and examples. **06 Hours**

Course Outcomes:

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

- Illustrate pattern recognition fundamentals
- Explain the advantages and disadvantages of various statistical methods for pattern recognition
- Determine how to apply a supervised learning algorithm to a classification problem for anomaly detection
- Explain the limitations of supervised learning for anomaly detection
- Practice applying the various techniques to different problems in different domains

Text Books:

1. Pattern Recognition (An Introduction) , V Susheela Devi, M Narsimha Murthy, Universities Press, ISBN 978-81-7371-725-3,2011.
2. Pattern Recognition & Image Analysis, Earl Gose, Richard Johnsonbaugh, Steve Jost. PHI ISBN-81-203-1484-0, 1996.
3. Statistical Pattern Recognition Second Edition, Andrew R. Webb QinetiQ Ltd., Malvern, UK, ISBN 0-470-84513-9,ISBN 0-470-84514-7.
4. Anomaly Detection Principles and Algorithms, Kishan G. Mehrotra, Chilukuri Mohan, Huaming Huang, Springer International Publishing, 2017,ISBN 978-3-319-67526-8

References:

1. Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000.

Pattern Recognition Lab

- 1.Feature Representation
- 2.Mean and Covariance
- 3.Linear Perceptron Learning
- 4.Generation of Random Variables
- 5.Bayesian Classification
- 6.MLE: Learning the classifier from data
- 7.Data Clustering: K-Means, MST-based

DECISION SUPPORT SYSTEMS(DSS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST741	3:0:0:0	3	CIE:50 SEE:50	3 hours	IE

Course objectives:

This course will enable students to:

- Identify among data processing systems, management information systems, and decision support/ expert systems
- Learn decision rules based on knowledge provided by an acknowledged expert and codify those rules as assertions, rules, and ad hoc procedures
- Outline the major components of Decision Support Systems(DSS)
- Learn how information is used to solve problems
- Utilize commercial spreadsheet and database integrated packages to develop
- Simulation models to support the decision-making process.

Syllabus

Module – I

Introduction to Decision Support Systems (DSS): Different types of Managerial Decision Problems and the Role of a DSS in solving them. Management Information System versus DSS, Range of Capabilities of a DSS, Components of a DSS, Examples of DSS, Basics of DSS Design Cycle.

08 Hours

Module – II

Models in Decision Support Systems: What is a Model? Classification of Models, Purpose of Modeling in DSS, Solution Techniques: Optimization, Heuristics, and Simulation, Traditional approach to modeling and its weaknesses, Desirable features for Models in DSS, Models and Managers: The Concept of a Decision Calculus'.

08 Hours

Module – III

Decision Support in Business: Introduction, Decision Support Trends, Management Information Systems, Online Analytical Processing, Using Decision Support Systems, Executive Information Systems, Enterprise Portals and Decision Support, Knowledge Management Systems. **08 Hours**

Module – IV

Data and Dialog Management Systems: Database, Sources of Data, Data Directory, Data Structure and Database Languages , Query Facility , Data Management System , DBMS as DSS Development Tool. User Interface, Graphics, Multimedia, Visual Interactive Modeling Natural Language Processing.

08 Hours

Module -V

Development and Applications of DSS: Development process, Software and Hardware and Data Acquisition, Model Acquisition, Dialog Development, Evaluation of Investment Proposals, Forecasting Demand for Independent Items, Determination of Product Mix, Vehicle Scheduling, Customer Centric Value Driven Decisions, Pricing Decisions. **08 Hours**

Course outcomes:

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

- Develop and implement DSS
- Describe the decision-making process, the concepts and principles of a decision support system.
- Identify decision support tools that can aid decision making.
- Apply system development methodology to develop a decision support system.

- Develop a functional prototype of a decision support system for a given case

Text Books

1. Peter G.W. Keen and Michael S. Scott Morton, „Decision Support Systems: An Organizational Perspective“ Addison-Wisely Publishing Company ISBN-9780201036671
2. Efraim turban and Jay E Aronson, 'Decision Support Systems and Intelligent Systems', Prentice Hall International, 1998, ISBN-9780130894656
3. „Decision Support Systems: Concepts and Resources for Managers', Daniel J.Power, Greenwood Publishing Group, ISBN-9781567204

References

1. McCosh, Andrew M, and Michael S. Scott Morton., “Management Decision Support Systems”, The Mac Millan Press Limited, 1978, ISBN-10: 0333190394
2. Sprague, Ralf H., Carlson, Eric D., “Building Effective Decision Support Systems”. Prentice Hall Inc., 1982, ISBN-978-0-13-086215-0
3. „Decision Support and Data Warehouse systems by E.G. Mallach – Tata McGraw Hill ISBN- 978007299818

E-Resources:

1. www.docsity.com/en/decision-support-system
2. <http://web.fsktm.um.edu.my/~norjihan/wmes3302.html>

ENTERPRISE RESOURCE PLANNING (ERP)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST742	3:0:0:0	3	CIE:50 SEE:50	3 hours	IE-I

Course Objectives:

This course will enable students to:

- Know contemporary and forward-looking on the theory and practice of Enterprise Resource Planning Technology.
- Focus on a strong emphasis upon practice of theory in Applications and Practical oriented approach.
- Train to learn the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth.
- Aim at preparing technological competitive and make them ready to self-upgrade with the higher technical skills.
- Gain the knowledge of existing modules of ERP systems.

Syllabus

Module-I

Introduction to ERP: Common ERP myths, Evolution of ERP, Advantages, Characteristics, Process integration with ERP system, Implementation costs, Roadmap for successful ERP implementation.

ERP Market and Vendors: ERP market, ERP vendors, Service oriented architecture, ERP package features. **08 Hours**

Module-II

Extended ERP services: Defining Extended ERP, Supply chain Management (SCM) and ERP, ERP and Business Intelligence (BI), ERP and E-commerce.

Business Process Re-engineering (BPR) and ERP: Defining BPR, BPR Vs TQM, BPR and change management, approaches in BPR implementation, Methodologies for BPR implementation, BPR success/failure factors. **08 Hours**

Module-III

Planning for ERP: Planning for ERP implementation, understanding organizational requirement, Economic and strategic justification, Project scope, Determining resources, organizational commitment to change, budget for ERP, select right ERP package.

Implementation of ERP: Designs of ERP system, ERP implementation approach, ERP implementation life cycle, different phases of ERP implementation. **08 Hours**

Module-IV

Managing ERP projects: Risk/Failure factors in ERP implementation, Example of ERP failure, Critical success factors, Complexities of ERP projects, Evaluating ERP projects.

ERP: Going Live and post implementation: Preparing to go live, Strategies for migration to new ERP system, Managing ERP after Go Live, Maintenance of ERP system. **08 Hours**

Module-V

ERP, Internet and WWW – ERP II: The internet explosion, ERP, Internet and WWW, ERP to ERP II, Best practices of ERP II.

Future directions and Trends in ERP: New markets, New channels, Easier communication tools, Business models, Need based applications, Expenditures, Reduction in implementation time, Market snapshots, Shifting revenue models. **08 Hours**

Course Outcomes

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

- Compare the concepts and importance of ERP system.
- Design ERP market and vendors.
- Differentiate the relationship of ERP and SCM.
- Evaluate the concept ERP implementation.
- Design the concepts of internet with respect to WWW.

Text Books:

1. Enterprise Resource Planning, Ashim Raj Singla, Cengage Learning India Pvt. Ltd., Second edition (1 July 2016) New Delhi, 2008. ISBN-No:8131532046.
2. Enterprise Resource Planning, Alexis Leon, 2nd edition, Tata Mcgraw Hill Education Pvt. Ltd., New Delhi, 2008. ISBN-No: 1259005917.

Reference Books:

1. E-Business and ERP: Transforming the Enterprise, Grant Norris, James R. Hurley, Kenneth M. Hartley, John R. Dunleavy, John D. Balls, John Wiley and Sons publications, 2000. ISBN-10: 0471392081.
2. Enterprise Resource Planning: Concepts and Practice, V.K. Garg. Second edition, PHI Learning Pvt. Ltd., Publications 2003 ISBN 8120322541,

E-Resources:

1. <http://8thinktank.com/erp/erp-implementation-life-cycle/#:~:text=ERP%20Implementation%20Life%20Cycle%20is,%2C%20implementation%2C%20transition%20and%20operations.>
2. https://en.wikipedia.org/wiki/Enterprise_resource_planning
3. <https://www.cio.com/article/2439502/what-is-erp-key-features-of-top-enterprise-resource-planning-systems.html>

SUPPLY CHAIN MANAGEMENT

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST743	3:0:0:0	3	CIE:50 SEE:50	3 hours	IE

Course Objectives :

This course will enable students to:

- Understand differences between logistics and supply chain management.
- Understand the framework of supply chain network.
- Learn about the components of inventory management.
- Understand the tools and techniques used in logistics management.
- Learn about the professional opportunities in supply chain management.

Syllabus

Module-I

Introduction : Basic concepts & philosophy of SCM, essential features, decision phases – process view, supply chain framework, key issues in SCM and benefits. **08 Hours**

Module-II

Designing the supply chain network : Designing the distribution network, role of distribution, factors influencing distribution, design options, distribution networks in practice, network design in the supply chain, factors affecting the network design decisions. Designing and Planning Transportation Networks, role of transportation, modes, design options, tailored transportation. **08 Hours**

Module-III

Inventory Management : Concept, various costs associated with inventory, EOQ, buffer stock, lead time reduction, reorder point / re-order level fixation, ABC analysis, SDE/VED Analysis. **08 Hours**

Module-IV

Inventory Management : Concept, various costs associated with inventory, EOQ, buffer stock, lead time reduction, reorder point / re-order level fixation, ABC analysis, SDE/VED Analysis. **08 Hours**

Module-V

Recent issues in SCM : Role of computer/ IT in supply chain management, CRM Vs SCM, Benchmarking concept, features and implementation, outsourcing – basic concepts, value addition in SCM.

Case study :

- Students are expected to choose any 4 Indian Organizations and study their supply chain in terms of drivers of the Supply chain and submit a report.
- Students should visit different logistics companies and understand the services provided by them and submit a report.
- Students should identify the various types of IT applications employed by Indian Organizations in their Supply chain. **08 Hours**

Course Outcomes:

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

- Identify and Analyze Business Models, Business Strategies and, corresponding Competitive Advantage.
- Formulate and implement supply chain management Best Practices
- Analyze supply chain management and Logistics operations for optimum utilization of resources.
- Evaluate cases for effective supply chain management and its implementation.

- Demonstrate the risk and issues involved in supply chain management.

Text Books :

1. Doyle, Bardi, Langley, A Logistic approach to Supply Chain Management –1st Edition, Cengage Learning, *ISBN: 9781337415750*.
2. Donald J Bowersox, Dand J Closs, M Bixby Coluper, Supply Chain Logistics Management, 2nd Edition, TMH, 2008, *ISBN 0-07- 1 1 23067*.

Reference Books :

1. Chopra Sunil and Peter Meindl, Supply chain management, - 3rd edition, Pearson, 2007, *ISBN 13: 9780131730427*.
2. Amith Sinha, Supply Chain Management-A Managerial Approach, Herbert, 2nd edition, TMH. *ISBN :9780071333436*.
3. Agarwal D.K., A Text Book of Logistics and Supply chain management, - 1st edition, Macmillan. *ISBN-13: 978-1403909954*.

E-Resources :

1. <http://library.jgu.edu.in/content/logistics-and-supply-chain-management>
2. <https://ggu.libguides.com/supplychain>

DIGITAL MARKETING (IE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST751	3:0:0:0	3	CIE:50 SEE:50	3 Hours	IE

Course Objectives:

This course will enable students to:

- Comprehend business advantages of digital marketing and its importance for marketing success and to develop a digital marketing plan.
- Learn Website and SEO optimization techniques and also, to outline Google Ad Words campaigns.
- Acquire knowledge of Google Analytics for measuring effects of digital marketing and to get insights of future trends that will affect the development of digital marketing.
- Learn to use various social media platforms in order to create, manage and evaluate digital marketing efficiently.
- Cognize strategies used for email marketing, resource planning and budgeting.

Syllabus

Module - I

Introduction to digital marketing, Digital vs. Real Marketing, Digital Marketing Channels, Creating initial digital marketing plan, Content management, SWOT analysis, Target group analysis, Web design, Optimization of Web sites.

08 Hours

Module - II

SEO Optimization, Writing the SEO content, Web design, Optimization of Web sites, Google AdWords- creating accounts, Google AdWords- types, Introduction to CRM, CRM platform, CRM models, Introduction to Web analytics, Web analytics- levels.

08 Hours

Module - III

Introduction of Social Media Marketing, Creating a Facebook page, Visual identity of a Facebook page Types of publications, Business opportunities and Instagram options, Optimization of Instagram profiles, Integrating Instagram with a Web Site and other social networks, Keeping up with posts.

08 Hours

Module - IV

Business tools on LinkedIn, Creating campaigns on LinkedIn, Analyzing visitation on LinkedIn, Creating business accounts on YouTube, YouTube Advertising, YouTube Analytics, Facebook Ads, Creating Facebook Ads, Ads Visibility.

08 Hours

Module - V

E-mail marketing, E-mail marketing plan, E-mail marketing campaign analysis, Keeping up with conversions, Digital Marketing Budgeting- resource planning - cost estimating - cost budgeting - cost control.

08 Hours

Course Outcomes:

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

- Examine the importance of digital marketing and create suitable plans for marketing success.
- Assess customer relationships across all digital channels and build better customer relationships.
- Create a digital marketing plan, starting from SWOT analysis and thereby defining a target

group.

- Use social media channels to achieve maximum benefit for the business, by using web analytics.
- Develop different ways for the integration of marketing plans taking into consideration the available resources and budget.

Text Book:

1. Damian Ryan & Calvin Jones, "Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation", Kogan Page Limited, 1st Edition, 2009, ISBN-978-0749453893.

Reference Books:

2. Joe Pulizzi, "Epic Content Marketing", McGraw-Hill Education, 1st Edition 2013, ISBN-978-0071819893.
3. The Beginner's Guide to Digital Marketing (2015), Digital Marketer. (PDF)

E-Resources:

- 1 <https://www.digitalmarketer.com/digital-marketing/>
- 2 https://www.tutorialspoint.com/digital_marketing/index.htm
- 3 <https://www.javatpoint.com/digital-marketing>

OPERATION RESEARCH

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CST752	3:0:0:0	3	CIE:50 SEE:50	3 Hours	IE

Course Objectives:

This course will enable students to:

- Learn 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.
- Expose with 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. **08Hours**

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. **08Hours**

Module – III

Transportation and Assignment Problems: The transportation problem, Initial Basic Feasible Solution (IBFS) by North West Corner Rule method, Matrix Minima Method, Vogel's Approximation Method. Optimal solution by Modified Distribution Method (MODI).

The Assignment problem: A Hungarian algorithm for the assignment problem. Minimization and Maximization varieties in transportation and assignment problems. **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.

08Hours

Course Outcomes:

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

- Develop Linear Programming models, interpret the models, solutions and infer solutions to the real-world problems.
- Explain optimization techniques for various problems.
- Understand the given problem as transportation and assignment problem and solve.
- Construct network diagrams and determine critical path, floats for deterministic and PERT networks including crashing of Networks.
- Illustrate game theory for decision support system

Text Books:

1. Frederick S. Hillier, Gerald J. Lieberman, Bodhibrata Nag, Preetam Basu: “Introduction to Operations Research”, 9th Edition, Tata McGraw Hill, 2013, ISBN-13: **9780071333467**.

Reference Books:

1. S D Sharma: “Operations Research”, 18th Edition, KedarNath RamNath, 2017, ISBN-13: 9789380803388.
2. Hamdy A Taha: “Operations Research, An Introduction”, 10th Edition, Pearson Education, 2017, ISBN-13: 9780134480220.

E-Resources:

1. www.nptelvideos.in/2012/12/fundamentals-of-operations-research.html
2. www.freevideos.com/courses/2678/advanced-operations-research

MANAGEMENT & ENTREPRENEURSHIP

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
19CSI753	3:0:0:0	3	CIE:50 SEE:50	3 hours	IE

Course Objectives :

This course will enable students to:

- Understand basics concepts in the area of management.
- Understand the role and importance of organizing and staffing
- Apply personal creativity in new venture as an entrepreneur.
- Analyse the key steps in elaboration of business idea.
- Create and analyze project with various advantages.

Syllabus

Module-I

Management and Planning: Management: Nature and Functions of Management – Importance, Definition, Management Functions, Levels of Management, Roles of Manager, Managerial Skills, Management & Administration, Management as a Science, Art & Profession. Planning: Planning-Nature, Importance, Types, Steps and Limitations of Planning; Decision Making – Meaning, Types and Steps in Decision Making. **08 Hours**

Module-II

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management (meaning and importance only), Departmentalisation, Committees– Meaning, Types of Committees; Centralization Vs Decentralization of Authority and Responsibility; Staffing-Need and Importance, Recruitment and Selection Process. **08 Hours**

Module-III

Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship. **08 Hours**

Module-IV

Modern Small Business Enterprises: Modern Small Business Enterprises: Role of Small Scale Industries, Impact of Globalization and WTO on SSIs, Concepts and definitions of SSI Enterprises, Government policy and development of the Small Scale sector in India, Growth and Performance of Small Scale Industries in India, Sickness in SSI sector, Problems for Small Scale Industries, Ancillary Industry and Tiny Industry. **08 Hours**

Module-V

Projects Management

A Project. Search for a Business idea: Introduction, Choosing an Idea, Selection of product, The Adoption process, Product Innovation, Product Planning and Development Strategy, Product Planning and Development Process. Concepts of Projects and Classification: Introduction, Meaning of Projects, Characteristics of a Project, Project Levels, Project Classification, Aspects of a Project, The project Cycle, Features and Phases of Project management, Project Management Processes. Project Identification: Feasibility Report, Project Feasibility Analysis. Project Formulation: Meaning, Steps in Project formulation, Sequential Stages of Project Formulation, Project Evaluation. Project Design and Network Analysis: Introduction, Importance of Network Analysis, Origin of PERT and CPM, Network, Network Techniques, Need for Network Techniques, Steps in PERT, CPM, Advantages, Limitations and Differences. **08 Hours**

Course Outcomes:

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

- Describe the basic principles of management.
- Distinguish clearly between the importance and role of organizing and staffing.
- Discuss entrepreneur mindset to develop and plan for a new venture.
- Interpret the concepts in establishing business idea.
- Demonstrate functions and types of project management.

Text Books :

1. Principles of Management – P. C. Tripathi, P.N. Reddy – Tata McGraw Hill. ISBN: 15-978 Dynamics of Entrepreneurial Development & Management-Vasant Desai, Himalaya Publishing House. ISBN: 98345789
2. Entrepreneurship Development – Poornima. M. Charantimath, Small Business Enterprises – Pearson Education - 2006 (2 & 4). ISBN – 15: 34519801

Reference Books:

1. Management Fundamentals - Concepts, Application, Skill Development – Robers Lusier, Thomson. ISBN-10: 0324306083
2. Entrepreneurship Development - S. S. Khanka, S. Chand & Co. New Delhi. ISBN: 9788121920148.
3. Management - Stephen Robbins, Pearson Education/PHI - 17th Edition, 2003. ISBN: 4388876091.

E-Resources:

1. <https://www.grin.com/document/453320>
2. <https://som.yale.edu/faculty-research-centers/centers-initiatives/program-on->
3. <https://businesscasestudies.co.uk/category/case-studies/people/>