KKR & KSR INSTITUTE OF TECHNOLOGY AND SCIENCES

(Autonomous)

DEPARTMENT OF CSE – ARTIFICIAL INTELLIGENCE

COURSE STRUCTURE & SYLLABUS
(Regulations – R20)

For B. Tech DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE
(Applicable for Batches admitted from 2020-2021)

KKR & KSR INSTITUTE OF TECHNOLOGY AND SCIENCES

(Autonomous)

(Accredited by NBA & NAAC with Grade "A" and Affiliated to JNTUK-Kakinada)
Vinjanampadu, Vatticherukuru Mandal, Guntur-522017.
Andhra Pradesh. INDIA

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

COURSE STRUCTURE & SYLLABUS – R20

SEMESTER - I

S No	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20CS1T01	Problem Solving and Programming Using C	3	0	0	3	30	70	100
2	20SH1T04	Applied Chemistry	3	0	0	3	30	70	100
3	20SH1T06	Differential Equations	3	0	0	3	30	70	100
4	20ME1T01	Engineering Graphics	1	0	4	3	30	70	100
5	20EE1T02	Basics of Electrical and Electronics Engineering	3	0	0	3	30	70	100
PRACTICAL									
6	20CS1L01	Problem Solving and Programming Using C Lab	0	0	3	1.5	15	35	50
7	20CS1L02	IT Workshop	0	0	3	1.5	15	35	50
8	20SH1L04	Applied Chemistry Lab	0	0	3	1.5	15	35	50
		Total Credits				**19.5**	**195**	**455**	**650**

Theory: BSC-2, ESC-3 **Practical:** BSC-1, ESC-2

SEMESTER - II

S. No	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH2T01	Communicative English	3	0	0	3	30	70	100
2	20SH2T02	Applied Physics	3	0	0	3	30	70	100
3	20SH2T07	Linear Algebra & Vector Calculus	3	0	0	3	30	70	100
4	20EC2T01	Digital Logic Design	3	0	0	3	30	70	100
5	20CS2T01	Python Programming	3	0	0	3	30	70	100
6	20GE2M01	Environmental Sciences	2	0	0	0	--	--	--
PRACTICAL									
8	20SH2L01	Communicative English Skills Lab	0	0	3	1.5	15	35	50
9	20SH2L02	Applied Physics Lab	0	0	3	1.5	15	35	50
10	20CS2L01	Python Programming Lab	0	0	3	1.5	15	35	50
		Total Credits				**19.5**	**195**	**455**	**650**

Theory: BSC-2, HSMC-1, ESC-2 **Practical:** BSC-1, HSMC-1, ESC-1 MC: 1

*Add on course "Fundamentals of Artificial Intelligence"

*Note: This course will complete through MOOCS

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

SEMESTER-III

S. No	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH3T05	Probability & Statistics	3	0	0	3	30	70	100
2	20CS3T04	Mathematical Foundations of Computer Science	3	0	0	3	30	70	100
3	20CS3T05	Data Structures & Algorithms	3	0	0	3	30	70	100
4	20IT3T01	Object Oriented Programming through Java	3	0	0	3	30	70	100
5	20CI3T01	Introduction to Artificial Intelligence	3	0	0	3	30	70	100
6	20GE3M01	Constitution of India	2	0	0	0	-	-	-
PRACTICAL									
6	20CS3L03	Data Structures &Algorithms Lab	0	0	3	1.5	15	35	50
7	20IT3L01	Object Oriented Programming through Java lab	0	0	3	1.5	15	35	50
8	20CI3L01	Introduction to Artificial Intelligence Lab	0	0	3	1.5	15	35	50
10	20CS3S01	Mobile App Development	1	0	2	2.0	--	50	50
Total Credits						**21.5**	**195**	**505**	**700**

Theory: BSC-01,PCC-3,ESC-01: **Practical:** PCC-3,SC-01,MC-01

SEMESTER - IV

S. No	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH4T03	Numerical Methods & Transformations	3	0	0	3	30	70	100
2	20CI4T01	Computer Organization	3	0	0	3	30	70	100
3	20CS4T01	Database Management Systems	3	0	0	3	30	70	100
4	20CS4T02	Formal Languages and Automata Theory	3	0	0	3	30	70	100
5	20SH4T01	Managerial Economics and Financial Accountancy	3	0	0	3	30	70	100
PRACTICAL									
6	20CS4L01	Database Management Systems Lab	0	0	3	1.5	15	35	50
7	20CI4L01	Web Application Development Lab	0	0	3	1.5	15	35	50
8	20CS4L03	R Programming Lab	0	0	3	1.5	15	35	50
9	20CI4S01	Fundamentals of Robotics	1	0	2	2.0	--	50	50
Total Credits						**21.5**	**195**	**505**	**700**

Theory: BSC-01, PCC-2,ESC-01,HSMC-01: **Practical:** PCC-03,SC-01

SEMESTER - I

Course Code	Course Name	L	T	P	C
20CS1T01	PROBLEM SOLVING AND PROGRAMMING USING C	3	0	0	3

Course Objectives:

The objectives of Programming for Problem Solving Using C are

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor
- To assimilate about File I/O and significance of functions

Course Outcomes:

At the end of the Course, the student will be able to

CO1: Build algorithms and to draw flowcharts for solving problems
CO2: Convert flowcharts/algorithms to C Programs, compile and debug programs
CO3: Use different operators, data types and write programs that use two-way/ multi-way selection
CO4: Select the best loop construct for a given problem
CO5: Design and implement programs to analyze the different pointer applications
CO6: Decompose a problem into functions and to develop modular reusable code

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Type Qualifiers. Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs.

UNIT II

Bitwise Operators: Exact Size Integer Types, Logical, Bitwise Operators, Shift Operators.
Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions. Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

UNIT III

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.

UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application. Processor Commands: Processor Commands.

UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Storage Classes, Scope, life time, Passing Array to Functions, Passing Pointers to Functions, Command Line Arguments, Recursion Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

Text Books:

1) *Programming for Problem Solving*, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2) *The C Programming Language*, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson.

Reference Books:

1) *Computer Fundamentals and Programming*, Sumithabha Das, Mc Graw Hill.
2) *Programming in C, Ashok N. Kamthane*, Amit Kamthane, Pearson.
3) *Computer Fundamentals and Programming in C*, PradipDey, Manas Ghosh, OXFORD.

E-Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.programiz.com/c-programming
3. https://www.javatpoint.com/c-programming-language-tutorial
4. https://www.javatpoint.com/c-programming-language-tutorial

SEMESTER - I

Course Code	Course Name	L	T	P	C
20SH1T04	APPLIED CHEMISTRY	3	0	0	3

COURSE OUTCOMES:

At the end of the Course, the student will be able to

CO1 : Understand the importance of plastics and composites in various fields.
CO2 : Apply corrosion control methods to protect metals.
CO3 : Understand the importance of advanced materials in engineering.
CO4 : Understand computational chemistry and importance of molecular machines.
CO5 : Understand the use of non-conventional energy sources to produce power

UNIT-I: POLYMER TECHNOLOGY

Polymerisation: Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties.

Plastics: Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers: Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers.

Learning Outcomes: At the end of this unit, the students will be able to outline the properties of polymers and various additives added and different methods of forming plastic materials.

Explain the preparation, properties and applications of some plastic materials. Interpret the mechanism of conduction in conducting polymers.

Discuss natural and synthetic rubbers and their applications.

UNIT-II: ANALYTICAL TECHNIQUES AND CORROSION

PART A: ANALYTICAL TECHNIQUES

Conductometric titrations – titrations between strong acid and strong base, strong acid and weak base. Potentiometric titrations (redox titrations). Complexometric titrations using EDTA

PART B: CORROSION

Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series - factors influencing rate of corrosion-corrosion control (proper designing, cathodic protection)- Protective coatings: Surface preparation, cathodic and anodic coatings, electroplating, electroless plating (nickel). Paints (constituents, functions, special paints).

Learning Outcomes: At the end of this unit, the students will be able to understand the principles of different analytical instruments.

explain the different applications of analytical instruments.

Categorize the reasons for corrosion and study some methods of corrosion control

UNIT-III : MATERIAL CHEMISTRY

PART A: Non-elemental semiconducting materials: Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators: Electrical insulators- applications.

PART B: *Nano materials:* Introduction-sol-gel method- characterization by BET, SEM and TEM methods applications of graphene-carbon nanotubes and fullerenes: Types, preparation and applications Liquid crystals: Introduction-types-applications.

Super conductors: Type –I, Type II-characteristics and applications

Learning Outcomes: At the end of this unit, the students will be able to

Understand the importance of materials like nanomaterials and fullerenes and their uses.
Understand liquid crystals and superconductors.
Understand the preparation of semiconductors

UNIT-IV: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY

Computational chemistry: Introduction, Ab Initio studies Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

Learning Outcomes: At the end of this unit, the students will be able to Obtain the knowledge of computational chemistry Understand importance molecular machines.

UNIT-V: GREEN CHEMISTRY & NON CONVENTIONAL ENERGY SOURCES

PART A: GREEN CHEMISTRY

Green synthesis: Principles –Applications - 3 or 4 methods of synthesis with examples – R4M4 principles.

PART B: NON CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, ocean thermal energy conversion, tidal and wave power.

Learning Outcomes: At the end of this unit

The importance of green synthesis is well understood and how they are different from conventional methods is also explained.

The students will be able to understand power generation by different natural sources.

TEXT BOOKS:

1. *Engineering Chemistry* by Jain and Jain; Dhanpat Rai Publicating Co.

REFERENCE BOOKS:

1. *Engineering Chemistry* by Shikha Agarwal; Cambridge University Press, 2019 edition.
2. *Engineering Chemistry* by Bharathi kumari Yelamanchili, VGS series

SEMESTER - I

Course Code	Course Name	L	T	P	C
20SH1T06	DIFFERENTIAL EQUATIONS	3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

CO1 : Solve the differential equations and apply differential equations related to various engineering fields

CO2 : Solve linear differential equations of second and higher order

CO3 : Calculate Jacobian, maxima and minima of functions of two Variables.

CO4 : Solve first order partial differential equations

CO5 : Solve the higher order partial differential equations

UNIT I: Differential equations of first order and first degree:

Linear differential equations – Bernoulli equations – Exact equations andequations reducible to exact form. Applications: Newton's Law of cooling - Law of natural growth and decay - Orthogonal trajectories.

UNIT II: Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax}, sin ax, cos ax, polynomials in x, e^{ax} V(x), $x^nV(x)$- Method of Variation of parameters. Applications: L-R circuit, C-R circuit and L-C-R circuit.

UNIT III: Differential Calculus:

Taylors and Mc Laurent's series for one & two variables – Functional dependence – Jacobian. Applications: Maxima and Minima of functions of two variables with constraints and without constraints.

UNIT IV: **First order Partial differential equations:**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations

UNIT V: Higher order Partial differential equations:

Solutions of Linear Partial differential equations with constant coefficients – RHS terms of the type eax+by , sin(ax+by), cos(ax+by), xmyn and Method of separation of Variables.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley- India.
2. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.
3. Peter O'Neil, Advanced Engineering Mathematics, Cengage

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

SEMESTER - I

Course Code	Course Name	L	T	P	C
20ME1T01	ENGINEERING GRAPHICS	1	0	4	3

COURSE OUTCOMES:

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

CO1: To illustrate the fundamental Engineering Drawing Standards and discuss about conics and scales.

CO2: Ability to draw the projection of points and straight lines.

CO3: Ability to draw the projection of planes

CO4: Understand the classification of solids and draw the projection of solids.

CO5: Ability to draw isometric and orthographic projections.

UNIT-I

Introduction to Engineering graphics: Conventions in drawing-lettering - BIS conventions.

Polygons: Constructing regular Polygon by general methods.

Curves: Conic sections in general method and Cycloid, Involutes tangent and normal for the curves

Scales: Plain scales, Diagonal scales and vernier scale.

UNIT-II

Introduction to Orthographic Projections; Projections of Points in various quadrants, Projections of Straight Lines parallel to both planes Projections of Straight Lines-Parallel to one and inclined to other plane

Projections of Straight Lines inclined to both planes, determination of true lengths, angle of inclinations and traces.

UNIT-III

Projections of Planes

Regular Planes Perpendicular / parallel to one Reference Plane and inclined to other Reference Plane, Planes inclined to both the Reference Planes.

UNIT-IV

Projections of solids: Projections of Prisms, Cylinders, with the axis inclined to one Reference Plane. Projections of Pyramids and Cones with the axis inclined to one Reference Plane

UNIT-V

Conversion of isometric views to orthographic views. Conversion of orthographic views to isometric views.

TEXT BOOKS :

1. *Elementary Engineering Drawing* By N.D.Bhatt, Charotar Publishing House

2. *Engineering Drawing*, Agarwal & Agarwal, Tata McGraw Hill Publishers.
3. *Engineering Drawing*, K.L.Narayana& P. Kannaiah, Scitech Publishers.

REFERENCE BOOKS

1. *A Text Book of Engineering Graphics* By P.J.Shah S.Chand & Company Ltd., New Delhi
2. *Engineering Graphics I and II* By Arunoday Kumar Tech Max Publication, Pune
3. *A text book of Engineering Drawing* By P.S.Gill S.K.Kataria & sons, Delhi

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

SEMESTER - I

Course Code	Course Name	L	T	P	C
20EE1T02	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	3	0	0	3

COURSE OUTCOMES:

At the end of the Course, the student will be able to

CO1 : Recognize the fundamentals of solar energy, simple DC and AC circuits.

CO2 : Demonstrate the construction, working principles and operating characteristics of DC machines and transformer

CO3 : Demonstrate the construction, working principles and operating characteristics of AC rotating machines.

CO4 : Demonstrate the working principles and operations of diode rectifiers and transistors

CO5 : Comprehend the concept of working principles and operations of operational amplifiers and CRO.

UNIT-I : DC & AC Fundamentals

Electrical Circuit Elements (R, L and C)-Voltage and Current Sources - Ohms Laws - Kirchoff's Laws - Series-Parallel- Series and Parallel Combination (Only Resistances)-Problems in Simple Circuits with DC Excitation - Representation of Sinusoidal Waveforms - Cycle, Time Period, Frequency, Instantaneous Value, Peak, Average and RMS Values- Phase Angle, Power Factor, Real Power, Reactive Power and Apparent Power (Definition and Simple Problems).

UNIT-II: DC Machines & Transformers

DC Machines: Principle of Operation of DC Generator – EMF Equation – Types of DC Machine – Torque Equation of DC Motor – Applications – Three-Point Starter, Speed Control Methods – OCC Of DC Generator Transformers: Principle of Operation of Single-Phase Transformers – EMF Equation – Losses – Efficiency and Regulation.

UNIT-III : AC Rotating Machines

Principle of Operation of Alternators – Regulation by Synchronous Impedance Method – Principle of Operation Of 3- Phase Induction Motor – Slip-Torque Characteristics - Efficiency – Applications.

UNIT-IV : Rectifiers and Transistors & Concept of Uninterrupted Power Supply (UPS)

PN Junction Diodes – Diode Applications (Half, Full Wave and Bridge Rectifiers) - Zener Diode-Applications (Voltage Regulator) – LED - Photo Diode – SCR- UJT (Principle of Operation)- BJT FET (Types & Principle of Operation)- Concept of UPS-Introduction-Types-Block diagram-applications-Advantages

UNIT-V : Operational Amplifiers and CRO.

Characteristics of Operation Amplifiers (OP-AMP) – Application Of OP-Amps (Inverting, Non-Inverting, Integrator & Differentiator)- Simple Problems on Operation Amplifiers - Cathode Ray Oscilloscope –Construction and Operation.

TEXT BOOKS:

1. D.P. Kothari and I.J. Nagrath, *Basic Electrical Engineering*, 4th ed., Tata McGraw-Hill, 2019.
2. J. Millman, C. Halkias, *Electronic Devices and Circuits*, 2nd ed., Tata Mc-Graw-Hill,2008
3. D. Roy Choudhury and Shail B. Jain, *Linear Integrated Circuits*, 2nd ed., New Age International (p) Ltd, 2004.

REFERENCE BOOKS:

1. P. V. Prasad, S. Sivanagaraju, K. R. Varmah, and Chikku Abraham, *Basic Electrical Engineering*, 1st ed., Cengage India, 2018.
2. D.C. Kulshreshtha, *Basic Electrical Engineering*, 1st ed., Revised, Tata McGraw-Hill, 2012.
3. V K Mehta & Rohit Mehta, *Principles of Electrical Engineering and Electronics*, 3rd ed.,S Chand Publishers, 2019.
4. S. Salivahanan, N. Suresh Kumar, *Electronic Devices and Circuits*, Tata Mc-Graw Hill Education, 2018.
5. S. Salivahanan, V.S. Kanchana Bhaaskaran, *Linear Integrated Circuits*, 3rd ed., McGraw-Hill Education, 2018

e-Resources :

1. https://www.slideshare.net/GautamMishra5/ups-uninterrupted-power-supply.

SEMESTER - I

Course Code	Course Name	L	T	P	C
20CS1L01	PROBLEM SOLVING AND PROGRAMMING USING C LAB	0	0	3	1.5

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

At the end of the Course, the student will be able to

CO 1:Gains Knowledge on various concepts of a C language.

CO 2: Draw flowcharts and write algorithms.

CO 3:Design and development of C problem solving skills.

CO 4:Design and develop modular programming skills.

CO 5:Trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r and s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.

2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.

2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk

SEMESTER - I

Course Code	Course Name	L	T	P	C
20CS1L02	IT WORKSHOP	0	0	3	1.5

Course Objectives:

The objective of IT Workshop is to

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on Linux
- Teach the usage of Internet for productivity and self paced lifelong learning
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes:

At the end of the Course, the student will be able to

CO1: Describe evolution of computers, storage devices, networking devices, transmission media and peripherals of a computer .

CO2: Configure, evaluate and select hardware platforms for the implementation and execution of computer applications, services and systems

CO3: Construct a fully functional virtual machine, Summarize various Linux operating system commands.

CO4: Develop presentation, documents and small applications using productivity tools such as word processor, presentation tools, spreadsheets, HTML, LaTex .

COMPUTER HARDWARE:

Experiment 1:

Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

OPERATING SYSTEMS:

Experiment 2: Virtual Machine setup:

- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Experiment 3: Operating System installation:

- Installing an Operating System such as Linux on Computer hardware.

Experiment 4:Linux Operating System Commands

- General command syntax, Basic help commands, Basic File system commands, Date and Time
- Basic Filters and Text processing, Basic File compression commands
- Miscellaneous: apt-get, vi editor

NETWORKING AND INTERNET

Experiment 5: Networking Commands

ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp.

INTERNET SERVICES:

Experiment 6:

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Email creation and usage, Creating a Digital Profile on LinkedIn

PRODUCTIVITY TOOLS:

OFFICE TOOLS

Experiment 7:

Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 8:

Demonstration and practice on Microsoft Word, Power Point

Experiment 9:

Demonstration and practice on Microsoft Excel.

Experiment 10:

Demonstration and practice on LaTeX and produce professional PDF documents.

Experiment 11:

Internet of Things (IoT): IoT fundamentals, applications, protocols, Architecture, IoT Devices communication models.

INTRODUCTION TO HTML:

Experiment 12:

Understanding HTML tags and creation of simple web pages.

Assignment: Develop your home page using HTML Consisting of your photo, name, address

and education details as a table and your skill set as a list.

TEXT BOOKS:

1. *Computer Fundamentals*, Anita Goel, Pearson Education, 2017
2. *PC Hardware Trouble Shooting Made Easy*, TMH
3. *Essential Computer and IT Fundamentals for Engineering and Science Students*, Dr.N.B.Vekateswarlu, S.Chand.
4. *HTML & CSS ,The Completee Reference* , Fifth Edition , Thomas A. powell
5. *LaTeX Companion* – Leslie Lamport, PHI/Pearson.

REFERENCE TEXT BOOKS:

1. B. Govindarajulu, "*IBM PC and Clones Hardware Trouble shooting and Maintenance*", 2nd edition, Tata McGraw-Hill, 2002
2. "*MOS study guide for word, Excel, Powerpoint& Outlook Exams*", Joan Lambert, Joyce Cox, PHI.
3. "*Introduction to Information Technology*", ITL Education Solutions limited, Pearson Education.
4. Bigelows, "*Trouble shooting, Maintaining& Repairing PCs*", TMH.
5. *Excel Functions and Formulas*, Bernd held, Theodor Richardson, Third Edition

E-Resources:

1. https://explorersposts.grc.nasa.gov/post631/20062007/computer_basics/ComputerPorts.doc
2. https://explorersposts.grc.nasa.gov/post631/2006-2007/bitsnbyte/Digital_Storage_Basics.doc
3. https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
4. https://www.pcsuggest.com/basic-linux-commands/
5. https://www.vmware.com/pdf/VMwarePlayerManual10.pdf
6. https://gsuite.google.com/learning-center/products/#!/
7. https://www.raspberrypi.org

SEMESTER - I

Course Code	Course Name	L	T	P	C
20SH1L04	APPLIED CHEMISTRY LAB	0	0	3	1.5

COURSE OUTCOMES:

At the end of the Course, the student will be able to

CO1 : Estimate unknown solutions by using volumetric titration method.
CO2 : Analyze the quality of water.
CO3 : Determine the p^H of liquid samples.
CO4 : Measure the strength of acids by conductometric and potentiometric titrations.
CO5 : Estimate the acid content in fruit juices and soft drinks.

LIST OF EXPERIMENTS

1. 1.Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis
2. Estimation of HCl using standard Na_2CO_3 solution.
3. Estimation of alkalinity of a sample containing Na_2CO_3 and NaOH.
4. Estimation of total hardness of water using standard EDTA solution.
5. Estimation of copper using standard EDTA solution.
6. Estimation of zinc using standard EDTA solution.
7. Estimation of Ferrous iron using standard K_2Cr_2O7 solution.
8. Estimation of $KMnO_4$ using standard Oxalic acid solution.
9. Estimation of pH of the given sample solution using pH meter.
10. Conduct ometric Titrations between strong acid and strong base.
11. Conduc to metric Titrations between strong acid and Weak base.
12. Preparation of Bakelite.
13. Estimation of acid content in soft drinks.
14. Potenti ometric Titrations between ferrous iron with potassium dichromate.
15. Estimation of copper (II) using standard hypo solution.
16. Estimation of iron (III) by colorimetric method

The above experiments at least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. *A Textbook of Quantitative Analysis*, Arthur J. Vogel.

2. Dr.Bharathi Kumari Yelamanchili - *Laboratory Manual of Engineering Chemistry*, VGS Techno Series

SEMESTER - II

Course Code	Course Name	L	T	P	C
20SH2T01	COMMUNICATIVE ENGLISH	3	0	0	3

COURSE OUTCOMES:

At the end of the Course, the student will be able to

CO1 : Recall life in one's past which had fine balancing act.
CO2 : Decide the qualities required to take up a promising career.
CO3 : Evaluate the obstacles hinder of student's progress & find the ways to overcome them.
CO4 : Explain the environment activism and empowerment of women
CO5 : Interpret the efforts of successful persons to keep idealistic approach in achieving goals.

UNIT-I: A Drawer full of happiness

Speaking: Asking and answering general questions on familiar topics such as home, family, work, Study and interests. Self introduction and introduce others.
Vocabulary: Technical vocabulary from a cross technical branches, GRE Vocabulary (Antonyms and Synonyms, Word applications).
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns-
Countable and uncountable; singular and plural, basic sentence structures; simple question form –„wh" questions; word order in sentences.
Writing: Note Making and Note Taking.
Employability Skills: Teamwork

UNIT-II: **Nehru's letter to daughter Indira on her Birthday**

Speaking: Discussion in pairs, small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.
Vocabulary: Technical vocabulary from across technical branches. GRE Vocabulary, Analogies (Antonyms and Synonyms, Word applications)
Grammar: Use of articles and zero article; prepositions.
Writing: Resume, Cover Letter.
Employability Skills: Time Management

UNIT-III: **Stephen Hawking-Positivity 'Benchmark'**

Speaking: Discussing specific topics in pairs or in small groups and reporting what is discussed. Functional English: Complaining and Apologizing.
Reading: Reading a text in detail by making basic inferences-recognizing and interpreting Specific context clues; strategies to use text clues for comprehension. Critical reading.
Vocabulary: Technical vocabulary from a cross technical branches, GREVocabulary(Antonyms and Synonyms, Word applications) Association, sequencing of words –
Grammar: Verbs– Tenses; subject-verb agreement.

Writing: Letter Writing: -Formal, Business, Editorial, Complaints, Applications, Permissions.
Employability Skills: Leadership skills.

UNIT-IV: Like a Tree, Unbowed: Wangari Maathai-biography

Reading: Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicative process or display complicated data.
Reading for Writing: Information transfer; describe, compare, contrast, identify significance / trends based on information provided in figures/charts/graphs/tables.
Vocabulary: Technical vocabulary from across technical branches, GRE Vocabulary,(Antonyms and Synonyms, Word applications) Cloze Encounters.
Writing: Essay Writings: - Paragraph Writing, Precis Writing,
Employability Skills: Management skills.

UNIT-V: Stay Hungry-Stay Foolish

Reading: RAP Strategy Intensive reading and Extensive reading techniques.
Reading for Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches, GRE Vocabulary (Antonyms and Synonyms, Word applications) Coherence, matching emotions.
Grammar: Editing short texts–identifying and correcting common errors in grammar and usage (Articles, prepositions, tenses, subject verb agreement)
Writing: E- Mail, Reports, Reporting to media.
Employability Skills: Creative Thinking.

TEXT BOOKS:

1. "*Infotech English*", Maruthi Publications.

REFERENCE BOOKS:

1. Bailey, Stephen. *Academic writing: A hand book for international students.* Routledge, 2014.
2. Chase, Becky Tarver. Pathways: *Listening, Speaking and Critical Thinking*. Heinley ELT; 2nd Edition, 2018.
3. *Skillful Level2 Reading & Writing Student's Book Pack* (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge *Academic English* (B2).CUP,2012.

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

SEMESTER - II

Course Code	Course Name	L	T	P	C
20SH2T02	APPLIED PHYSICS	3	0	0	3

COURSE OUTCOMES:

At the end of the Course, the student will be able to

CO1: Explain the need of coherent sources and the conditions for sustained interference.
CO2: Understand the basic concepts of LASER light Sources
CO3: Analyze the physical significance of wave function.
CO4: Identify the type of semiconductor using Hall effect.
CO5: Apply the concept of magnetism to magnetic devices

UNIT-I : WAVE OPTICS

INTERFERENCE: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications -Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

DIFFRACTION: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits(Qualitative) – Grating - Dispersive power and resolving power of Grating(Qualitative).

POLARIZATION: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT-II LASERS & FIBER OPTICS

LASERs: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation- Einstein's coefficients – Population inversion –Lasing action- Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

FIBER OPTICS: Introduction –Principle of optical fiber- Acceptance Angle-Numerical Aperture-Classification of optical fibers based on refractive index profile and modes –Propagation of electromagnetic wave through optical fibers - Applications.

UNIT-III MAGNETISM & DIELECTRICS

MAGNETISM: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment - Bohr magneton- Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism – Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

DIELECTRICS: Introduction - Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations: Electronic and Ionic (Quantitative), Orientation Polarizations (Qualitative) - Lorentz Internal field-Claussius –Mossotti's equation- Frequency dependence of polarization - Applications of dielectrics.

UNIT-IV : QUANTUM MECHANICS , FREE ELECTRON THEORY & BAND THEORY OF SOLIDS

Introduction – matter waves – de Broglie's hypothesis, Heisenberg's Uncertainty Principle Schrödinger time independent and time dependent wave equations – physical significance of Schrödinger wave function – Particle in a potential box (determination of energy).
FREE ELECTRON THEORY: Introduction - Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory- Equation for electrical conductivity based on quantum free electron theory-Fermi-Dirac distribution- Density of states (3D) – Fermi energy

BAND THEORY OF SOLIDS:
Introduction - Bloch thorem, krong-Penney model, E vsK diagram, effective mass of electron, classification of c solids –concept of hole.

UNIT – V : SEMICONDUCTOR PHYSICS
Introduction – Intrinsic semiconductors - density of charge carriers – Electrical conductivity - Fermi level - extrinsic semiconductors - P-type & N-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature- Drift and Diffusion currents - Einstein's equation. Hall effect- Hall coefficient - Applications of Hall effect.

TEXT BOOKS:
1. B. K. Pandey, S. Chaturvedi .,"*Engineering Physics*" - Cengage Publications, 2012
2. M.N. Avadhanulu, P.G.Kshirsagar., "*A Text book of Engineering Physics*" - S.Chand, 2017.
3. D.K.Bhattacharya and Poonam Tandon., "*Engineering Physics*", Oxford press (2015).
4. R.K Gaur. and S.L Gupta., "*Engineering Physics*" - Dhanpat Rai publishers, 2012.

REFERENCE BOOKS:
1. M.R.Srinivasan, "*Engineering Physics*", New Age international publishers (2009).
2. Ajoy Ghatak "*Optics*", 6th Edition McGraw Hill Education, 2017.
3. A.J.Dekker "*Solid State Physics*", Mc Millan Publishers (2011).

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

SEMESTER - II

Course Code	Course Name	L	T	P	C
20SH2T07	LINEAR ALGEBRA & VECTOR CALCULUS	3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

CO 1 : Solve simultaneous linear equations numerically using various matrix methods.

CO 2 : Find the Eigen values and Eigen vectors of a given matrix and nature of quadratic form.

CO 3 : Determine double integral over a region and triple integral over a volume.

CO 4 : Calculate gradient of a scalar function, divergence and curl of a vector function.

CO5 : Determine line, surface and volume integrals and apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT I: Linear systems of equations:

Rank - Echelon form – Normal form – Solving system of homogeneous and Non– Homogeneous equations – Gauss elimination – Gauss Jordon. Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms:

Eigen values – Eigen vectors– Properties (without proof) – Clayey-Hamilton theorem (Without of proof) – Inverse and powers of a matrix by using Clayey-Hamilton theorem– Diagonalisation – Reduction of quadratic form to canonical form by Orthogonalisation – Rank – Positive, negative and semi definite – Index – Signature.

UNIT III: Multiple integrals:

Double and Triple integrals – Change of order of integration – Change of variables. Applications: Finding Areas.

UNIT IV: Vector Differentiation:

Gradient– Directional derivative – Divergence – Curl – Scalar Potential – Laplacian and second order operators -Vector identities.

UNIT V: Vector Integration

Line integral – Work done – Potential function – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) .

Text Books:

1. **B. S. Grewal,** *Higher Engineering Mathematics*, 43rd Edition, Khanna Publishers.
2. **B. V. Ramana,** *Higher Engineering Mathematics*, 2007 Edition, Tata Mc. Graw HillEducation.

Reference Books:

1. **Erwin Kreyszig,** *Advanced Engineering Mathematics*, 10th Edition, Wiley-India.
2. **Dass H.K., Rajnish Verma. Er.,** *Higher Engineering Mathematics*, S. Chand Co.Pvt. Ltd, Delhi

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

SEMESTER - II

Course Code	Course Name	L	T	P	C
20EC2T01	DIGITAL LOGIC DESIGN	3	0	0	3

COURSE OUTCOMES:

At the end of the Course, Student will be able to:

CO1 : Define different number systems and recognize various applications of it.

CO2 : Select the concept of Boolean algebra in minimization and identify the solution of switching functions.

CO3 : Execute different types of combinational logiccircuits.

CO4 : Execute thePLA logic for different applications

CO5 : Use knowledge of flip-flops in operation of Registers andcounters

UNIT-I: **NUMBER SYSTEMS & CODES:**

Review of number systems, conversions, r's and r-1's complements of signed numbers, arithmetic addition and subtraction, Gray code, 4-bit codes, Error detection and correction codes.

UNIT-II: **BOOLEAN THEOREMS &MINIMIZATION TECHNIQUES**

Boolean theorems, representations of Boolean functions, logic gates, NAND-NAND and NOR-NOR realizations, Minimization of switching functions using Boolean theorems, K-map (up to 5 variables) and tabular method, with & without Don't-care conditions.

UNIT-III: **COMBINATIONAL LOGIC CIRCUIT DESIGN**

Analysis and design procedure of combinational logic circuits: Half-adder, Full-adder, Half-subtractor, Full-subtractor, 4-bit adder-subtractor, Decoders, Encoders, Multiplexers, De-Multiplexers, comparator, code converts.

UNIT-IV: **INTRODUCTION OF PROGRAMMABLE LOGIC DEVICES**

PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table, memory types

UNIT-V: **SEQUENTIAL LOGIC CIRCUIT DESIGN**

Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops: RS, JK, D and T flip-flops truth and excitation tables, conversion of flip-flops. Registers, shift registers, Counters: synchronous and asynchronous.

TEXT BOOKS:

1. M.Morris Mano, *Digital Design*, 4th Edition, PHI Publication, 2008.
2. A. Anand Kumar, *Fundamentals of digital circuits*, 4th Edition, PHI Publication, 2016.

REFERENCE BOOKS:

1. Norman Balabanian and Bradley Carlson, *Digital Logic Design Principles* 1st Edition,Wiley Publisher, 2010
2. John P.Hayes, *Introduction to Digital Logic Design*, 1st Edition, Pearson Publication,1993.
3. Alam Mansaf and Alam Bashir, *Digital Logic Design*, PHI Publication, 2015.

SEMESTER - II

Course Code	Course Name	L	T	P	C
20CS2T01	PYTHON PROGRAMMING	3	0	0	3

Course Objectives:

The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops &functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:

At the end of the Course, the student will be able to

CO1: Develop essential programming skills in computer programming concepts like data types, containers

CO2: Apply the basics of programming in the Python language

CO3: Solve coding tasks related conditional execution, loops

CO4: Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming.

UNIT I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.

Programming: Introduction to Programming Concepts with Scratch.

UNIT II

Repetition Structures: Introduction, while loop, for loop, Nested Loops.

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods TextFiles, string pattern matching. Understanding

read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

UNIT III

List and Dictionaries: Lists, tuple, Dictionaries and sets, frozen sets.

Design with Function: Defining Simple Functions, Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Managing a Program's Namespace, Higher Order Function.

Modules: Modules, Standard Modules, Packages.

UNIT IV

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Inheritance, overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support.

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism.

UNIT V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUIResources, Turtle Graphics

Testing: Basics of testing? unit testing in python, writing test cases, running tests.

Text Books

1) *Fundamentals of Python First Programs*, Kenneth. A. Lambert,Cengage.
2) *Python Programming: A Modern Approach*, VamsiKurama,Pearson.
3) ReemaThareja, *Python Programming using problem solving Approach*, Oxford University Press 2017
4) R. NageswaraRao *core python Programming* second Edition.

Reference Books:

1) *Introduction to Python Programming*, Gowrishankar.S, VeenaA, CRC Press.
2) *Introduction to Programming Using Python*, Y. Daniel Liang,Pearson.

E - Resources:

1. https://www.tutorialspoint.com/python3/python_tutorial.pdf
2. https://bugs.python.org/file47781/Tutorial_EDIT.pdf

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

SEMESTER - II

Course Code	Course Name	L	T	P	C
20GE2M01	ENVIRONMENTAL SCIENCES	2	0	0	0

COURSE OUTCOMES:

After successful completion of this course, students will be able to

CO1 : Identify the fundamental concepts and the first global initiatives towards sustainable development and the possible means to combat the challenges

CO2 : Examine the natural resources, their availability for the sustenance of the life and recognize the need to promote the green technologies to conserve the natural resources

CO3 : Assess the concepts of the ecosystem, its function in the environment and the need for protecting various ecosystems
Discuss the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity

CO4 : Explain various attributes of the pollution and their impacts and measures to control the pollution along with waste management practices

CO5 : Outline the social issues including the environmental legislations of India and environmental assessment and also to investigate the industrial, urban and rural conditions in the surroundings.

UNIT I: Scope and Importance of Environmental Studies

Definition and components of environment, Scope and Importance: Sustainability: Stockholm and Rio Summit: Global Environmental Challenges: Global warming and climate change- Acid rains, Ozone layer depletion, Population Explosion and effects, Role of IT in environmental protection and human health.

UNIT-II: Natural Resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems,

Energy resources: Growing energy needs, renewable and non-renewable energy sources

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification.

UNIT-III: Ecosystems and Biodiversity and its conservation

Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem –Bio geo chemical cycles-Ecological succession. – Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

Green Campus and Green Energy. Identification of species by involving in activities like plantation inside or outside the campus.

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity - classification - Value of biodiversity: consumptive use, productive use, social- India as a mega-diversity nation - Hot-spots of biodiversity- Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity.

UNIT-IV: Environmental Pollution

Definition, Cause, effects and control measures of **Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards**. Role of an individual in prevention of pollution. - Pollution case studies,

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management. Industrial Disasters and Pollution Case studies: -Bhopal Disaster, Chernobyl accident, Love canal Disaster.

UNIT-V: Environmental Legislation and the Environmental Management

Environmental Protection Act –Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness

Impact Assessment and its significance-various stages of EIA, preparation of EMP and EIS, Eco-tourism.

Visit to an Industry / Urban/Rural/Agricultural Ecosystem and submit a report individually on any issues or Documentation of Plants and Animals (Field work Equal to 3 lecture hours).

TEXT BOOKS:

1. *Environment Studies*, Fourth Edition, Anubha Kaushik, C P Kaushik, New Age International Publishers.
2. *A Textbook of Environmental Studies*, Shaashi Chawla, TMH, New Delhi.
3. *Fundamentals of Environment Studies*, MahuaBasu and S.Xavier, Cambridge Publishers, 2014.
4. *Textbook of Environmental Science*, M. Anji Reddy, B S Publications, Hyderabad

REFERENCE BOOKS:

1. *Text Book of Environmental Studies*, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. *A Textbook of Environmental Studies*, Shaashi Chawla, TMH, NewDelhi

3. *Environmental Studies*, Benny Joseph, Tata McGraw Hill Co, NewDelhi
4. *Perspectives in Environment Studies*, Anubha Kaushik, C P Kaushik, New AgeInternational Publishers,2014

SEMESTER - II

Course Code	Course Name	L	T	P	C
20SH2L01	COMMUNICATIVE ENGLISH SKILLS LAB	0	0	3	1.5

Module - I:

Introduction to Phonetics.

a) Brief Introduction to Consonants
b) Brief Introduction to Vowels & Diphthongs

Module - II:

Listening Comprehension

a) Comprehending Spoken material in British English.
b) Comprehending Spoken material in American English.
c) Intelligent Listening in Situations.

Module -III:

Role – Play / Dialogue Writing

a) Introducing one and others.
b) Asking for and giving information.
c) Asking for and responding to give directions.
d) Seeking permission, requests.
e) Apologizing.

Module - IV:

Communication Skills

a) Verbal and Non – verbal communications
b) Barriers of communication.
c) Body Language – Voluntary and Involuntary.

Module - V:

Presentation Skills.

a) Extempore
b) JAM Sessions
c) Paper Presentation

Module - VI:

a) Group Discussions: Dos and Don'ts- Types, Modalities

Resume Preparation

References:

1. Infotech English, Maruthi Publications (with Compact Disc).
2. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.

3. English Pronunciation in use- Mark Hancock, Cambridge University Press.
4. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
5. English Pronunciation in use- Mark Hewings, Cambridge University Press.
6. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
7. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
8. Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
9. Technical Communication- Gajendrea Singh Chauhan, SmitaKashiramka, Cengage Publications.

SEMESTER - II

Course Code	Course Name	L	T	P	C
20SH2L02	APPLIED PHYSICS LAB	0	0	3	1.5

COURSE OUTCOMES:

After successful completion of this course, students should be able to

CO1 : **Memorize** the conditions for sustained Interference and Diffraction.
CO2 : **Understand** the basic concepts of LASER.
CO3 : **Identify** the properties of various materials.
CO4 : **Apply** the concept of dielectrics on the materials.
CO5 : **Analyze** the acoustic properties of sound.

List of Experiments :

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
4. Energy Band gap of a Semiconductor p - n junction
5. Characteristics of Thermistor – Temperature Coefficients
6. Determination of dielectric constant.
7. LASER - Determination of wavelength by plane diffraction grating
8. Rigidity modulus of material by wire-dynamic method (Torsional pendulum)
9. Verification of laws of vibrations in a stretched string – Sonometer
10. LASER - Determination of particle size using laser.
11. Determination of moment of inertia of a fly wheel.
12. Melde's Experiment – Transverse and longitudinal waves
13. Determination of time constant – C- R Circuit.
14. I/V Characteristics of ZENAR diode.

SEMESTER - II

Course Code	Course Name	L	T	P	C
20CS2L01	PYTHON PROGRAMMING LAB	0	0	3	1.5

Course Objectives:

The aim of Python Programming Lab is

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Course Outcomes*:*

At the end of the Course, the student will be able to

CO 1: Write, Test and Debug Python Programs

CO 2: Use Conditionals and Loops for Python Programs

CO 3: Use functions and represent Compound data using Lists, Tuples and Dictionaries

CO 4: Use various applications using python

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86,89.
4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

```
*
**
***
****
```

6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and Not closeotherwise.
8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program

should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*

10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be1,000,000.
11) Write a program that generates a list of 20 random numbers between 1 and100.
12) Print the list.
13) Print the average of the elements in the list.
14) Print the largest and smallest values in the list.
15) Print the second largest and second smallest entries in the list
16) Print how many even numbers are in the list.
17) Write a program to use split and join methods in the given string and store them in a dictionary data structure.
18) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].
19) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, it is much shorter with lists and it is also easier to add new conversions if you use lists.
20) Write a function called *sum_digits*that is given an integer num and returns the sum of the digits of num.
21) Write a function called *first_diff*that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return-1.
22) Write a function called *number_of_factors*that takes an integer and returns how many factors the number has.
23) Write a function called *is_sorted*that is given a list and returns True if the list is sorted and False otherwise.
24) Write a function called root that is given a number x and an integer n and returns x1/n. In the function definition, set the default value of n to 2.
25) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
    (a)Do this using the sort method. (b) Do this without using the sort method
26) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
27) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
28) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file calledftemps.txt.

29) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price*that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase*that receives the number of items to be bought and decreases amount by thatmuch.
30) Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes*that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours*that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
31) Write a Python class to implement pow(x,n).
32) Write a Python class to reverse a string word byword.
33) Write a program to demonstrate Try/except/else.
34) Write a function nearly _equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
35) Write a python program to create wheel using turtle graphics.
36) Write a python program on GUI to create a Registration form.
37) Write a python program to check whether a string starts and ends with the same character or not (using Regular Expression re module).

Text Books

1) *Fundamentals of Python First Programs*, Kenneth. A. Lambert,Cengage.
2) *Python Programming: A Modern Approach*, VamsiKurama,Pearson.
3) ReemaThareja, *Python Programming using problem solving Approach*, Oxford University Press 2017
4) R. NageswaraRao *core python Programming* second Edition.

Reference Books:

1) *Introduction to Python Programming*, Gowrishankar.S, VeenaA, CRC Press.
2) *Introduction to Programming Using Python*, Y. Daniel Liang,Pearson.

E-Resources:

1) https://www.tutorialspoint.com/python3/python_tutorial.pdf
2) https://bugs.python.org/file47781/Tutorial_EDIT.pdf

SEMESTER - III

Course Code	Course Name	L	T	P	C
20SH3T05	PROBABILITY & STATISTICS	3	0	0	3

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

At the end of the Course, the student will be able to

CO1 : Determine the mean and variance of discrete and continuous random variables.

CO2 : Calculate probabilities using normal distribution and construct sampling distribution of means.

CO3 : Estimate the confidence interval for the mean of a population and test a hypothesis concerning means.

CO4: Estimate the confidence intervals, test a hypothesis concerning variances and proportions.

CO5 : Calculate correlation coefficient and determine line a regression for bivariate data.

Unit I:

Random Variables: Random variables, types of random variables, probability distribution function, probability density function, mean and variance of a random variable

Unit II:

Probability Distributions and Sampling Distributions:

Normal distribution: calculating normal probabilities, normal approximation to the Binomial distribution. Sampling distributions: population and sample, sampling distribution of the mean (known), sampling distribution of the mean (unknown).

Unit III:

Estimation and Test of Hypothesis of Means :

Point estimation, interval estimation, introduction to test of hypothesis, hypotheses is concerning one mean, hypothesis concerning two means, matched pair comparisons.

Unit IV:

Estimation, Test of Hypothesis of Variances and Proportions Estimation of variance, hypothesis concerning one variance, hypothesis concerning two variances, estimation of proportion, hypothecs is concerning one proportion, hypotheses are concerning several proportions.

Unit V:

Regression analysis:

The method of least squares, curvilinear regression, multiple regression, correlation (excluding causation).

Text book:

1. Richard A. Johnson,"*Miller & Freund's Probability and Statistics for Engineers*", 8th edition, PHIL earning India Private Limited, 2011.

Reference Books:

1) S.Ross,"*A First Coursein Probability*", Pearson Education India, 2002.
2) W. Feller, "*An Introduction to Probability Theory and its Applications*", 1st edition, Wiley,1968.
3) Gilbert Strang, "*Introduction to Linear Algebra*", 5thedition, Wellesely- Cambridge Press, 2016.

SEMESTER - III

Course Code	Course Name	L	T	P	C
20CS3T04	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	3	0	0	3

Course Objectives:

This course is designed to:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

Course Outcomes:

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

CO1: Demonstrate skills in solving mathematical problems.

CO2: Comprehend mathematical principles and logic.

CO3: Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software.

CO4: Manipulate and analyze data numerically and/or graphically using appropriate Software.

CO5: Communicate effectively mathematical ideas/results verbally or in writing.

UNIT I

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II

Set Theory: Sets: Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hassie Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Sub group and Abelian Group, Homomorphism, Isomorphism.

UNIT III

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial

Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem, Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems.

UNIT IV

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.

UNIT V

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, BFS and DFS Spanning Trees.

Text Books:

1) *Discrete Mathematical Structures with Applications to Computer Science*, J. P. Tremblay and P.Manohar, Tata McGraw Hill.
2) *Elements of Discrete Mathematics-A Computer Oriented Approach*, C. L. Liu and D. P. Mohapatra,3rdEdition, Tata McGraw Hill.

Reference Books:

1. *Discrete Mathematics for Computer Scientists and Mathematicians*, J. L. Mott, A. Kandel and T. P.Baker, 2nd Edition, Prentice Hall of India.
2. *Discrete Mathematical Structures,* Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3. *Discrete Mathematics and its Applications with Combinatorics and Graph Theory*, K. H. Rosen, 7th Edition, Tata McGraw Hill.

E-Resources:

1) https://nptel.ac.in/courses/106/106/106106094/

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

SEMESTER - III

Course Code	Course Name	L	T	P	C
20CS3T05	DATA STRUCTURES & ALGORITHMS	3	0	0	3

COURSE OUTCOMES:

At the end of the Course, the student shall be able to

CO 1: Analyze algorithms and Describe searching, sorting and hashing techniques.
CO 2: Describe the concepts of stacks and queues.
CO 3: Apply the concepts of linked lists.
CO 4: Describe the concepts of trees.
CO 5: Explain the concepts of graphs

UNIT-I: **Analysis of Algorithms:** Efficiency of algorithms, Apriori Analysis, Asymptotic notations, Time complexity of algorithms using Onotation, Polynomial Vs Exponential algorithms, Average, Best, Worstcase complexities, Analyzing recursive programs.
Searching: Introduction, Linear Search, Binary Search, Fibonacci Search.
Internal Sorting: Introduction, Bubble Sort, Insertion Sort, Selection Sort.
Hashing : Introduction, Hash Table Structure, Hash Functions

UNIT-II: Stacks: Introduction, Stack operations, Applications.
Queues : Introduction, Operations on queues, circular queues, Priority queues, Applications

UNIT-III

Linked Lists: Introduction, Singly linked lists, Circular linked lists, Doubly linked lists, Multiple linked lists, Applications.
Linked Stacks and Linked Queues: Introduction, Operations on linked stacks and linked queues, Dynamic memory management, Implementation of linked representations, Applications

UNIT-IV: Trees and Binary Trees: Introduction, Trees: Definition and Basic Terminologies, Representation of trees. Binary trees: Basic terminologies and types, representation of binary trees, binary tree traversals, applications.
Binary Search Trees and AVL Trees : Introduction, Binary search trees: Definition and operations, AVL Trees: Definition and operations, Applications

UNIT-V

Graphs: Introduction, Definitions and basic terminologies, Representations of graphs, Graph traversals and applications.

TEXT BOOKS:

1. *Data Struct & Algorithm Analysis in C* | Second Edition | Mark Allen Weiss |by Pearson

2. *Data Structures using C* |Second Edition| by Reema Thareja| Oxford
3. *Data Structures&Algorithm Analysisin C++*|ThirdEdition| MarkAllen Weiss|byPearson

REFERENCES:

1. G.A.V. PAI, *Data Structures and Algorithms, Concepts, Techniques and Applications*,Volume1,1st Edition , TataMcGraw-Hill,2008.
2. Richard F. Gilberg & Behrouz A. Forouzan, *Data Structures, Pseudo code Approach withC*,2nd Edition, CengageLearningIndiaEdition,2007.
3. angsam,M.J.Augenstein,A.M.Tanenbaum,*Data structure susing C and C++*, 2nd Edition, PHIE ducation, 2008.
4. Sartaj Sahni, Ellis Horowitz, *Fundamentals of Data Structures in C*, 2nd Edition, Orient blacks wan, 2010.

E- REFERENCES:

1. https://www.javatpoint.com/data-structure-tutorial

SEMESTER - III

Course Code	Course Name	L	T	P	C
20IT3T01	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	3	0	0	3

Course Objectives:

The learning objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes,invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exceptionhandling in Java applications
- To understand how to design applications with threads in Java
- To understand how to use Java APIs for program development

Course Outcomes:

By the end of the course, the student will be

CO1: Able to realize the concept of Object Oriented Programming & Java Programming Constructs

CO2: Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages,Enumeration and various keywords.

CO3: Apply the concept of exception handling and Input/ Output operations

CO4: Able to design the applications of Java & Java applet

CO5: Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

UNIT I

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java. time. Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling :Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class

String Buffer, Class String Builder.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

Text Books:

1) *JAVA one step ahead,* Anitha Seth, B.L.Juneja, Oxford.
2) *The complete Reference Java*, 8th edition, Herbert Schildt, TMH

References Books:

1) *Introduction to java programming*, 7th edition by Y Daniel Liang, Pearson
2) Murach's *Java Programming*, Joel Murach

E-Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

SEMESTER – III

Course Code	Course Name	L	T	P	C
20CI3T01	Introduction to Artificial Intelligence	3	0	0	3

Course Objectives:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence.
- To provide a basic exposition to the goals and methods of Artificial Intelligence.
- To apply the techniques in applications which involve perception, reasoning and learning?

Course Outcomes:

At the end of the Course, the student will be able to
CO1 : Enumerate the history and foundations of Artificial Intelligence
CO2 : Apply the basic principles of AI in problem solving
CO3 : Choose the appropriate Knowledge representation scheme
CO4: Solve the problems with uncertainty using probability
CO5: Examine the Scope of AI and its societal implications

UNITI

Introduction: What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNITII

Problem Solving: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Non deterministic Actions.

UNITIII

Knowledge Representation: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

UNITIV

Uncertain Knowledge and Reasoning: Acting under Uncertainty**,** Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, RepresentingKnowledgeinanUncertainDomain,TheSemanticsofBayesianNetworks.

UNITV

AI present and Future: Weak AI: Can Machines Act Intelligently?, Strong AI: Can Machines Really Think?, The Ethics and Risks of Developing Artificial Intelligence, Agent Components, Agent Architectures, Are We Going in the Right Direction?, What If AIDoes Succeed?.

Text Books:

1) Stuart Russell and Peter Norvig, "*Artificial Intelligence: AModern Approach*", 3rd Edition, Pearson.
2) Elaine Rich and Kevin Knight, "*ArtificialIntel ligence*", Tata Mc Graw Hill

Reference Books:

1) Saroj Kaushik, "*Artificial Intelligence*", Cengage Learning India, 2011
2) David Poole and Alan Mack worth, "*Artificial Intelligence: Foundations for Computational Agents* ", Cambridge University Press 2010.
3) Trivedi,M.C., "*A Classical Approach to Artificial Intelligence*", Khanna Publishing House,Delhi.

Web Resources:

1) https://nptel.ac.in/courses/106105077
2) https://nptel.ac.in/courses/106106126
3) https://aima.cs.berkeley.edu
4) https://ai.berkeley,edu/project_overview.html

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

SEMESTER - III

Course Code	Course Name	L	T	P	C
20GE3M01	Constitution of India	2	0	0	0

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

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

CO1: Understand historical background of the constitution making and its importance for building a democratic India.

CO2: Understand the functioning of three wings of the governmentie., executive, legislative and judiciary.

CO3: Understand the value of the fundamental rights and duties for becoming good citizen of India.

CO4 : Analyze the decentralization of power between central, state and local self-government.

CO5 : Apply the knowledge in strengthen in gof the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

UNITI

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution -Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNITII

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

UNITIII

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNITIV

Local Administration - District's Administration Head-Role and Importance, Municipalities -Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy-(Different departments), Village level Role of Elected and Appointed officials - Importance of grass root

UNITV

Election Commission: Election Commission – Role of Chief Election Commissioner and Election Commissione rate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

References:

1) Durga DasBasu, *Introduction to the Constitution of India, Prentice Hall of India* Pvt.Ltd.
2) Subash Kashyap, *Indian Constitution*, National Book Trust
3) J.A.Siwach, *Dynamics of Indian Government & Politics*
4) D.C.Gupta, *Indian Government and Politics*
5) H.M.Sreevai, *Constitutional Law of India,* 4th edition in 3 volumes (Universal Law Publication)
6) J.C.Johari, *Indian Government and Politics Hans*
7) J.Raj *Indian Government and Politics*
8) M.V.Pylee, *Indian Constitution Durga Das Basu, Human Rightsin Constitutional Law*, Prentice–HallofIndiaPvt.Ltd..NewDelhi

e-Resources:

1) nptel.ac.in/courses/109104074/8
2) nptel.ac.in/courses/109104045/
3) nptel.ac.in/courses/101104065/
4) www.hss.iitb.ac.in/en/lecture-details
   www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution
5) https://www.javatpoint.com/html-tutorial
6) https://www.javatpoint.com/css-tutorial

SEMESTER - III

Course Code	Course Name	L	T	P	C
20CS3L03	DATA STRUCTURES & ALGORITHMS LAB	0	0	3	1.5

Course Outcomes:

At the end of this course, students will be able to:

CO1: Apply recursive and iterative methodologies to solve complex engineering problems.

CO2: Solve searching and sorting techniques and evaluate time & space complexities.

CO3: Develop solutions to create and implement operations of linear and nonlinear data structures.

CO 4: Identify and apply suitable data structure for a given real time problem

List of Experiments:

Exercise 1:

a) Write a recursive C program to calculate Factorial of an integer.

b) Write a recursive C program which computes the n^{th} Fibonacci number, for appropriate values of n.

Exercise 2:

a) Write a recursive C program to calculate GCD (n, m).

b) Write a recursive C program for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.

Exercise 3:

a) Write a C program that implements Selection sort, to sort a given list of integers in ascending order.

b) Write a C program that implements Insertion sort, to sort a given list of integers in ascending order.

Exercise 4:

a) Write a C program that implements Quick sort, to sort a given list of integers in ascending order.

b) Write a C program that implements Radix sort, to sort a given list of integers in ascending order.

c) Write a C program that implements Merge sort, to sort a given list of integers in ascending order.

Exercise 5:

a) Write a C program that implements Stack (its operations) using arrays.

b) Write a C program that uses Stack operations to convert infix expression into postfix expression

Exercise 6:

a) Write a C program that implements Queue (its operations) using arrays.
b) Write a C program that implements Circular Queue (its operations) using arrays.

Exercise 7:

a) Write a C program that uses functions to create a singly linked list and its operations(insert, delete, search).
b) Write a C program to reverse elements of a singly linked list.

Exercise 8:

a) Write a C program that implements Stack (its operations) using Linked list.
b) Write a C program that implements Queue (its operations) using Linked list.

Exercise 9:

a) Write a C program to create a Circular Linked list and its operations(insert, delete, search).
a) Write a C program to create a Doubly Linked list and its operations(insert, delete, search).

Exercise 10:

a) Write a C program to create a Binary Search Tree and its operations.
b) Write a recursive C program for traversing a Binary Search Tree in preorder, inorder and postorder.

Exercise 11:

a) Write a C program to perform BFS traversal on given graph.
b) Write a C program to perform DFS traversal on given graph.

TEXT BOOKS:

1. Richard F, Gilberg, Forouzan, *Data Structures*, 2nd edition, Cengage
2. Aaron M. Tenenbaum, YedidyahLangsam, Moshe J Augenstein, *Data Structures using C*, Pearson.
3. Mark Allen Weiss, *Data structures and Algorithm Analysis in C*, 2nd edition, Pearson Education. Ltd.

REFERENCE BOOKS:

1. Jean-Paul Tremblay Paul G. Sorenson, *An Introduction to Data Structures with Applications*, 2nd edition, Mc Graw Hill Higher Education
2. Seymour Lipschutz, *Data Structure with C*, TMH
3. ReemaThareja, *Data Structures using C*, 2nd edition, Oxford

SEMESTER - III

Course Code	Course Name	L	T	P	C
20IT3L01	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB	0	0	3	1.5

Course Objectives:

The aim of this lab is to

- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language
- Learn use of Java in a variety of technologies and on different platforms

Course Outcomes:

By the end of the course student will be able to write java program for

CO1: Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings

CO2: Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism.

CO3: Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism

CO4: Construct Threads, Event Handling, implement packages, developing applets

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary searchmechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using StringBuffer to delete, remove character

Exercise - 3 (Class, Objects)

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.

b) Write a JAVA program to implement constructor

Exercise - 4 (Methods)

a) Write a JAVA program to implement constructor overloading.

b) Write a JAVA program implement method overloading

Exercise - 5 (Inheritance)

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance

c) Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

a) Write a JAVA program give example for "super" keyword.

b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

a) Write a JAVA program for creation of Illustrating throw

b) Write a JAVA program for creation of Illustrating finally

c) Write a JAVA program for creation of Java Built-in Exceptions

d) Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)

b) Write a program illustrating **isAlive** and **join ()**

c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

a) Write a JAVA program Producer Consumer Problem

b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)

a) Write a JAVA program illustrate class path
b) Write a case study on including in class path in your os environment of your package.
c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)

a) Write a JAVA program to paint like paint brush in applet.
b) Write a JAVA program to display analog clock using Applet.
c) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)

a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.
b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet

TEXT BOOKS:

1. Herbert schildt and Dale skrien, *Java Fundamentals- A Comprehensive introduction*, TMH.
2. P.J.Dietel and H.M.Dietel, *Java: How to Program* , PHI.

REFERENCE BOOKS:

1. P.Radha Krishna, *Object Oriented Programming through java*, Universities Press.
2. Bruce Eckel, *Thinking in Java,* Pearson Education.
3. S.Malhotra and S.Choudhary, *Programming in Java*, Oxford University Press

SEMESTER - III

Course Code	Course Name	L	T	P	C
20CI3L01	INTRODUCTION TO ARTIFICIAL INTELLIGENCE LAB	0	0	3	1.5

Course Objectives:

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

Course Outcomes:

At the end of the Course, the student will be able to

CO1: Apply the basic principles of AI in problem solving using LISP/PROLOG

CO2: Implement different algorithms using LISP/PROLOG

CO3: Develop an Expert System using JESS/PROLOG

List of Experiments

1. Implementation of DFS for water jug problem using LISP/PROLOG
2. Implementation of BFS for tic-tac-toe problem using LISP/PROLOG/Java
3. Implementation of TSP using heuristic approach using Java/LISP/Prolog
4. Implementation of Simulated Annealing Algorithm using LISP/PROLOG
5. Implementation of Hill-climbing to solve 8-Puzzle Problem
6. Implementation of Monkey Banana Problem using LISP/PROLOG
7. Implementation of A* Algorithm using LISP/PROLOG
8. Implementation of Hill Climbing Algorithm using LISP/PROLOG
9. Implementation Expert System with forward chaining using JESS/CLIPS
10. Implementation Expert System with backward chaining using RVD/PROLOG

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

SEMESTER – III

Course Code	Course Name	L	T	P	C
20CS3S01	MOBILE APP DEVELOPMENT	1	0	2	2

Course Objectives:

- To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.

Course Outcomes:

At the end of this course, students will be able to:

CO1: Identify various concepts of mobile programming that make it unique from programming for other Platforms.

CO2: Critique mobile applications on their design pros and cons

CO3: Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,

CO4: Program mobile applications for the Android operating system that use basic and advanced phone features and Deploy applications to the Android marketplace for distribution.

LIST OF EXPERIMENTS:

1. Introduction to mobile technologies and devices , Android platform and applications overview
2. Setting Android development environments
3. Writing Android applications, Understanding anatomy of an Android application
4. Develop an application that uses GUI components, Font and Colours
5. Develop an application that uses Layout Managers and event listeners.
6. Write an application that draws basic graphical primitives on the screen.
7. Develop an application that makes use of databases.
8. Develop an application that makes use of Notification Manager
9. Implement an application that uses Multi-threading
10. Develop a native application that uses GPS location information
11. Implement an application that writes data to the SD card.
12. Implement an application that creates an alert upon receiving a message
13. Write a mobile application that makes use of RSS feed
14. Develop a mobile application to send an email.
15. Develop a Mobile application for simple needs (Mini Project)

References:

1. *Android Programming unleashed* , B.M. Harwani, Pearson, 2013.
2. *Android Programming (Big Nerd Ranch Guide*), by Bill Phillips, Chris Stewart, Brian Hardy, Kristin Marsicano, Pearson, 2016
3. *Android Programming* – Pushing the limits by Hellman by Erik Hellman, WILEY, 2013

Web References:

1. The Complete Android N Developer Course –Udemy https://www.udemy.com/course/complete-android-n-developer-course/?altsc=428526
2. Android Development Courses on Google developers training https://developers.google.com/training/android/
3. Mobile Computing - Video course- NPTEL https://nptel.ac.in/courses/106/106/106106147/#
4. Android Tutorial – Tutorial Point https://www.tutorialspoint.com/android/index.htm

SEMESTER - IV

Course Code	Course Name	L	T	P	C
20SH4T03	NUMERICAL METHODS & TRANSFORMATIONS	3	0	0	3

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced levelby handling various real world applications.

Course Outcomes:

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

CO1: Evaluate approximating the roots of polynomial and transcendental equations

CO2: Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals.

CO3: Apply different algorithms for approximating the solutions of ordinary Differential equations toits analytical computations .

CO4: Apply the Laplace transform for solving differential equations.

CO5: Find or compute the Fourier series of periodic signals and apply integral Expressions for the forwards and inverse Fourier transform to a range of non- periodic waveforms.

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UNIT I : Iterative methods:

Introduction – Bisection method – Iteration method – Newton-Raphson method (One variable) – Jacobi and Gauss-Seidel methods for solving system of equations.

UNIT II: Interpolation:

Introduction – Finite differences – Forward differences – Backward differences – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula.

UNIT III: Numerical integration and solution of ordinary differential equations

Trapezoidal rule – Simpson's 1/3rd and 3/8th rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order).

UNIT-IV: Laplace Transform :

Laplace transforms of standard functions-Shifting Theorems, Transforms of derivatives and integrals , Inverse Laplace transforms– Convolution theorem (with out proof).Application : Solutions of ordinary differential equations using Laplace transforms

UNIT V: Fourier Series:

Introduction- Periodic functions – Fourier series of -periodic function - Dirichlet's conditions–

Even and odd functions –Change of interval– Half-range sine and cosine series. **Fourier Transforms**: Fourier integral theorem (without proof) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

Text Books:

1. **B. S. Grewal,** *Higher Engineering Mathematics*, 43rd Edition, Khanna Publishers.
2. **B. V. Ramana,** *Higher Engineering Mathematics*, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, Wiley-India.
2. Dass H.K., Rajnish Verma. Er., *Higher Engineering Mathematics*, S. Chand Co. Pvt. Ltd, Delhi

SEMESTER - IV

Course Code	Course Name	L	T	P	C
20CI4T01	COMPUTER ORGANIZATION	3	0	0	3

Course Objectives:

The course objectives of Computer Organization are to discuss and make student familiar with

- Principles and the Implementation of Computer Arithmetic
- Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
- Fundamentals of different Instruction Set Architectures and their relationship to the CPU Design
- Memory System and I/O Organization
- Principles of Operation of Multi processor Systems and Pipelining

Course Outcomes:

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

CO1: Develop a detailed understanding of computer systems

CO2: Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations

CO3: Develop a detailed understanding of architecture and functionality of central processing unit

CO4: Exemplify in a better way the I/O and memory organization

CO5: Illustrate concepts of parallel processing, pipelining and inter processor communication

UNITI

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating, Point Representation. Other Binary Codes, Error Detection Codes.

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNITII

Register Transfer Language and Micro operations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory–Reference Instructions. Input–Output and Interrupt, Complete Computer Description.

UNITIII

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

Micro programmed Control: Control Memory, Address Sequencing, MicroProgram example, Design of Control Unit.

UNITIV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

UNITV

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.

Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:

1) *Computer System Architecture*, M.Morris Mano,Third Edition, Pearson, 2008.
2) *Computer Organization*, Carl Hamacher,ZvonkoVranesic,SafwatZaky,5/e,McGrawHill,2002.

Reference Books:

1) *Computer Organization and Architecture*,WilliamStallings,6/e,Pearson, 2006.
2) *Structured Computer Organization*, AndrewS.Tanenbaum,4/e,Pearson,2005.
3) *Fundamentals of Computer Organization and Design*, Sivarama P. Dandamudi, Springer, 2006.

WebResources:

1) https://nptel.ac.in/courses/106/105/106105163/
2) http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf

SEMESTER - IV

Course Code	Course Name	L	T	P	C
20CS4T01	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

Course Objectives:

- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptualdesign, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexingtechniques and storage techniques

Course Outcomes:

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

CO1 : Describe a relational database and object-oriented database
CO2 : Create, maintain and manipulate a relational database using SQL
CO3: Describe ER model and normalization for database design
CO4 : Examine issues in data storage and query processing and can formulate appropriate solutions
CO5: Outline the role and issues in management of data such as efficiency, privacy, security, ethicalresponsibility, and strategic advantage

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure.

UNIT II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV

Schema Refinement (Normalization):Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Failure Classification.

Indexing Techniques: File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing: Tree base Indexing, Comparison of File Organizations.

Text Books:

1) *Database Management Systems*, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2) *Database System Concepts,*5/e, Silberschatz, Korth, TMH

Reference Books:

1) *Introduction to Database Systems*, 8/e C J Date, PEA.
2) *Database Management System*, 6/e RamezElmasri, Shamkant B. Navathe, PEA
3) *Database Principles Fundamentals of Design Implementation and Management,* Corlos Coronel,Steven Morris, Peter Robb, Cengage Learning.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105175/
2) https://www.geeksforgeeks.org/introduction-to-nosql/

SEMESTER - IV

Course Code	Course Name	L	T	P	C
20CS4T02	FORMAL LANGUAGES AND AUTOMATA THEORY	3	0	0	3

Course Objectives:

- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Regular Language and Finite Automata and machines
- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators
- To understand the relation between Contexts free Languages, PDA and TM
- To learn how to design PDA as acceptor and TM as Calculators

Course Outcomes:

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

CO1: Classify machines by their power to recognize languages.
CO2: Summarize language classes & grammars relationship among them with the help of Chomskyhierarchy
CO3: Employ finite state machines to solve problems in computing
CO4: Illustrate deterministic and non-deterministic machines
CO5: Quote the hierarchy of problems arising in the computer science

UNIT I

Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with Є-Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT II

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.

UNIT III

Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, Є-Productions and Unit Productions, Normal Forms-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT IV

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

UNIT V

Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:

1) *Introduction to Automata Theory, Languages and Computation*, J. E. Hopcroft, R. Motwani and J. D. Ull man, 3rd Edition, Pearson, 2008
2) *Theory of Computer Science-Automata, Languages and Computation*, K. L. P. Mishra and N. Chandra sekharan, 3rd Edition, PHI, 2007

Reference Books:

1) *Elements of Theory of Computation*, Lewis H.P. &Papadimition C.H., Pearson /PHI
2) *Theory of Computation*, V. Kulkarni, Oxford University Press, 2013
3) *Theory of Automata, Languages and Computation*, Rajendra Kumar, McGraw Hill, 2014

e-Resources:

1) https://nptel.ac.in/courses/106/104/106104028/

SEMESTER - IV

Course Code	Course Name	L	T	P	C
20SH4T01	MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY	3	0	0	3

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for aproduct.

CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the leastcost combination of inputs.

CO3: The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.

CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools forAnalysis.

CO5: The Learner can able to evaluate various investment project proposals with the help of capitalbudgeting techniques for decision making.

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions- Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and mplicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements- Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems).

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, *Managerial Economics and Financial Analysis*, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, *Managerial Economics*, S. Chand & Company Ltd.
2) JL Pappas and EF Brigham, *Managerial Economics*, Holt, R & W; New edition
3) N.P Srinivasn and M. SakthivelMurugan, *Accounting for Management*, S. Chand & Company Ltd.
4) MaheswariS.N, *An Introduction to Accountancy*, Vikas Publishing House Pvt Ltd
5) I.M Pandey, *Financial Management* , Vikas Publishing House Pvt Ltd
6) V. Maheswari, *Managerial Economics*, S. Chand & Company Ltd.

SEMESTER - IV

Course Code	Course Name	L	T	P	C
20CS4L01	DATABASE MANAGEMENT SYSTEMS LAB	0	0	3	1.5

Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:

At the end of this course, students will be able to:

CO1 : Utilize SQL to execute queries for creating database and performing data manipulation Operations.

CO2 : Examine integrity constraints to build efficient databases

CO3 : Apply Queries using Advanced Concepts of SQL

CO4 : Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Exercises:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creatingtables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example: Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.
   i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printedfor those who secured first class and an exception can be raised if no records were found)
   ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression.The program can be extended using the NULLIF and COALESCE functions

7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN And OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements andwrite complex functions
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERECURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexingtechniques.

Text Books/Suggested Reading:

1) Oracle: *The Complete Reference by Oracle Press*
2) Nilesh Shah, "*Database Systems Using Oracle*", PHI, 2007
3) Rick F Vander Lans, "*Introduction to SQL*", Fourth Edition, Pearson Education, 2007

SEMESTER - IV

Course Code	Course Name	L	T	P	C
20CI4L01	Web Application Development Lab	0	0	3	1.5

Course Objectives:

- To develop the skill in Creating dynamic web pages with servlets
- To provide knowledge in connecting java programs with database using JDBC.
- To develop the skill in server side programming using JSP, node.js, React.js
- To provide knowledge about MERN stack
- Testing the application on an Application Server.
- Debugging Web applications locally and remotely

Course Outcomes:

At the end of the course, the student will be able to
CO1: Develop Single Page Applications
CO2: Develop Node JS & React JSRe usable Service
CO3: Store the data in MySQL
CO4: Get acquainted with the latest web application development trends in the IT industry

List of Experiments:

1. Authentication using Java Servlet
2. Authentication using JSP
3. Connect MySQL database using JSP
4. Design and development of Online Book Shop using JSP/Node.js & React.js
5. Design and development of Online Examination using JSP/Node.js & React.js
6. Design and development of online ticket reservation system using JSP/Node.js & React.js
7. Design and development of online library using JSP/Node.js & React.js
8. Design and development of online banking using JSP/Node.js & React.js
9. Design and development of online job portal using JSP/Node.js & React.js
10. Design and development of Online Auction using JSP/Node.js & React.js

Note: Students are encouraged to propose innovative ideas in the field of E-commerce as projects.

References

1. Jason Hunter, William Crawford, *Java Servlet Programming*, SecondEdition,,O'ReillyMedia
2. Hans Bergsten, *Java Server Pages*,O'Reilly
3. http://www.oracle.com/technetwork/java/index-jsp-135475.html
4. http://www.oracle.com/technetwork/java/javaee/jsp/index.html

SEMESTER - IV

Course Code	Course Name	L	T	P	C
20CS4L03	R PROGRAMMING LAB	0	0	3	1.5

Course Objective:

In this course student will learn about the fundamentals of R programming, standard R libraries, solid understanding of R functions, write programs using the R and gain skills in R programming Language, get acquaintances with Arrays, Files, Strings, Packages, and distributions using R.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Implement basic concepts of R programming, and its different module that includes conditional,looping, lists, Strings, Functions, Frames, Arrays, and File programming.
CO2: Implement the concepts of R Script to extract the data from data frames and file operations.
CO3: Implement the various statistical techniques using R.
CO4: Extend the functionality of R by using add-on packages
CO5: Use R Graphics and Tables to visualize results of various statistical operations on data

List of Lab Experiments:

Week 1:

a) Installing R and RStudio
b) Basic functionality of R, variable, data types in R

Week 2:

a) Implement R script to show the usage of various operators available in R language.
b) Implement R script to read person's age from keyboard and display whether he is eligible for voting or not.
c) Implement R script to find biggest number between two numbers.
d) Implement R script to check the given year is leap year ornot

Week 3:

a) Implement R Script to create a list.
b) Implement R Script to access elements in the list.
c) Implement R Script to merge two or more lists. Implement R Script to perform matrix operation

Week 4:

Implement R script to perform following operations:

a) various operations on vectors
b) Finding the sum and average of given numbers using arrays.

c) To display elements of list in reverse order.
d) Finding the minimum and maximum elements in the array.

Week 9*:*
a) Implement R Script to perform Normal, Binomial distributions.
b) Implement R Script to perform correlation, Linear and multiple regression.

Week 10:
a) Introduction to Non-Tabular Data Types: Time series, spatial data, Network data. Data Transformations: Converting Numeric Variables into Factors, Date Operations, String Parsing, Geocoding

Week 5:
a) Implement R Script to perform various operations on matrices
b) Implement R Script to extract the data from dataframes.
c) Write R script to display file contents.
d) Write R script to copy file contents from one file to another

Week 6 :
a) Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcar s& cars datasets.
b) Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset

Week 7:
a) Reading different types of data sets (.txt, .csv) from Web or disk and writing in file in specific disklocation.
b) Reading Excel data sheet in R.
c) Reading XML dataset in R

Week 8:
a) Implement R Script to create a Pie chart, Bar Chart, scatter plot and Histogram (Introduction toggplot2 graphics)
b) Implement R Script to perform mean, median, mode, range, summary, variance, standard deviation operations.

Week 11:
a) Introduction Dirty data problems: Missing values, data manipulation, duplicates, forms of data dates,outliers, spelling

Week 12:
a) Data sources: SQLite examples for relational databases, Loading SPSS and SAS files, Reading

fromGoogle Spreadsheets, API and web scraping examples

References:

1. R Cookbook Paperback – 2011 by Teetor Paul O Reilly Publications
2. Beginning R: The Statistical Programming Language by Dr. Mark Gardener, Wiley Publications
3. R Programming For Dummies by JorisMeysAndrie de Vries, Wiley Publications
4. Hands-On Programming with R by Grolemund, O Reilly Publications
5. Statistical Programming in R by KG Srinivas G.M. Siddesh, ChetanShetty&Sowmya B.J. - 2017edition
6. R Fundamentals and Programming Techniques, ThomasLumely.
7. R for Everyone Advanced Analytics and Graphics, Jared P. Lander- Addison WesleySeries
8. The Art of R Programming, Norman Matloff, CengageLearning
9. Maria DoloresUgarte,AnaF.Militino,AlanT.Arnholt—ProbabilityandStatisticswithR||2nd Edition on, CRC Press,2016.
10. R-programming for Data science, RogerD.Peng.
11. An Introduction to statistical learning-with applications in R, Trevor Hastie and Rob Tibshirani

E-Resources:

1. URL: https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf (Online Resources)
2. http://nptel.ac.in/courses/106104135/48
3. http://nptel.ac.in/courses/110106064/

SOFTWARE requirements:

1. The R statistical software program. Available from: https://www.r-project.org/
2. RStudio an Integrated Development Environment (IDE) for R. Available from: https://www.rstudio.com/

SEMESTER - IV

Course Code	Course Name	L	T	P	C
20CI4S01	Fundamentals of Robotics	1	0	2	2

Course Objective:

The objective of this course is to enlighten the students about the fundamentals of robotic systems.

- To understand the basics of robot, Robot Transformations and Sensors,
- To program them for functioning.

Course Outcomes:

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

CO 1: Specify the characteristics of robots used in different domains.
CO 2: Describe about the different types of grip per mechanisms
CO 3: Describe the use of sensor network sand quality control
CO 4: Discuss about the advanced methods for control of robot moments.
CO 5: Summarize the applications of automation and robotics.

List of Experiments:

1. Study of different types of robots based on configuration and application.
2. Study of different type of links and joints used in robots
3. Study of components of robots with drive system and end effectors
4. Determination of maximum and minimum position flinks
5. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
6. Estimation of accuracy, repeatability and resolution
7. Implement the following functionality in robot

A. Programming a simple Robot on Wheels.
B. Programming a Walking Robot.
C. Experiments based on Bipedal Robot.
D. Experiments based on Humanoid Robot-ROOBONOVA.
E. Pick and Place Application Programming with4DOF Robot Arm by Interfacing to PC.
F. Swap Application Programming with 4DOF Robot Arm by Interfacing to PC.