R23 I YEAR COURSE STRUCTURE
INDUCTION PROGRAMME

S.No	Course Name	Category	L	T	P	CREDITS
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0	0	6	0
2	Career Counselling	MC	2	0	2	0
3	Orientation to all branches -- career options, tools, etc.	MC	3	0	0	0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2	0	3	0
5	Proficiency Modules & Productivity Tools	ES	2	1	2	0
6	Assessment on basic aptitude and mathematical skills	MC	2	0	3	0
7	Remedial Training in Foundation Courses	MC	2	1	2	0
8	Human Values & Professional Ethics	MC	3	0	0	0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2	1	2	0
10	Concepts of Programming	ES	2	0	2	0

I B.TECH - I SEMESTER

S.No	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R23CC1101	LINEAR ALGEBRA & CALCULUS	BS&H	30	70	100	3	0	0	3
2	R23CC1102	INTRODUCTION TO PROGRAMMING	ES	30	70	100	3	0	0	3
3	R23CC1106	ENGINEERING PHYSICS	BS&H	30	70	100	2	0	0	3
4	R23CC1107	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	ES	30	70	100	3	0	0	3
5	R23CC1108	ENGINEERING GRAPHICS	ES	30	70	100	3	0	0	3
6	R23CC11L1	COMPUTER PROGRAMMING LAB	ES	30	70	100	0	0	3	1.5
7	R23CC11L5	IT WORKSHOP	ES	30	70	100	0	0	2	1
8	R23CC11L6	ENGINEERING PHYSICS LAB	ES	30	70	100	0	0	3	1
9	R23CC11L7	EEE WORKSHOP	ES	30	70	100	0	0	2	1.5
10	R23CC11MC2	NSS/NCC/SCOUTS & GUIDES/ COMMUNITY SERVICE	BS&H	100	-	100	-	-	1	0.5
TOTAL										**20.5**

I B.TECH - II SEMESTER

S.No	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R23CC1201	DIFFERENTIAL EQUATIONS & VECTOR CALCULUS	BS&H	30	70	100	3	0	0	3
2	R23CC1202	DATA STRUCTURES	PC	30	70	100	3	0	0	3
3	R23CC1206	COMMUNICATIVE ENGLISH	BS&H	30	70	100	1	0	4	2
4	R23CC1207	CHEMISTRY	BS&H	30	70	100	3	0	0	3
5	R23CC1212	BASIC CIVIL AND MECHANICAL ENGINEERING	ES	30	70	100	3	0	0	3
6	R23CC12L1	DATA STRUCTURES LAB	PC	30	70	100	0	0	3	1.5
7	R23CC12L9	ENGINEERING WORKSHOP	ES	30	70	100	0	0	2	1.5
8	R23CC12L10	CHEMISTRY LAB	BS&H	30	70	100	0	0	2	1
9	R23CC12L12	COMMUNICATIVE ENGLISH LAB	ES	30	70	100	0	0	3	1
10	R23CC12MC1	HEALTH & WELLNESS, YOGA & SPORTS	BS&H	100	-	100	-	-	1	0.5
TOTAL										**19.5**

R23 II YEAR COURSE STRUCTURE

II YEAR I SEMESTER

S.No.	Subcode	Category	Title	L	T	P	Credits
1	R23CC2101	BS&H	Discrete Mathematics & Graph Theory	3	0	0	3
2	R23CC2102	BS&H	Universal human values understanding harmony and ethical human conduct	2	1	0	3
3	R23DS2107	Engineering Science	Introduction to Data Science	3	0	0	3
4	R23CC2104	Professional Core	Advanced Data Structures &Algorithms Analysis	3	0	0	3
5	R23CC2105	Professional Core	Object Oriented Programming Through Java	3	0	0	3
6	R23DS21L1	Professional Core	Data Science Lab	0	0	3	1.5
7	R23CC21L2	Professional Core	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	R23CC21L3	Skill Enhancement course	Python programming	0	1	2	2
Total				14	2	8	20

II YEAR II SEMESTER

S.No.	Subcode	Category	Title	L	T	P	Credits
1	R23CC2208	Management Course-I	Optimization Techniques	2	0	0	2
2	R23DS2201	Engineering Science/ Basic Science	Statistical Methods for Data Science	3	0	0	3
3	R23DS2202	Professional Core	Data Engineering	3	0	0	3
4	R23CC2204	Professional Core	Database Management Systems	3	0	0	3
5	R23DS2203	Professional Core	Computer Organization and Architecture	3	0	0	3
6	R23DS22L2	Professional Core	Data Engineering Lab	0	0	3	1.5
7	R23CC22L1	Professional Core	DBMS Lab	0	0	3	1.5
8	R23DS22L4	Skill Enhancement course	Exploratory Data Analysis with Python	0	1	2	2
9	R23CC22L3	BS&H	Design Thinking &Innovation	1	0	2	2
10	R23CC22MC	BS&H	Environmental Studies	2	0	0	-
Total				17	1	10	21
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation							

B.Tech. – III Year I Semester

S.No	Subject Codes	Category	Title	L	T	P	C
1	R23DS3101	Professional Core	Machine Learning	3	0	0	3
2	R23CC3111	Professional Core	Computer Networks	3	0	0	3
3	R23CC3112	Professional Core	Software Engineering	3	0	0	3
4	R23CC3113 R23CC3118 R23DS3102 R23CC3114 R23CC31MOOC	Professional Elective-I	1. Automata Theory & Compiler Design 2. Object Oriented Analysis and Design 3. Soft computing 4. Internet of Things 5. Any of the 12-Week SWAYAM /NPTEL Course suggested by the BoS	3	0	0	3
5	R23OE3121 R23OE3122 R23OE3119	Open Elective- I	1. Entrepreneurship Development & Venture Creation 2. Operating Systems 3. Computer Organization and Architecture	3	0	0	3
6	R23DS31L1	Professional Core	Machine Learning Lab	0	0	3	1.5
7	R23DS31L2	Professional Core	Computer Networks Lab	0	0	3	1.5
8	R23DS31L3	Skill Enhancement course	Full Stack development -1 / SWAYAM Plus – Data Engineer / AI Engineer	0	1	2	2
9	R23DS31L4	ES	Tinkering Lab *(User Interface Design using Flutter)/* SWAYAM Plus - Android Application Development (with Flutter)/**AICTE – Design Thinking and Idea Lab**	0	0	2	1
10	R23CC31CSP	Evaluation of Community Service Project Internship		-	-	-	2
	Total			**15**	**1**	**10**	**23**
MC		Student may select from the Same Minor Pool		3	0	3	4.5
MC		Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)		3	0	0	3
HC		Student may select from the Same Honors Pool		3	0	0	3
HC		Student may select from the Same Honors Pool		3	0	0	3

B. Tech– III Year II Semester

S.No	Subject Codes	Category	Title	L	T	P	C
1	R23DS3201	Professional Core	Deep Learning	3	0	0	3
2	R23DS3202	Professional Core	Operating Systems	3	0	0	3
3	R23DS3203	Professional Core	Data Visualization	3	0	0	3
4	R23DS3204 R23DS3205 R23DS3206 R23DS3207 R23DS3208 R23DS3209	Professional Elective-II	1. Social Media Analytics 2. Cryptography & Network Security 3. Recommender Systems 4. Cloud Computing 5. Sensor Networks 6. **Unix and Shell Programming**	3	0	0	3
5	R23DS3210 R23DS3211 R23DS3212 R23DS3213 R23CC32MOOC1	Professional Elective-III	1. Software Project Management 2. Quantum Computing 3. Computer Vision 4. NoSQL databases 5. Any of the 12-Week SWAYAM /NPTEL Course suggested by the BoS	3	0	0	3
6	R23OE3222 R23OE3224	Open Elective – II	1. Database Management Systems 2. **Fundamentals of Unix Programming**	3	0	0	3
7	R23DS32L1	Professional Core	Deep Learning Lab	0	0	3	1.5
8	R23DS32L2	Professional Core	Data Visualization Lab	0	0	3	1.5
9	R23DS32L3	Skill Enhancement course	Soft skills	0	1	2	2
10	R23CC32MC	Audit Course	Technical Paper Writing & IPR	2	0	0	-
	Total			**20**	**01**	**08**	**23**
	*Mandatory Industry Internship / Mini Project of 08 weeks duration during summer vacation						
MC		Student may select from the same minors pool		3	0	3	4.5
MC		Minor Course (Student may select from the same specialized minors pool)		3	0	0	3
HC		Student may select from the same honors pool		3	0	0	3
HC		Honors Course (Student may select from the honors pool)		3	0	0	3

**** Under Industry Internship interested students can pursue SWAYAM Plus courses viz., Hands-on Masterclass on Data Analytics OR Artificial Intelligence for Real-World Application***

Note: *Student need to do at least ONE MOOC Course (3 credits out of 160 credits) to meet the mandatory requirement (11th criteria, as per R23 Regulations)*

Open Electives, offered to other department students:

Open Elective I:

- Entrepreneurship Development & Venture Creation
- Operating Systems
- Computer Organization and Architecture

Open Elective II:

- Database Management Systems
- Fundamentals of Unix Programming

Open Elective III:

- Object Oriented Programming Through Java

Open Elective IV:

- Computer Networks
- Software Engineering
- IOT Based Smart Systems

Minor Engineering

Note:

- *To obtain Minor Engineering, student needs to obtain 18 credits by successfully completing any of the following courses in the concern stream.*
- *During Minor/Honors Course selection, there should not be any overlapping with Regular/Major/OPEN Electives*

Minor in Data Science

• Introduction to Data Science	3-0-3-4.5 (II-II)
• Operating Systems	3-0-0-3 (III-I)
• Data Engineering	3-0-3-4.5 (III-II)
• Deep Learning	3-0-0-3 (IV-I)

Any of the following 12 Week 3 credit NPTEL MOOC Courses

- Introduction to Database Systems
- Artificial Intelligence: Knowledge Representation and Reasoning
- Computer Networks and Internet Protocol
- Fundamentals of Object Oriented Programming
- Discrete Mathematics for CS
- Software Engineering

Suggested MOOC Courses for Honors Degree in Data Science

Note: ***To obtain Honor's degree, student needs to obtain 18 credits by successfully completing any of the following courses in the concern stream (without duplication).***

Mandatory Course(s):

- Deep Learning for Natural Language Processing - 12 Week 3 Credit Course, MOOCS
- Applied Time-Series Analysis 12 Week 3 Credit Course, MOOCS

Any of the following for remaining 12 Credits

- Social Network Analysis 12 Week 3 Credit Course, MOOCS
- Privacy and Security in Online Social Media 12 Week 3 Credit Course, MOOCS
- Reinforcement Learning 12 Week 3 Credit Course, MOOCS
- Algorithms in Computational Biology and Sequence Analysis 12 Week 3 Credit Course, MOOCS
- GPU Architecture and Programming 12 Week 3 Credit Course, MOOCS
- Quantum Algorithms and Cryptography 12 Week 3 Credit Course, MOOCS
- Affective Computing 12 Week 3 Credit Course, MOOCS
- Unmanned Arial Systems & Robotics 12 Week 3 Credit Course, MOOCS

I B.TECH - I SEMESTER

S.No	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R23CC1101	LINEAR ALGEBRA & CALCULUS	BS&H	30	70	100	3	0	0	3
2	R23CC1102	INTRODUCTION TO PROGRAMMING	ES	30	70	100	3	0	0	3
3	R23CC1106	ENGINEERING PHYSICS	BS&H	30	70	100	2	0	0	3
4	R23CC1107	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	ES	30	70	100	3	0	0	3
5	R23CC1108	ENGINEERING GRAPHICS	ES	30	70	100	3	0	0	3
6	R23CC11L1	COMPUTER PROGRAMMING LAB	ES	30	70	100	0	0	3	1.5
7	R23CC11L5	IT WORKSHOP	ES	30	70	100	0	0	2	1
8	R23CC11L6	ENGINEERING PHYSICS LAB	ES	30	70	100	0	0	3	1
9	R23CC11L7	EEE WORKSHOP	ES	30	70	100	0	0	2	1.5
10	R23CC11MC2	NSS/NCC/SCOUTS & GUIDES/ COMMUNITY SERVICE	BS&H	100	-	100	-	-	1	0.5
TOTAL										**20.5**

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUB CODE: R23CC1101	**LINEAR ALGEBRA & CALCULUS (Common to All Branches of Engineering)**						

COURSE OBJECTIVES:

- Grasping fundamental principles in linear algebra, including linear transformations, solving systems of linear equations, and applying matrix calculus.
- To become proficiency in solving computational problems of linear algebra.
- To acquire knowledge on mean value theorems in calculus.
- Familiarization about the techniques in calculus and multivariate analysis.

COURSE OUTCOMES:

After completion of the course, the students should be able to:

- Solve the system of linear equations and transformations. **[K3]**
- Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors. **[K4]**
- Utilize mean value theorems to real life problems**. [K3]**
- Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering. **[K3]**
- Identify the area and volume by interlinking them to appropriate double and triple integrals. **[K3]**

SYLLABUS

UNIT-I: Matrices

Introduction to Linear Transformation-Rank of a matrix by Echelon form and normal form - Cauchy-Binet formulae (without proof) - Inverse of non-singular matrices by Gauss-Jordan method - System of linear equations: Solving system of homogeneous and non-homogeneous equations - Gauss elimination method, Jacobi and Gauss-Seidel iteration methods.

Applications: L-C-R Circuits

UNIT-II: Eigenvalues, Eigenvectors and Orthogonal transformation

Eigenvalues, Eigenvectors and their properties - Diagonalization of a matrix - Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem - Quadratic form and nature of a quadratic form - Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT-III: Calculus

Mean Value Theorems (without proofs): Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation - Cauchy's mean value theorem - Taylor's and Maclaurin's theorems with remainders - Problems and applications on the above theorems.

UNIT-IV: Partial differentiation and Applications (Multi variable calculus)

Functions of several variables: Continuity and Differentiability - Partial derivatives – Homogeneous function-Euler's Theorem on homogeneous functions-Total derivatives - Chain rule - Taylor's and Maclaurin's series expansion of functions of two variables - Jacobians - Functional dependence - Maxima and minima of functions of two variables - Method of Lagrange's multipliers.

UNIT-V: Multiple Integrals (Multi variable calculus)

Double integrals - Triple integrals - Change of order of integration - Change of variables to polar, cylindrical and spherical coordinates - Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXTBOOKS:

- Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition.
- Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

REFERENCE BOOKS:

- Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
- Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
- Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
- Advanced Engineering Mathematics, Micheael Greenberg, Pearson publishers, 9th edition.
- Higher Engineering Mathematics, H. K. Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021).

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUB CODE : R23CC1102	INTRODUCTION TO PROGRAMMING						

COURSE OBJECTIVES:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, controlstructures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

COURSE OUTCOMES:

After completion of the course, student will be able to:

CO1: Infer the basic concepts of computers, algorithms and Flowcharts **[K3].**
CO2: Develop programs using appropriate control structures **[K3].**
CO3: Write programs using arrays and strings **[K3].**
CO4: Develop programs using structures and pointers. **[K3].**
CO5: Make use of functions and file Operations in C programming for a given application **[K3].**

UNIT I: Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program- Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operators, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT II: Control Structures

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

UNIT III: Arrays and Strings

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Strings: Introduction-Reading Strings-Writing Strings-String Manipulation functions -Array of Strings.

UNIT IV: Pointers & User Defined Data types

Pointers, dereferencing and address operators, pointer and address arithmetic, arraymanipulation using pointers, User-defined data types-Structures and Unions.

Functions & File Handling

Introduction to Functions, Function Declaration and Definition, Function call Return Types andArguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling.

Note: The syllabus is designed with C Language as the fundamental language ofimplementation**.**

TEXTBOOKS:

- "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 2005.
- C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition.
- How to solve it by Computer, R G Dromey, and Pearson Education.

REFERENCE BOOKS:

- Computing Fundamentals and C Programming, Balagurusamy, E., McGraw-HillEducation, 2008.
- Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
- Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education,1998.

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUB CODE: R23CC1106	ENGINEERING PHYSICS						

COURSE OBJECTIVES:

- To bridge the gap between the Physics at 10+2 level and UG level engineering courses
- Identifying the importance of Lasers and optical fibers,
- Enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics,
- Introduce novel concepts of magnetic materials and superconductors, physics of semiconductors and smart materials.

COURSE OUTCOMES:

After completion of the course, student will be able to:

CO 1: Analyze the intensity variation of Laser light and it's propagation in optical fibers.**[K4]**
CO 2: Familiarize with the basics of crystals and their structures. **[K3]**
CO 3: Summarize various types of Magnetic materials and Super conductors.**[K2]**
CO 4: Explain the basic concepts of Quantum Mechanics and the band theory of solids.**[K2]**
CO 5: Identify the type of semiconductor and smart materials. **[K3]**

SYLLABUS

UNIT I: Lasers and Optical Fibers

Lasers: Introduction – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Population inversion - Einstein's coefficients and relation between them - Ruby laser – Helium Neon laser- Semiconductor laser-Applications.

Optical Fibers: Introduction- Basic Structure and Principle of optical fiber - Acceptance angle – Acceptance cone - Numerical Aperture - Step Index and Graded index fibers -Applications.

UNIT II: Crystallography and X-ray diffraction

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC.

X-ray diffraction: Miller indices – separation between successive (hkl) planes.
Bragg's law - crystal structure determination by Laue's and powder methods.

UNIT III: Magnetic Materials and Superconductivity

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility, permeability and relation between them - Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Hysteresis - soft and hard magnetic materials.

Superconductivity: Introduction- Properties, Meissner effect - Type-I and Type-II super conductors- BCS Theory- AC and DC Josephson effect-Applications

UNIT IV: Quantum Mechanics and Free electron theory

Quantum Mechanics: de-Broglie's matter Waves – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent wave equation – Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – electrical conductivity based on Classical free electron theory -Quantum free electron theory –- Fermi energy- Fermi-Dirac distribution.

UNIT V: Semiconductors and Smart materials:

Semiconductors: Formation of energy bands – classification of solids – Types of semiconductors - Drift and diffusion currents – Einstein's equation - Hall Effectand its applications.

Smart materials: Introduction – properties- types of smart materials- shape memory alloys – piezoelectric materials- magnetostrictive materials – Thermoelectric materials- magneto rheological fluids- electro rheological fluids- Chromic materials – Engineering applications of smart materials.

TEXTBOOKS:

- A Text book of Engineering Physics - M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
- Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).

REFERENCE BOOKS:

- Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning
- Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
- Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
- Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUB CODE : R23CC1107	BASIC ELECTRICAL & ELECTRONICS ENGINEERING						

PART A: BASIC ELECTRICAL ENGINEERING

COURSE OBJECTIVES

To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1: Explore the fundamental laws and concept of DC and AC circuits. **[K3]**

CO2: Demonstrate the working and operating principles of electrical machines, measuring instruments. [**K3]**

CO3: Demonstrate the working and operating principles of different power generation stations. **[K3]**

CO4: Calculate electrical load, electricity bill of residential and commercial buildings and safety measures. **[K3]**

UNIT I: DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT II: Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone Bridge.

UNIT III: Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

TEXTBOOKS:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition

2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013

3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

REFERENCE BOOKS:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition

2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020

3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017

4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

WEB RESOURCES:

- https://nptel.ac.in/courses/108105053
- https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

COURSE OBJECTIVES:

- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1: Describe the working of diode and explore the operation of BJT and its applications. [**K2]**
CO2: Describe the working of Rectifiers and amplifiers in electronic circuits. **[K2]**
CO3: Manipulate numeric information in different forms, various codes such as ASCII, Gray, and BCD, simple Boolean expressions and Boolean Theorems **[K3]**
CO4: Design and analyse combinational circuits, sequential circuits, flip flops Registers and Counters. **[K4]**

UNIT I: SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT II: BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT III: DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops(S-R, J-K, D and T Flip flops), Registers(4-bit Shift Register - serial input and output) and counters (Ripple Counters, Binary Ripple Counter, Ring Counter) (Elementary Treatment only)

TEXTBOOKS:

- R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
- R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

REFERENCE BOOKS:

- R. S. Sedha, a Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
- Salivahanan, N. Suresh Kumar, A. Vallavaraj, “Electronic Devices and Circuits” Tata McGraw-Hill, Second Edition, 2008.
- Jacob Millman, C. Halkies, C.D. Parikh, Satyabrata Jit, “Integrated Electronics”, Tata McGraw-Hill, Second Edition, 2011.

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	0	4	30	70	100	3
SUB CODE : R23CC1108	ENGINEERING GRAPHICS						

COURSE OBJECTIVES:

- To enable the students with various concepts like dimensioning, conventions andstandards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometricand Perspective projections.

COURSE OUTCOMES:

After the completion of the course students will be able to

CO1: Construct the principles of engineering drawing, including engineering curves, scales, Orthographic and isometric projections**. [K3]**

CO2: Construct orthographic projections of points, lines, planes and solids in front, top and Side views**. [K3]**

CO3: Analyze and draw projection of solids in various positions in first Quadrant. [**K4**]

CO4: Develop the sections of Solids & Development of Surfaces**. [K3]**

CO5: Compare & Draw isometric Views & Orthographic Views**. [K2]**

SYLLABUS

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III

Projections of Solids: Types of solids: Polyhedral and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformationsusing Auto CAD (*Not for end examination*).

TEXTBOOK:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

REFERENCE BOOKS:

- Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
- Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc, 2009.
- Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, TataMcGraw Hill, 2017.

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUB CODE: R23CC11L1	COMPUTER PROGRAMMING LAB						

COURSE OBJECTIVES:

- The course aims to give students hands – on experience and train them on the concepts of theC-programming language.

COURSE OUTCOMES:

After completion of the course, student will be able to**:**

CO1: Analyze and trace the execution of programs written in C language **[K4].**

CO2: Implement programs with appropriate control structures for solving the problems **[K3].**

CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers **[K3].**

CO4: Code, Debug and Execute programs to demonstrate the applications of arrays, functions, files and various other concepts in C **[K3].**

UNIT1

WEEK 1

Objective: Getting familiar with the programming environment on the computer and writingthe first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

- Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- Basic commands of Linux (sudo, pwd, cd, ls, cat, cp, mv, mkdir, rmdir, rm, touch, locate, find, grep, df, du, head, tail, diff, tar, chmod, chown, kill, ping)
- Exposure to Turbo C, gcc
- Writing simple programs using printf(), scanf()

WEEK 2

Objective: Getting familiar with how to formally describe a solution to a problem in a seriesof finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

- Sum and average of 3 numbers
- Conversion of Fahrenheit to Celsius and vice versa
- Simple interest calculation

WEEK 3

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

- Finding the square root of a given number
- Finding compound interest
- Area of a triangle using heron's formulae
- Distance travelled by an object

UNIT II

WEEK 4

Objective: Explore the full scope of expressions, type-compatibility of variables & constantsand operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity

- Evaluate the following expressions.
  - A+B*C+(D*E) + F*G
  - A/B*C-B+A*D/3
  - A+++B---A
  - J= (i++) + (++i)
- Find the maximum of three numbers using conditional operator
- Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

Objective: Explore the full scope of different variants of "if construct" namely if-else, null- else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

- Write a C program to find the max and min of four numbers using if-else.
- Write a C program to generate electricity bill.
- Find the roots of the quadratic equation.
- Write a C program to simulate a calculator using switch case.
- Write a C program to find the given year is a leap year or not.

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when eachof these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

- Find the factorial of given number using any loop.
- Find the given number is a prime or not.
- Compute sine and cos series
- Checking a number palindrome
- Construct a pyramid of numbers.

UNIT III

WEEK 7:

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7:1D Array manipulation, linear search

- Find the min and max of a 1-D integer array.
- Perform linear search on1D array.
- The reverse of a 1D integer array
- Find 2's complement of the given binary number.
- Eliminate duplicate elements in an array.

WEEK 8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

- Addition of two matrices
- Multiplication two matrices
- Sort array elements using bubble sort
- Concatenate two strings without built-in functions
- Reverse a string using built-in and without built-in string functions

UNIT IV

WEEK 9:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array
and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gainexperience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

- Write a C program to find the sum of a 1D array using malloc()
- Write a C program to find the total, average of n students using structures
- Enter n students data using calloc() and display failed students list

- Read student name and marks from the command line and display the student details alongwith the total.
- Write a C program to implement realloc()

WEEK 10:
Objective: Experiment with C Structures, Unions, bit fields and self-referential structures(Singly linked lists) and nested structures

Suggested Experiments/Activities:
Tutorial 10: Bitfields, Self-Referential Structures, Linked lists
Lab10: Bitfields, linked lists
Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the samewithout using bit- fields

- Create and display a singly linked list using self-referential structure.
- Demonstrate the differences between structures and unions using a C program.
- Write a C program to shift/rotate using bitfields.
- Write a C program to copy one structure variable to another structure of the same type.

UNIT V

WEEK 11:
Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:
Tutorial 11: Functions, call by value, scope and extent,
Lab 11: Simple functions using call by value, solving differential equations using Eulerstheorem.

- Write a C function to calculate NCR value.
- Write a C function to find the length of a string.
- Write a C function to transpose of a matrix.
- Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12:
Objective: Explore how recursive solutions can be programmed by writing recursive functionsthat can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:
Tutorial 12: Recursion, the structure of recursive calls
Lab 12: Recursive functions

- Write a recursive function to generate Fibonacci series.
- Write a recursive function to find the lcm of two numbers.
- Write a recursive function to find the factorial of a number.
- Write a C Program to implement Ackermann function using recursion.
- Write a recursive function to find the sum of series.

WEEK 13:
Objective: Explore the basic difference between normal and pointer variables, Arithmeticoperations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

- Write a C program to swap two numbers using call by reference.
- Demonstrate Dangling pointer problem using a C program.
- Write a C program to copy one string into another using pointer.
- Write a C program to find no of lowercase, uppercase, digits and othercharacters using pointers.

WEEK14:

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

- Write a C program to write and read text into a file.
- Write a C program to write and read text into a binary file using fread() and fwrite()
- Copy the contents of one file to another file.
- Write a C program to merge two files into the third file using command-linearguments.
- Find no. of lines, words and characters in a file
- Write a C program to print last n characters of a given file.

WEEK 15: Virtual Labs:

https://ps-iiith.vlabs.ac.in/List%20of%20experiments.html

TEXTBOOKS:

- Ajay Mittal, Programming in C: A practical approach, Pearson.
- Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

REFERENCE BOOKS:

- Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
- C Programming, a Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	2	30	70	100	1
SUB CODE: R23CC11L5	IT WORKSHOP						

COURSE OBJECTIVES:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, spread sheets and Presentation tools.

COURSE OUTCOMES:

After completion of the course, student will be able to:

CO1: Identify Hardware components and inter dependencies **[K3].**

CO2: Utilize Antivirus s/w to Safe guard computer systems while using Internet **[K3].**

CO3: Develop a Document or Presentation.

CO4: Make use of spreadsheets to perform calculations **[K3].**

CO5: Utilize the AI Tool Chat GPT **[K3].**

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Labinstructors should verify the work and follow it up with a Viva. Also students need to go throughthe video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Labinstructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with bothWindows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configuredas dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finallystudents should

demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWWon the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LANproxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and howto use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customizetheir browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent(FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Usinghelp and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing,Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeXand Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns,Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS)tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using helpand resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slideslotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – Chat GPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the modelresponds. Try asking questions, starting conversations, or even providing incomplete sentencesto see how the model completes them.

- **Ex:** Prompt: "You are a knowledgeable AI. Please answer the following question: Whatis the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a storyor a description of a scene, and let the model generate the rest of the content. This can be a funway to brainstorm creative ideas

- **Ex:** Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output tosee how accurate and fluent the translations are.

- **Ex:** Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

REFERENCE BOOKS:

- Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
- The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech,2013, 3rd edition
- Introduction to Information Technology, ITL Education Solutions limited, PearsonEducation, 2012, 2nd edition
- PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
- LaTeX Companion, Leslie Lamport, PHI/Pearson.
- IT Essentials PC Hardware and Software Companion Guide, David Anfins on and KenQuamme. – CISCO Press, Pearson Education, 3rd edition IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCOPress, Pearson Education, 3rd edition

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	2	30	70	100	1
SUB CODE: R23CC11L6	ENGINEERING PHYSICS LAB						

COURSE OBJECTIVES:

- To study the concepts of optical phenomenon like interference, diffraction etc.,
- Recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors
- Study the parameters and applications of dielectric and magnetic materials by conducting experiments.

COURSE OUTCOMES:

After completion of the course students will be able to

CO1: Operate optical instruments like travelling microscope and spectrometer**. [K3]**

CO2: Estimate the wavelengths of different colors using diffraction grating. **[K2]**

CO3: Plot the intensity of the magnetic field of circular coil carrying current with distance. **[K3]**

CO4: Calculate the band gap of a given semiconductor. **[K3]**

List of Experiments:

- Determination of radius of curvature of a given plano convex lens by Newton's rings.
- Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
- Verification of Brewster's law
- Determination of dielectric constant using charging and discharging method.
- Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
- Determination of wavelength of Laser light using diffraction grating.
- Estimation of Planck's constant using photoelectric effect.
- Determination of the resistivity of semiconductors by four probe methods.
- Determination of energy gap of a semiconductor using p-n junction diode.
- Magnetic field along the axis of a current carrying circular coil by Stewart Gee'sMethod.
- Determination of Hall voltage and Hall coefficient of a given semiconductor usingHall effect.
- Determination of temperature coefficients of a thermistor.
- Determination of acceleration due to gravity and radius of Gyration by using acompound pendulum.
- Determination of magnetic susptibility by Kundt's tube method.
- Determination of rigidity modulus of the material of the given wire using Torsionalpendulum.
- Sonometer: Verification of laws of stretched string.
- Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
- Determination of Frequency of electrically maintained tuning fork by Melde'sexperiment.

Note: Any **TEN** of the listed experiments are to be conducted. Out of which any **TWO** Experiments may be conducted in virtual mode.

References: A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. ChandPublishers, 2017.

URL: *www.vlab.co.in*

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUB CODE : R23CC11L7	EEE WORKSHOP (COMMON TO ALL BRANCHES OF ENGINEERING)						

PART A: ELECTRICAL ENGINEERING LAB

COURSE OBJECTIVES:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

COURSE OUTCOMES:

After completion of this course, the student will be able to

CO1: Measure voltage, current and power in an electrical circuit. **[K3]**

CO2: Measure of Resistance using Wheatstone bridge [**K4]**

CO3: Discover critical field resistance and critical speed of DC shunt generators. [**K4]**

CO4: Investigate the effect of reactive power and power factor in electrical loads. **[K5]**

ACTIVITIES:

- Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
- Provide some exercises so that hardware tools and instruments are learned to be used by the students.
- Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
- Provide some exercises so that measuring instruments are learned to be used by the students.
- Components:
- Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
- Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

LIST OF EXPERIMENTS:

- Verification of KCL and KVL
- Verification of Superposition theorem
- Measurement of Resistance using Wheatstone bridge
- Magnetization Characteristics of DC shunt Generator
- Measurement of Power and Power factor using Single-phase wattmeter
- Measurement of Earth Resistance using Megger
- Calculation of Electrical Energy for Domestic Premises

- Determination of open circuit and short circuit parameters of a 1-phase transformer(Content Beyond syllabus)

REFERENCE BOOKS:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition

2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013

3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

***Note:** Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

COURSE OBJECTIVES:

- To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

COURSE OUTCOMES:

After competition of this course, the student will be able to

CO1: Analyze the characteristics of various electronic components. [**K4]**
CO2: Implement Rectifiers circuits. **[K3]**
CO3: Design Amplifiers circuit. **[K6]**
CO4: Examine the operation of Logic gates. **[K4]**

LIST OF EXPERIMENTS:

- Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
- Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
- Implementation of half wave and full wave rectifiers
- Plot Input & Output characteristics of BJT in CE and CB configurations
- Frequency response of CE amplifier.
- Simulation of RC coupled amplifier with the design supplied
- Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
- Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.
- Design a Full Adder Circuit and verify the truth table. (Content beyond syllabus)

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

REFERENCES:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	1	100	-	100	0.5
SUB CODE : R23CC11MC2	NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE						

COURSE OBJECTIVES:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

COURSE OUTCOMES:

After completion of the course the students will be able to

CO1: Understand the importance of discipline, character and service motto. **[K3]**
CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques. **[K6]**
CO3: Explore human relationships by analyzing social problems. **[K4]**
CO4: Determine to extend their help for the fellow beings and downtrodden people. **[K5]**
CO5: Develop leadership skills and civic responsibilities. **[K6]**

UNIT I Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organizing Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III Community Service

Activities:

- Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities experts- etc.
- Conducting awareness programs on Health-related issues such as General Health, Mental

health, Spiritual Health, HIV/AIDS,

- Conducting consumer Awareness. Explaining various legal provisions etc.
- Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
- Any other programmes in collaboration with local charities, NGOs etc.

REFERENCE BOOKS:

- Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme*, Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
- *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
- Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
- Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
- Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

GENERAL GUIDELINES:

1. Institutes must assign slots in the Timetable for the activities.

2. Institutes are required to provide instructor to mentor the students.

EVALUATION GUIDELINES:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

I B.TECH - II SEMESTER

S.No	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R23CC1201	DIFFERENTIAL EQUATIONS & VECTOR CALCULUS	BS&H	30	70	100	3	0	0	3
2	R23CC1202	DATA STRUCTURES	PC	30	70	100	3	0	0	3
3	R23CC1206	COMMUNICATIVE ENGLISH	BS&H	30	70	100	1	0	4	2
4	R23CC1207	CHEMISTRY	BS&H	30	70	100	3	0	0	3
5	R23CC1212	BASIC CIVIL AND MECHANICAL ENGINEERING	ES	30	70	100	3	0	0	3
6	R23CC12L1	DATA STRUCTURES LAB	PC	30	70	100	0	0	3	1.5
7	R23CC12L9	ENGINEERING WORKSHOP	ES	30	70	100	0	0	2	1.5
8	R23CC12L10	CHEMISTRY LAB	BS&H	30	70	100	0	0	2	1
9	R23CC12L12	COMMUNICATIVE ENGLISH LAB	ES	30	70	100	0	0	3	1
10	R23CC12MC1	HEALTH & WELLNESS, YOGA & SPORTS	BS&H	100	-	100	-	-	1	0.5
TOTAL										**19.5**

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUB CODE : R23CC1201	**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (COMMON TO ALL ENGINEERING BRANCHES)**						

COURSE OBJECTIVES:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1: First order ordinary differential equations to real life situations. [**K3**]
CO2: Identify and apply suitable methods in solving the higher order differential equations [**K3**]
CO3: Solve the partial differentiation equations. [**K3**]
CO4: Interpret the physical meaning of different operators as gradient, curl and divergence. [**K3**]
CO5: Estimate the work done against a field, circulation and flux using vector calculus. [**K5**]

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

Linear differential equations - Bernoulli's equations - Exact equations and equations reducible to exact form - Applications: Newton's law of cooling - Law of natural growth and decay - Electrical circuits.

UNIT-II: Linear differential equations of higher order (constant coefficients)

Definitions, homogenous and non-homogenous, complimentary function, particular integral, general solution - Wronskian, Method of variation of parameters - Simultaneous linear equations - Applications to L-C-R circuit problems and Simple harmonic motion.

UNIT-III: Partial differential equations

Introduction and formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Solutions of first order linear equations using Lagrange's method - Homogeneous and Non-homogeneous linear partial differential equations with constant coefficients.

UNIT-IV: Vector differentiation

Scalar and vector point functions - Vector operator del - Del applied to scalar point functions - Gradient, Directional derivative - Del applied to vector point functions - Divergence and Curl –Solenoidal vector-Irrotational-scalar potential of vector - Vector identities.

UNIT-V: Vector integration

Line integral - Circulation - Work done - Surface integral, flux - Green's theorem in the plane (without proof) - Stoke's theorem (without proof) - Volume integral - Gauss divergence theorem (without proof) and related problems.

TEXTBOOKS:

- Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition.
- Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

REFERENCE BOOKS:

- Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
- Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
- Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
- Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint). Higher Engineering Mathematics, B. V. Ramana, Mc Graw Hill Education, 2017

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUB CODE : R23CC1202	DATA STRUCTURES						

COURSE OBJECTIVES:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1: Analyze the role of linear data structures in organizing and accessing data efficiently **[K4].**

CO2: Design, implement, and apply linked lists for dynamic data storage **[K6].**

CO3: Analyze the implementation of stacks queues and dequeues using arrays and linked lists **[K3].**

CO4: Identify and implement novel solutions to small scale programming challenges involving data structures such as Graphs and Trees **[K3].**

CO5: Identify scenarios where hashing is advantageous, and design hash-based solutions for specific problems **[K3].**

UNIT I

Introduction to Data Structures: Definition and importance of data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity,analysis of data structures. Searching Techniques: Linear, Binary & Fibonacci Search. Sorting Techniques: Bubble sort, Selection sort, Insertion Sort, Quick Sort, Merge Sort.

UNIT II

Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circularlinked lists, Comparing arrays and linked lists, Applications of linked lists.

UNIT III

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays andlinked lists. Applications of stacks in expression evaluation, backtracking, reversing list etc.

Queues: Introduction to queues: properties and operations, implementing queues using arraysand linked lists, Applications of queues in breadth-first search, scheduling, etc.

Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

UNIT IV

Trees: Introduction to Trees, Binary Tress- Tree traversals, Binary Search Tree – Insertion, Deletion & Traversal, AVL tree and Operations on AVL tree, Heap Tree, Heap Sort.

UNIT V

Graphs: Introduction to Graphs, representation of graphs, Graph traversals, Topological Sort.

Hashing: Brief introduction to hashing and hash functions, Hash tables: basic implementation and operations, Collision resolution techniques: chaining and open addressing.

TEXTBOOKS:

- Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
- Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

REFERENCE BOOKS:

- Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and PeterSanders
- C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E.Hopcroft
- Problem Solving with Algorithms and Data Structures" by Brad Miller and DavidRanum
- Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, and Clifford Stein
- Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching,and Graph Algorithms" by Robert Sedgewick

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	30	70	100	2
SUB CODE: R23CC1206	**COMMUNICATIVE ENGLISH** (COMMON TO ALL BRANCHES)						

COURSE OBJECTIVES:

The main objective of introducing this course, *Communicative English,* is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

COURSE OUTCOMES:

After completion of course student will be able to

CO1: Summarize texts based on the comprehension of the material provided**. [K3]**

CO2: Create coherent and well-structured paragraphs, essays, and letters on a range of familiar topics. **[K5]**

CO3: Utilize a diverse array of grammatical structures with flexibility, striving to minimize errors. **[K3]**

CO4: Use vocabulary adequately and appropriately to express and write on a variety of topics. **[K3]**

UNIT I

Lesson: HUMAN VALUES: Gift of Magi (Short Story)

Listening: Identifying the topic, the context and specific pieces of information by listeningto short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home,family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces ofinformation.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas afterlistening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structuretalks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to linkthe ideas in a paragraph together.

Writing: Structure of a paragraph - Paragraph writing (specific topics)

Grammar: Cohesive devices - linkers, use of articles and zero article; repositions.

Vocabulary: Homonyms, Homophones, Homographs.

UNIT III

Lesson: BIOGRAPHY: Elon Musk

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what isdiscussed

Reading: Readinga text in detail by making basic inferences -recognizing and interpretingspecific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

UNIT IV

Lesson: INSPIRATION: The Toys of Peace by Saki

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters, Resumes
Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary: Words often confused, Jargons

UNIT V

Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering a series ofrelevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension.
Writing: Writing structured essays on specific topics.
Grammar: Editing short texts –identifying and correcting common errors in grammar andusage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

TEXTBOOKS:

- Pathfinder: Communicative English for Undergraduate Students, 1st Edition, OrientBlack Swan, 2023 (Units 1,2 & 3)
- Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

REFERENCE BOOKS:

- Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
- Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge,2014.
- Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge UniversityPress, 2019.
- Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building aSuperior Vocabulary. Anchor, 2014.

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUB CODE: R23CC1207	**CHEMISTRY**						

C**OURSE OBJECTIVES:**

- To familiarize chemistry and its applications
- To train the students on the principles and applications of electrochemistry, polymers and modern engineering materials
- To introduce instrumental methods.

COURSE OUTCOMES:

After completion of the course, the students will be able to:

CO 1: Explain the concept of electron delocalization and its importance in chemical bonding. **[K2]**

CO 2: Solve problems and utilize modern materials in practical engineering scenarios. **[K6]**

CO 3: Apply scientific concepts, experimental findings and applications related to electrochemistry**. [K3]**

CO 4: Explore the synthesis of polymers, with specific polymer structures, properties and applications**. [K3]**

CO 5: Summarize the concepts of Instrumental methods**. [K2]**

UNIT I: Structure and Bonding Models

Molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO, etc. calculation of bond order, π-molecular orbitals of butadiene and benzene,. Hydrogen Bonding-Inter molecular hydrogen bonding with examples -Intra molecular hydrogen bonding with examples.

UNIT II: Modern Engineering materials

Modern Engineering materials Semiconductors – Introduction, preparation (zone refining process and czochralski process), applications.

Super conductors: Introduction, types -applications.

Supercapacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, Preparation (arc discharge and laser ablation methods), properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

UNIT-III: Electrochemistry and Applications

Electrochemical cell, Electrochemical series –applications, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductometric titrations (acid-base titrations).

Electrochemical sensors: potentiometric sensors with examples. Primary cells – Zinc-air battery-Secondary cells –lithium-ion -Sodium –ion batteries - Fuel cells- hydrogen-oxygen fuel cell, working of the batteries including cell reactions; Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT-IV: Polymer Chemistry

Introduction to polymers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of free radical polymerisation.

Plastics –Thermo plastics and thermosetting plastics, Moulding Techniques-Compression moulding, injection moulding, preparation, properties and applications of PVC and Bakelite.

Elastomers–Preparation, properties and applications of Buna-S, Buna-N.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA)

UNIT V: Instrumental Methods and Applications

Electromagnetic spectrum, Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transitions, Instrumentation, and applications. FT-IR Instrumentation and applications. NMR principle–Instrumentation –applications.

TEXTBOOKS:

- Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
- Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOKS:

- Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
- J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
- Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUB CODE: R23CC1212	BASIC CIVIL AND MECHANICAL ENGINEERING						

PART A: BASIC CIVIL ENGINEERING

COURSE OBJECTIVES:

- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques.

COURSE OUTCOMES:

After completion of the course, the student should be able to:

CO1: Acquire knowledge on various sub-divisions of Civil Engineering and to appreciate their role inensuring better society. **[K3]**

CO2: Apply the concepts of surveying to calculate distances, anglesand levels. . **[K3]**

CO3: Realize the importance of transportation in nation's economy and to identify the importance of Water Storage and Conveyance Structures. . **[K2]**

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

UNIT II

Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements-Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

UNIT III

Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

TEXTBOOKS:

- Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
- Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
- Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

REFERENCE BOOKS:

- Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
- Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
- Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
- Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
- Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B: BASIC MECHANICAL ENGINEERING

COURSE OBJECTIVES:

The students after completing the course are expected to

- Get familiarized with the scope and importance of Mechanical Engineering in differentsectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems andintroduce basics of robotics and its applications.

COURSE OUTCOMES:

After completion of the course, the student should be able to

CO1: Illustrate the role of mechanical engineering and its technologies in various sectors and knowledge of engineering materials. **[K2]**

CO2: Explain the basics of various manufacturing processes and thermal engineering and its applications. **[K2]**

CO3: Describe the working of different powerplants, mechanical power transmission systems and basics of robotics and its applications. **[K3]**

UNIT I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries andSociety - Mechanical Engineering Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace and Marine Engineering.

Engineering Materials – Basics of Metals (Ferrous & Non-ferrous), Ceramics, Composites, Smart materials.

UNIT II

Manufacturing Processes: Basics of - Principles of Casting**,** Forming and joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering: Basics of - working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT III

Power plants: Basics of - Working principle of Steam, Diesel, Hydro, Nuclear power plants. **Mechanical Power Transmission:** Basics of - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics: Basics of - Joints & links, configurations, and applications of robotics.

(**Note:** The subject covers only the basic principles of Civil and Mechanical Engineeringsystems. The evaluation shall be intended to test only the fundamentals of the subject)

TEXTBOOKS:

- Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India)Pvt. Ltd.
- A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications,(India) Pvt. Ltd.
- An introduction to Mechanical Engineering by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

REFERENCE BOOKS:

- Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
- 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak MPandey, Springer publications
- Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.
- G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, TataMcGraw Hill publications (India) Pvt. Ltd.

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUB CODE: R23CC12L1	DATA STRUCTURES LAB						

COURSE OBJECTIVES:

- The course aims to strengthen the ability of the students to identify and apply the suitable datastructure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

COURSE OUTCOMES:

After completion of the course, student will be able to:

CO1: Analyze and develop the role of linear data structures in organizing and accessing data efficiently in algorithms **[K4].**

CO2: Design, implement and apply linked lists for dynamic data storage **[K6].**

CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems **[K3].**

CO4: Apply queue-based algorithms for efficient task scheduling and distinguish between deques and priority queues and apply them appropriately to solve data management challenges **[K3**].

CO5: Develop hash-based solutions for specific problems **[K3].**

LIST OF EXPERIMENTS

Exercise 1: Array Manipulation

- Write a program to reverse an array.
- C Programs to implement the Searching Techniques – Linear & Binary Search
- C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

Exercise 2: Linked List Implementation

- Implement a singly linked list and perform insertion and deletion operations.
- Develop a program to reverse a linked list iteratively and recursively.
- Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications

- Create a program to detect and remove duplicates from a linked list.
- Implement a linked list to represent polynomials and perform addition.
- Implement a double-ended queue (deque) with essential operations.

Exercise 4: Double Linked List Implementation

- Implement a doubly linked list and perform various operations to understand itsproperties and applications.
- Implement a circular linked list and perform insertion, deletion, and traversal.

Exercise 5: Stack Operations

- Implement a stack using arrays and linked lists.
- Write a program to evaluate a postfix expression using a stack.

- Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations

- Implement a queue using arrays and linked lists.
- Develop a program to simulate a simple printer queue system.
- Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications

- Use a stack to evaluate an infix expression and convert it to postfix.
- Create a program to determine whether a given string is a palindrome or not.
- Implement a stack or queue to perform comparison and check for symmetry.

Exercise 8: Binary Tree

A) Implement following Operations on a Binary Tree
i) Create **ii)** In-order traversal **iii)** Pre-order traversal **iv)** Post-order traversal
B) Implementing a BST using Linked List. and Traversing of BST.
C) Implement operations of AVL tree

Exercise 9: Graphs and Hashing

- Represent Graphs using adjacency list and adjacency matrix
- Implement various traversals on graphs (DFS, BFS)
- Implement topological sort on Graphs.
- Implement a hash table with collision resolution techniques.
- Write a program to implement a simple cache using hashing.

Exercise - 10 Virtual Lab: http://cse01-iiith.vlabs.ac.in/ Any three programs must be submitted with result from the above link.

TEXT BOOKS:

- Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
- Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008.

REFERENCE BOOKS:

- Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and PeterSanders
- C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E.Hopcroft
- Problem Solving with Algorithms and Data Structures" by Brad Miller and DavidRanum
- Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, and Clifford Stein Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching,and Graph Algorithms by Robert Sedgewick

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUB CODE: R23CC12L9	ENGINEERING WORKSHOP						

COURSE OBJECTIVES:

- To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

COURSE OUTCOMES:

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

CO1: Identify workshop tools and their operational capabilities**. [K3]**

CO2: Compare Manufacturing Components used in workshop trades including fitting, carpentry, foundry, welding and Plumbing**. [K2]**

CO3: Apply fitting operations in various applications**. [K3]**

CO4: Apply basic electrical engineering knowledge for House Wiring Practice [**K3]**

LIST OF EXPERIMENTS:

ENGINEERING WORKSHOP TRADES FOR EXERCISE:

1. Demonstration: Safety practices and precautions to be observed in workshop.

2. Wood Working: Familiarity with different types of woods and tools used in wood Working and make following joints.

a) Half – Lap joint

b) Dovetail joint

3. Sheet Metal Working: Familiarity with different types of tools used in sheet metal Working, Developments of following sheet metal job from GI sheets.

a) Conical funnel

b) Brazing

4. Fitting: Familiarity with different types of tools used in fitting and do the following Fitting exercises.

a) V-fit

b) Bicycle tire puncture

5. Electrical Wiring: Familiarity with different types of basic electrical circuits and make The following connections.

a) Parallel and Series

b) Tube light

6. Foundry Trade: Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.

7. Welding Shop: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.

8. Plumbing: Demonstration and practice of Plumbing tools, Preparation of Pipe joints With coupling for same diameter and with reducer for different diameters**.**

9. Demonstration and basic repair works of two wheeler vehicle

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1
SUB CODE: R23CC12L10	**CHEMISTRY LAB**						

COURSE OBJECTIVES:

- Verify the fundamental concepts with experiments.

COURSE OUTCOMES:

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

CO 1: Develop and perform analytical chemistry techniques to address the water related problems. **[K6]**
CO 2: Determine the strength of an acid, cell constant, potentials and conductance of solutions. **[K5]**
CO 3: Prepare advanced polymer Bakelite and nanomaterials. **[K4]**
CO 4: Explain the functioning of different analytical instruments. **[K3]**

LIST OF EXPERIMENTS:

- Determination of hardness of water sample by EDTA method
- Determination of alkalinity of water sample
- Estimation of Dissolved Oxygen by Winkler's method
- Estimation of Ferrous Iron by Dichrometry
- Determination of Strength of an acid in Pb-Acid battery
- Estimation of Mg in Antacid
- Estimation of Vitamin C
- Preparation of a polymer (Bakelite)/urea formaldehyde resin.
- Preparation of nanomaterials by precipitation method
- Conductometric titration of strong acid vs. strong base
- Conductometric titration of weak acid vs. strong base
- Determination of cell constant and conductance of solutions
- Potentiometry - determination of redox potentials and emfs
- Verify Lambert-Beer's law
- Wavelength measurement of sample through UV-Visible Spectroscopy

Note: Any TEN of the listed experiments are to be conducted.

REFERENCE: "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar

I B.Tech I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	2	30	70	100	1
SUB CODE: R23CC12L12	COMMUNICATIVE ENGLISH LAB						

COURSE OBJECTIVES:

The main objective of introducing this course, Communicative English Laboratory, is to exposethe students to a variety of self-instructional, learner friendly modes of language learning. Thestudents will get trained in basic communication skills and also make them ready to face job interviews.

COURSE OUTCOMES:

After completion of the course, the students will be able to

CO 1: Use connected speech, applying a range of phonological features like rhythm, stress and intonation to convey clear meaning. **[K3]**

CO 2: Create a compelling resume, cover letter and Sop. **[K6]**

CO 3: Make formal presentations and engage effectively in debates and group discussions in academic and professional contexts. **[K3]**

CO 4: Apply employability skills to confidently navigate job interviews. **[K3]**

LIST OF TOPICS:

- Vowels & Consonants
- Neutralization/Accent Rules
- Communication Skills & JAM
- Role Play or Conversational Practice
- E-mail Writing
- Resume Writing, Cover letter, SOP
- Group Discussions-methods & practice
- Debates - Methods & Practice
- PPT Presentations/ Poster Presentation
- Interviews Skills

SUGGESTED SOFTWARE:

- Walden Infotech
- Young India Films

REFERENCE BOOKS:

- Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
- Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India,2016
- Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.
- J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed),Kindle, 2013.

WEB RESOURCES:

SPOKEN ENGLISH:

- www.esl-lab.com
- www.englishmedialab.com
- www.englishinteractive.net
- https://www.britishcouncil.in/english/online
- http://www.letstalkpodcast.com/
- https://www.youtube.com/c/mmmEnglish_Emma/featured
- https://www.youtube.com/c/ArnelsEverydayEnglish/featured
- https://www.youtube.com/c/engvidAdam/featured
- https://www.youtube.com/c/EnglishClass101/featured
- https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
- https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

VOICE & ACCENT:

- https://www.youtube.com/user/letstalkaccent/videos
- https://www.youtube.com/c/EngLanguageClub/featured
- https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
- https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	1	100	-	100	0.5
SUB CODE: R23CC12MC1	HEALTH AND WELLNESS, YOGA AND SPORTS						

COURSE OBJECTIVES:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

COURSE OUTCOMES:

After completion of the course the student will be able to

CO1: Understand the importance of yoga and sports for Physical fitness and sound health. **[K2]**
CO2: Demonstrate an understanding of health-related fitness components. **[K2]**
CO3: Compare and contrast various activities that help enhance their health. **[K2]**
CO4: Assess current personal fitness levels. **[K5]**
CO5: Develop Positive Personality. **[K6]**

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

ACTIVITIES:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

ACTIVITIES:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

ACTIVITIES:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-Kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics.

ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

REFERENCE BOOKS:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022.
2. T.K.V.Desikachar. the Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993.
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014.
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014.

GENERAL GUIDELINES:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

EVALUATION GUIDELINES:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

II YEAR I SEMESTER

S.No.	Subcode	Category	Title	L	T	P	Credits
1	R23CC2101	BS&H	Discrete Mathematics & Graph Theory	3	0	0	3
2	R23CC2102	BS&H	Universal human values understanding harmony and ethical human conduct	2	1	0	3
3	R23DS2107	Engineering Science	Introduction to Data Science	3	0	0	3
4	R23CC2104	Professional Core	Advanced Data Structures &Algorithms Analysis	3	0	0	3
5	R23CC2105	Professional Core	Object Oriented Programming Through Java	3	0	0	3
6	R23DS21L1	Professional Core	Data Science Lab	0	0	3	1.5
7	R23CC21L2	Professional Core	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	R23CC21L3	Skill Enhancement course	Python programming	0	1	2	2
Total				14	2	8	20

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R23CC2101	DISCRETE MATHEMATICS & GRAPH THEORY						

COURSE OBJECTIVES:

- 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 students will be able to

CO1: Apply the logical statements, connectivity among the statements and different types of normal forms. [K3]

CO2: Analyze the operations, properties and functions of sets. [K4].

CO3: Solve mathematical problems with recurrence relations using different methods. [K3].

CO4: Classify the types of graphs to formulate and solve computational problems. [K4].

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: Operations on Sets, Principle of Inclusion-Exclusion, **Relations:** Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, **Functions:** Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties.

UNIT-III: Combinatorics and Recurrence Relations:

Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems.

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

UNIT-IV: Graph Theory:

Basic Concepts, Graph Theory and its Applications, Subgraphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs.

UNIT-V: Multi Graphs:

Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

TEXT BOOKS:

- Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
- Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
- Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.

REFERENCE BOOKS:

- Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India publishers.
- Discrete Mathematics, S. K. Chakraborthy and B. K. Sarkar, Oxford press, 2011.
- Discrete Mathematics and its Applications with Combinatorics and GraphTheory, K.H. Rosen, 7th Edition, Tata McGraw Hill.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
SUBCODE: R23CC2102	UNIVERSAL HUMAN VALUES UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT						

COURSE OBJECTIVES:

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: Analyze various Value Education methods. [K2]
CO2: Compare and Contrast various types of Harmony in the Human Being. [K4]
CO3: Compare and Contrast various types of Harmony in the Family and Society [K4]
CO4: Compare and Contrast various types of Harmony in the Nature/Existence. [K4]
CO5: Analyze the various consequences of professional ethics. [K2**]**

COURSE TOPICS

- The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.
- The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I

Introduction to Value Education (6 lectures and 3 tutorials for practice session)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: Self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II

Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and the body.

Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III
Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV
Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V
Implications of the Holistic Understanding-a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I –
Introduction to Value Education
PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II –
Harmony in the Human Being

PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III –
Harmony in the Family and Society
PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV –
Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V –
Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:
Textbook and Teachers Manual
a. The Textbook
R R Gaur, R Asthana, G P Bagaria, a Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
b. The Teacher's Manual
R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS
- JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
- Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
- The Story of Stuff (Book).
- The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
- Small is Beautiful - E. F Schumacher.
- Slow is Beautiful - Cecile Andrews
- Economy of Permanence - J C Kumarappa
- Bharat Mein Angreji Raj – PanditSunderlal
- Rediscovering India - by Dharampal
- Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
- India Wins Freedom - Maulana Abdul Kalam Azad
- Vivekananda - Romain Rolland (English)
- Gandhi - Romain Rolland (English)

MODE OF CONDUCT:
Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than "extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting. Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

ONLINE RESOURCES:

1. https://fdp-si.aicte-india.org/UHV II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV %201%20Teaching%20Material/D3- S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human Values/chapter-5- holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R23DS2107	**INTRODUCTION TO DATA SCIENCE**						

COURSE OBJECTIVES: From the course the student will learn

- Knowledge and expertise to become a data scientist.
- Essential concepts of statistics and machine learning that are vital for data science;
- Significance of exploratory data analysis (EDA) in data science.
- Critically evaluate data visualizations presented on the dashboards
- Suitability and limitations of tools and techniques related to data science process

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: Understand and articulate the foundational concepts of data science, and the overall data science process. [K2]

CO2: Apply machine learning techniques using Python tools Analyze case studies on predicting malicious URLs and building. [K4]

CO3: Apply NoSQL databases for managing big data. [K3]

CO4: Make use of advanced data science tools for graph databases. [K3]

CO5: Develop interactive dashboards for data visualization. [K3]

UNIT I:

Introduction to Data science, benefits and uses, facets of data, data science process in brief, big data ecosystem and data science

Data Science process: Overview, defining goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory analysis, model building, presenting findings and building applications on top of them

UNIT II:

Applications of machine learning in Data science, role of ML in DS, Python tools like sklearn, modelling process for feature engineering, model selection, validation and prediction, types of ML, semi-supervised learning

Handling large data: problems and general techniques for handling large data, programming tips for dealing large data, case studies on DS projects for predicting malicious URLs, for building recommender systems.

UNIT III:

NoSQL movement for handling Bigdata: Distributing data storage and processing with Hadoop framework, case study on risk assessment for loan sanctioning, ACID principle of relational databases, CAP theorem, base principle of NoSQL databases, types of NoSQL databases, case study on disease diagnosis and profiling

UNIT IV:

Tools and Applications of Data Science: Introducing Neo4jfor dealing with graph databases, graph query language Cypher, Applications graph databases, Python libraries like nltk and SQLite for handling Text mining and analytics, case study on classifying Reddit posts

UNIT V:

Data Visualization and Prototype Application Development: Data Visualization options, Crossfilter, Creating an interactive dashboard with dc.js, Dashboard development tools.

Applying the Data Science process for real world problem solving scenarios as a detailed case study.

TEXTBOOK:

- Davy Cielen, Arno D.B.Meysman, and Mohamed Ali, "Introducing to Data Science using Python tools", Manning Publications Co, Dreamtech press, 2016
- Prateek Gupta, "Data Science with Jupyter" BPB publishers, 2019 for basics

REFERENCE BOOKS:

- Joel Grus, "Data Science From Scratch", OReilly, 2019
- Doing Data Science: Straight Talk From The Frontline, 1 st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R23CC2104	**ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS**						

COURSE OBJECTIVES:

The main objectives of the course is to

- provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

COURSE OUTCOMES:

At the end of the course students will be able to

- Apply asymptotic notations to measure the performance of algorithms [K3]
- Appling divide and conquer parading when an algorithmic design situation calls for it. [K3]
- Construct greedy algorithms and dynamic programming techniques to solve problems [K3]
- Utilize backtracking and branch and bound algorithms to solve combinatorial problems construct [K3]
- Classifying computational problems into NP, NP-Hard, and NP-Complete. [K4]

UNIT – I:

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations. AVL Trees – Creation, Insertion, Deletion operations and Applications

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications

UNIT – II:

Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication.

UNIT – III:

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths

Dynamic Programming: General Method, All pairs shortest paths, Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

UNIT – IV:

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

UNIT – V:

NP Hard and NP Complete Problems: Basic Concepts

NP Hard Graph Problems: Clique Decision Problem (CDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems: Scheduling Identical Processors

TEXTBOOKS:

- Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh 2nd Edition Universities Press
- Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran 2nd Edition University Press

REFERENCE BOOKS:

- Data Structures and program design in C, Robert Kruse, Pearson Education Asia
- An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill
- The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
- Data Structures using C & C++: Langsam, Augenstein & Tanenbaum, Pearson, 1995
- Algorithms + Data Structures & Programs:, N.Wirth, PHI
- Fundamentals of Data Structures in C++: Horowitz Sahni & Mehta, Galgottia Pub.
- Data structures in Java:, Thomas Standish, Pearson Education Asia

ONLINE LEARNING RESOURCES:

- https://www.tutorialspoint.com/advanced_data_structures/index.asp
- http://peterindia.net/Algorithms.html
- Abdul Bari, 1. Introduction to Algorithms (youtube.com)

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R23CC2105	**OBJECT-ORIENTED PROGRAMMING THROUGH JAVA**						

COURSE OBJECTIVES:

The learning objectives of this course are to:

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

COURSE OUTCOMES:

After completion of this course, the students would be able to:

CO1: Interpret the syntax and semantics of java programs language and OOPs concepts. [K2]
CO2: Make use of different predefined classes and packages and interfaces to develop programs using OOPs concepts. [K3]
CO3: Apply exception handling and FILE I/O operations on java programs.[K3]
CO4: Make use of Multithreading and String handling Functions on java. [K3]
CO5: Make use of Java FX and Event-Handling to in the design of GUI Applications. [K3]

UNIT I:

Object Oriented Programming: Basic concepts, Principles, 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.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java (Text Book 2)

UNIT V:

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

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 FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

TEXT BOOKS:

- JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
- Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
- JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

REFERENCES BOOKS:

- The complete Reference Java, 11thedition, Herbert Schildt,TMH
- Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

ONLINE RESOURCES:

- https://nptel.ac.in/courses/106/105/106105191/
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUBCODE: R23DS21L1	DATA SCIENCE LAB						

COURSE OBJECTIVES:

The main objective of the course is to inculcate the basic understanding of Data Science and its practical implementation using Python.

COURSE OUTCOMES:

- Perform various operations on numpy arrays. [K3]
- Apply various techniques to extract data from websources and usage of Pandas for different file formats. [K3]
- Explore various preprocessing techniques to handle Data Sets. [K3]
- Draw different types of charts using matplotlib. [K4]

List of Experiments

1. Creating a NumPy Array

- Basic ndarray
- Array of zeros
- Array of ones
- Random numbers in ndarray
- An array of your choice
- Imatrix in NumPy
- Evenly spaced ndarray

2. The Shape and Reshaping of NumPy Array

- Dimensions of NumPy array
- Shape of NumPy array
- Size of NumPy array
- Reshaping a NumPy array
- Flattening a NumPy array
- Transpose of a NumPy array

3. Expanding and Squeezing a NumPy Array

- Expanding a NumPy array
- Squeezing a NumPy array
- Sorting in NumPy Arrays

4. Indexing and Slicing of NumPy Array

- Slicing 1-D NumPy arrays

- Slicing 2-D NumPy arrays
- Slicing 3-D NumPy arrays
- Negative slicing of NumPy arrays

5. Stacking and Concatenating Numpy Arrays

- Stacking ndarrays
- Concatenating ndarrays
- Broadcasting in Numpy Arrays

6. Perform following operations using pandas

- Creating dataframe
- concat()
- Setting conditions
- Adding a new column

7. Perform following operations using pandas

- Filling NaN with string
- Sorting based on column values
- groupby()

8. Read the following file formats using pandas

- Text files
- CSV files
- Excel files
- JSON files

9. Read the following file formats

- Pickle files
- Image files using PIL
- Multiple files using Glob
- Importing data from database

10. Demonstrate web scraping using python

11. Perform following preprocessing techniques on loan prediction dataset

- Feature Scaling
- Feature Standardization
- Label Encoding
- One Hot Encoding

12. Perform following visualizations using matplotlib

- Bar Graph

- Pie Chart
- Box Plot
- Histogram
- Line Chart and Subplots
- Scatter Plot

13. Getting started with NLTK, install NLTK using PIP

14. Python program to implement with Python Sci Kit-Learn & NLTK

15. Python program to implement with Python NLTK/Spicy/Py NLPI.

WEB REFERENCES:

- https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-datascience-beginners/
- https://www.analyticsvidhya.com/blog/2021/07/data-science-with-pandas-2-minutesguide-to-key-concepts/
- https://www.analyticsvidhya.com/blog/2020/04/how-to-read-common-file-formatspython/
- https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessingpython-scikit-learn/
- https://www.analyticsvidhya.com/blog/2020/02/beginner-guide-matplotlib-datavisualization-exploration-python/
- https://www.nltk.org/book/ch01.html

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUBCODE: R23CC21L2	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**						

COURSE OBJECTIVES:

The aim of this course is to

- Practice object oriented programming in the Java programming language
- Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

EXPERIMENTS COVERING THE TOPICS:

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: Develop Java program, by using OOP concepts. [K3]
CO2: Make use of inheritance and interface concepts in Java programs. [K3]
CO3: Make use of Exception handling and Multithreading concepts in Java Programs. [K3]
CO4: Develop GUIs with JavaFX and JDBC programs. [K3]

SAMPLE EXPERIMENTS:

Exercise – 1:

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

Exercise - 2

- Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
- Write a JAVA program to sort for an element in a given list of elements using bubble sort
- Write a JAVA program using StringBuffer to delete, remove character.

Exercise - 3

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

Exercise - 4

- Write a JAVA program to implement Single Inheritance
- Write a JAVA program to implement multi-level Inheritance

- Write a JAVA program for abstract class to find areas of different shapes

Exercise - 5

- Write a JAVA program give example for "super" keyword.
- Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
- Write a JAVA program that implements Runtime polymorphism

Exercise - 6

- Write a JAVA program that describes exception handling mechanism
- Write a JAVA program Illustrating Multiple catch clauses
- Write a JAVA program for creation of Java Built-in Exceptions
- Write a JAVA program for creation of User Defined Exception

Exercise - 7

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 is Alive and join ()

- Write a Program illustrating Daemon Threads.
- Write a JAVA program Producer Consumer Problem

Exercise – 8

- Write a JAVA program that import and use the user defined packages
- Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
- Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

Exercise – 9

- Write a java program that connects to a database using JDBC
- Write a java program to connect to a database using JDBC and insert values into it.
- Write a java program to connect to a database using JDBC and delete values from it

Virtual Lab: http://ps-iiith.vlabs.ac.in/, www.w3schools.com

Any three programs must be submitted with result from the above link.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	1	2	30	70	100	2
SUBCODE: R23CC21L3	**PYTHON PROGRAMMING (SKILL ENHANCEMENT COURSE)**						

COURSE OBJECTIVES:

The main objectives of the course are to

1. Introduce core programming concepts of Python programming language.
2. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: Make use of control flow statements and functions to develop python programs.[K3].
CO2: Develop Python programs using strings, Lists, dictionaries, tuples and sets. [K3].
CO3: Develop Python programs on object oriented programming and regular expressions. [K3].
CO4: Develop Python programs using Nuimpy and Pandas. [K3].

UNTI-I:

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

- Write a program to find the largest element among three Numbers.
- Write a Program to display all prime numbers within an interval
- Write a program to swap two numbers without using a temporary variable.
- Demonstrate the following Operators in Python with suitable examples.
  i) Arithmetic Operators **ii)** Relational Operators **iii)** Assignment Operators i**v)** Logical Operators **v)** Bit wise Operators **vi)** Ternary Operator **vii)** Membership Operators **viii)** Identity Operators
- Write a program to add and multiply complex numbers
- Write a program to print multiplication table of a given number.

UNIT-II:

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.
Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

- Write a program to define a function with multiple return values.
- Write a program to define a function using default arguments.
- Write a program to find the length of the string without using any library functions.
- Write a program to check if the substring is present in a given string or not.
- Write a program to perform the given operations on a list:

i. Addition **ii.** Insertion **iii.** Slicing

6. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III:
Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.
Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

- Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
- Write a program to count the number of vowels in a string (No control flow allowed).
- Write a program to check if a given key exists in a dictionary or not.
- Write a program to add a new key-value pair to an existing dictionary.
- Write a program to sum all the items in a given dictionary.

UNIT-IV:
Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.
Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

- Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
- Python program to print each line of a file in reverse order.
- Python program to compute the number of characters, words and lines in a file.
- Write a program to create, display, append, insert and reverse the order of the items in the array.

- Write a program to add, transpose and multiply two matrices.
- Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V:

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

- Python program to check whether a JSON string contains complex object or not.
- Python Program to demonstrate NumPy arrays creation using array () function.
- Python program to demonstrate use of ndim, shape, size, dtype.
- Python program to demonstrate basic slicing, integer and Boolean indexing.
- Python program to find min, max, sum, cumulative sum of array
- Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    - Apply head () function to the pandas data frame
    - Perform various data selection operations on Data Frame
- Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

REFERENCE BOOKS:

- Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
- Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
- Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

ONLINE LEARNING RESOURCES / VIRTUAL LABS:

- https://www.coursera.org/learn/python-for-applied-data-science-ai
- https://www.coursera.org/learn/python?specialization=python#syllabus

II YEAR II SEMESTER

S.No.	Subcode	Category	Title	L	T	P	Credits
1	R23CC2208	Management Course- I	Optimization Techniques	2	0	0	2
2	R23DS2201	Engineering Science/ Basic Science	Statistical Methods for Data Science	3	0	0	3
3	R23DS2202	Professional Core	Data Engineering	3	0	0	3
4	R23CC2204	Professional Core	Database Management Systems	3	0	0	3
5	R23DS2203	Professional Core	Computer Organization and Architecture	3	0	0	3
6	R23DS22L2	Professional Core	Data Engineering Lab	0	0	3	1.5
7	R23CC22L1	Professional Core	DBMS Lab	0	0	3	1.5
8	R23DS22L4	Skill Enhancement course	Exploratory Data Analysis with Python	0	1	2	2
9	R23CC22L3	BS&H	Design Thinking &Innovation	1	0	2	2
10	R23CC22MC	BS&H	Environmental Studies	2	0	0	-
Total				17	1	10	21
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation							

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R23CC2208	OPTIMIZATION TECHNIQUES						

Pre-requisite:

COURSE OBJECTIVES:

- To define an objective function and constraint functions in terms of design variables, and then state the optimization problem.
- To state single variable and multi variable optimization problems, without and with constraints.
- To explain linear programming technique to an optimization problem, define slackand surplus variables, by using Simplex method.
- To state transportation and assignment problem as a linear programming problem to determine Simplex method.
- To study and explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.

COURSE OUTCOMES:

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

- Apply the optimization problem, without and with constraints, by usingdesign variables from an engineering design problem. [K3]
- Apply classical optimization techniques to minimize or maximize a multi-variableobjective function, without or with constraints, and arrive at an optimal solution. [K3]
- Apply and Solve transportation and assignment problem by using Linear programming Simplex method. [K3]
- Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions. [K3]
- Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution. [K3]

UNIT I: Introduction and Classical Optimization Techniques:

Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems.

Classical Optimization Techniques: Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions.

UNIT II: Linear Programming:

Standard form of a linear programming problem, geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm

UNIT III: Transportation Problem:

Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method, testing for optimality of balanced transportation problems, Special cases in transportation problem.

UNIT IV: Nonlinear Programming:

Unconstrained cases, one – dimensional minimization methods: Classification, Fibonacci method, Univariate method, steepest descent method. Constrained cases– Characteristics of a constrained problem, Classification, Basic approach of PenaltyFunction method, Basic approaches of Interior and Exterior penalty function methods,

UNIT V: Dynamic Programming:

Dynamic programming multistage decision processes, types, concept of sub optimization and the principle of optimality, computational procedure in dynamic programming, examples illustrating the calculus method of solution, examples illustrating the tabular method of solution.

TEXTBOOKS:

- "Engineering optimization: Theory and practice", S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
- "Introductory Operations Research", H.S. Kasene& K.D. Kumar, Springer (India),Pvt.LTd.

REFERENCE BOOKS:

- "Optimization Methods in Operations Research and systems Analysis", by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
- Operations Research, Dr.S.D.Sharma, Kedarnath, Ramnath & Co

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R23DS2201	STATISTICAL METHODS FOR DATA SCIENCE						

COURSE OBJECTIVES:

This course aims at providing knowledge on basic concepts of Statistics, Estimation and testing of hypotheses for large and small samples**.**

COURSE OUTCOMES:

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

- Analyze data and draw conclusion about collection of data and fitting of distributions [K4]
- Analyzing the testing of hypothesis for Large and Small samples.[K4]
- Applying skills in problem solving of the regression analysis [K3]
- Applying the significance of Time Series data in various fields [K3
- Understanding the classification using Logistic Regression [K2]

UNIT – I : Data Visualization and Distributions

Data Visualization Techniques: Introduction to Statistical methods- Exploratory Data Analysis-Charts (Line, Pie, Bar); Plots (Bubble, Scatter); Maps (Heat, Dot Distribution); Diagrams (Trees and Matrices)-Principal Components Analysis.

Introduction to Data Distributions - Probability Distributions – discrete (binomial, Poisson), Continuous Distributions (Normal, exponential).

UNIT – II : Hypothesis Testing

Introduction to Parametric Estimation-Parametric Confidence Intervals

Choosing a Statistic - Hypothesis Testing - Parametric test: the T-test - Applications to Hypothesis Tests-Pair wise comparisons.

UNIT- III : Linear Regression and Multiple Regression

Regression: Linear Regression, Curvilinear Regression: Exponential Regression- Polynomial Regression- Power Model.

Practical Examples - The nature of the 'relationship' - Multiple Linear Regression - Important measurements of the regression estimate - Multiple Regression with Categorical Explanatory Variables - Inference in Multiple Regression - Variable Selection.

UNIT -IV: Time Series

Time series: Significance of Time series analysis, Components of Time series, Secular trend: Graphic method, Semi-average method, Method of moving averages, Method of least squares: straight line and non-linear trends, Logarithmic methods – Exponential trends, Growth curves, **Seasonal Variations:** Method of simple averages, Ratio-to-trend method, ratio-to-moving average method, Link relative method.

UNIT-V: Logistic Regression

The classification problem - Logistic Regression Setup - Interpreting the Results - Comparing Models - Classification Using Logistic Regression.

TEXTBOOKS:

- Elizabeth Purdom, "Statistical methods for Data science"
- K.Murugesan, P.Gurusamy , “Probability, Statistics and Random Processes”

REFERENCE BOOKS:

- Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of Hypotheses, Prentice Hall of India, 2014.
- Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical Inference,9th edition, Pearson publishers,2013.
- Chris Chatfield, “The analysis of time series an introduction,” 5th edition, Chapman & Hall/CRC.
- Peter J. Brockwell, Richard A.Davis, “Introduction to Time series and Forecasting,” Second edition, Springer

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R23DS2202	**DATA ENGINEERING**						

COURSE OBJECTIVES:

- Explain basic concepts of Data Engineering
- Discuss bout Data Engineering Life Cycle
- How to design Good Data Architecture

COURSE OUTCOMES:

After Completion of the course, Students are able to:

CO1: Interpret the fundamental concepts and roles within data engineering. [K2]
CO2: Analyze the stages and major considerations of the data engineering life cycle. [K4]
CO3: Analyze data structures and generate data from various source systems. [K4]
CO4: Evaluate and implement effective data storage and ingestion strategies. [K5]
CO5: Analyze and optimize data queries and serve data analytics for machine learning. [K4]

UNIT-I:

Introduction to Data Engineering: Definition, Data Engineering Life Cycle, Evolution of Data Engineer, Data Engineering Versus Data Science, Data Engineering Skills and Activities, Data Maturity, Data Maturity Model, Skills of a Data Engineer, Business Responsibilities, Technical Responsibilities, Data Engineers and Other Technical Roles.

UNIT-II:

Data Engineering Life Cycle: Data Life Cycle Versus Data Engineering Life Cycle, Generation: Source System, Storage, Ingestion, Transformation, Serving Data.
Major undercurrents across the Data Engineering Life Cycle: Security, Data Management, DataOps, Data Architecture, Orchestration, Software Engineering.

UNIT-III:

Designing Good Data Architecture: Enterprise Architecture, Data Architecture, Principles of Good Data Architecture, Major Architecture Concepts.
Data Generation in Source Systems: Sources of Data, Files and Unstructured Data, APIs, Application Databases (OLTP), OLAP, Change Data Capture, Logs, Database Logs, CRUD, Source System Practical Details.

UNIT-IV:

Storage: Raw Ingredients of Data Storage, Data Storage Systems, Data Engineering Storage Abstractions, Data warehouse, Data Lake, Data Lakehouse.
I**ngestion**: Data Ingestion, Key Engineering considerations for the Ingestion Phase, Batch Ingestion Considerations, Message and Stream Ingestion Considerations, Ways to Ingest Data

UNIT-V:

Queries, Modeling and Transformation: Queries, Life of a Query, Query Optimizer, Queries on Streaming Data, Data Modelling, Modeling Streaming Data, Transformations, Streaming Transformations and Processing.

Serving Data for Analytics, Machine Learning and Reverse ETL: General Considerations for serving Data, Business Analytics, Operational Analytics, Embedded Analytics, Ways to serve data for analytics and ML, Reverse ETL.

TEXT BOOKS:

1. Joe Reis, Matt Housley, Fundamentals of Data Engineering, O'Reilly Media, Inc.,June 2022,ISBN: 9781098108304

REFERENCE BOOKS:

- Paul Crickard , Data Engineering with Python,Packt Publishing, October 2020.
- Ralph Kimball, Margy Ross, The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling, Wiley, 3rd Edition, 2013
- James Densmore, Data Pipelines Pocket Reference: Moving and Processing Data for Analytics, O'Reilly Media, 1st Edition, 2021

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R23CC2204	**DATABASE MANAGEMENT SYSTEMS**						

COURSE OBJECTIVES:

The main objectives of the course is to

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

COURSE OUTCOMES:

After Completion of the course, Students are able to:

CO 1: Interpret the fundamentals of DBMS. [K2]
CO 2: Analyzing relational database designing. [K4]
CO 3: Developing queries in RDBMS [K3]
CO 4: Analyzing database design methodology and normalization process [K4].
CO 5: Analyze transaction concepts and File indexing. [K2]

UNIT I:

Introduction: Database system, Characteristics (Database Vs File System), Database Users, 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, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

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, Relational Algebra, Relational Calculus. BASIC SQL:Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT III:

SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).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 dependencyLossless join and dependency

preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V:

Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing:

TEXT BOOKS:

- Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
- Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

REFERENCE BOOKS:

- Introduction to Database Systems, 8thedition, C J Date, Pearson.
- Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
- Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

WEB-RESOURCES:

- https://nptel.ac.in/courses/106/105/106105175/
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672820224 56_shared/overview

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE: R23DS2203	COMPUTER ORGANIZTION AND ARCHITECTURE						

COURSE OBJECTIVES:

The purpose of the course is

- Discuss about principles of computer organization and the basic architectural concepts.
- Explain in depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems.

COURSE OUTCOMES:

After Completion of the course, Students are able to:

CO1: Demonstrate an understanding of the different number systems, codes and relate postulates of Boolean algebra and minimize combinational functions. [K2]

CO2: Evaluate and learn different combinational circuits, sequential circuits and able to design them. [K5]

CO3: Organize, determine and learns basic structure of components register through language, micro operations and able to write micro programs. [K3]

CO4: Determine and able to learn micro programme control and central processing unit. [K3]

CO5: Able to learns the internal organization of computers and able to analyze performance of them. [K4]

UNIT I:

Digital Computers and Data Representation: Introduction, Numbering Systems, Decimal to Binary Conversion, Binary Coded Decimal Numbers, Weighted Codes, Self-Complementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCI Code Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Boolean Algebra and Logical gates: Boolean Algebra :Theorems and properties, Boolean functions, canonical and standard forms , minimization of Boolean functions using algebraic identities; Karnaugh map representation and minimization using two and three variable Maps; Logical gates ,universal gates and Two- level realizations using gates : AND-OR, OR-AND, NAND-NAND and NOR-NOR structures.

UNIT II:

Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Implementation using universal gates, Multi-bit adder, Multiplexers, De-multiplexers, Decoders Sequential Switching Circuits: Latches and Flip-Flops, Ripple counters using T flip-flops;

Synchronous counters: Shift Registers; Ring counters

UNIT III: Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Booth multiplication algorithm, Division Algorithms, Floating – point Arithmetic Operations. Register Transfer language and microinstructions: Bus memory transfer, arithmetic and logical micro-operations, shift and rotate micro-operations.

Basic Computer Organization and Design: Stored program concept, computer Registers, common bus system, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input–Output configuration and program Interrupt.

UNIT IV: Microprogrammed Control:
Control memory, Address sequencing, microprogram example, design of control unit.
Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation.
Program Control: conditional Flags and Branching.

UNITV:
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.
Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

TEXT BOOKS:
1. Digital Logic and Computer Design, Moriss Mano, 11th Edition, Pearson.
2. Computer System Architecture, 3rd Edition, M.Morris Mano, PHI

REFERENCE BOOKS:
1. Digital Logic and Computer Organization, Rajaraman, Radha krishnan, PHI, 2006
2. Computer Organization, 5Th Edition, Hamacher, Vranesic, Zaky, TMH, 2002
3. Computer Organization & Architecture: Designing for Performance, 7th Edition, William Stallings, PHI, 2006

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUBCODE: R23DS22L2	**DATA ENGINEERING LAB**						

COURSE OBJECTIVES:

The main objective of this course is to teach how build data engineering infrastructure and data pipelines.

COURSE OUTCOMES:

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

CO1: Build our Data Engineering Infrastructure
CO2: Demonstrate Reading and Writing files
CO3: Build Data Pipelines and integrate with Dashboard
CO4: Deploy the Data Pipeline in production

EXPERIMENTS:

- Installing and configuring Apache NiFi, Apache Airflow
- Installing and configuring Elasticsearch, Kibana, PostgreSQL, pgAdmin 4
- Reading and Writing files
  - Reading and writing files in Python
  - Processing files in Airflow
  - NiFi processors for handling files
  - Reading and writing data to databases in Python
  - Databases in Airflow
  - Database processors in NiFi
- Working with Databases
  - Inserting and extracting relational data in Python
  - Inserting and extracting NoSQL database data in Python
  - Building database pipelines in Airflow
  - Building database pipelines in NiFi
- Cleaning, Transforming and Enriching Data
- Performing exploratory data analysis in Python
  - Handling common data issues using pandas
- Cleaning data using Airflow
- Building the Data Pipeline
- Building a Kibana Dash Board
- Perform the following operations
  - Staging and validating data
  - Building idempotent data pipelines
  - Building atomic data pipelines

- Version Control with the NiFi Registry
  - Installing and configuring the NiFi Registry
  - Using the Registry in NiFi
  - Versioning your data pipelines
  - Using git-persistence with the NiFi Registry
- Monitoring Data Pipelines
  - Monitoring NiFi in the GUI
  - Monitoring NiFi using processors
  - Monitoring NiFi with Python and the REST API
- Deploying Data Pipelines
  - Finalizing your data pipelines for production
  - Using the NiFi variable registry
  - Deploying your data pipelines
- Building a Production Data Pipeline
  - Creating a test and production environment
  - Building a production data pipeline
  - Deploying a data pipeline in production

REFERENCE BOOKS:

1. Paul Crickard, Data Engineering with Python,Packt Publishing, October 2020

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUBCODE: R23CC22L1	**DATABASE MANAGEMENT SYSTEMS LAB**						

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,

EXPERIMENTS COVERING THE TOPICS:

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

COURSE OUTCOMES:

After Completion of this course student must be able to

CO1: Apply SQL commands like DDL, DML, DCL and Indexing to perform different Database operations [K3].
CO2: Develop PL/SQL block statements, control statements and cursors. [K3]
CO3: Develop PL/SQL programs using functions and procedures. [K3]
CO4: Develop PL/SQL programs using packages and Triggers. [K3]
CO5: Develop a Java Program to connect to a database. [K3].

SAMPLE EXPERIMENTS:

- Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
- 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.
- Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
- 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)
- 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 printed for those who secured first class and an exception can be raised if no records were found)
- Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
- Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.

- Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
- Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
- Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
- Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
- Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
- Create a table and perform the search operation on table using indexing and nonindexing techniques.
- Write a Java program that connects to a database using JDBC
- Write a Java program to connect to a database using JDBC and insert values into it
- Write a Java program to connect to a database using JDBC and delete values from it

TEXT BOOKS/SUGGESTED READING:

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

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	1	2	30	70	100	1.5
SUBCODE: R23DS22L4	**EXPLORATORY DATA ANALYSIS USING PYTHON (SKILL DEVELOPMENT COURSE)**						

COURSE Objectives:

- This course introduces the fundamentals of Exploratory Data Analysis
- It covers essential exploratory techniques for understanding multivariate data by summarizing it through statistical methods and graphical methods.

COURSE OUTCOMES:

After Completion of this course student must be able to

CO1: Enumerate the fundamentals of Exploratory Data Analysis.
CO2: Visualize the data using basic graphs and plots.
CO3: Apply different Data Transformation Techniques.
CO4: Summarize the data using descriptive statistics, evaluate and select the best model.

UNIT-I

Exploratory Data Analysis Fundamentals: Understanding data science, The significance of EDA, Steps in EDA, Making sense of data, Numerical data, Categorical data, Measurement scales, Comparing EDA with classical and Bayesian analysis, Software tools available for EDA, Getting started with EDA.

Sample Experiments:

- **a)** Download Dataset from Kaggle using the following link : https://www.kaggle.com/datasets/sukhmanibedi/cars4u

b) Install python libraries required for Exploratory Data Analysis (numpy, pandas, matplotlib,seaborn)

- Perform Numpy Array basic operations and Explore Numpy Built-in functions.
- Loading Dataset into pandas dataframe
- Selecting rows and columns in the dataframe

UNIT-II

Visual Aids for EDA: Technical requirements, Line chart, Bar charts, Scatter plot using seaborn, Polar chart, Histogram, Choosing the best chart

Case Study: EDA with Personal Email, Technical requirements, Loading the dataset, Data transformation, Data cleansing, Applying descriptive statistics, Data refactoring, Data analysis.

Sample Experiments:

1. Apply different visualization techniques using sample dataset
   a) Line Chart **b)** Bar Chart **c)** Scatter Plots **d)** Bubble Plot
2. Generate Scatter Plot using seaborn library for iris dataset
3. Apply following visualization Techniques for a sample dataset
   a) Area Plot **b)** Stacked Plot **c)** Pie chart **d)** Table Chart
4. Generate the following charts for a dataset.
   a) Polar Chart **b)** Histogram **c)** Lollipop chart
5. Case Study: Perform Exploratory Data Analysis with Personal Email Data

UNIT-III

Data Transformation: Merging database-style dataframes, Concatenating along with an axis, Merging on index, Reshaping and pivoting, Transformation techniques, Handling missing data, Mathematical operations with NaN, Filling missing values, Discretization and binning, Outlier detection and filtering, Permutation and random sampling, Benefits of data transformation, Challenges.

Sample Experiments:

- Perform the following operations
  - Merging Dataframes
  - Reshaping with Hierarchical Indexing
  - Data Deduplication
  - Replacing Values
- Apply different Missing Data handling techniques
  - NaN values in mathematical Operations
  - Filling in missing data
  - Forward and Backward filling of missing values
  - Filling with index values
  - Interpolation of missing values
- Apply different data transformation techniques
  - Renaming axis indexes

b) Discretization and Binning

  - Permutation and Random Sampling
  - Dummy variables

UNIT-IV

Descriptive Statistics: Distribution function, Measures of central tendency, Measures of dispersion, Types of kurtosis, Calculating percentiles, Quartiles, Grouping Datasets,
Correlation, Understanding univariate, bivariate, multivariate analysis, Time Series Analysis

Sample Experiments:

- Study the following Distribution Techniques on a sample data
  - Uniform Distribution
  - Normal Distribution
  - Gamma Distribution
  - Exponential Distribution
  - Poisson Distribution
  - Binomial Distribution
- Perform Data Cleaning on a sample dataset.
- Compute measure of Central Tendency on a sample dataset
  a) Mean **b)** Median **c)** Mode
- Explore Measures of Dispersion on a sample dataset
  a) Variance **b)** Standard Deviation **c)** Skewness **d)** Kurtosis
- **a)** Calculating percentiles on sample dataset
  b) Calculate Inter Quartile Range (IQR) and Visualize using Box Plots
- Perform the following analysis on automobile dataset.
  a) Bivariate analysis **b)** Multivariate analysis
- Perform Time Series Analysis on Open Power systems dataset

UNIT-V

Model Development and Evaluation: Unified machine learning workflow, Data preprocessing, Data preparation, Training sets and corpus creation, Model creation and training, Model evaluation, Best model selection and evaluation, Model deployment

Case Study: EDA on Wine Quality Data Analysis

Sample Experiments:

1. Perform hypothesis testing using statsmodels library
   a) Z-Test **b)** T-Test
2. Develop model and Perform Model Evaluation using different metrics such as prediction score, R2 Score, MAE Score, MSE Score.

   Case Study: Perform Exploratory Data Analysis with Wine Quality Dataset

TEXT BOOK:

1. Suresh Kumar Mukhiya, Usman Ahmed, Hands-On Exploratory Data Analysis with Python, Packt Publishing, 2020.

REFERENCES:

- Ronald K. Pearson, Exploratory Data Analysis Using R, CRC Press, 2020
- Radhika Datar,Harish Garg, Hands-On Exploratory Data Analysis with R: Become an expert in exploratory data analysis using R packages, Ist Edition, Packt Publishing, 2019

WEB REFERENCES:

- https://github.com/PacktPublishing/Hands-on-Exploratory-Data-Analysis-withPython
- https://www.analyticsvidhya.com/blog/2022/07/step-by-step-exploratory-dataanalysis-eda-using-python/#h-conclusion
- https://github.com/PacktPublishing/Exploratory-Data-Analysis-with-PythonCookbook

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	0	2	30	70	100	2
SUBCODE: R23CC22L3	**DESIGN THINKING & INNOVATION**						

COURSE OBJECTIVES:

The objectives of the course are to

1. Bring awareness on innovative design and new product development.
2. Explain the basics of design thinking.
3. Familiarize the role of reverse engineering in product development.
4. Train how to identify the needs of society and convert into demand.
5. Introduce product planning and product development process.

COURSE OUTCOMES:

After Completion of the course, Students are able to:

- Define the concepts related to design thinking. [L1]
- Explain the fundamentals of Design Thinking and innovation. [L2]
- Apply the design thinking techniques for solving problems in various sectors. [L3]
- Analyse to work in a multidisciplinary environment. [L4]
- Evaluate the value of creativity. [L5]

UNIT – I: Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT – II: Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT – III: Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT – IV: Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT – V: Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine

business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.
Activity: How to market our own product, about maintenance, Reliability and plan for startup.

TEXTBOOKS:

- Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
- Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

REFERENCE BOOKS:

- David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
- Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
- William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
- Chesbrough.H, The era of open innovation, 2003.

ONLINE LEARNING RESOURCES:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0				
SUBCODE: R23CC22MC	**ENVIRONMENTAL STUDIES**						

COURSE OBJECTIVES:

- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
- To save earth from the inventions by the engineers.

COURSE OUTCOMES:

After Completion of the course, Students are able to:

- Understand multi-disciplinary nature of environmental studies and analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources. [L2]
- Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web. Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity. [L2]
- Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management [L2]
- Understand the rainwater harvesting, watershed management, ozonelayer depletion and waste land reclamation. [L2]
- Illustrate the causes of population explosion, value education and welfare programmes. [L3]

UNIT – I

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – 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, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- Forest ecosystem.
- Grassland ecosystem
- Desert ecosystem

- Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation : Introduction and Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

Environmental Pollution: Definition, Cause, effects and control measures of:

- Air Pollution.
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies –

Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment 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.

UNIT – V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health –Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

TEXTBOOKS:

- Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.
- Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.
- S.Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
- K.Raghavan Nambiar, “Text book of Environmental Studies for UndergraduateCourses as per

UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

REFERENCE BOOKS:

- Deeksha Dave and E.Sai Baba Reddy, Textbook of Environmental Science, 2/e,Cengage Publications, 2012.
- M.Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, 2014.
- J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
- J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering,Prentice Hall of India Private limited, 1988.
- G.R. Chatwal, a Text Book of Environmental Studies, Himalaya Publishing House,2018.
- Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineeringand Science, 1/e, Prentice Hall of India Private limited, 1991.

ONLINE LEARNING RESOURCES:

- https://onlinecourses.nptel.ac.in/noc23_hs155/preview
- https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-d84c-4773-8388-1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science+Part+3%3A+Pollution+and+Resources&source=edX&product_category=course&placement url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmental- science
- http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-I/Data%20Files/pdf/lec07.pdf
- https://www.youtube.com/watch?v=5QxxaVfgQ3k

B.Tech. – III Year I Semester

S.No	Subject Codes	Category	Title	L	T	P	C
1	R23DS3101	Professional Core	Machine Learning	3	0	0	3
2	R23CC3111	Professional Core	Computer Networks	3	0	0	3
3	R23CC3112	Professional Core	Software Engineering	3	0	0	3
4	R23CC3113 R23CC3118 R23DS3102 R23CC3114 R23CC31MOOC	Professional Elective-I	6. Automata Theory & Compiler Design 7. Object Oriented Analysis and Design 8. Soft computing 9. Internet of Things 10. Any of the 12-Week SWAYAM /NPTEL Course suggested by the BoS	3	0	0	3
5	R23OE3121 R23OE3122 R23OE3119	Open Elective- I	1. Entrepreneurship Development & Venture Creation 2. Operating Systems 3. Computer Organization and Architecture	3	0	0	3
6	R23DS31L1	Professional Core	Machine Learning Lab	0	0	3	1.5
7	R23DS31L2	Professional Core	Computer Networks Lab	0	0	3	1.5
8	R23DS31L3	Skill Enhancement course	Full Stack development -1 / SWAYAM Plus – Data Engineer / AI Engineer	0	1	2	2
9	R23DS31L4	ES	Tinkering Lab *(User Interface Design using Flutter)/* SWAYAM Plus - Android Application Development (with Flutter)/**AICTE – Design Thinking and Idea Lab**	0	0	2	1
10	R23CC31CSP	Evaluation of Community Service Project Internship		-	-	-	2
	Total			**15**	**01**	**10**	**23**
MC		Student may select from the Same Minor Pool		3	0	3	4.5
MC		Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)		3	0	0	3
HC		Student may select from the Same Honors Pool		3	0	0	3
HC		Student may select from the Same Honors Pool		3	0	0	3

III B.Tech. I Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3101	MACHINE LEARNING						

Course Objectives:

The objectives of the course are to

- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.

COURSE OUTCOMES: After completion of this course, the students would be able to:

CO1: Analyze and Design Intelligent Agents [K4]

CO2: Apply Search Algorithms to Problem Solving [K3]

CO3: Apply techniques for constraint propagation and reasoning under uncertainty [K3]

CO4: Utilize inductive learning, decision trees, and explanation-based learning for learning from observation. [K3]

CO5: Analyze and compare typical expert systems such as MYCIN, DART, and XCON [K4]

SYLLABUS:

UNIT - I: Introduction to Machine Learning:

Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

UNIT - II: Nearest Neighbor-Based Models:

Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

UNIT - III: Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.

The Bayes Classifier: Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

UNIT - IV: Linear Discriminants for Machine Learning:
Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

UNIT - V: Clustering: Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

Text Books:

1. "Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

Reference Books:

1. "Machine Learning", Tom M. Mitchell, McGraw-Hill Publication, 2017
2. "Machine Learning in Action", Peter Harrington, Dream Tech
3. "Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

III B.Tech. I Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23CC3111	COMPUTER NETWORKS						

Course Objectives:

The course is designed to

- To understand the different types of networks
- To develop an understanding the principles of computer networks.
- To familiarize with Reference model OSI and TCP/IP
- To understand various layers of Reference models functions
- To explore network protocols

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

CO1: Describe different types of networks and explain the OSI and TCP/IP models. [K2]

CO2: Explain data link layer functions and apply error control and access methods in wired networks. [K3]

CO3: Apply routing and congestion control methods and compare IPv4 and IPv6 addressing. [K4]

CO4: Compare transport layer protocols like UDP, TCP, and SCTP. [K4]

CO5: Identify and explain application layer protocols such as HTTP, DNS, and FTP. [K2]

SYLLABUS:

UNIT - I: Introduction

Types of Computer Networks, Reference Models- The OSI Reference Model, The TCP/IP Reference Model, A Critique of the OSI Model and Protocols, A Critique of the TCP/IP Reference Model. History of Internet.

UNIT -II: The Data Link Layer

Transmission Media, Guided and Un-guided media,
Data Link Layer Design Issues, Services Provided to the Network Layer, Error detecting and Error Correcting codes, Elementary Data Link Protocols, Sliding Window Protocols, HDLC, PPP. Multiple Access Protocols Wired Lans: Ethernet, Fast Ethernet, Gigabit Ethernet

UNIT - III: The Network Layer

Network Layer Design Issues, Routing Algorithms, Congestion, Congestion control algorithms. The Network Layer in the Internet, the IP Version 4 Protocol, IP Addresses- Classful, CIDR, NAT, IP Version 6 Protocol, Transition from IPV4 to IPV6

UNIT -IV: The Transport Layer

The Transport Layer Services, Transport Layer Protocols: UDP, TCP and SCTP

UNIT -V: The Application Layer

The World Wide Web, HTTP, Domain Name Space, Remote Loging, Electronic Mail and File Transfer

Textbooks:

- "Computer Networks", Andrew S Tanenbaum, David J Wetherall, 5th Edition, Pearson
- "Data Communications and Networking", Behrouz A Forouzan, 4th Edition, Tata McGraw Hill Education

Reference Books:

- "Data and Computer Communication", William Stallings, Pearson
- "TCP/IP Protocol Suite", Behrouz Forouzan, McGraw Hill.

III B.Tech. I Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23CC3112	SOFTWARE ENGINEERING						

COURSE OBJECTIVES:

The objectives of this course are to introduce

- Software lifecycle models, Software requirements and SRS document.
- Project Planning, quality control and ensuring good quality software.
- Software Testing strategies, use of CASE tools, Implementation issues, validation &verification procedures.

COURSE OUTCOMES:

CO1: Compare and analyse various process models [K1]
CO2: Develop SRS document and estimate the modularity of the project [K2]
CO3: Develop data flow diagrams and compare the user interface design [K2]
CO4: Compare testing strategies and analyse the software quality [K3]
CO5: Apply Computer Aided Software Engineering tools and analyse the components of software maintenance and reuse [K2]

SYLLABUS:

UNIT - I:

Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

Software Life Cycle Models: Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.

UNIT - II:

Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.

Requirements Analysis and Specification: Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

UNIT - III:

Software Design: Overview of the design process, How to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design.

Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile

Process Models, Tool Set for the Agile Process (Text Book 2)

Function-Oriented Software Design: Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.

User Interface Design: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

UNIT - IV:

Coding And Testing: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing**,** testing object-oriented programs, Smoke testing, and some general issues associated with testing.

Software Reliability and Quality Management: Software reliability. Statistical testing, Software quality, Software quality management system, ISO9000. SEI Capability maturity model. Fewother important quality standards, and Six Sigma**.**

UNIT - V:

Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, towards second generation CASE Tool, and Architecture of a CASE Environment.

Software Maintenance: Characteristics of software maintenance, Software reverse engineering, software maintenance process models and Estimation of maintenance cost.

Software Reuse: Reuse-definition, Introduction, Reason behind no reuses of ar, Basic issues in any reuse program, a reuse approach, and Reuse at organization level.

Text Books:

- Fundamentals of Software Engineering, RajibMall, 5thEdition, PHI.
- Software Engineering a Practitioner's Approach, Roger S. Pressman, 9thEdition, McGraw Hill International Edition.

Reference Books:

- Software Engineering, IanSommerville, 10thEdition, Pearson.
- Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

Resources:

- https://nptel.ac.in/courses/106/105/106105182/
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01338269041100390473 5_shared/overview

COURSE OBJECTIVES:

III B.Tech. I Semester P.E. I	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23CC3113	AUTOMATA THEORY AND COMPILER DESIGN						

- To introduce the. Fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1: Explain the basics of automata theory. [K3]
CO2: Make use of regular expressions and grammars to describe languages and identify ambiguity using the Pumping Lemma. [K4]
CO3: Compare PDA and CFGs, and explain Turing machines and undecidable problems. [K4]
CO4: Explain lexical and syntax analysis and use basic parsing methods. [K3]
CO5: Apply syntax-directed translation and generate intermediate code for expressions and statements. [K3]

SYLLABUS:

UNIT – I:

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems. Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions. Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA.

UNIT – II:

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions. Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma. Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT – III:

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

UNIT – IV:

Introduction: The structure of a compiler, Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex.

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing.

Introduction to LR Parsing: Simple LR, More Powerful LR Parsers R18 B.Tech. CS&D Syllabus JNTU Hyderabad.

UNIT – V:

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax Directed Translation Schemes, Implementing L-Attributed SDD's. Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

TEXT BOOKS:

- Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
- Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, 2nd Edition, Pearson.
- Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

REFERENCE BOOKS:

- Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
- Introduction to Languages and the Theory of Computation, John C Martin, TMH.
- Lex &Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
- Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

III B.Tech. I Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits

P.E. I	3	0	0	30	70	100	3
SUBCODE: R23CC3118	OBJECT ORIENTED ANALYSIS AND DESIGN						

COURSE OBJECTIVES: The main objective is for students to

- Become familiar with all phases of Object-Oriented Analysis and Design (OOAD).
- Master the main features of UML,
- Understand Object Technologies and their applications, develop problem-solving skills in various domains
- Learn Object Design Principles and their implementation

COURSE OUTCOMES: After completion of this course, the students would be able to
CO1: Analyze methods to organize complex systems using design principles. [K4]
CO2: Apply UML to model software using structural diagrams. [K3]
CO3: Develop class and object diagrams. [K3]
CO4: Construct behavioural models for real time systems. [K3]
CO5: Make use of state chart, component and deployment diagrams to model dynamic aspects of software systems. [K3]

SYLLABUS:
UNIT - I:
Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems.
Case Study: System Architecture: Satellite-Based Navigation

UNIT - II:

Introduction to UML: Importance of modeling, principles of modeling, object-oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle.
Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.
Case Study: Control System: Traffic Management.

UNIT - III:

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.
Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. **Case Study:** AI: Cryptanalysis.

UNIT - IV:

Basic Behavioral Modeling-I: Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams.

Case Study: Web Application: Vacation Tracking System

UNIT-V:

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams

Case Study: Weather Forecasting

TEXT BOOKS:

1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, "Object- Oriented Analysis and Design with Applications", 3rd edition,2013, PEARSON.
2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

REFERENCE BOOKS:

- Meilir Page-Jones: Fundamentals of Object-Oriented DesigninUML, Pearson Education.
- PascalRoques: Modeling Software SystemsUsingUML2, WILEY- Dreamtech India Pvt. Ltd.
- Atul Kahate: Object Oriented Analysis &Design, The McGraw-Hill Companies.
  Appling UML and Patterns: An introduction to Object–Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

III B.Tech. I Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
P.E. I	3	0	0	30	70	100	3
SUBCODE: R23DS3102	SOFT COMPUTING						

COURSE OBJECTIVES:

To introduce the concepts in Soft Computing such as Artificial Neural Networks, Fuzzy logic-based systems, genetic algorithm-based systems and their hybrids.

COURSE OUTCOMES: The students will be able to

CO1: Learn soft computing techniques and their applications.
CO2: Analyze various neural network architectures.
CO3: Define the fuzzy systems.
CO4: Understand the genetic algorithm concepts and their applications.
CO5: Identify and select a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution

SYLLABUS:

UNIT - I:

Introduction to Soft Computing, Artificial neural networks, biological neurons, Basic models of artificial neural networks, Connections, Learning, Activation Functions, McCulloch and Pitts Neuron, Hebb network.

UNIT - II:

Perceptron networks, learning rule, Training and testing algorithm, Adaptive Linear Neuron, Back propagation Network, Architecture, Training algorithm

UNIT - III:

Fuzzy logic, fuzzy sets, properties, operations on fuzzy sets, fuzzy relations, operations on fuzzy relations, Fuzzy membership functions, fuzzification, Methods of membership, value assignments, intuition, inference, rank ordering, Lambda –cuts for fuzzysets, Defuzzification methods.

UNIT - IV:

Truth values and Tables in Fuzzy Logic, Fuzzy propositions, Formation of fuzzy rules, Decomposition of rules, Aggregation of rules, Fuzzy Inference Systems, Mamdani and Sugeno types, Neuro-fuzzy hybrid systems, characteristics, classification.

UNIT - V:

Introduction to genetic algorithm, operators in genetic algorithm, coding, selection, crossover, mutation, stopping condition for genetic algorithm flow, Genetic-neuro hybrid systems, Genetic Fuzzy rule-based system

TEXT BOOKS:

- S. N. Sivanandamand S. N. Deepa, Principles of soft computing–John Wiley & Sons, 2007.
- Timothy J. Ross, Fuzzy Logic with engineering applications, John Wiley& Sons, 2016.

REFERENCE BOOKS:

- N. K. Sinhaand M. M. Gupta, Soft Computing & Intelligent Systems: Theory & Applications-Academic Press /Elsevier. 2009.
- Simon Haykin, Neural Network- A Comprehensive Foundation-Prentice Hall International, Inc.1998
- R. Eberhart and Y. Shi, Computational Intelligence: Concepts to Implementation, Morgan Kaufman/Elsevier, 2007.
- Driankov D., Hellendoorn H.and Reinfrank M., an Introduction to Fuzzy Control Narosa Pub., 2001.
- BartKosko, Neural NetworkandFuzzySystems-PrenticeHall,Inc.,Englewood Cliffs, 1992
- Goldberg D.E.,Genetic Algorithms in Search, Optimization, and Machine Learning Addison Wesley, 1989

III B.Tech. I Semester P.E. I	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23CC3114	INTERNET OF THINGS						

Course Objectives:

- Vision and Introduction to Internet of Things (IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

Course Outcomes: After completion of this course, the students would be able to

CO1: Explain the basics of IoT, and common communication protocols. [K2]
CO2: Describe IoT/M2M architecture, communication technologies. [K2]
CO3: Apply web and message communication protocols to enable connectivity for IoT devices. [K3]
CO4: Organize and manage IoT data to support applications. [K3]
CO5: Make use of cloud platforms and sensor technologies for data collection, storage, and computing in IoT applications. [K3]

SYLLABUS:

UNIT-I:

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles for Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT-II:

Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High- level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT-III:

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT-IV:

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT-V:

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

TEXT BOOKS:

- Internet of Things: Architecture, Design Principles and Applications, Rajkamal, McGraw Hill Higher Education
- Internet of Things, A. Bahgya and V. Madisetti, University Press, 2015

REFERENCE BOOKS:

- Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
  Getting Started with the Internet of Things, Cuno Pfister, Oreilly

III B.Tech. I Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits

	0	**0**	**3**	**30**	**70**	**100**	**1.5**
SUBCODE: R23DS31L1	**MACHINE LEARNING LAB**						

Course Objectives:

- To learn about computing central tendency measures and Data preprocessing techniques
- To learn about classification and regression algorithms
- To apply different clustering algorithms for a problem.

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

CO1: Analyze data by measuring central tendency measures. [K4]

CO2: Develop various regression techniques on datasets. [K3]

CO3: Apply clustering algorithms and calculate performance on given datasets. [K3]

CO4: Develop programs using advance machine learning techniques. [K3]

Software's Required: Python/R/Weka

List of Experiments:

1. Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.

2. Apply the following Pre-processing techniques for a given dataset.
   a. Attribute selection
   b. Handling Missing Values
   c. Discretization
   d. Elimination of Outliers

3. Apply KNN algorithm for classification and regression

4. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results

5. Demonstrate decision tree algorithm for a regression problem

6. Apply Random Forest algorithm for classification and regression

7. Demonstrate Naïve Bayes Classification algorithm.

8. Apply Support Vector algorithm for classification

9. Demonstrate simple linear regression algorithm for a regression problem

10. Apply Logistic regression algorithm for a classification problem

11. Demonstrate Multi-layer Perceptron algorithm for a classification problem

12. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.

13. Demonstrate the use of Fuzzy C-Means Clustering

14. Demonstrate the use of Expectation Maximization based clustering algorithm

III B.Tech. I Semester	**L**	**T**	**P**	**Internal Marks**	**External Marks**	**Total Marks**	**Credits**

	0	**0**	**3**	**30**	**70**	**100**	**1.5**
SUBCODE: R23DS31L2	**COMPUTER NETWORKS LAB**						

Course Outcomes: On completion of this course, the student will be able to

- Learn to set up and use network devices, tools, and basic LAN connections.
- Practice implementing and testing networking protocols for error control, flow control, and routing.
- Use tools like Wireshark, Nmap, and NS2 to monitor, analyze, and simulate network performance.

Course Outcomes: After completion of this course, the students would be able to

CO1: Identify and configure basic network devices and establish LAN connectivity. [K3]
CO2: Implement data link layer protocols for framing, error detection, and correction. [K3]
CO3: Simulate and analyze routing and congestion control algorithms using suitable programming tools. [K4]
CO4: Make use of network simulation and analysis tools to evaluate network performance. [K4]

List of Experiments:

- Study of Network devices in detail and connect the computers in Local Area Network.
- Write a Program to implement the data link layer farming methods such as i) Character stuffing ii) bit stuffing.
- Write a Program to implement data link layer farming method checksum.
- Write a program for Hamming Code generation for error detection and correction.
- Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
- Write a Program to implement Sliding window protocol for Goback N.
- Write a Program to implement Sliding window protocol for Selective repeat.
- Write a Program to implement Stop and Wait Protocol.
- Write a program for congestion control using leaky bucket algorithm
- Write a Program to implement Dijkstra‘s algorithm to compute the Shortest path through a graph.
- Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
- Write a Program to implement Broadcast tree by taking subnet of hosts.
- Wireshark
  - i. Packet Capture Using Wire shark
  - ii. Starting Wire shark
  - iii. Viewing Captured Traffic
  - iv. Analysis and Statistics & Filters.
- How to run Nmap scan

- Operating System Detection using Nmap
- Do the following using NS2 Simulator
  - i. NS2 Simulator-Introduction
  - ii. Simulate to Find the Number of Packets Dropped
  - iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
  - iv. Simulate to Find the Number of Packets Dropped due to Congestion
  - v. Simulate to Compare Data Rate& Throughput.

III B.Tech. I Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	0	1	2	30	70	100	2
SUBCODE: R23DS31L3	FULL STACK DEVELOPMENT – I						

	(SKILL ENHANCEMENT COURSE)

Course Objectives:

The main objectives of the course are to

- Make use of HTML elements and their attributes for designing static webpages.
- Build a webpage by applying appropriate CSS styles to HTML elements.
- Experiment with Java Script to develop dynamic webpages and validate forms.

COURSE OUTCOMES: After Completion of this course student will be able to:

CO1: Develop static html pages by using HTML5 elements and attributes. [K3].
CO2: Construct a static html pages by using Cascading Style Sheets [K3].
CO3: Build webpages using Java Script [K3].
CO4: Develop a Web pages Using JQuery [K3].

Experiments covering the Topics:

1. Lists, Links and Images
2. HTML Tables, Forms and Frames
3. HTML5 and Cascading Style Sheets, Types of CSS
4. Selector forms
5. CSS with Color, Background, Font, Text and CSS Box Model
6. Applying Java Script-internal and external, I/O, Type Conversion
7. JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
8. JavaScript Functions and Events
9. Node.js

Sample Experiments:

- **Lists, Links and Images**
- Write a HTML program, to explain the working of lists.

Note: It should have an ordered list, unordered list, nested list and ordered list in an unordered list and definition lists.

- Write a HTML program, to explain the working of hyperlinks using<a>tag and href, target Attributes.
- Create a HTML document that has your image and your friend's image with a specific height and width. Also, when clicked on the images it should navigate to their respective profiles.
- Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full-sized version of the image. Create an image gallery using this technique

- **HTML Tables, Forms and Frames**
- Write a HTML program, to explain the working of tables. (**use tags:** <table>, <tr>, <th>, <td> and attributes: border, rowspan, colspan)
- Write a HTML program, to explain the working of tables by preparing a timetable.
- (**Note:** Use <caption>tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).
- Write a HTML program, to explain the working of forms by designing Registration form. (**Note:** Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags,<text area>and two buttons i.e. submit and reset. Use tables to provide a better view).
- Write a HTML program, to explain the working of frames, such that page is to be divided into3parts on either direction. (**Note:** first frame image, second frame paragraph, third frame hyperlink. And also make sure of using "no frame" attribute such that frames to be fixed).

- **HTML5 and Cascading Style Sheets, Types of CSS**
  - Write a HTML program, that makes use of<article>,<aside>,<figure>,<figcaption>,<footer>, <header>,<main>,<nav>,<section>, ,tags.
  - Write a HTML program, to embed audio and video into HTML web page.
  - Write a program to apply different types (of levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value).

- **Selector forms**
  - Write a program to apply different types of selector forms
    1. Simple selector (element, id, class, group, universal)
    2. Combinator selector (descendant, child, adjacent sibling, general sibling)
    3. Pseudo-class selector
    4. Pseudo-element selector
    5. Attribute selector

- **CSS with Color, Background, Font, Text and CSS Box Model**
  - Write a program to demonstrate the various ways you can reference a color in CSS.
- Write a CSS rule that places a background image half way down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
  - Write a program using the following terms related to CSS font and text: **i.** font-size **ii.** font-weight **iii.** font-style **iv.** text-decoration **v.** text-transformation **vi.** text-alignment
- Write a program, to explain the importance of CSS Box model using

i. Content **ii.** Border **iii.** Margin **iv.** Padding

- **Applying JavaScript-internal and external, I/O, Type Conversion**
    - Write a program to embed internal and external Java Script in a web page.
- Write a program to explain the different ways for displaying output.
    - Write a program to explain the different ways for taking input.
- Create a web page which uses prompt dialogue box to ask a voter for his name and age. Displaythe information in table format along with either the voter can vote or not

- **Java Script Pre-defined and User-defined Objects**
    - Write a program using document object properties and methods
- Write a program using window object properties and methods.
    - Write a program using array object properties and methods.
- Write a program using math object properties and methods.
    - Write a program using string object properties and methods.
- Write a program using regex object properties and methods.
- Write a program using date object properties and methods.
- Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

- **Java Script Conditional Statements and Loops**
- Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGERNUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
- Write a program to display weekdays using switch case.
    - Write a program to print1to10 numbers using for, while and do-while loops.
- Write a program to print data in object using for-in, for-each and for-of loops
- Develop a program to determine whether a given number is an 'ARMSTRONGNUMBER' or not. [Ex: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e.,13
  + 53+33 = 153]
- Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's,20's,10's,5's,2's&1's.(Ex: If deposited amount is Rs.163, the output shouldbe1-100's,1- 50's, 1- 10's, 1-2's & 1-1's)

- **Java Script Functions and Events**
    - Design a appropriate function should be called to display
- Factorial of that number
- Fibonacci series up to that number

- Prime numbers up to that number
- Is it palindrome or not
- Design a HTML having a textbox and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
- Factorial of that number
- Fibonacci series up to that number
- Prime numbers up to that number
- Is it palindrome or not
- Write a program to validate the following fields in a registration page
- Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
  - Mobile (onlynumbersandlength10 digits)
  - E-mail (should contain format like xxxxxxx@xxxxxx.xxx)

Text Books:

- ProgrammingtheWorldWideWeb,7th Edition, Robet W Sebesta, Pearson, 2013.
- WebProgrammingwithHTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).
- ProMERNStack:FullStackWebAppDevelopmentwithMongo,Express,React,and Node, Vasan Subramanian, 2nd edition, A Press, O'Reilly

Web Links:

Infosys spring board*

- https://www.w3schools.com/html
- https://www.w3schools.com/css
- https://www.w3schools.com/js/
- https://www.w3schools.com/nodejs
- https://www.w3schools.com/typescript

III B.Tech. I Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	0	0	2	30	70	100	1
SUBCODE: R23DS31L4	TINKERING LAB (USER INTERFACE DESIGN USING FLUTTER)						

COURSE OBJECTIVES:

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widges and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

COURSE OUTCOMES: After completion of this course, the students would be able to

CO1: Demonstrate understanding of Dart programming and Flutter widgets for building cross-platform mobile applications. [K3]

CO2: Design responsive and interactive user interfaces using layout widgets, navigation, and custom styling in Flutter. [K6]

CO3: Develop REST APIs in Flutter apps. [K6]

CO4: Test and debug Flutter applications using unit testing and debugging tools for improved performance and reliability. [K5]

LIST OF EXPERIMENTS:

Students need to implement the following experiments

- a) Install Flutter and Dart SDK.
  b) Write a simple Dart program to understand the language basics.

- a) Explore various Flutter widgets (Text, Image, Container, etc.).
  b) Implement different layout structures using Row, Column, and Stack widgets.

- a) Design a responsive UI that adapts to different screen sizes.
  b) Implement media queries and breakpoints for responsiveness.

- a) Set up navigation between different screens using Navigator.
  b) Implement navigation with named routes.

- a) Learn about stateful and stateless widgets.
  b) Implement state management using set State and Provider.

- a) Create custom widgets for specific UI elements.
  b) Apply styling using themes and custom styles.

- a) Design a form with various input fields.
  b) Implement form validation and error handling.

- a) Add animations to UI elements using Flutter's animation framework.
  b) Experiment with different types of animations (fade, slide, etc.).

- a) Fetch data from a REST API.
  b) Display the fetched data in a meaningful way in the UI.

- a) Write unit tests for UI components.
  b) Use Flutter's debugging tools to identify and fix issues.

TEXT BOOKS:

- Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.
- Rap Payne, Beginning App Development with Flutter: Create Cross-Platform Mobile Apps 1st Edition, Apres.

III B.Tech. I Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	0	0	2	30	70	100	1
SUBCODE: R23DS31L4	AICTE Design Thinking and Idea Lab						

COURSE OBJECTIVES

- To accelerate development of indigenous products in line with the "Make in India" campaign.
- To encourage aspiring engineers to actualize their ideas under one roof.

- To impart multidisciplinary education to all students to promote innovation and product development.
- To promote experiential learning and entrepreneur skills.

COURSE OUTCOMES

Upon completion of the course, students shall have ability to

CO1 Recall the basic concepts of Design Thinking. [K2]

CO2 Use the equipment, tools and inventories associated with Design Thinking Laboratory. [K3]

CO3 Perform fundamental fabrication operation using hand tools, power tools, welding equipment, laser cutter and engraver. [K3]

CO4 Perform fundamental electrical and electronic circuit design using PCB machine. [K3]

CO5 Develop innovative products by implementing the design thinking approach [K4]

COURSE CONTENTS

DESIGN THINKING

Design Thinking: Definition, Need and Objective, Concepts and Brainstorming, Stages – Empathize, Define, Ideate, Prototype, Test. Practical Examples of Customer Challenges, Alignment of Customer Expectations with Product Design - Feedback, Re-Design and Re-Create.

INTRODUCTION TO TOOLS AND EQUIPMENT

Introduction to Hand Tools and Power Tools - 3-axis CNC routing, basic turning, milling, drilling and grinding operations, Laser cutting, Laser engraving etc.

Basic 2D and 3D designing using CAD tools such as FreeCAD, Sketchup, Prusa Slicer, FlatCAM, Inkspace and OpenBSP - 2D and 3D structures for prototype building using CNC machine - Basic welding and other joining techniques for assembly - Basics of 3D scanning, Point cloud data generation for reverse engineering.

Exposure to PCB prototype fabrication - Familiarity and use of soldering and de-soldering equipment - Usage of Breadboard, Arduino, Raspberry Pi.

EXPERIMENTAL LEARNING

- 2D profile cutting of press fit box / casing in acrylic (3 or 6 mm thickness) / polymer / cardboard / MDF (2 mm thickness) board using laser cutter and engraver.
- Machine 3D geometry on soft material such as soft wood using CNC router.
- Fabricate products like trusses using cutting and welding tools.
- 3D printing of scanned geometry using FDM or SLA printer.
- Designing a suitable PCB layout, fabrication and testing of the circuit.
- Assemble and disassemble electronic components on a PCB using soldering and de-soldering equipment.
- Embedded programming using Arduino, Raspberry Pi and BeagleBone.

DESIGN THINKING PROJECT

- Design and implementation of a capstone project.

TOTAL PERIODS: 30

TEXT BOOKS

- Veeranna D.K, "Workshop / Manufacturing Practices (with Lab Manual)", AICTE's Prescribed Textbook, Khanna Book Publishing, 2022.
- E. Balaguruswamy, "Developing Thinking Skills (The way to Success)", Khanna Book Publishing Company, 2022.

REFERENCE BOOKS

- Lal, D. M., "Design Thinking- Beyond the Sticky Notes", Sage Publications India Pvt. Ltd., 2021.
- Malik, A. D. M., "Design Thinking for Educators", Notion Press, Chennai, India, 2019.
- Panke, S., "Design Thinking in Education: Perspectives, Opportunities and Challenges", Open Education Studies, 2021.

WEB RESOURCES

- https://fab-coep.vlabs.ac.in/List%20of%20experiments.html
- https://www.innovationtraining.org/how-to-use-design-thinking-to-design-an-innovation-lab/https://www.erdster.co.in/design-thinking-lab.html

B. Tech– III Year II Semester

S.No	Subject Codes	Category	Title	L	T	P	C
1	R23DS3201	Professional Core	Deep Learning	3	0	0	3
2	R23DS3202	Professional Core	Operating Systems	3	0	0	3
3	R23DS3203	Professional Core	Data Visualization	3	0	0	3
4	R23DS3204 R23DS3205 R23DS3206 R23DS3207 R23DS3208 R23DS3209	Professional Elective-II	7. Social Media Analytics 8. Cryptography & Network Security 9. Recommender Systems 10. Cloud Computing 11. Sensor Networks 12. **Unix and Shell Programming**	3	0	0	3
5	R23DS3210 R23DS3211 R23DS3212 R23DS3213 R23CC32MOOC1	Professional Elective-III	6. Software Project Management 7. Quantum Computing 8. Computer Vision 9. NoSQL databases 10. Any of the 12-Week SWAYAM /NPTEL Course suggested by the BoS	3	0	0	3
6	R23OE3222 R23OE3224	Open Elective – II	1. Database Management Systems 2. **Fundamentals of Unix Programming**	3	0	0	3
7	R23DS32L1	Professional Core	Deep Learning Lab	0	0	3	1.5
8	R23DS32L2	Professional Core	Data Visualization Lab	0	0	3	1.5
9	R23DS32L3	Skill Enhancement course	Soft skills	0	1	2	2
10	R23CC32MC	Audit Course	Technical Paper Writing & IPR	2	0	0	-
	Total			**20**	**01**	**08**	**23**
	*Mandatory Industry Internship / Mini Project of 08 weeks duration during summer vacation						
MC		Student may select from the same minors pool		3	0	3	4.5
MC		Minor Course (Student may select from the same specialized minors pool)		3	0	0	3
HC		Student may select from the same honors pool		3	0	0	3
HC		Honors Course (Student may select from the honors pool)		3	0	0	3

III B.Tech. II Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3201	DEEP LEARNING						

COURSE OBJECTIVES:

- The objective of this course is to cover the fundamentals of neural networks as well as some advanced topics such as recurrent neural networks, long short-term memory cells and convolution neural networks.

COURSE OUTCOMES: After completion of this course, the students would be able to

CO1: Understand Perceptron Learning Algorithm. [K2]
CO2: Develop and train multilayer perceptron with regularization techniques. [K3]
CO3: Compare various neural network optimization techniques and regularization methods to enhance model performance. [K4]
CO4: Explain RNNs, LSTMs, and CNNs.. [K2]
CO5: Explain recent deep learning trends and their applications in vision, NLP, and speech. [K2]

SYLLABUS:

UNIT-I:

Basics- Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thres holding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability, Convergence theorem for Perceptron Learning Algorithm.

UNIT-II:

Feed forward Networks- Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, autoencoders.
Deep Neural Networks: Difficulty of training deep neural networks, Greedy layer wise training.

UNIT-III:

Better Training of Neural Networks –Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point proble minneural networks, Regularization methods (dropout, drop connect, batch normalization).

UNIT-IV:

Recurrent Neural Networks- Back propagation through time, Long Short-Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs.
Convolutional Neural Networks: LeNet, AlexNet. Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.

UNITV:

Recent trends- Variational Autoencoders, Transformers, GPT Applications: Vision, NLP, Speech

TEXTBOOKS:

- Deep Learning, Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016

REFERENCE BOOKS:

- Neural Networks: A Systematic Introduction, RaúlRojas,1996
- Pattern Recognition and Machine Learning, Christopher Bishop,2007
- Deep Learning with Python, François Chollet, Manning Publications,2017

III B.Tech. II Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3202	OPERATING SYSTEMS						

COURSE OBJECTIVES:

- Understand the basic concepts and principles of operating systems, including process
- management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve
- better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

COURSE OUTCOMES: After completion of this course, the students would be able to

CO1: Classify various operating system generations, functions and services. [K2]
CO2: Analyze process scheduling, management and synchronization. [K4]
CO3: Analyze deadlock prevention, detection, avoidance and recovery techniques [K4]
CO4: Analyze various memory management and storage management techniques [K4].
CO5: Analyze the concepts of file system [K4]

UNIT – I:

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems System **Structures:** Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging

UNIT - II

Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication. Threads and Concurrency: Multithreading models, Thread libraries, Threading issues. CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

UNIT – III

Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, semaphores, Monitors, Classic problems of Synchronization. Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT - IV

Memory- Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping. Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement Allocation of frames, Thrashing Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT - V

File System: File System Interface: File concept, Access methods, Directory Structure; Filesystem Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing. Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix

Text Books:

- Operating System Concepts, Silberschatz A, GalvinPB, GagneG,10th Edition, Wiley, 2018.
- Modern Operating Systems, Tanenbaum AS,4th Edition, Pearson ,2016

Reference Books:

- Operating Systems -Internals and Design Principles, Stallings W, 9thedition, Pearson, 2018
- Operating Systems: A Concept Based Approach, D. M Dhamdhere, 3rd Edition, McGraw- Hill, 2013

Online Learning Resources:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

III B.Tech. II Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits

	3	0	0	30	70	100	3
SUBCODE: R23DS3203	DATA VISUALIZATION						

Pre-Requisites: Computer Graphics, Image Processing

Course Objective:

- Familiarize students with the basic and advanced techniques of information visualization and scientific visualization
- Learn key techniques of the visualization process
- A detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques

Course Outcomes: After completion of this course, the students would be able to

CO1: Understand the basics of data visualization. [K2]
CO2: Apply visualization models and techniques to design effective visual applications. [K3]
CO3: Classify different types of visualization systems. [K4]
CO4: Model complex data structures. [K3]
CO5: Illustrate advanced visualization techniques for maps, simulations, and collaborative environments, and analyze recent trends and tools. [K2]

SYLLABUS:

UNIT-I:

Introduction: What Is Visualization? History of Visualization, Relationship between Visualization and Other Fields. The Visualization Process, Introduction of visual perception, visual representation of data, Gestalt principles, information overloads.

UNIT-II:

Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications

UNIT-III:

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT-IV:

Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

UNIT-V:

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations

Recent trends in various perception techniques, various visualization techniques, data structures used in data visualization.

TEXT BOOKS:

- WARD, GRINSTEIN, KEIM.I nteractive Data Visualization: Foundations, Techniques, and Applications. Natick: A K Peters, Ltd.
- E. Tufte, The Visual Display of Quantitative Information, Graphics Press.

RESOURCES:

https://kdd.cs.ksu.edu/Courses/CIS536/Lectures/Slides/Lecture-34-Main_6up.pdf

III B.Tech. II Semester P.E.II	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3

SUBCODE: R23DS3204	SOCIAL MEDIA ANALYTICS

COURSE OBJECTIVES: Knowledge on social media and its analytics Course

COURSE OUTCOMES:
CO1: Understanding characteristic sand types of social media
CO2: Knowledge on layers of social media analytics
CO3: Apply text analysis tools on social media data
CO4: Understand the significance of action analytics
CO5: Detect viral topics on social media (YouTube)

SYLLABUS:
UNIT - I:
Introduction to Social Media, World Wide Web, Web 1.0, Web 2.0, Web 3.0, Social Media, jCore Characteristics of Social Media, Types of Social Media, Social Networking Sites, Using Facebook for Business Purposes, Content Communities

UNIT - II:
Social Media Analytics Overview, Purpose of Social Media Analytics, social media Vs. Traditional Business Analytics, Seven Layers of Social Media Analytics, Types of Social Media Analytics, Social Media Analytics Cycle, Challenges to Social Media Analytics, social media Analytics Tools. Case Study: The Underground Campaign That Scored Big

UNIT - III:
Social Media Text Analytics, Types of Social Media Text, Purpose of Text Analytics, Steps in Text Analytics, Social Media Text Analysis Tools. CaseStudy: Tapping Into Online Customer Opinions

UNIT - IV:
Social Media Actions Analytics, Introduction to Actions Analytics, Common Social Media Actions, Actions Analytics Tools. Case Study: Cover-More Group

UNIT - V:
Social Media Hyperlink Analytics Types of Hyperlinks, Hyperlink Analytics, Types of Hyperlink Analytics, Hyperlink Analytics Tools. Case Study: Hyperlinks And Viral YouTube Videos

TEXT BOOKS:
- Seven Layers of Social Media Analytics Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, And Location Data by Gohar F. Khan Isbn: 1507823207, Isbn-13: 9781507823200

REFERENCE BOOKS:
- Social Media Analytics: Techniques And Insights for Extracting Business Value Out of Social Media by Matthew Ganis, Avinash Kohirkar, Pearson Education.
- Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, Marshall Sponder, MGH.
- Big Data and Analytics, Seema Acharya, Subhasinin Chellappan, Wiley Publications.
- Big Data, Black Booktm, DreamtechPress, 2015 Edition.

COURSE OBJECTIVES:

III B.Tech. II Semester P.E. II	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3205	CRYPTOGRAPHY & NETWORK SECURITY						

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand the basic categories of threats to computers and networks
- Discusses the Mathematics of Cryptography
- Discuss the fundamental ideas of Symmetric and Asymmetric cryptographic Algorithms
- Discusses the Network layer, Transport Layer and Application layer Protocols Enhanced security mechanisms

COURSE OUTCOMES: At the end of the course, student will be able to

CO1: Summarize the fundamentals of Cryptography. [K2]

CO2: Apply algebraic and number-theoretic concepts to solve problems in symmetric and asymmetric cryptography. [K3]

CO3: Apply symmetric and asymmetric encryption techniques to secure communication using classical and modern cryptographic algorithms. [K3]

CO4: Interpret the role of hash functions and digital signatures in information security. [K2]

CO5: Illustrate the use of encryption techniques to secure the data in transit across the networks. [K2]

SYLLABUS:

UNIT – I: Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography. Classical Encryption Techniques-symmetric cipher model, Substitution techniques, Transposition techniques, Rotor Machines, Steganography.

UNIT – II: Introduction to Symmetric Cryptography: Algebraic Structures-Groups, Rings, Fields, GF(2^n) fields, Polynomials.**Mathematics of Asymmetric cryptography:** Primes, Checking For Primness, Eulers phi-functions, Fermat's Little Theorem, Euler's Theorem, Generating Primes, Primality Testing, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Exponentiation And Logarithm.

UNIT – III: Symmetric key Ciphers: Block Cipher principles, DES, AES, Blow fish, IDEA, Block cipher operation, Stream ciphers: RC4, RC5

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Elgamal Cryptographic system, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

UNIT – IV: Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithms (SHA)

Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MAC'S, MAC'S Based on Hash Functions: HMAC, MAC'S Based On Block Ciphers: DAA And CMAC
Digital Signatures: Digital Signatures, Elgamal Digital Signature Scheme, Elliptic Curve Digital Signature Algorithm, RSA-PSS Digital Signature Algorithm.

UNIT – V: Network and Internet Security: Transport-Level Security: Web Security Considerations, Transport Level Security, HTTPS, SSH.
IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Authentication Header Protocol.
Electronic-Mail Security: Internet-mail Security, Email Format, Email Threats and Comprehensive Email Security, S/MIME, PGP.

Text Books:

- Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 7th Edition, 2017
- Cryptography and Network Security: Behrouz A. Forouzan Debdeep, Mc Graw Hill, 3rd Edition, 2015

Reference Books:

- Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition
- Introduction to Cryptography with Coding Theory: Wade Trappe, Lawrence C. Washington, Pearson.
- Modern Cryptography: Theory and Practice by Wenbo Mao. Pearson

III B.Tech. II Semester P.E. II	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3206	RECOMMENDER SYSTEMS						

Course Objectives:

- This course covers the basic concepts of recommender systems, including personalization algorithms, evaluation tools, and user experiences

Course Outcomes: After completion of this course, the students would be able to

CO1: Understand basic techniques and problems in the filed of recommender systems. [K2]
CO2: Evaluate types of recommender systems. [K3]
CO3: Apply algorithms and techniques to develop recommender systems that rae wides used in the Internet industry. [K3]
CO4: Apply knowledge based and hybrid recommender systems foe designing models. [K3]
CO5: Develop state-of-the-are recommender systems. [K3]

SYLLABUS:

UNIT - I:

Introduction: Recommender system functions, Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses, covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system.

UNIT - II:

Collaborative Filtering: User-based nearest neighbor recommendation, Item-based nearest neighbor recommendation, Model based and pre-processing based approaches, Attacks on collaborative recommender systems.

UNIT - III:

Content-based recommendation: High level architecture of content-based systems, Advantages and drawbacks of content-based filtering, Item profiles, Discovering features of documents, Obtaining item features from tags, Representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.
Knowledge based recommendation: Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders.

UNIT - IV:

Hybrid approaches: Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies.

UNIT - V:

Evaluating Recommender System: Introduction, General properties of evaluation research, Evaluation designs, Evaluation on historical datasets, Error metrics, Decision-Support metrics, User-Centred metrics.

Recommender Systems and communities: Communities, collaboration and recommender systems in personalized web search, social tagging recommender systems, Trust and recommendations

TEXT BOOKS:

- Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
- Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer (2011), 1st ed.

REFERENCES:

- Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems for Learning, Springer (2013), 1st ed.

III B.Tech. II Semester P.E.III	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3207	CLOUD COMPUTING						

COURSE OBJECTIVES:

- To explain the evolving utility computing model called cloud computing.
- To introduce the various levels of services offered by cloud.
- To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
- To emphasize the security and other challenges in cloud computing.
- To introduce the advanced concepts such as containers, serverless computing and cloud-centric Internet of Things.

COURSE OUTCOMES: After completion of this course, the students would be able to

CO1: Understand what cloud computing is and know about its services and providers. [K2]
CO2: Explain the basic technologies used in cloud computing. [K2]
CO3: Understand how virtualization and containers work in cloud environments. [K2]
CO4: Identify problems like security, standards, and energy use in cloud systems. [K2].
CO5: Analyze the use of serverless computing, IoT, and DevOps in modern cloud environments. [K4]

SYLLABUS:

UNIT - I: **Introduction to Cloud Computing Fundamentals**

Cloud computing at a glance, defining a cloud, cloud computing reference model, types of services (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google App Engine).

UNIT - II: **Cloud Enabling Technologies**

Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication, technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), Web services, virtualization.

UNIT - III: **Virtualization and Containers**

Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration, Docker Swarm and Kubernetes, public cloud VM (e.g. Amazon EC2) and container (e.g. Amazon Elastic Container Service) offerings.

UNIT-IV: **Cloud computing challenges**

Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, cloud shared responsibility model, security in cloud deployment models.

UNIT -V: **Advanced concepts in cloud computing**

Serverless computing, Function-as-a-Service, serverless computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. OpenFaaS) serverless platforms, Internet of Things (IoT), applications, cloud-centric IoT and layers, edge and fog computing, DevOps, infrastructure-as-code, quantum cloud computing.

TEXT BOOKS:

- Mastering Cloud Computing, 2nd edition, Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, Shivananda Poojara, Satish N. Srirama, Mc Graw Hill, 2024.
- Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

REFERENCE BOOKS:

- Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier, 2018.
- Essentials of cloud Computing, K. Chandrasekhran, CRC press, 2014.
- Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)

III B.Tech. II Semester P.E. III	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3208	SENSOR NETWORKS						

COURSE OBJECTIVES:

- To understand the basics of wireless sensor networks, types of networks like MANETs and WSNs, their applications, advantages, and challenges.
- To learn about communication protocols, routing, synchronization, localization, and tools used for developing and simulating sensor networks.

COURSE OUTCOMES:

CO1: Explain about sensor networks and emerging technologies. [K2]
CO2: Illustrate node and network architecture of sensor nodes and its execution environment. [K2]
CO3: Explain the concepts of communication, MAC, routing protocols and also study about the naming and addressing in WSN. [K2]
CO4: Illustrate topology control and clustering in networks with timing synchronization for localization services with sensor tasking and control. [K2]
CO5: Explain sensor node hardware and software platforms and understand the simulation and programming techniques. [K2]

SYLLABUS:

UNIT-I: Introduction and Overview:

Overview of wireless networks, types, infrastructure-based and infrastructure-less, introduction to MANETs (Mobile Ad-hoc Networks), characterise, reactive and proactive routing protocols with examples, introduction to sensor networks, commonalities and differences with MANETs, constraints and challenges, advantages, applications, enabling technologies for WSNs.

UNIT-II: Architectures:

Single-node architecture - hardware components, design constraints, energy consumption of sensor nodes, operating systems and execution environments, examples of sensor nodes, sensor network scenarios, types of sources and sinks - single hop vs. multi hop networks, multiple sources and sinks - mobility, optimization goals and figures of merit, gateway concepts, design principles for WNs, service interfaces for WSNs.

UNIT- III: Communication Protocols:

Physical layer and transceiver design considerations, MAC protocols for wireless sensor networks, low duty cycle protocols and wakeup concepts - S-MAC, the mediation device protocol, wakeup radio concepts, address and name management, assignment of MAC addresses, routing protocols-

classification, gossiping, flooding, energy-efficient routin inicast protocols, multi-path routing, data-centric routing, data aggregation, SPIN, LEACH, Directed-Diffusion, geographic routing.

UNIT- IV: Infrastructure Establishment:
Topology control, flat network topologies, hierarchical networks by clustering, time synchronization, properties, protocols based on sender-receiver and receiver-receiver synchronization, LTS, TPSN, RBS, HRTS, localization and positioning, properties and approaches, single-hop localization, positioning in multi-hop environment, range-based localization algorithms - location services, sensor tasking and control.

UNIT-V: Sensor Network Platforms and Tools:
Sensor node hardware, Berkeley motes, programming challenges, node-level software platforms, node-level simulators, state-centric programming, Tiny OS, nesC components, NS2 simulator, TOSSIM.

TEXT BOOKS:

1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

REFERENCE BOOKS:

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
3. Thomas Haenselmann, "Sensor Networks", available online for free, 2008.
4. Edgar Callaway, "Wireless Sensor Networks: Architectures and Protocols", Auerbach, 2003.

III B.Tech. II Semester P.E.II	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3209	Unix and Shell Programming						

COURSE OBJECTIVES:

- To provide introduction to UNIX Operating System and its File System
- To gain an understanding of important aspects related to the SHELL and the process
- To develop the ability to formulate regular expressions and use them for pattern matching.
- To provide a comprehensive introduction to SHELL programming, services and utilities.

COURSE OUTCOMES:

CO1: Explain the architecture and features of UNIX Operating System and distinguish it from other Operating System. [K2]
CO2: Demonstrate UNIX commands for file handling and process control. [K2]
CO3: Write Regular expressions for pattern matching and apply them to various filters for a specific task. [K3]
CO4: Develop basic shell scripts and command-line utilities for task automation. [K3]
CO5: Demonstrate process management in UNIX. [K2]

SYLLABUS:

UNIT-I Introduction to unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

UNIT-II The File system –The Basics of Files-What's in a File-Directories and File Names-Permissions INodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

UNIT-III Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.
Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

UNIT-IV Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

UNIT-V The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control.

TEXT BOOKS:

1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.

REFERENCE BOOKS: Unix and shell programming by B.M. Harwani, OXFORD univer

III B.Tech. II Semester P.E.III	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3210	SOFTWARE PROJECT MANAGEMENT						

COURSE OBJECTIVES:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

COURSE OUTCOMES: After completion of this course, the students would be able to

CO1: Illustrate the conventional software project management and economics. [K2]
CO2: Outline the software lifecycle phases and artifacts. [K2]
CO3: Illustrate various workflows, check points and iterative process planning. [K2]
CO4: Apply organizational structures, automation building blocks, and software metrics to manage and control software projects effectively. [K3]
CO5: Apply Agile and DevOps methodologies to enhance software development through iterative practices, automation, and effective tool adoption. [K3]

SYLLABUS:

UNIT-I:

Conventional Software Management: The waterfall model, conventional software Management performance.
Evolution of Software Economics: Software Economics, pragmatic software cost estimation.
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.
The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT-II:

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.
Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT- III:

Model based software architectures: A Management perspective and technical perspective.
Work Flows of the process: Software process workflows, Iteration workflows.

Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT- IV:
Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.
Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT-V:
Agile Methodology, ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility. **Fundamentals of DevOps**: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

TEXT BOOKS:
- Software Project Management, Walker Royce, PEA, 2005.
- Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
- The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim, John Willis, Patrick Debois, Jez Humb,1st Edition, O'Reilly publications, 2016.

REFERENCE BOOKS:
- Software Project Management, Bob Hughes,3/e, Mike Cotterell, TM
- Software Project Management, Joel Henry, PEA
- Software Project Management in practice, Pankaj Jalote, PEA, 2005.
- Effective Software Project Management, Robert K.Wysocki, Wiley,2006.
- Project Management in IT, Kathy Schwalbe, Cengage

III B.Tech. II Semester P.E III	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3211	QUANTUM COMPUTING						

COURSE OBJECTIVES:

- To introduce the fundamentals of quantum computing, the problem-solving approach using finite dimensional mathematics

COURSE OUTCOMES:

CO1: Differentiate between classical and quantum computing paradigms, including bits vs. qubits and logical operations. [K4]

CO2: Apply foundational concepts of linear algebra, quantum mechanics, and biology to understand the principles of quantum computing. [K3]

CO3: Apply single and multi-qubit gates to build quantum circuits and *demonstrate* qubit representation on the Bloch sphere. [K3]

CO4: Analyze key quantum algorithms such as Deutsch's, Shor's, and Grover's to understand their efficiency over classical algorithms. [K4]

CO5: Explain quantum error correction techniques and *compare* classical and quantum approaches to information security and cryptography. [K2]

SYLLABUS:

UNIT - I

History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

UNIT - II

Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements.

Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

UNIT - III

Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

UNIT - IV

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

UNIT - V

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

TEXT BOOKS:

- Nielsen M. A., Quantum Computation and Quantum Information, Cambridge

REFERENCE BOOKS:

- Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
- Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.I: Basic Concepts, Vol II
- Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms

III B.Tech. II Semester P.E.III	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3212	COMPUTER VISION						

COURSE OBJECTIVES:

- To understand the Fundamental Concepts related to sources, shadows and shading
- To understand the Geometry of Multiple Views

Course Outcomes: After completion of this course, the students would be able to

CO1: Illustrate fundamental image processing techniques required for computer vision. [K2]
CO2: Interpret boundary tracking techniques. [K2]
CO3: Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections. [K3]
CO4: Apply 3D vision techniques and Implement motion related techniques.. [K3]
CO5: Develop applications using computer vision techniques. [K3]

SYLLABUS:

UNIT – I:

CAMERAS: Pinhole Cameras Radiometry–Measuring Light: Light in Space, Light Surfaces, Important Special Cases Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

UNIT - II:

Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Edge **Detection:** Noise, Estimating Derivatives, Detecting Edges Texture 0: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

UNIT - III:

The Geometry of Multiple Views: Two Views Stereopsis: Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras Segmentation by Clustering: What Is Segmentation? Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

UNIT - IV:

Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, **Tracking With Linear Dynamic Models:** Tracking as an Abstract Inference Problem, Linear Dynamic Models,Kalman Filtering, Data Association, Applications and Examples

UNIT - V:

Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry,

Case study: Mobile Robot Localization Model- Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Case study: Registration in Medical Imaging Systems, Curved Surfaces and Alignment.

Text Books:

- David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.

Reference Books:

- E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
- R. C. Gonzalez and R. E. Woods "Digital Image Processing" Addison Wesley 2008. 3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag London Limited 2011.

III B.Tech. II Semester P.E.III	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23DS3213	NO SQL DATABASES						

Pre-requisites: Basic Knowledge about DBMS

Course Objectives:

- To grasp the challenges and benefits of handling data, concurrency and integration.
- To gain practical knowledge in key database models like key-value stores, document database and graph databases.

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

CO1: Explain and compare different types of NoSQL Databases. [K2]
CO2: Compare and contrast RDBMS with different NoSQL databases. [K4]
CO3: Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases. [K2]
CO4: Explain performance tune of Key-Value Pair NoSQL databases. [K2]
CO5: Apply NoSQL development tools on different types of NoSQL Databases. [K3]

SYLLABUS:

UNIT - I

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, the Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, the Emergence of NoSQL, Key Points.

UNIT - II

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, Map Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT - III

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT - IV

Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT - V

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

Text Books:

- Sadalage, P. & Fowler, *NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence*, Wiley Publications, 1st Edition, 2019.

Web References:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa

III B.Tech. II Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	0	0	3	30	70	100	1.5
SUBCODE: R23DS32L1	DEEP LEARNING LAB						

Course Objectives:

- To implement and experiment with various neural network architectures using real-world datasets.
- To understand and apply deep learning techniques for classification, prediction, and natural language processing.
- To work with popular deep learning frameworks such as TensorFlow and Keras.

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

CO1: Build basic neural network models such as multi-layer perceptrons for classification and prediction tasks. [K3]

CO2: Develop and evaluate convolutional neural networks for solving image classification problems using real-world datasets. [K3]

CO3: Interpret the results of two different deep learning models. [K2]

CO4: Analyze and compare the performance of deep learning models including RNNs and pre-trained networks across different use cases.[K4]

Software Packages required:

- Keras
- Tensorflow
- PyTorch

List of Experiments:

- Implement multi-layer perceptron algorithm for MNIST Handwritten Digit Classification.
- Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
- Design a neural Network for classifying news wires (Multi class classification) using Reuters dataset.
- Design a neural network for predicting house prices using Boston Housing Price dataset.
- Build a Convolution Neural Network for MNIST Handwritten Digit Classification.
- Build a Convolution Neural Network for simple image(dogs and Cats) Classification
- Use a pre-trained convolution neural network (VGG16) for image classification.
- Implement one hoten coding of words or characters.
- Implement word embeddings for IMDB dataset.
- Implement a Recurrent Neural Network for IMDB movie review classification problem.

Text Books:

- Reza Zadehand Bharath Ram sundar, “Tensorflow for Deep Learning”, O’Reilly publishers, 2018

References:

- https://github.com/fchollet/deep-learning-with-python-notebooks

COURSE OBJECTIVES:

III B.Tech. II Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	0	0	3	30	70	100	1.5
SUBCODE: R23DS32L2	DATA VISUALIZATION LAB						

- To visualize the different datasets using histograms, line charts.
- To understand the use of bar charts and box plots.
- To understand Scatter plots, mosaic plots
- To understand different Map visualizations
- To learn advanced graphs such as correlogram, heatmap and 3D graphs.

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

CO1: Interpret the different datasets using histograms, line charts. [K2]
CO2: Makeuse of bar charts and box plots on different datasets. [K3]
CO3: Apply Scatter plots, mosaic plots in R for different datasets. [K3]
CO4: Create advanced graphs such as correlogram, heatmap and 3D graphs. [K6]

List of Experiments:

- a) Load VA Deaths (Death Rates in Virginia) dataset in R and visualize the data using different histograms.
  b) Load air quality dataset in R and visualize La Guardia Airport's daily maximum temperature using histogram.
- Load Air Passengers dataset in R and visualize the data using line chart that shows increase in air passengers over given time period.
- a) Load iris dataset in R, visualize the data using different Bar Charts and also demonstrate the use of stacked plots.
  b) Load air quality dataset in R and visualize ozone concentration in air.
- a) Load iris dataset in R, visualize the data using different Box plots including group by option and also use color palette to represent species.
  b) Load air quality dataset in R and visualize air quality parameters using box plots.
- Visualize iris dataset using simple scatter, multivariate scatter plot and also visualize scatter plot matrix to visualize multiple variables across each other.
- Load diamonds dataset in R and visualize the structure in datasets with large data points using hexagon binning and also add color palette then use the
- Load Hair Eye Color dataset in R and plot categorical data using mosaic plot.
- Load mtcars dataset in R and visualize data using heat map.
- Install leaflet library in R and perform different map visualizations.
- Visualize iris dataset using 3d graphs such as scatter3d, cloud, xyplot.
- Make use of correlogram to visualize data in correlation matrices for iris dataset.
- Install maps library in R and draw different map visualizations.

Web References:

- https://www.analyticsvidhya.com/blog/2015/07/guide-data-visualization-r/
- https://www.geeksforgeeks.org/data-visualization-in-r/

III B.Tech. II Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	0	1	2	30	70	100	2
SUBCODE: R23DS32L3	SOFT SKILLS (SKILL ENHANCEMENT COURSE)						

COURSE OBJECTIVES:

- To equip the students with the skills to effectively communicate in English
- To train the students in interview skills, group discussions and presentation skills
- To motivate the students to develop confidence
- To enhance the students' interpersonal skills
- To improve the students' writing skills

COURSE OUTCOMES:

CO1: Develop analytical thinking, listening, and communication skills [K6]
CO2: Apply self-management techniques and demonstrate leadership and teamwork. [K3]
CO3: Apply proper etiquette in social and professional situations. [K3]
CO4: Use grammar and writing skills for effective professional communication. [K3]
CO5: Prepare for job-related scenarios like group discussions, interviews, and resume writing. [K3]

UNIT – I

Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.
Communication Skills: Verbal Communication; Non-Verbal Communication (Body Language)

UNIT – II

Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT – III

Standard Operation Methods: Basic Grammars, Tenses, Prepositions, Pronunciation, Letter Writing; Note Making, Note Taking, Minutes Preparation, Email & Letter Writing

UNIT-IV

Job-Oriented Skills: Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews

UNIT-V

Interpersonal relationships: Introduction, Importance, Types, Uses, Factors affecting interpersonal relationships, Accommodating different styles, Consequences of interpersonal relationships

TEXT BOOKS:

- Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
- S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

REFERENCE BOOKS:

- R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand& Company Ltd., 2018.
- Raman, Meenakshi& Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

E-RESOURCES:

- https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01

COURSE OBJECTIVE:

III B.Tech. II Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	2	0	0	30	70	100	0
SUBCODE: R23CC32MC	TECHNICAL PAPER WRITING & IPR						

- The course will explain the basic related to writing the technical reports and understanding the concepts related to formatting and structuring the report. This will help students to comprehend the concept of proofreading, proposals and practice

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Describe how to write clear and structured technical reports. [K2]

CO2: Apply correct grammar, simple language, and visuals in report writing. [K3]

CO3: Summarize technical content effectively. [K3]

CO4: Make use of word processing tools to format, reference, and secure documents. [K3]

CO5: Explain the basics of intellectual property and the process of getting a patent. [K2]

SYLLABUS:

UNIT- I:

Introduction: An introduction to writing technical reports, technical sentences formation, using transitions to join sentences, Using tenses for technical writing.

Planning and Structuring: Planning the report, identifying reader(s), Voice, Formatting and structuring the report, Sections of a technical report, Minutes of meeting writing.

UNIT-II:

Drafting report and design issues: The use of drafts, Illustrations and graphics.

Final edits: Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity.

UNIT-III:

Proofreading and summaries: Proofreading, summaries, Activities on summaries.

Presenting final reports: Printed presentation, Verbal presentation skills, Introduction to proposals and practice.

UNIT-IV: Using word processor:

Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index, Creating an Outline, Adding Comments, Tracking Changes, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes, Working with Footnotes and Endnotes, inserting citations and Bibliography, Comparing Documents, Combining Documents, Mark documents final and make them read only., Password protect Microsoft Word documents., Using Macros,

UNIT-V:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of **Patenting and Development:** technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property

Text Books:

- Kompal Bansal & Parshit Bansal, "Fundamentals of IPR for Beginner's", 1st Ed., BS Publications, 2016.
- William S. Pfeiffer and Kaye A. Adkins, "Technical Communication: A Practical Approach", Pearson.
- Ramappa,T., "Intellectual Property Rights Under WTO", 2nd Ed., S Chand, 2015.

Reference Books:

- Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.
- Day R, How to Write and Publish a Scientific Paper, Cambridge University Press(2006)

E-resources:

- https://www.udemy.com/course/reportwriting/
- https://www.udemy.com/course/professional-business-english-and-technical-report-writing/
- https://www.udemy.com/course/betterbusinesswriting/

III B.Tech. II Semester	L	T	P	Internal Marks	External Marks	Total Marks	Credits

O.E. I	3	0	0	30	70	100	3
SUBCODE: R23OE3121	Entrepreneurship Development & Venture Creation						

COURSE OBJECTIVES: By the end of the program, students will be / able to:

- Inspired; develop entrepreneurial mind-set and attributes; entrepreneurial skill sets for venture creation and intrapreneurial leadership
- Apply process of problem-opportunity identification and feasibility assessment through developing a macro perspective of the real market, industries, domains and customers while using design thinking principles to refine and pivot their venture idea.
- Analyse Customer and Market segmentation, estimate Market size, develop and validate Customer Persona.
- Initiate Solution design, Prototype for Proof of Concept. Understand MVP development and validation techniques to determine Product-Market fit
- Craft initial Business and Revenue models, financial planning and pricing strategy for profitability and financial feasibility of a venture. Understand relevance and viability of informal and formal funding with respect to different business models.
- Understand and develop Go-to-Market strategies with a focus on digital marketing channels.
- Understand and apply story telling skills in presenting a persuasive and defensible Venture Pitch.

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

CO1: Develop an entrepreneurial mindset and appreciate the concepts of entrepreneurship, cultivate essential attributes to become an entrepreneur or Intrapreneur and demonstrate skills such as problem solving, team building, creativity and leadership. [K3]

CO2: Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution.

CO3: Analyse and refine business models to ensure sustainability and profitability. [K4]

CO4: Build Prototype for Proof of Concept and validate MVP of their practice venture idea [K6]

CO5: Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture. [K6]

CO6: Prepare and deliver an investible pitch deck of their practice venture to attract.

SYLLABUS:

UNIT I: Entrepreneurship Fundamentals & Context: Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skillsets, attributes and networks while on campus.
Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity

UNIT II: Problem & Customer Identification: Understanding and analysing the macro-Problem and Industry perspective, technological, socio economic and urbanization trends and their implication on new opportunities. Identifying passion, identifying and defining problem using Design thinking principles. Analysing problem and validating with the potential customer. Iterating problem-customer fit. Understanding customer segmentation, creating and validating customer personas. Competition and Industry trends mapping and assessing initial opportunity.
Core Teaching Tool: Several types of activities including Class, game, Gen AI, 'Get out of the Building' and Venture Activity.

UNIT III: Solution design, Prototyping & Opportunity Assessment and Sizing - Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition. Developing Problem-solution fit in an iterative manner. Understanding prototyping and MVP. Developing a feasibility prototype with differentiating value, features and benefits. Initial testing for proof-of-concept and iterate on the prototype. Assess relative market position via competition analysis, sizing the market and assess scope and potential scale of the opportunity.
Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

UNIT IV: Business & Financial Model, Go-to-Market Plan
Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach.
Business planning: components of Business plan- Sales plan, People plan and financial plan.
Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance.
Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt & Equity, Map the Start-up Lifecycle to Funding Options.
Core Teaching Tool: Founder Case Studies – Sama and SecurelyShare; Class activity and discussions; Venture Activities.

UNIT V: Scale Outlook and Venture Pitch readiness - Understand and identify potential and aspiration for scale vis a vis your venture idea. Persuasive Storytelling and its key components. Build an Investor ready pitch deck.

Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
2. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business
3. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons.
4. Simon Sinek (2011) Start with Why, Penguin Books limited
5. Brown Tim (2019) Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business
6. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
7. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd

Web Resources

- Learning resource- Ignite 5.0 Course Wadhwani platform (Includes 200+ components of custom created modular content + 500+ components of the most relevant curated content)

III B.Tech. I Semester (O.E.-I)	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23OE3122	OPERATING SYSTEMS						

Course Objectives:

- Understand the basic concepts and principles of operating systems, including process
- management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve
- better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

Course Outcomes: After completion of this course, the students would be able to

CO 1: Classify various operating system generations, functions and services. [K2]
CO 2: Analyze process scheduling, management and synchronization. [K4]
CO 3: Analyze deadlock prevention, detection, avoidance and recovery techniques [K4]
CO 4: Analyze various memory management and storage management techniques [K4].
CO 5: Analyze the concepts of file system [K4]

SYLLABUS:

UNIT-I: Operating Systems Overview: Introduction, operating system functions, operating system operations, Computing environments, Free and Open-Source Operating Systems.
System Structures: Operating System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, Operating System Structure, Building and Booting an Operating System, Operating System Debugging.

UNIT-II: Processes: Process Concept, Process Scheduling, Operations on Processes, Inter-Process Communication.
Threads and Concurrency: Multithreading Models, Thread Libraries, Threading Issues.
CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling.

UNIT-III: Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic Problems of Synchronization.
Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT-IV: Memory-Management Strategies: Introduction, Contiguous Memory Allocation, Paging, Structure of the Page Table, Swapping.
Virtual Memory Management: Introduction, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing.
Storage Management: Overview of Mass Storage Structure, HDD Scheduling**.**

UNIT-V: File System: File System Interface, File Concept, Access Methods, Directory Structure. File System Implementation: File-System Structure, File-System Operations, Directory Implementation, Allocation Methods, Free Space Management.
File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing.
Protection: Goals of Protection, Principles of Protection, Protection Rings, Domain of Protection, Access Matrix.

TEXT BOOKS:

- Operating System Concepts, Silberschatz A, Galvin PB, Gagne G, 10th Edition, Wiley, 2018. Modern Operating Systems, Tanenbaum AS, 4th Edition, Pearson, 2016**.**

REFERENCE BOOKS:

1. Operating Systems - Internals and Design Principles, Stallings W, 9th Edition, Pearson, 2018.
2. Operating Systems: A Concept-Based Approach, D. M. Dhamdhere, 3rd Edition, McGraw-Hill, 2013.

ONLINE LEARNING RESOURCES:

- https://nptel.ac.in/courses/106/106/106106144/
- http://peterindia.net/OperatingSystems.html

III B.Tech. I Semester O.E. I	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23OE3119	Computer Organization and Architecture						

COURSE OBJECTIVES: The purpose of the course is

- Discuss about principles of computer organization and the basic architectural concepts.
- Explain in depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems.

COURSE OUTCOMES: After Completion of the course, Students are able to:

CO1: Demonstrate an understanding of the different number systems, codes and relate postulates of Boolean algebra and minimize combinational functions. [K2]

CO2: Evaluate and learn different combinational circuits, sequential circuits and able to design them. [K5]

CO3: Organize, determine and learns basic structure of components register through language, micro operations and able to write micro programs. [K3]

CO4: Determine and able to learn micro programme control and central processing unit. [K3]

CO5: Able to learns the internal organization of computers and able to analyze performance of them. [K4]

UNIT I:

Digital Computers and Data Representation: Introduction, Numbering Systems, Decimal to Binary Conversion, Binary Coded Decimal Numbers, Weighted Codes, Self-Complementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCI Code Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Boolean Algebra and Logical gates: Boolean Algebra :Theorems and properties, Boolean functions, canonical and standard forms , minimization of Boolean functions using algebraic identities; Karnaugh map representation and minimization using two and three variable Maps; Logical gates ,universal gates and Two- level realizations using gates : AND-OR, OR-AND, NAND-NAND and NOR-NOR structures.

UNIT II:

Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Implementation using universal gates, Multi-bit adder, Multiplexers, De-multiplexers, Decoders Sequential Switching Circuits: Latches and Flip-Flops, Ripple counters using T flip-flops;

Synchronous counters: Shift Registers; Ring counters

UNIT III:

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Booth multiplication algorithm, Division Algorithms, Floating – point Arithmetic Operations. Register Transfer language and microinstructions: Bus memory transfer, arithmetic and logical micro-operations, shift and rotate micro-operations.

Basic Computer Organization and Design: Stored program concept, computer Registers, common bus system, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input–Output configuration and program Interrupt.

UNIT IV:

Microprogrammed Control: Control memory, Address sequencing, microprogram example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation.

Program Control: conditional Flags and Branching.

UNIT V:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

TEXT BOOKS:

1. Digital Logic and Computer Design, Moriss Mano, 11th Edition, Pearson.
2. Computer System Architecture, 3rd Edition, M.Morris Mano, PHI

REFERENCE BOOKS:

1. Digital Logic and Computer Organization, Rajaraman, Radha krishnan, PHI, 2006
2. Computer Organization, 5Th Edition, Hamacher, Vranesic, Zaky, TMH, 2002
3. Computer Organization & Architecture: Designing for Performance, 7th Edition, William Stallings, PHI, 2006

III B.Tech. I Semester O.E. II	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23OE3222	DATABASE MANAGEMENT SYSTEMS						

COURSE OBJECTIVES: The main objectives of the course is to

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

COURSE OUTCOMES: After Completion of the course, Students are able to:

CO 1: Interpret the fundamentals of DBMS. [K2]
CO 2: Analyzing relational database designing. [K4]
CO 3: Developing queries in RDBMS [K3]
CO 4: Analyzing database design methodology and normalization process [K4].
CO 5: Analyze transaction concepts and File indexing. [K2]

UNIT I:

Introduction: Database system, Characteristics (Database Vs File System), Database Users, 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, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

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, Relational Algebra, Relational Calculus. BASIC SQL:Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT III:

SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).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 dependencyLossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V:

Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing:

TEXT BOOKS:

- Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
- Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

REFERENCE BOOKS:

- Introduction to Database Systems, 8thedition, C J Date, Pearson.
- Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
- Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

WEB-RESOURCES:

- https://nptel.ac.in/courses/106/105/106105175/
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672820224 56_shared/overview

III B.Tech. II Semester O.E. II	L	T	P	Internal Marks	External Marks	Total Marks	Credits
	3	0	0	30	70	100	3
SUBCODE: R23OE3224	Fundamentals of Unix Programming						

COURSE OBJECTIVES:

- To introduce the fundamentals of the UNIX operating system, including its file system structure, command-line interface, and basic utilities.
- To enable students to apply core UNIX concepts such as file handling, shell scripting, redirection, piping, and text processing using standard command-line tools.

COURSE OUTCOMES: After completion of this course, the students would be able to

CO 1: *Demonstrate* the ability to navigate the UNIX file system. [K2]

CO 2: *Apply* basic UNIX commands for file and directory management using command-line syntax and wildcards. [K3]

CO 3: *Apply input and output redirection and piping to connect and manage UNIX command operations.* [K3]

CO 4: *Demonstrate* the use of C shell, bash, and korn shell features to perform basic command automation. [K2].

CO 5: *Use* UNIX text processing tools like vi, sed, and grep to perform simple search and replace operations. [K3]

SYLLABUS:

UNIT-I

Introduction to unix-A brief history of Unix, The Unix kernel, The UNIX file system Getting started navigating the file system, The file system structure, Directories and files, Pathnames, Navigating the file system, Exercise: Logging on to the system.

UNIT-II

Unix Basic Commands: Command line syntax, Basic file handling commands, Directory handling commands, Filename wildcard characters.

UNIT-III

Redirection and Pipes: Input redirection, Output redirection, Pipes.

UNIT-IV

C Shell Programming: Recalling and Editing Commands, Overview, The bash shell, the korn shell.

UNIT-V

Searching and Replacing Text : Replacing text ,Using the vi editor, Using sed for search and replace, Searching for text with grep, Linking files, Exercises: Searching and Replacing Text

TEXT BOOKS:

1. Gail Anderson and Paul Anderson, "The Unix C Shell Field Guide", Prentice-Hall, 1986.

REFERENCE BOOKS:

1. Richard Petersen, "Linux - The Complete Reference", 6th Ed., TMH, 2008.