R23-COURSE STRUCTURE
CSE(AI&ML)

O – SEMESTER

Induction Program   3 Weeks

I – SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits	CIE	SEE	Total
Contact hours/week header above L T P; Scheme of Valuation above CIE SEE Total									

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1.	23FE01	Communicative English	2	0	0	2	30	70	100
2.	23FE02	Chemistry	3	0	0	3	30	70	100
3.	23FE03	Linear Algebra & Calculus	3	0	0	3	30	70	100
4.	23CM01	Basic Civil and Mechanical Engineering	3	0	0	3	30	70	100
5.	23CS01	Introduction to Programming	3	0	0	3	30	70	100
Laboratory Courses									
6.	23IT51	IT Workshop	0	0	2	1	30	70	100
7.	23FE51	Communicative English Lab	0	0	2	1	30	70	100
8.	23FE52	Chemistry Lab	0	0	2	1	30	70	100
9.	23CS51	Computer Programming Lab	0	0	3	1.5	30	70	100
10.	23AU01	Health and wellness, Yoga and sports	0	0	1	0.5	100	-	100
Total			**14**	**00**	**10**	**19**	**370**	**630**	**1000**

II- SEMESTER

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1.	23FE04	Engineering Physics	3	0	0	3	30	70	100
2.	23FE05	Differential Equations & Vector Calculus	3	0	0	3	30	70	100
3.	23EE01	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100
4.	23ME01	Engineering Graphics	2	0	2	3	30	70	100
5.	23CS02	Data Structures	3	0	0	3	30	70	100
Laboratory Courses									
6.	23FE53	Engineering Physics Lab	0	0	2	1	30	70	100
7.	23EE51	Electrical & Electronics Engineering Workshop	0	0	3	1.5	30	70	100
8.	23ME51	Engineering Workshop	0	0	3	1.5	30	70	100
9.	23CS52	Data Structures Lab	0	0	3	1.5	30	70	100
10.	23AU02	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5	100	-	100
Total			**14**	**00**	**14**	**21**	**370**	**630**	**1000**

III–SEMESTER

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23FE11	Discrete Mathematics & Graph Theory	3	0	0	3	30	70	100
2	23HS01	UHV 2 - Understanding Harmony and Ethical Human Conduct	2	1	0	3	30	70	100
3	23AD02	Artificial Intelligence	3	0	0	3	30	70	100
4	23CS04	Advanced Data Structures & Algorithm Analysis	3	0	0	3	30	70	100
5	23CS05	Object Oriented Programming Through Java	3	0	0	3	30	70	100
6	23MC01	Environmental Science	2	0	0	-	30	-	30
Laboratory Courses									
7	23CS53	Advanced Data Structures & Algorithm Analysis Lab	0	0	3	1.5	30	70	100
8	23CS54	Object Oriented Programming Through Java Lab	0	0	3	1.5	30	70	100
9	23CSS1	Python Programming	0	1	2	2	30	70	100
		Total	**16**	**02**	**08**	**20**	**270**	**560**	**830**

IV– SEMESTER

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1.	23ME09	Optimization Techniques	2	0	0	2	30	70	100
2.	23FE10	Probability & Statistics	3	0	0	3	30	70	100
3.	23AM01	Machine Learning	3	0	0	3	30	70	100
4.	23CS03	Database Management Systems	3	0	0	3	30	70	100
5.	23IT01	Digital Logic & Computer Organization	3	0	0	3	30	70	100
Laboratory Courses									
6.	23AM51	Machine Learning Lab	0	0	3	1.5	30	70	100
7.	23CS56	Database Management Systems Lab	0	0	3	1.5	30	70	100
8.	23CSS2	Full Stack Development-1	0	1	2	2	30	70	100
9.	23ME57	Design Thinking & Innovation	1	0	2	2	30	70	100
		Total	**15**	**01**	**10**	**21**	**270**	**630**	**900**
Mandatory Community Service Project Internship of '08 weeks' duration during summer vacation									

V–SEMESTER

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23AM02	Information Retrieval Systems	3	0	0	3	30	70	100
2	23CS07	Computer Networks	3	0	0	3	30	70	100
3	23CS06	Operating Systems	3	0	0	3	30	70	100
4		**Program Elective-I**	3	0	0	3	30	70	100
	23IT02	Software Engineering							
	23CS11	Cloud Computing							
	23AM04	Internet of Things							
	23CS12	Automata Theory & Compiler Design							
5		Open Elective- I	3	0	0	3	30	70	100
Laboratory Courses									
6	23AM52	Information Retrieval Lab	0	0	3	1.5	30	70	100
7	23CS58	Computer Networks Lab	0	0	3	1.5	30	70	100
8	23CSS3	Full Stack development -2	0	1	2	2	30	70	100
9	23IT53	User Interface Design using Flutter	0	0	2	1	30	70	100
10	23PI01	Evaluation of Community Service Internship	-	-	-	2	-	50	50
Total			**15**	**1**	**10**	**23**	**270**	**680**	**950**

VI–SEMESTER

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23AM05	Natural Language Processing	3	0	0	3	30	70	100
2	23AM06	Deep Learning	3	0	0	3	30	70	100
3	23AD05	Data Visualization	3	0	0	3	30	70	100
4		**Program Elective-II**	3	0	0	3	30	70	100
	23IT06	Software Testing Methodology							
	23CS13	Cryptography & Network Security							
	23IT08	DevOps							
	23AM08	Recommender Systems							
5		**Program Elective-II**	3	0	0	3	30	70	100
	23IT07	Software Project Management							
	23CS14	Mobile Adhoc & Sensor Networks							
	23AM07	Computer Vision							
	23AD08	NoSQL Databases							
6.		Open Elective- II	3	0	0	3	30	70	100
Laboratory Courses									
7	23AM53	Deep Learning Lab	0	0	3	1.5	30	70	100
8	23AD54	Data Visualization Lab	0	0	3	1.5	30	70	100
9	23HSS1	Soft skills	0	1	2	2	30	70	100
10	23MC04	Technical Paper Writing & IPR	2	0	0	-	30	-	30
Total			**20**	**1**	**20**	**1**	**8**	**23**	**300**
Mandatory Industry Internship / Mini Project of 08 weeks duration during summer vacation									
MC		Student may select from the same minor pool	3	0	3	4.5	**30**	**70**	**100**
HC		Student may select from the same honor's pool	3	0	0	3	**30**	**70**	**100**

Under Industry Internship interested students can purse SWAYAM Plus courses viz, Hands on Masterclass on Data Analytics OR Artificial Intelligence for Real –World Applications.

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)
OPEN ELECTIVES

Course Code	Course Name	Offered to the branches
23AD81	Introduction to Artificial Intelligence	ASE, CE, ECE,EEE & ME
23AD82	Fundamentals of Data Science	ASE, CE, ECE,EEE & ME
23AD83	Introduction to Cloud Computing	ASE, CE, ECE,EEE & ME
23AD84	Data Analytics	ASE, CE, ECE,EEE & ME
23AE81	PRINCIPLES OF FLIGHT	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AE82	SPACE SCIENCE	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AE83	AIRCRAFT INSTRUMENTATION	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AE84	AIR TRANSPORTATION SYSTEMS	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AM81	Python Programming for AI & ML	ASE, CE, ECE,EEE & ME
23AM82	AI in healthcare	ASE, CE, ECE,EEE & ME
23AM83	Fundamentals of Machine Learning	ASE, CE, ECE,EEE & ME
23AM84	Introduction to Deep learning	ASE, CE, ECE,EEE & ME
23CE81	Disaster Management	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE82	Climate change impact on Eco system	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE83	Environmental Sanitation	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE84	Introduction to Remote Sensing and GIS	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE85	Water Supply Systems	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE86	Sustainability in Engineering Practices	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CS81	Introduction to Java Programming	ASE, CE, ECE,EEE & ME
23CS82	Principles of Operating Systems	ASE, CE, ECE,EEE & ME
23CS83	Principles of Database Management Systems	ASE, CE, ECE,EEE & ME
23CS83	Principles of Database Management Systems	ASE, CE, ECE,EEE & ME
23CS84	IoT based smart Systems	ASE, CE, ECE,EEE & ME
23EC81	Linear and Digital IC Applications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC82	Principles of communications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC83	Fundamentals of VLSI Design	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC84	Principles of Cellular & Mobile communications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC85	Fundamentals of Satellite Communications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

Course Code	Course Name	Offered to the branches
23EE81	Basic Control System	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE82	Basic Electrical Measurements	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE83	Utilization of Electrical Energy	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE84	Electric Vehicles	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE85	Concepts of Energy Auditing & Management	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE86	Electrical Wiring Estimation and Costing	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23IT81	Computer System Architecture	ASE, CE, ECE,EEE & ME
23IT82	Introduction to Programming in Java	ASE, CE, ECE,EEE & ME
23IT83	Principles of Software Engineering	ASE, CE, ECE,EEE & ME
23ME81	Sustainable Energy Technologies	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME82	Introduction to Industrial Robotics	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME83	Applied Operations Research	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME84	Entrepreneurship	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME85	Additive Manufacturing	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME86	Vehicle Technology	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT

	L	T	P	Cr.
	2	0	0	2

I B.Tech (I Sem)

23FE01 - COMMUNICATIVE ENGLISH

Pre-requisite: Nil

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:
CO1 Understand the context, topic, and pieces of specific information from social or Transactional dialogues.**(Understand)**

CO2 Apply grammatical structures to formulate sentences and correct word forms.**(Apply)**

CO3 Use discourse markers to speak clearly on a specific topic in informal discussions.**(Apply)**

CO4 Read / Listen the texts and write summaries based on global comprehension of these texts.(**Understand)**

CO5 Prepare a coherent paragraph, essay, and resume.**(Apply)**

UNIT I
Lesson: HUMAN VALUES: Gift of Magi **(Short Story)**

Listening:	Identifying the topic, the context and specific pieces of information by listening to 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 of information.
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 after listening to audio texts.
Speaking:	Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading:	Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing:	Structure of a paragraph - Paragraph writing (specific topics)
Grammar:	Cohesive devices - linkers, use of articles and zero article; prepositions.
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 is discussed
Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific 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 of relevant 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 and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

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

Reference Books:
1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014

Web Resources:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

L	T	P	Cr.
3	0	0	3

I B.Tech (I Sem)

23FE02 - CHEMISTRY

Pre-requisite: Nil

Course Objectives:

- To enable the students to understand the fundamental concepts of chemistry and to provide them with the knowledge of industrial problems and finding the solutions.
- To strengthen the basic concepts of bonding models, advanced engineering materials, electrochemistry, batteries and polymers.
- To introduce instrumental methods and their applications.

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

CO1: Understand the fundamentals of quantum mechanics and molecular orbital energy diagrams for molecules. (**Understand**)

CO2: Summarize the suitability of advanced materials like semiconductors, superconductors, super capacitors and nano materials, in advanced fields. (**Understand**)

CO3: Apply Nernst equation in calculating cell potentials and understand conduct metric, potentiometric titrations, electrochemical sensors and compare batteries for different applications. (**Understand**)

CO4: Outline the importance of polymers and conducting polymers in advanced technologies. (**Understand**)

CO5: Understand the fundamentals of UV-Visible, IR spectroscopic techniques and basic principles of chromatographic techniques. (**Understand**)

UNIT I **Structure and Bonding Models:**

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT II **Modern Engineering materials**

Semiconductors – Introduction, basic concept, application

Super conductors-Introduction basic concept, applications.

Super capacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

UNIT III **Electrochemistry and Applications**

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells.

Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT IV   Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna- N–preparation, properties and applications.

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 transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

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

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

I B.Tech (I Sem)

L	T	P	Cr.
3	0	0	3

23FE03 - LINEAR ALGEBRA & CALCULUS

Pre-requisite: Nil

Course Objectives:

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

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

CO1	Apply matrix algebra techniques to solve engineering problems.	**Apply**
CO2	Use Eigen values and Eigen vectors concept to find nature of quadratic form, inverse and powers of matrix.	**Apply**
CO3	Expand various functions using Mean value theorems.	**Understand**
CO4	Understand the concepts of functions of several variables which are useful in optimization.	**Understand**
CO5	Evaluate areas and volumes by using double and triple integrals.	**Apply**

UNIT I Matrices

Rank of a matrix by echelon form, 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 by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

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 forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT III Calculus

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), 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, total derivatives, chain rule, Directional derivative, 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 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:

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

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

L	T	P	Cr.
3	0	0	3

I B.Tech (I Sem)

23CM01-BASIC CIVIL AND MECHANICAL ENGINEERING

Pre-requisite: Nil

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

CO1: Describe various sub-divisions of Civil Engineering and to appreciate their role in societal development. **(Understand)**

CO2: Outline the concepts of surveying and obtain the theoretical measurement of distances, angles and levels through surveying. **(Understand)**

CO3: Classify the various materials used in construction and highway engineering and identify their appropriate usage as per the needs. **(Understand)**

CO4: Illustrate the fundamental principles involved in transportation network system, their individual components and their engineering importance. **(Understand)**

CO5: Explain the quality parameters of various water sources and functions of selected water storage and conveyance structures. **(Understand)**

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

Reference Books:
1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. 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 different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

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

CO1: Summarize the different manufacturing processes.(**Remember**)

CO2: Explain the basics of thermal engineering and its applications. (**Understand**)

CO3: Illustrate the working of different mechanical power transmission systems and power plants.

(**Understand**)

CO4: Describe the basics of robotics and its applications. (**Understand**)

UNIT I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.
Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT II

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

Thermal Engineering – 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 – Working principle of Steam, Diesel, Hydro, Nuclear power plants.
Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.
Introduction to Robotics - Joints & links, configurations, and applications of robotics.

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

Textbooks:

1. Internal Combustion Engines by V.Ganesan, ByTata McGraw Hill publications (India) Pvt. Ltd.
2. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

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

I B.Tech (I Sem)

L	T	P	Cr.
3	0	0	3

23CS01 - INTRODUCTION TO PROGRAMMING

Pre-requisite: Nil

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, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

Course Outcomes: A student after completion of the course will be able to

CO1: Understand basics of computers, concept of algorithms and flowcharts. (**Understand)**
CO2: Understand the features of C language. (**Understand**)
CO3: Interpret the problem and develop an algorithm to solve it. (**Apply**)
CO4: Implement various algorithms using the C programming language. (**Apply**)
CO5: Develop skills required for problem-solving and optimizing the code (**Apply)**

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, Operations, 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, Introduction to Strings.

UNIT IV   Pointers & User Defined Data types
Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

UNIT V   Functions & File Handling
Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, 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 of implementation**.**

Textbooks:
1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

Reference Books:
1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

Web Resources:
https://onlinecourses.nptel.ac.in/noc22_cs40/preview

	L	**T**	**P**	**Cr.**
I B.Tech (I Sem)	**0**	**0**	**2**	**1**

23IT51-IT WORKSHOP

Pre-requisite: Nil

Course Objectives:
- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dualboot 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: At the end of the course, the students will be able to

CO1: Identify the components of a PC and troubleshooting the malfunctioning of PC.**(Apply)**
CO2: Develop presentation /documentation using Office tools and LaTeX. **(Apply)**
CO3: Build dialogs and documents using ChatGPT. **(Apply)**
CO4: Improve individual / teamwork skills, communication and report writing skills with ethical values.

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. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the 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. Lab instructor 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 both Windows 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 configured as 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. Finally students 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 WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy 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 how to 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 customize their 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, Using help 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 TeX and 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 help and 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, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

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

•   Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way 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 to see how accurate and fluent the translations are.

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

Textbooks:

1. COMPUTER BASICS 1st Edition, Kindle Edition

Reference Books:

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

Web Resources:

https://youtube.com/live/pSudQqA-uDw?feature=share
https://nptel.ac.in/workshops

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0	0	2	1

I B.Tech (I Sem)   23FE51- COMMUNICATIVE ENGLISH LAB

Prequisites: Nil

Course Objectives:

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

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

CO1	Understand the different aspect of the English language proficiency with emphasis on LSRW skills.	**Understand**
CO2	Apply Communication Skills through various language learning activities.	**Apply**
CO3	Identifying the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking, comprehension.	**Understand**
CO4	Exhibit professionalism in participating in debates and group discussions.	**Apply**

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:
- Walden Infotech
- Young India Films

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

Web Resources:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

2. https://www.youtube.com/user/letstalkaccent/videos
3. https://www.youtube.com/c/EngLanguageClub/featured
4. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
5. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

	L	T	P	Cr.
I B.Tech (I Sem)	0	0	2	1

23FE52- CHEMISTRY LAB

Prequisites : Nil

Course Objectives:

- To enable the students to perform different types of volumetric titrations.
- To provides an overview of preparation of polymers, nanomaterials and analytical techniques.

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

CO1: Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus. (Analyze)

CO2: Acquire practical knowledge related to preparation of Bakelite and nanomaterials. (Apply)

CO3: Measure the strength of acid present in Pb-Acid battery. (Apply)

CO4: Analyze important parameters of water to check its suitability for drinking purpose and industrial applications. (Analyze)

CO5: Improve individual / teamwork skills, communication and report writing skills with ethical values. (Apply)

List of Experiments:
1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

Reference:

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

	L	T	P	Cr.
I B.Tech (I Sem)				
23CS51- COMPUTER PROGRAMMING LAB	0	0	3	1.5

Prequisites: Nil

Course Objectives:

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

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

CO1: Read, understand, and trace the execution of programs written in C language. (**Understand**)

CO2: Apply the right control structure for solving the problem. (**Apply**)

CO3: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, pointers and files in C. (**Apply**)

CO4: Improve individual / teamwork skills, communication and report writing skills with ethical values.

UNIT I

WEEK 1
Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:
Tutorial 1: Problem-solving using Computers.
Lab1: Familiarization with programming environment
  i)   Basic Linux environment and its editors like Vi, Vim & Emacs etc.
  ii) Exposure to Turbo C, gcc
  iii) Writing simple programs using printf(), scanf()

WEEK 2
Objective: Getting familiar with how to formally describe a solution to a problem in a series of 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
  i)   Sum and average of 3 numbers
  ii) Conversion of Fahrenheit to Celsius and vice versa
  iii) 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.
  i)   Finding the square root of a given number
       Finding compound interest
  ii) Area of a triangle using heron's formulae
  iii) Distance travelled by an object

UNIT II

WEEK 4
Objective: Explore the full scope of expressions, type-compatibility of variables & constants and 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
  i)   Evaluate the following expressions.
           a. A+B*C+(D*E) + F*G
           b. A/B*C-B+A*D/3
           c. A+++B---A
           d. J= (i++) + (++i)
  ii) Find the maximum of three numbers using conditional operator
  iii) 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.
  i)   Write a C program to find the max and min of four numbers using if-else.
  ii) Write a C program to generate electricity bill.
  iii) Find the roots of the quadratic equation.
  iv) Write a C program to simulate a calculator using switch case.
  v)   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 each of 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
  i)   Find the factorial of given number using any loop.
  ii) Find the given number is a prime or not.
  iii) Compute sine and cos series
  iv) Checking a number palindrome
  v)   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
    i) Find the min and max of a 1-D integer array.
    ii) Perform linear search on 1D array.
    iii) The reverse of a 1D integer array
    iv) Find 2's complement of the given binary number.
    v) 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
    i) Addition of two matrices
    ii) Multiplication two matrices
    iii) Sort array elements using bubble sort
    iv) Concatenate two strings without built-in functions
    v) 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. Gain experience 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.
    i) Write a C program to find the sum of a 1D array using malloc()
    ii) Write a C program to find the total, average of n students using structures
    iii) Enter n students data using calloc() and display failed students list
    iv) Read student name and marks from the command line and display the student details along with the total.
    v) 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 same without using bit- fields
  i)   Create and display a singly linked list using self-referential structure.
  ii) Demonstrate the differences between structures and unions using a C program.
  iii) Write a C programto shift/rotate using bitfields.
  iv) Write a C programto copyone 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 byparameter 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 Eulers theorem.
  i)   Write a C function to calculate NCR value.
  ii) Write a C function to find the length of a string.
  iii) Write a C function to transpose of a matrix.
  iv) 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 functions that 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
  i)   Write a recursive function to generate Fibonacci series.
  ii) Write a recursive function to find the lcm of two numbers.
  iii) Write a recursive function to find the factorial of a number.
  iv) Write a C Program to implement Ackermann function using recursion.
  v)   Write a recursive function to find the sumof series.

WEEK 13:
Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers
Suggested Experiments/Activities:
Tutorial 13: Call byreference, dangling 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
  i) Write a C program to write and read text into a file.
  ii) Write a C program to write and read text into a binary file using fread() and fwrite()
  iii) Copythe contents of one file to another file.
  iv) Write a C program to merge two files into the third file using command-line arguments.
  v) Find no. of lines, words and characters in a file
  vi) Write a C program to print last n characters of a given file.

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

Reference Books:
  1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India

Web Resources:
 https://onlinecourses.nptel.ac.in/noc22_cs40/preview
 C Programming, AProblem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

	L	T	P	Cr.
	0	0	1	0.5

I B.Tech (I Sem)

23AU01- HEALTH AND WELLNESS, YOGA AND SPORTS

Prequisites: Nil

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 ofthe course the student will be able to

CO1: Understand the importance of yoga and sports for Physical fitness and sound health. **(Understand)**

CO2: Demonstrate an understanding of health-related fitness components. **(Apply)**

CO3: Compare and contrast various activities that help enhance their health.**(Understand)**

CO4: Assess current personal fitness levels. **(Apply)**

CO5: Develop Positive Personality **(Apply)**

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 ofhealth 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, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

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3	0	0	3

I B.Tech (II Sem)   **23FE04 - ENGINEERING PHYSICS**

Prequisites: Nil

Course Objectives:

- To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes:

CO1: Analyze the intensity variation of light due to interference, diffraction, and Polarization (**Apply**).
CO2: Understand the basics of crystals and their structures (**Understand**).
CO3: Summarize various types of polarization of dielectrics and classify the magnetic materials (**Understand**)
CO4: Explain fundamentals of quantum mechanics and free electron theory of metals (**Understand**).
CO5: Identify the type of semiconductor using Hall Effect (**Apply**).

UNIT I   Wave Optics
Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.
Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT II 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 - Miller indices – separation between successive (hkl) planes.

X- ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

UNIT III Dielectric and Magnetic Materials
Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarization s- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss.
Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT IV Quantum Mechanics and Free electron Theory

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

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

UNIT V Semiconductors

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications.

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

Reference Books:
1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

Web Resources:
 https://www.loc.gov/rr/scitech/selected-internet/physics.html

I B.Tech (II Sem)

L	T	P	Cr.
3	0	0	3

23FE05 - DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

Prequisites: Nil

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

CO1	Solve the differential equations related to various engineering fields (Unit – I&II)	**Apply**
CO2	Apply knowledge of partial differentiation in modelling and solving of Partial differential equations.	**Apply**
CO3	Interpret the physical meaning of different operators such as gradient, curl and divergence.	**Apply**
CO4	Evaluate the work done against a field, circulation and flux using Vector Calculus.	**Apply**

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, general solution, particular integral, 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 Linear Partial differential equations with constant coefficients.

UNIT IV Vector differentiation

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V Vector integration

LWithoutegral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

Textbooks:

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

Reference Books:

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

	L	T	P	Cr.
I B.Tech (II Sem)	**3**	**0**	**0**	**3**

23EE01 - BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Pre-requisite: Nil

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: Extract electrical variables of AC & DC circuits using fundamental laws. **(Understand)**
CO2: Understand the operation of electrical machines and measuring instruments. **(Understand)**
CO3: Classify various energy resources, safety measures and interpret electricity bill generation in electrical systems. **(Understand)**

PART A: BASIC ELECTRICAL ENGINEERING

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:
1. https://nptel.ac.in/courses/108105053
2. 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 CO4:

Interpret the characteristics of various semiconductor devices **(Knowledge)**
CO5: Infer the operation of rectifiers, amplifiers. **(Understand)**
CO6: Contrast various logic gates, sequential and combinational logic circuits. **(Understand).**

UNIT I   SEMI CONDUCTOR 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

Rectifiers and power supplies: 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, Registers and counters (Elementary Treatment only)

Textbooks:

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

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

End examinationpattern:

i) Question paper shall bein two parts viz., Part A and Part B with equal weightage of 35 marks each.

ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1 mark.

iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.

The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

I B.Tech (II Sem)

L	T	P	Cr.
2	0	2	3

23ME01-ENGINEERING GRAPHICS

Pre-requisite: Nil
Course Objectives:

- To enable the students with various concepts like dimensioning, conventions and standards 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 Isometric and Perspective projections.

Course Outcomes:

CO1: Understand the principles of engineering drawing, including engineering curves, scales,

orthographic and isometric projections. (**Understand**)

CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front,

top and side views. (**Apply**)

CO3: Understand and draw projection of solids in various positions in first quadrant. (**Apply**)

CO4: Able to draw the development of surfaces of simple objects (**Apply**)

CO5: Prepare isometric and orthographic sections of simple solids. (**Apply**)

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods. **(Covered theoretically in class. Not for the end examination)**

Scales: Plain scales, diagonal scales and vernier scales. (Covered theoretically in class. Not for the end examination) Curves: Construction of ellipse, parabola and hyperbola by general method only, Cycloids, Involutes, Normal and tangent to Curves.

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

UNIT II

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.

UNIT III

Projections of Solids: Types of solids: Polyhedra 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 Transformations using Auto CAD (**Not for end examination**).

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

Reference Books:
1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, DhananjayJolhe, Tata McGraw Hill, 2017.

I B.Tech (II Sem)

L	T	P	Cr.
3	0	0	3

23CS02- DATA STRUCTURES

Pre-requisites: 'C' Programming

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

CO1: Understand the role of linear and non linear data structures in organizing and accessing data (**Understand**)

CO2: Implement abstract data type (ADT) and data structures for given application. (**Apply**)

CO3: Design algorithms based on techniques like linked list, stack, queue, trees etc.(**Apply**)

CO4: Apply the appropriate linear and nonlinear data structure techniques for solving a problem. (**Apply**)

CO5: Design hash-based solutions for specific problems**. (Apply)**

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

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

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

UNIT IV
Queues: Introduction to queues: properties and operations, implementing queues using arrays and 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 V
Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal

Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.

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

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

Web Resources:

https://nptel.ac.in/courses/106102064

I B.Tech (II SEM)

23FE53- ENGINEERING PHYSICS LAB

L	T	P	Cr.
0	0	2	1

Pre-requisite: Nil

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 and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes: The students will be able to

CO1: Analyze the wave properties of light using optical instruments (**Apply**).

CO2: Estimate the elastic modulii of various materials and acceleration due to gravity (**Apply**).

CO3: Demonstrate the vibrations in stretched strings (**Understand**).

CO4: Evaluate dielectric constant and magnetic field of circular coil carrying current (**Apply**).

CO5: Examine the characteristics of semiconductor devices (**Apply**).

List of Experiments:
1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

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. Chand Publishers, 2017.

Web-resources:

www.vlab.co.inhttps://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

	L	T	P	Cr.
	0	0	3	1.5

I B.Tech (II Sem)

23EE51- ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

Pre-requisite: Nil

Course Objectives:

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

Course Outcomes:

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

CO1. Compute voltage, current and power in an electrical circuit. **(Apply)**

CO2. Compute medium resistance using Wheat stone bridge. **(Apply)**

CO3. Discover critical field resistance and critical speed of DC shunt generators. **(Apply)**

CO4. Estimate reactive power and power factor in electrical loads. **(Understand)**

CO5: Plot the characteristics of semiconductor devices. **(Apply)**

CO6: Demonstrate the working of various logic gates using ICs. **(Understand)**

Activities:

1. 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.

2. 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.

3. 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.

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

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.

List of Experiments:
1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K & D flip flops using respective ICs.

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, PearsonEducation, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, IntroductoryElectronic 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.

	L	**T**	**P**	**Cr.**
I B.Tech (II Sem) **23CS52** -**DATA STRUCTURES LAB**	**0**	**0**	**3**	**1.5**

Pre-requisite: 'C' Programming

Course objective:

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

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

CO1: Apply Linear Data Structures for organizing the data efficiently (**Apply**)

CO2: Apply Non-Linear Data Structures to organize data efficiently (**Apply**)

CO3: Develop and implement hashing techniques for solving problems. (**Apply**)

CO4: Improve individual / teamwork skills, communication and report writing skills with ethical values.

List of Experiments:

Exercise 1: Array Manipulation
  i) Write a program to reverse an array.
  ii) C Programs to implement the Searching Techniques – Linear & Binary Search
  iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

Exercise 2: Linked List Implementation
  i) Implement a singly linked list and perform insertion and deletion operations.
  ii) Develop a program to reverse a linked list iteratively and recursively.
  iii) Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications
  i) Create a program to detect and remove duplicates from a linked list.
  ii) Implement a linked list to represent polynomials and perform addition.
  iii) Implement a double-ended queue (deque) with essential operations.

Exercise 4: Double Linked List Implementation
  i) Implement a doubly linked list and perform various operations to understand its properties and applications.
  ii) Implement a circular linked list and perform insertion, deletion, and traversal.

Exercise 5: Stack Operations
  i) Implement a stack using arrays and linked lists.
  ii) Write a program to evaluate a postfix expression using a stack.
  iii) Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations
i) Implement a queue using arrays and linked lists.
ii) Develop a program to simulate a simple printer queue system.
iii) Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications
i) Use a stack to evaluate an infix expression and convert it to postfix.
ii) Create a program to determine whether a given string is a palindrome or not.
iii) Implement a stack or queue to perform comparison and check for symmetry.

Exercise 8: Binary Search Tree
i) Implementing a BST using Linked List.
ii) Traversing of BST.

Exercise 9: Hashing
i) Implement a hash table with collision resolution techniques.
ii) Write a program to implement a simple cache using hashing.

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

Reference Books:
1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein

Web-resources: https://nptel.ac.in/courses/106102064

	L	T	P	Cr.
I B.Tech (II Sem)	0	0	1	0.5

23AU02 - NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

Pre-requisites : Nil

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. **(Understand)**

CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques. **(Apply)**

CO3: Explore human relationships by analyzing social problems. **(Understand)**

CO4: Determine to extend their help for the fellow beings and downtrodden people **(Apply)**

CO5: Develop leadership skills and civic responsibilities. **(Apply)**

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- anyother 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) Organising 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:

i) 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.

ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,

iii) Conducting consumer Awareness. Explaining various legal provisions etc.

iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.

v) Anyother programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. 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.

L	T	P	Cr.
3	0	0	3

II B.Tech (III Sem)　　**23FE11-DISCRETE MATHEMATICS AND GRAPH THEORY**

Pre-requisites: Mathematics courses of first year of study.

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:

CO1: Construct mathematical arguments using logical connectives and quantifiers and verify them. **(Apply- L3)**

CO2: Demonstrate the basic terminology of functions, relations, lattices and their operations. **(Understand -L2)**

CO3: Illustrate the basic principles/techniques to solve different combinatorial problems and linear recurrence relations.**(Apply- L3)**

CO4: Demonstrate the different types of graphs.**(Understand -L2)**

CO5: Apply the properties of graphs to solve the graph theory problems in computer science.**(Apply- L3)**

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, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving In homogeneous 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:

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

REFERENCE BOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

	L	T	P	Cr.
II B.Tech (III Sem) **23HS01-UHV-2 UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT**	2	1	0	3

Pre-requisite: Nil
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 student able to

CO1: Describe the terms like Natural Acceptance, Happiness and Prosperity **(L2)**
CO2: Identify one's self, and one's surroundings (family, society nature) **(L2)**
CO4: Relate human values with human relationship and human society. **(L2)**
CO5: Illustrate the need for universal human values and harmonious existence **(L2)**
CO6: Develop as socially and ecologically responsible engineers **(L3)**

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)
Lecture13: 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 (6lectures 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

Textbook and Teachers Manual
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
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
1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. 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.

Web 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%20 Respect %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/3-days%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 https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

				L	T	P	Cr.

II B.Tech (III Sem) **23AD02- ARTIFICIAL INTELLIGENCE**

L	T	P	Cr.
3	0	0	3

Pre-requisites: Computer Programming, Mathematical Foundations of Computer Science, linear algebra, data structures and algorithms

Course Objectives: The main objectives of the course is to
- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.
- The student should be made to introduce the concepts of Expert Systems.

Course Outcomes: At the end of the course, students will be able to
CO1: Enumerate the history & foundation of AI. **(Understand- L2)**
CO2: Apply the searching algorithms for AI in problem solving. **(Apply- L3)**
CO3: Choose the appropriate representation of knowledge. **(Apply- L3)**
CO4: Choose the appropriate logic concepts**. (Apply- L3)**
CO5: understand Expert systems techniques in AI **(Understand-L2)**

UNIT - I
Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT - II
Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT - III
Representation of Knowledge: Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and dempstershafer theory.

UNIT - IV
Logic concepts: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT - V
Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

Textbooks:
1. S. Russeland P. Norvig, "Artificial Intelligence – A Modern Approach",
SecondEdition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill

Reference Books:
1. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: a logical
approach", Oxford University Press.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth
Edition, Pearson Education.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
4. Artificial Intelligence, SarojKaushik, CENGAGE Learning.

Web Resources:
1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

		L	T	P	Cr.
II B.Tech (III Sem)	**23CS04-ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS**	3	0	0	3

Pre-requisites: Data structures

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: After successful completion of the course the students are able to

CO1: Identify the characteristics of an algorithm, analyze its time and space complexity and construct balanced binary trees. **(Apply-L3)**

CO2: Understand Heap structures and graph terminology to perform various operations on non-linear data structures. **(Understand-L2)**

CO3: Apply Divide and Conquer, Greedy algorithm and dynamic programming for solving problems**. (Apply - L3)**

CO4: Analyze the backtracking and branch-and-bound search methods on optimization problems **(Apply - L3)**

CO5: Summarize the importance of NP-Hard and its applications. **(Understand-L2)**

UNIT – I:
Introduction: Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.
AVL Trees – Creation, Insertion, Deletion operations and Applications
B-Trees – Creation, Insertion, Deletion operations and Applications

UNIT – II:
Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications
Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications
Divide and Conquer: The General Method, Finding Max-Min, 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, Optimal Storage on tapes, Huffman coding.

UNIT – IV:
Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths– General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem.

UNIT – V:
Backtracking: General Method, n-Queens Problem, Sum of Subsets problem, Graph Coloring.
Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem
Introduction to Complexity classes: P and NP Problems, NP-Complete Problems.

Textbooks:

1.   Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press

2.   Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

Reference Books:

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia

2. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.

4. Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995 Algorithms + Data Structures & Programs: N.Wirth, PHI

6. Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.

7. Data structures in Java: Thomas Standish, Pearson Education Asia

Web Resources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp

2. http://peterindia.net/Algorithms.html

3. Abdul Bari, Introduction to Algorithms (youtube.com)

	23CS05-OBJECT ORIENTED PROGRAMMING	**L**	**T**	**P**	**Cr.**
II B.Tech (III Sem)	**THROUGH JAVA**	3	0	0	3

Pre-requisites: Introduction to Programming

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 successful completion of the course the students are able to

CO1: Identify the syntax and semantics of java programming language and basic concepts of Java. **(Understand-L2)**

CO2: Understand the basic concepts of object-oriented programming **(Understand-L2)**

CO3: Develop reusable programs using the concepts of inheritance, polymorphism, and interfaces. **(Apply-L3)**

CO4: Apply the concepts of packages, exception handling & I/O streams to develop secure, error free, and efficient applications **(Apply-L3)**

CO5: Design multithreaded and GUI based applications which mimic the real word scenarios. **(Apply-L3)**

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: 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.

Constructors and Methods: Introduction, Defining Methods, Constructor Methods for Class, Overloaded Constructor Methods, Overloaded Methods, Nested Classes, Passing Arguments by Value and by Reference, Keyword this. Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Attributes Final and Static.

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

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, Relationship between classes- Has-a, Is-a, 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: 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, Formatting for Date/Time in Java, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords try, catch, throw, throws, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, Generating user defined exception.

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

Multithreaded Programming: Introduction, Need for Multiple Threads., Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread - Creation of New Threads, Thread States, Thread Priorities, Synchronization, Inter-thread Communication- producer consumer problem.

Java Collections: Introduction, Purpose of Collection Framework, Hierarchy of collection Interfaces / classes, Methods defined in Collection Interface, Interface Iterator, Collection classes/Interfaces – List, Set, Map.

Java FX GUI: Overview of AWT & Swings API, limitations, 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:
1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object-Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:
1. The complete Reference Java, 11thedition, Herbert Schildt, TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Web Resources:
1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618 816347_shared/overview

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2	0	0	-

II B.Tech (III Sem)   **23MC01-ENVIRONMENTAL SCIENCE**

Pre-requisites: Nil

Course Objectives: The objective of this course is to understand Environmental issues like natural resource depletion, pollution, interaction between human and ecosystems and their role in the food web in the natural world, importance of global biodiversity and significance of environmental law in India.

Course Outcomes:
In this course the student will learn about
CO1: The necessity of resources, their exploitation and sustainable management **(Understand – L2)**
CO2: The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation. **(Understand – L2)**
CO3: Environmental problems like pollution, disasters and possible solutions. **(Remember – L1)**
CO4: The importance of environmental decision making in organizations through understanding the environmental law and environmental audits. **(Remember – L1)**
CO5: Environmental issues like over population, human health etc related to local, regional and global levels. **(Understand – L2)**

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.–Energy resources:

UNIT–II
Ecosystems: Concep to fan 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:
a. Forest ecosystem.
b. Grassl and ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
Biodiversity And Its Conservation: Introduction 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-sportsof 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:

a. Air Pollution

b. Water pollution

c. Soil pollution

d. Marine pollution

e. Noise pollution

f. Thermal pollution

g. Nuclear hazards

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 land slides.

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 – Wastel and reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act.

–Water (Prevention and control of Pollution) Act–Wild life Protection Act–Forest Conservation Act–Issues involved in enforcement of environment allegislation–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, hills lopes,etc..

Text books:

1. Text book of Environmental Studies for Undergraduate Courses ErachBharucha for University Grants Commission, Universities Press.

2. Palaniswamy,"Environmental Studies",Pearson education

3. S.AzeemUnnisa,"Environmental Studies"Academic Publishing Company

4. K.Raghavan Nambiar,"Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt.Ltd.

Reference Books:

1. Deeksha Dave and E.Sai Baba Reddy, "Text book of Environmental Science",Cengage Publications.

2. M.AnjiReddy,"Text book of Environmental Sciences and Technology",BSPublication.

3. P.Sharma, Comprehensive Environmentalstudies, Laxmi publications.

4. J.GlynnHenry and GaryW.Heinke,"Environmental Sciences and Engineering", Prentice Hall of India Private limited

5. G.R.Chatwal,"A Text Book of Environmental Studies "Himalaya Publishing House

6. Gilbert M.Masters and WendellP.Ela, "Introduction to Environmental Engineering and Science,Prentice Hall of India Private limited.

		L	T	P	Cr.
II B.Tech (III Sem)	**23CS53-ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB**	0	0	3	1.5

Pre-requisites: Data Structures Lab

Course Objectives: The objectives of the course is to
- Acquire practical skills in constructing and managing Data structures
- Apply the popular algorithm design methods in problem-solving scenarios

Course Outcomes: After successful completion of the course the students are able to

CO1: Implement balanced binary trees, heaps and graph traversals using arrays and linked list. **(Apply-L3)**

CO2: Implement Various Sorting Techniques. **(Apply - L3)**

CO3: Implement optimization problems using greedy, dynamic programming, backtracking and branch-and-bound techniques. **(Apply - L3)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

Experiments covering the Topics:
1. Operations on AVL trees, B-Trees, Heap Trees
2. Graph Traversals
3. Sorting techniques
4. Minimum cost spanning trees
5. Shortest path algorithms
6. 0/1 Knapsack Problem
7. Travelling Salesperson problem
8. Optimal Binary Search Trees
9. N-Queens Problem
10. Job Sequencing

Sample Programs:
1. Implement AVL Tree operations using linked list.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by
   a) Adjacency Matrix   b) Adjacency Lists
5. Write a program for finding the biconnected components in a given graph.
6. Write a program to find maximum and minimum element in array using Divide and conquer.
7. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
8. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
9. Implement Job Sequencing with deadlines using Greedy strategy.
10. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
11. Implement N-Queens Problem Using Backtracking.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, Sahni Sartaj, Mehta, Dinesh, 2ndEdition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2ndEdition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

Web Resources:

1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html

		L	T	P	Cr.
	23CS54-OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB	0	0	3	1.5

II B.Tech (III Sem)

Pre-requisites: Computer Programming 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

Course Outcomes: After successful completion of the course the students are able to

CO1: Implement basic concepts of the java programming language. **(Apply-L3)**
CO2: Implement object-oriented programming concepts and exception handling **(Apply- L3).**
CO3: Design multithreaded, database and GUI based applications. **(Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

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, Java FX GUI

Sample Experiments:

Exercise – 1:
   a. Write a JAVA program to display default value of all primitive data type of JAVA
   b. Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2
   a. Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
   b. Write a JAVA program to sort for an element in a given list of elements using bubble sort
   c. Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3
   a. Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
   b. Write a JAVA program implements method overloading.
   c. Write a JAVA program to implement constructor.
   d. Write a JAVA program to implement constructor overloading.

Exercise - 4
   a. Write a JAVA program to implement Single Inheritance
   b. Write a JAVA program to implement multilevel Inheritance
   c. Write a JAVA program for abstract class to find areas of different shape

Exercise - 5
    a.   Write a JAVA program give example for "super" keyword.
    b.   Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
    c.   Write a JAVA program that implements Runtime polymorphism

Exercise - 6
    a.   Write a JAVA program that describes exception handling mechanism
    b.   Write a JAVA program Illustrating Multiple catch clauses
    c.   Write a JAVA program for creation of Java Built-in Exceptions
    d.   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 ()
    c.   Write a Program illustrating Daemon Threads.
    d.   Write a JAVA program Producer Consumer Problem

Exercise – 8
    a.   Write a JAVA program that import and use the user defined packages
    b.   Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
    c.   Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

Exercise-9:
    a.   Implement the programs using List Interface and its implemented classes.
    b.   Implement the programs using Set Interface and its implemented classes.
    c.   Implement the programs using Map Interface and its implemented classes.

Web Resources:

1.   https://nptel.ac.in/courses/106/105/106105191/
2.   https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618 816347_shared/overview

		L	T	P	Cr.
II B.Tech (III Sem)	**23CSS1-PYTHON PROGRAMMING**	0	1	2	2

Pre-requisites: Introduction to Programming

Course Objectives: The main objectives of the course are to
- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these
-

Course Outcomes: After learning the contents of this course, the student must be able to

CO1: Implement the core programming concepts of Python programming language. **(Apply-L3)**

CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**

CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications. **(Apply-L3)**

CO4: Improve individual/ teamwork skills, communication & report writing skills with ethical values

SYLLABUS:

UNIT-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:
1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators
   iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. 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:
1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. 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:
1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. 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:
1. 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.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of the items in the array.
5. Write a program to add, transpose and multiply two matrices.
6. 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:

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array () function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. 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:
7. Apply head () function to the pandas data frame
8. Perform various data selection operations on Data Frame
9. 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:

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

Web Resources:

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

	L	T	P	Cr.
II B.Tech (IV Sem.) **23ME09 – OPTIMIZATION TECHNIQUES**	2	0	0	2

Pre-requisite: Engineering Mathematics

Course Objectives:

The course aims to equip students with the ability to define objective and constraint functions in terms of design variables for optimization problems, including both single and multi- variable problems with and without constraints. It covers the application of linear programming techniques, including the use of slack and surplus variables in the Simplex method, and the formulation of transportation and assignment problems as linear programming problems. Additionally, the course presents nonlinear programming techniques for both unconstrained and constrained problems, including the use of penalty functions.

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

CO1: State and formulate optimization problems, with and without constraints, using design variables from an engineering design problem. **(Remember-L1)**
CO2: Apply classical optimization techniques to minimize or maximize a multi-variable objective function, with or without constraints, and arrive at an optimal solution. **(Understand-L2)**
CO3: Apply and solve transportation and assignment problems using the Linear Programming Simplex method. **(Apply-L3)**
CO4: Apply gradient and non-gradient methods to nonlinear optimization problems, using interior or exterior penalty functions for constraints, to derive optimal solutions. **(Apply-L3)**
CO5: Formulate and apply Dynamic Programming techniques to problems such as inventory control, production planning, and engineering design, to reach a final optimal solution from the current optimal solution. **(Analyse-L4)**

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.

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 Penalty Function method, Basic approaches of Interior and Exterior penalty function methods, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions.

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:

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

Reference Books:

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

Web Resources:

https://nptel.ac.in/courses/111105039

L	T	P	Cr.
3	0	0	3

II B.Tech (IV Sem)   **23FE10-PROBABILITY & STATISTICS**

Pre-requisite: Nil

Course Objectives:

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

Course Outcomes: Upon successful completion of this course, the student should be able to

CO1: Classify the concepts of data science and its importance **(Understand-L2)**

CO2: Interpret the association of characteristics and through correlation and regression tools **(Analyze-L3)**

CO3: Apply discrete and continuous probability distributions **(Apply-L3)**

CO4: Design the components of a classical hypothesis test **(Apply-L4)**

CO5: Infer the statistical inferential methods based on small and large sampling tests (**Analyze-L4**)

Unit – I: Descriptive statistics and methods for data science:
Data science – Statistics Introduction – Population vs Sample –Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability – Skewness – Kurtosis.

UNIT – II: Correlation and Regression:
Correlation – Correlation coefficient – Rank correlation.
Linear Regression: Straight line – Multiple Linear Regression - Regression coefficients and properties – Curvilinear Regression: Parabola – Exponential – Power curves.

UNIT – III: Probability and Distributions:
Probability– Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT – IV: Sampling Theory:
Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Point and Interval estimations – Maximum error of estimate – Central
        limit theorem (without proof) – Estimation using t,   ᵡ2 and F-distributions.

UNIT – V: Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Test of significance for large samples and Small Samples: Single and difference means – Single and two proportions – Student's t-test, F-test, ᵡ2 -test.

Text Books:

1. Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2. Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4. Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

		L	T	P	Cr.
II B.Tech (IV Sem)	**23AM01-MACHINE LEARNING**	3	0	0	3

Pre-requisites: Probability and Statistics, Data Warehousing and Data Mining

Course Objectives:

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

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

CO1: Understand development steps of model building and evaluation approaches. **(Understand-L2)**

CO2: Apply Nearest Neighbor-based models to solve real-time regression and classification problems **(Apply-L3)**

CO3: Make use of supervised learning algorithms to solve classification problems **(Apply-L3)**

CO4: Apply linear discriminants and perceptron classifiers to classify datasets **(Apply-L3)**

CO5: Apply various clustering techniques to solve complex problems **(Apply-L3)**

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, DreamTech
3. "Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

Web Resources:

https://nptel.ac.in/courses/106106139

	L	T	P	Cr.
II B.Tech (IV Sem.) **23CS03-DATABASE MANAGEMENT SYSTEMS**	3	0	0	3

Pre-requisites: Data Structures

Course Objectives: The main objective of this course is

- 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 successful completion of the course the students are able to

CO1: Understand the foundation of database management system and various data models. **(Understand-L2)**

CO2: Identify relational model concepts, implement various constraints, perform SQL queries and DML operations. **(Understand-L2)**

CO3: Apply SQL queries, functions, and work with nested queries, grouping, joins, views, and set operations. **(Apply-L3)**

CO4: Apply various normalization techniques for efficient data handling. **(Apply-L3)**

CO5: Understand Transaction management, recovery & indexing techniques. **(Understand-L2)**

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.

UNIT II:

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

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.

UNIT III:

SQL: BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update). 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 dependency Lossless 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 Processing and Concurrency Control: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability. Two-Phase Locking Techniques for concurrency control: Types of Locks, Time stamp-based locking.
Introduction to Recovery Protocols: Recovery Concepts, No-UNDO/REDO Recovery Based on Deferred Update, Recovery Techniques Based on Immediate Update**, Shadow** Paging, ARIES.
Introduction to Indexing: Hash based Indexing

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

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

Web Resources:

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672820 22456_shared/overview

	L	T	P	Cr.
II B.Tech (IV Sem) **23IT01-DIGITAL LOGIC & COMPUTER ORGANIZATION**	3	0	0	3

Pre-requisites: Fundamentals of computer hardware

Course Objectives: The main objectives of the course is to

- Provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts

Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

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

CO1: Evaluate digital number systems and use Boolean algebra theorems, Properties and Canonical forms for digital logic circuit design. **(Understand- L2)**

CO2: Design Sequential logic circuits and understand basic functional blocks a computer system **(Apply- L3)**

CO3: Understand computer architecture and Data representation to perform computer arithmetic operations and processor organization. **(Understand- L2)**

CO4: Analyze the memory hierarchy in a computer system**. (Understand- L2)**

CO5: Understand the I/O operations and the interfaces **(Understand-L2)**

UNIT – I:

Data Representation: Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

UNIT – II:

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters

Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture

UNIT – III:

Computer Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

UNIT – IV:

The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

UNIT – V:

Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces

Textbooks:

1. Computer Organization, CarlHamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson.

Reference Books:

1. Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson
2. Computer Organization and Design, David A. Paterson, John L.Hennessy, Elsevier
3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson

Web Resources:

https://nptel.ac.in/courses/106/103/106103068/

	L	T	P	Cr.
II B.Tech (IV Sem) **23AM51-MACHINE LEARNING LAB**	0	0	3	1.5

Pre-requisite: Probability and Statistics, Programming Knowledge

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: This Course will enable students to

CO1: Apply the appropriate pre-processing techniques on data set. **(Apply – L3)**
CO2: Implement supervised Machine Learning algorithms. **(Apply – L3)**
CO3: Implement advanced Machine Learning algorithms. **(Apply – L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

Software Required: Python/R/Weka

Lab should cover the concepts studied in the course work, sample 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.

Text Books:

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

Reference Books:

"Machine Learning", Tom M. Mitchell, McGraw-Hill Publication, 2017

"Machine Learning in Action",Peter Harrington, DreamTech

"Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

Web Resources:

https://nptel.ac.in/courses/106106139

		L	T	P	Cr.
II B.Tech (IV Sem)	**23CS56- DATABASE MANAGEMENT SYSTEMS LAB**	0	0	3	1.5

Pre-requisite: Programming language, Discrete Mathematical Structures, and Data Structures.

Course Objectives: This Course will enable students to

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

Course Outcomes: After successful completion of the course the students are able to

CO1: Implement SQL queries using DDL/DML commands.**(Apply-L3)**
CO2: Apply different Integrity constraints & Normalization techniques for effective database design. **.(Apply-L3)**
CO3: Implement PL/SQL including procedures, functions, cursors and triggers. **.(Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

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

Sample Experiments:

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

7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.

8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.

11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

12. Create a table and perform the search operation on table using indexing and non- indexing techniques.

13. Write a Java program that connects to a database using JDBC

14. Write a Java program to connect to a database using JDBC and insert values into it

15. Write a Java program to connect to a database using JDBC and delete values from it

Design Database for any one of the following Case Studies Case

Study1: Hospital Management System

Aim: XYZ hospital is a multi-specialty hospital that includes a number of departments, rooms, doctors, nurses, compounders, and other staff working in the hospital. Patients having different kinds of ailments come to the hospital and get checkup done from the concerned doctors. If required they are admitted in the hospital and discharged after treatment. The aim of this cases study is to design and develop a database for the hospital to maintain the records of various departments, rooms, and doctors in the hospital. It also maintains records of the regular patients, patients admitted in the hospital, the checkup of patients done by the doctors, the patients that have been operated, and patients discharged from the hospital.

Description: In hospital, there are many departments like Orthopedic, Pathology, Emergency, Dental, Gynecology, Anesthetics, I.C.U., Blood Bank, Operation Theater, Laboratory, M.R.I., Neurology, Cardiology, Cancer Department, Corpse, etc. There is an OPD where patients come and get a card (that is, entry card of the patient) for check up from the concerned doctor. After making entry in the card, they go to the concerned doctor's room and the doctor checks up the ailments. According to the ailments, the doctor either prescribes medicine or admits the patient in the concerned department. The patient may choose either private or general room according to his/her need. But before getting admission in the hospital, the patient has to fulfill certain formalities of the hospital like room charges, etc. After the treatment is completed, the doctor is charges the patient. Before discharging from the hospital, the patient again has to complete certain formalities of the hospital like balance charges, test charges, operation charges (if any), blood charges, doctors' charges, etc. Next we talk about the doctors of the hospital. There are two types of the doctors in the hospital, namely, regular doctors and call on doctors. Regular doctors are those doctors who come to the hospital daily. Calls on doctors are those doctors who are called by the hospital if the concerned doctor is not available.

Table Description:

Following are the tables along with constraints used in Hospital Management Database

Constraint: Identity number is unique for each doctor and the corresponding department should exist in DEPARTMENT table.

1.DEPARTMENT: This table consists of details about the various departments in the hospital. The information stored in this table includes department name, department location, and facilities available in that department.
Constraint: Department name will be unique for each department.

2. ALL_DOCTORS: This table stores information about all the doctors working for the hospital and the departments they are associated with. Each doctor is given an identity number starting with DR or DC prefixes only.

3.DOC_REG: This table stores details of regular doctors working in the hospital. Doctors are referred to by their doctor number. This table also stores personal details of doctors like name, qualification, address, phone number, salary, date of joining, etc. Constraint: Doctor's number entered should contain DR only as a prefix and must exist in ALL_DOCTORS table.

4.DOC_ON_CALL: This table stores details of doctors called by hospital when additional doctors are required. Doctors are referred to by their doctor number. Other personal details like name, qualification, fees per call, payment due, address, phone number, etc., are also stored.

Constraint: Doctor's number entered should contain DC only as a prefix and must exist in ALL_DOCTORS table.

5.PAT_ENTRY: The record in this table is created when any patient arrives in the hospital for a checkup. When patient arrives, a patient number is generated which acts as a primary key. Other details like name, age, sex, address, city, phone number, entry date, name of the doctor referred to, diagnosis, and department name are also stored. After storing the necessary details patient is sent to the doctor for checkup.

Constraint: Patient number should begin with prefix PT. Sex should be M or F only. Doctor's name and department referred must exist.

6.PAT_CHKUP: This table stores the details about the patients who get treatment from the doctor referred to. Details like patient number from patient entry table, doctor number, date of checkup, diagnosis, and treatment are stored. One more field status is used to indicate whether patient is admitted, referred for operation or is a regular patient to the hospital. If patient is admitted, further details are stored in PAT_ADMIT table. If patient is referred for operation, the further details are stored in PAT_OPR table and if patient is a regular patient to the hospital, the further details are stored in PAT_REG table.
Constraint: Patient number should exist in PAT_ENTRY table and it should be unique.

7.PAT_ADMIT: When patient is admitted, his/her related details are stored in this table. Information stored includes patient number, advance payment, mode of payment, room number, department, date of admission, initial condition, diagnosis, treatment, number of the doctor under whom treatment is done, attend an tname, etc.

Constraint: Patient number should exist in PAT_ENTRY table. Department, doctor number, room number must be valid.

8. PAT_DIS: An entry is made in this table whenever a patient gets discharged from the hospital. Each entry includes details like patient number, treatment given, treatment advice, payment made, mode of payment, date of discharge, etc.

Constraint: Patient number should exist in PAT_ENTRY table.

9. PAT_REG: Details of regular patients are stored in this table. Information stored includes date of visit, diagnosis, treatment, medicine recommended, status of treatment, etc.

Constraint: Patient number should exist in patient entry table. There can be multiple entries of one patient as patient might be visiting hospital repeatedly for checkup and there will be entry for patient's each visit.

10. PAT_OPR: If patient is operated in the hospital, his/her details are stored in this table. Information stored includes patient number, date of admission, date of operation, number of the doctor who conducted the operation, number of the operation theater in which operation was carried out, type of operation, patient's condition before and after operation, treatment advice, etc.

Constraint: Patient number should exist in PAT_ENTRY table. Department, doctor number should exist or should be valid.

11. ROOM_DETAILS: It contains details of all rooms in the hospital. The details stored in this table include room number, room type (general or private), status (whether occupied or not), if occupied, then patient number, patient name, charges per day, etc.

Constraint: Room number should be unique. Room type can only be G or P and status can only be Y or N.

CaseStudy2: Railway Reservation

Aim: The railway reservation system facilitates the passengers to enquire about the trains available on the basis of source and destination, booking and cancellation of tickets, enquire about the status of the booked ticket, etc. The aim of case study is to design and develop a database maintaining the records of different trains, train status, and passengers. The record of train includes its number, name, source, destination, and days on which it is available, where as record of train status includes dates for which tickets can be booked, total number of seats available, and number of seats already booked. The database has been developed and tested on the Oracle.

Description:
Passengers can book their tickets for the train in which seats are available. For this, passenger must provide the desired train number and the date for which ticket is to be booked. Before booking a ticket for a passenger, the validity of train number and booking date is checked. Once the train number and booking date are validated, it is checked whether the seat is available. If yes, the ticket is booked with confirm status and corresponding ticket ID is generated which is stored along with other details of the passenger. After all the available tickets are booked, certain numbers of tickets are booked with waiting status. If waiting lot is also finished, then tickets are not booked and a message of non-availability of seats is displayed. The ticket once booked can be cancelled at any time. For this, the passenger must provide the ticket ID (the unique key). The ticket ID is searched,

and the corresponding record is deleted. With this, the first ticket with waiting status also gets confirmed.

List of Assumption

Since the reservation system is very large in reality, it is not feasible to develop the case study to that extent and prepare documentation at that level. Therefore, a small sample case study has b0een created to demonstrate the working of the reservation system. To implement this sample case study, some assumptions have been made, which are as follows:

1. The number of trains has been restricted to 5.

2. The booking is open only for next seven days from the current date.

3. Only two categories of tickets can be booked, namely, AC and General.

4. The total number of tickets that can be booked in each category AC and General is 10.

5. The total number of tickets that can be given the status of waiting is 2.

6. The in-between stop page stations and their bookings are not considered.

Description of Tables and Procedures:

Tables and procedures that will be created are as follows:
1.TrainList: This table consists of details about all the available trains. The information stored in this table includes train number, train name, source, destination, fair for AC ticket, fair for general ticket, and weekdays on which train is available.
Constraint: The train number is unique.
2.Train_Status: This table consists of details about the dates on which ticket can be booked for a train and the status of the availability of tickets. The information stored in this table includes train number, train date, total number of AC seats, total number of general seats, number of AC seats booked, and number of general seats booked.
Constraint: Train number should exist in Train List table.

3.Passenger: This table consists of details about the booked tickets. The information stored in this table includes ticket ID, train number, date for which ticket is booked, name, age, sex and address of the passenger, status of reservation (either confirmed or waiting), and category for which ticket is booked.
Constraint: Ticket ID is unique and the train number should exist in Train List table.

4.Booking: In this procedure, the train number, train date, and category is read from the passenger. On the basis of the values provided by the passenger, corresponding record is retrieved from the Train_ Status table. If the desired category is AC, then total number of AC seats and number of booked AC seats are compared in order to find whether ticket can be booked or not. Similarly, it can be checked for the general category. If ticket can be booked, then passenger details are read and stored in the Passenger table.

5.Cancel: In this procedure, ticket ID is read from the passenger and corresponding record is searched in the Passenger table. If the record exists, it is deleted from the table. After deleting the record (if it is confirmed), first record with waiting status for the same train and same category searched from the Passenger table and its status is changed to confirm.

CaseStudy3: Painting Hire Business

System Description

A local business woman has decided to start her own Internet business, called Masterpieces Ltd, Hiring paintings to private individuals and commercial companies. Because of your reputation database designer, she has called upon your services to design and implement a database to support her new business. At the initial planning meeting, to discuss the design, the following user requirements were requested. The system must be able to manage the details of customers, paintings and those paintings currently on hire to customers. Customers are categorized as B(bronze), S (silver), G (gold) orP (platinum). These categories entitle a customer to a discount of0%,5%,10%or15%respectively.

Customers often request paintings by a particular artist or theme (e.g. animal, landscape, seascape, naval, still-life, etc). Over time a customer may hire the same painting more than once.

Each painting is allocated a customer monthly rental price defined by the owner. The owner of the painting is then paid 10% of that customer rental price. Any paintings that are not hired with in six months are returned to the owner. However, after three months, an owner mayre submit a returned painting. Each painting can only have one artist associated with it .Several reports are required from the system. Three main ones are :For each customer, are ports howing an overview of all the paintings they have hired or are currently hiring.

For each artist, are port of all paintings submitted for hiref or each artist, are turns report for those paintings no third over the past six months remember to identify key attributes and any foreign key attributes.

Text Books:

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

Web Resources:

https://onlinecourses.nptel.ac.in/noc22_cs91/preview

L	T	P	Cr.
0	1	2	2

II B.Tech (IV Sem)   **23CSS2-FULL STACK DEVELOPMENT-I**

Pre-requisite: Knowledge of basic Computer hardware & software.

Course Objectives: The main objectives of the course are to
   • Make use of HTML elements and their attributes for designing static web pages
   • Build a web page by applying appropriate CSS styles to HTML elements
   • Experiment with JavaScript to develop dynamic web pages and validate forms

Course Outcomes: After successful completion of the course the students are able to

CO1: Design static web pages by using HTML elements. **(Apply-L3)**
CO2: Develop a web page by applying appropriate CSS styles to HTML elements. **(Apply-L3)**
CO3: Develop dynamic web pages and validate forms using JavaScript. **(Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values

Experiments covering the Topics:
• Lists, Links and Images
• HTML Tables, Forms and Frames
• HTML 5 and Cascading Style Sheets, Types of CSS
• Selector forms
• CSS with Color, Background, Font, Text and CSS Box Model
• Applying JavaScript - internal and external, I/O, Type Conversion
• JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
• JavaScript Functions and Events
• Node.js

Sample Experiments:

1. Lists, Links and Images
a. Write a HTML program, to explain the working of lists.
Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.
b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.
c. 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.
d. 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

2. HTML Tables, Forms and Frames
a. Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>, <td> and attributes: border, rowspan, colspan)

b. 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.).
c. 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 ie: submit and reset. Use tables to provide a better view).

d. Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts 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).

3. HTML 5 and Cascading Style Sheets, Types of CSS

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

4. Selector forms

a. Write a program to apply different types of selector forms
i Simple selector (element, id, class, group, universal)
i. Combinator selector (descendant, child, adjacent sibling, general sibling)
i Pseudo-class selector
iv. Pseudo-element selector
v. Attribute selector

5. CSS with Color, Background, Font, Text and CSS Box Model

a. Write a program to demonstrate the various ways you can reference a color in CSS.
b. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
c. 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
d. Write a program, to explain the importance of CSS Box model using
i. Content ii. Border iii. Margin iv. padding

6. Applying JavaScript - internal and external, I/O, Type Conversion

a. Write a program to embed internal and external JavaScript in a web page.
b. Write a program to explain the different ways for displaying output.
c. Write a program to explain the different ways for taking input.
d. Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not

7. Java Script Pre-defined and User-defined Objects

a. Write a program using document object properties and methods.
b. Write a program using window object properties and methods.
c. Write a program using array object properties and methods.
d. Write a program using math object properties and methods.
e. Write a program using string object properties and methods.
f. Write a program using regex object properties and methods.
g. Write a program using date object properties and methods.
h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

8. Java Script Conditional Statements and Loops

a. 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 "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".

b. Write a program to display week days using switch case.

c. Write a program to print 1 to 10 numbers using for, while and do-while loops.

d. Write a program to print data in object using for-in, for-each and for-of loops

e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e.,13 + 53+ 33 = 153]

f. 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. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1- 10's, 1-2's & 1-1's)

9. Java Script Functions and Events

a. Design a appropriate function should be called to display

i Factorial of that number

i Fibonacci series up to that number

i Prime numbers up to that number

iv. palindrome or not

b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display

i Factorial of that number

i Fibonacci series up to that number

i Prime numbers up to that number

iv. Is it palindrome or not

c. Write a program to validate the following fields in a registration page

i Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)

i Mobile (only numbers and length 10 digits)

i E-mail (should contain format like xxxxxxx@xxxxxx.xxx)

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

Web Resources:

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/
4. https://www.w3schools.com/nodejs

	L	T	P	Cr.
II B.Tech (IV Sem.) 23ME57-DESIGN THINKING & INNOVATION	1	0	2	2

Pre-requisite: Nil

Course Objectives: The objectives of the course are to

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

Course Outcomes:

CO1: Apply fundamental design components, principles, and new materials to create and improve design projects. **(Applying-L3)**

CO2: Apply the design thinking process to develop and present innovative product solutions. **(Applying-L3)**

CO3: Analyze the relationship between creativity and innovation, evaluate their roles in organizations, and develop strategic plans for transforming creative ideas into innovative solutions. **(Analyzing-L4)**

CO4: Analyze to work in a multidisciplinary environment. **(Analyzing-L4)**

CO5: Apply design thinking principles to address business challenges, develop and test business models and prototypes, and evaluate the value of creativity. **(Evaluating-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:
1. Tim Brown, Change bydesign, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:
1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universalprinciples ofdesign, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Web 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

L	T	P	Cr.
3	0	0	3

B.Tech (V Sem.)　　　**23AM02 - Information Retrieval Systems**

Pre-requisite: Data Structures; Data Mining

Course Educational Objective: The main objective of the course is

- To introduce the fundamental concepts and components of Information Retrieval (IR), design and use of inverted files and signature files in information retrieval applications and explore indexing mechanisms using data structures like PAT trees and to analyze lexical processing and stop list creation.

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

- CO1**:** Understand the fundamental concepts of Information Retrieval Systems and the associated data structures and algorithms. (**Understand L2**)
- CO2**:** Apply inverted and signature file structures for efficient information retrieval. (**Apply L3**)
- CO3: Apply PAT Trees, lexical analysis techniques, and stop lists for developing new text indices. (**Apply L3**)
- CO4**:** Apply stemming algorithms and construct thesauri from textual data. (**Apply L3**)
- CO5**:** Apply and compare string searching algorithms for efficient text processing and pattern matching. (**Apply L3**)

UNIT-I :
Introduction to Information storage and retrieval systems: Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation
Introduction to Data structures and algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

UNIT-II:
Inverted Files and Signature Files: Introduction, Structures used in Inverted Files, building an Inverted file using a sorted array, Modifications to the Basic Techniques.
Signature Files: Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT-III:
New Indices for Text, Lexical Analysis and Stop lists: PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICA Trees, PAT representation as Arrays. Stop lists.

UNIT-IV:
Stemming Algorithms and Thesaurus Construction: Types of Stemming algorithms, Experimental Evaluations of Stemming, stemming to Compress Inverted Files.
Thesaurus Construction: Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

UNIT-V:

String Searching Algorithms: Introduction, Preliminaries, The Naive Algorithm, The Knutt-Morris-Pratt Algorithm, The Boyer-Moore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm.

Text books:
1. Modern Information Retrieval, Ricardo Baeza-Yates, Neto, PEA,2007.
2. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark Academic Press, 2000.

Reference books:
1. Search Engines: Information Retrieval in Practice, Bruce Croft, Donald Metzler, Trevor Strohman, Pearson, 2015.
2. Introduction to Information Retrieval, Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, Cambridge University Press, 2008.
3. Information Retrieval: Algorithms and Heuristics, David A. Grossman, Ophir Frieder, Springer, 2nd Edition, 2004.

E-resources:

1. https://www.pearson.com/store/p/search-engines-information-retrieval-in-practice/P100000676406
2. https://nlp.stanford.edu/IR-book/information-retrieval-book.html
3. https://mitpress.mit.edu/9780262026512/information-retrieval/

	L	T	P	Cr.
B.Tech (V Sem.) **23CS07 - Computer Networks**	3	0	0	3

Pre-requisite: Fundamentals of Computers, Knowledge on Programming Language

Course Educational Objective: The main objective of the course is to make students

- To provide insight about networks, topologies, and the key concepts and gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.

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

- CO1**:** Understand various network types, topologies, reference models, and transmission media (**Understand L2)**
- CO2: Examine data link layer design issues, framing techniques, error control, and flow control mechanisms. **(Apply L3)**
- CO3**:** Apply multiple media access control techniques and evaluate Ethernet standards for network communication. **(Apply L3)**
- CO4: Implement routing algorithms, congestion control techniques, and IP addressing schemes for efficient network communication. **(Apply L3)**
- CO5**:** Utilize transport layer protocols (UDP & TCP) and application layer services (HTTP, DNS, Email) to enable secure and reliable data communication. **(Apply L3)**

UNIT-I:

Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models. **Physical Layer** –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and introduction about unguided media.

UNIT-II:

Data link layer: Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer.

Elementary Data Link Layer protocols: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.

Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol

UNIT-III:

Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance.

Channelization: frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA).

Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

UNIT-IV:

The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks.

Routing Algorithms - The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Traffic Control Algorithm-Leaky bucket & Token bucket.

Internet Working: Network layer in the internet – IP protocols-IP Version 4 protocol-IPV4 Header Format, IP addresses, Class full Addressing, CIDR, Subnets-IP Version 6- The main IPV6 header, Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6.

UNIT-V:

The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services- TCP features- Segment- A TCP connection.

Application Layer –- World Wide Web: HTTP, Electronic mail-Architecture- web based mail- email security- TELENET-local versus remote Logging-Domain Name System.

Text books:

1. Computer Networksm, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks, Behrouz A. Forouzan, Fifth Edition TMH.

Reference books:

1. Data Communications and Networks- Achut S Godbole, AtulKahate
2. Computer Networks, Mayank Dave, CENGAGE

E-resources:

1. https://www.geeksforgeeks.org/computer-networks/computer-network-tutorials/
2. https://mrcet.com/downloads/digital_notes/CSE/III%20Year/COMPUTER%20NETWORKS%20NOTES.pdf
3. https://www.vssut.ac.in/lecture_notes/lecture1423905560.pdf

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B.Tech (V Sem.)   **23CS06 - Operating Systems**

Pre-requisite: Computer organization

Course Educational Objective: The main objective of the course is to make students

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection and Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.

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

- CO1**:** Understand the fundamental concepts, functions, and structures of operating systems, including their design, implementation, and the various types of system calls and services. **(Understand L2)**
- CO2**:** Understand process concepts, multithreading models, and CPU scheduling algorithms to effectively manage operations on processes, inter-process communication, and threading issues in operating systems. **(Understand L2)**
- CO3**:** Apply synchronization tools, deadlock handling methods to solve critical section problems and ensure efficient process synchronization in operating systems. **(Apply L3)**
- CO4**:** Apply different memory management techniques paging and segmentation to understand their suitability for various memory allocation scenarios. **(Apply L3)**
- CO5**:** Apply knowledge of file system structures and protection mechanisms to design and implement secure file management systems. **(Apply L3)**

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

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 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:

1. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 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

E-resources:

1. https://www.youtube.com/watch?v=YGe9e9jiK8A&list=PLp6ek2hDcoNCM91hLp1Z3X12zc
2. https://www.youtube.com/watch?v=xw_OuOhjauw

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B.Tech (V Sem.)   **23CS11- Cloud Computing**

Pre-requisite: Computer Networks, Operating System, Parallel and Distributed Computing.

Course Educational Objective: The objective of this course is

- To explain the evolving utility computing model called cloud computing, introduce the various levels of services offered by cloud and discuss the fundamentals of cloud enabling technologies such as distributed computing, service- oriented architecture and virtualization.

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

- CO1**:** Understand the concept of cloud computing reference models, Services, Deployment models and cloud service providers. (**Understand L2**)
- CO2**:** Understand the cloud enabling technologies for Parallel and distributed computing, Service-Oriented Architecture and Web services. (**Understand L2**)
- CO3**:** Implement the levels of virtualization tools and containers for resource provisioning and the orchestration tools. (**Apply L3**)
- CO4**:** Understand the challenges of cloud computing and to know the security issues in cloud computing. (**Understand L2**)
- CO5**:** Apply the advanced concepts of cloud computing for server-less-computing, fog, edge and quantum computing. (**Apply L3**)

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: Server less computing, Function-as-a-Service, server less computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. Open FaaS) server less platforms, Internet of Things (IoT), applications, cloud-centric IoT and layers, edge and fog computing, DevOps, infrastructure-as-code, quantum cloud computing.

Text books:
1. Mastering Cloud Computing, 2nd edition, Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, Shivananda Poojara, Satish N. Srirama, Mc Graw Hill, 2024.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

Reference books:
1. Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier, 2018.
2. Essentials of cloud Computing, K. Chandrasekhran, CRC press, 2014.

E-resources:
1. https://www.ibm.com/cloud/learn/cloud-computing
2. NPTEL Cloud Computing:
   https://www.youtube.com/watch?v=NzZXz3fJf6o&list=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J
3. Cloud Computing Videos : https://www.youtube.com/watch?v=Rzzi_CGMIHc
4. Azure Course Videos:
5. https://www.youtube.com/watch?v=10jm7Waan8M&list=PLdpzxOOAlwvIcxgCUyBHVOcWs0Krjx9xR
6. Aws Course Videos:
   https://www.youtube.com/watch?v=GkKNxyLp_V0&list=PLdpzxOOAlwvLNOxX0RfndiYSt1Le9azze
7. GCP Course Videos : https://www.youtube.com/watch?v=jVE7qKWg8mc

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B.Tech (V Sem.)   **23AM52 - Information Retrieval Lab**

Pre-requisite: Python / R

Course Educational Objective: The objective of this course is

- To introduce students practical concepts and methods used in Information Retrieval (IR), such as vector space modelling and similarity computation and provide hands-on experience in preprocessing text data, including techniques like stop-word removal and stemming.

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

- CO1**:** Compute the similarity between text documents (**Apply L3**)
- CO2**:** Apply all pre-processing steps for text-data (**Apply L3**)
- CO3**:** Implement classification of text documents. (**Apply L3**)
- CO4**:** Improve individual/teamwork skills, communication & report writing skills with ethical values.

Lab Experiments:

1. Representation of a Text Document in Vector Space Model and Computing Similarity between two documents.
2. Pre-processing of a Text Document: stop word removal and stemming
3. Construction of an Inverted Index for a given document collection comprising of at least 50 documents with a total vocabulary size of at least 1000 words.
4. Classification of a set of Text Documents into known classes (You may use any of the Classification algorithms like Naive Bayes, Max Entropy, Rochio's, Support Vector Machine). Standard Datasets will have to be used to show the results.
5. Text Document Clustering using K-means. Demonstrate with a standard dataset and compute performance measures- Purity, Precision, Recall and F-measure.
6. Crawling/ Searching the Web to collect news stories on a specific topic (based on user input). The program should have an option to limit the crawling to certain selected websites only.
7. To parse XML text, generate Web graph and compute topic specific page rank
8. Implement Matrix Decomposition and LSI for a standard dataset.
9. Mining Twitter to identify tweets for a specific period (and/or from a geographical location) and identify trends and named entities.
10. Implementation of Page Rank on Scholarly Citation Network.

Reference Links:
1. https://link.springer.com/book/10.1007/b116174
2. https://nlp.stanford.edu/IRbook/pdf/irbookonlinereading.pdf

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B.Tech (V Sem.) **23CS58 - Computer Networks Lab**

Pre-requisite: C Programming.

Course Educational Objective: The objective of this course is to

- Understand fundamental concepts of computer networking, including network types, topologies, and layered architectures (OSI and TCP/IP models) and Gain detailed knowledge of core networking protocols, with an emphasis on the TCP/IP protocol suite.

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

- CO1: Apply fundamental networking concepts by configuring network devices, analyzing protocols, and implementing data link layer techniques. **(Apply L3)**
- CO2**:** Implement various network algorithms, including error detection, congestion control, routing, and shortest path computation**. (Apply L3)**
- CO3**:** Apply network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator**. (Apply L3)**
- CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

Lab Experiments:
1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as
   i)Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. 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).
11. Wireshark
    i) Packet Capture Using Wire shark
    ii)Starting Wire shark
    iii)Viewing Captured Traffic
    iv)Analysis and Statistics & Filters.
12. Do the following using NS3 Simulator
    i)NS3 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.

Reference Links:

1. Tanenbaum, A. S., & Wetherall, D. J. (2013).Computer Networks (5th Edition). Pearson.
2. Kurose, J. F., & Ross, K. W. (2021).Computer Networking: A Top-Down Approach (8th Edition). Pearson.
3. Forouzan, B. A. (2006). Data Communications and Networking (4th Edition). McGraw-Hill.

E-resources:

1. Wireshark Official Documentation: https://www.wireshark.org/docs/
2. GeeksforGeeks – Computer Networks Programming: https://www.geeksforgeeks.org/computer-networks/computer-network-tutorials/

L	T	P	Cr.
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B.Tech (V Sem.)　　　**23CSS3 - Full Stack development -2**

Pre-requisite: Object oriented programming, Full stack development-I

Course Educational Objective: The objective of this course are to
- Understand full stack web development concepts using Java, Node.js, and React, Learn backend development with JDBC, Servlets, Express.js, and database integration (MySQL, MongoDB) and Develop responsive frontends using React.js.

Course Outcomes: At the end of the course student will be able to
- CO1**:** Apply JDBC and Servlet technologies to develop web applications that interact with relational databases. (**Apply L3)**
- CO2**:** Apply the MVC architecture using JSP, Servlets, and JavaBeans to design structured and maintainable web applications. (**Apply L3**)
- CO3**:** Apply Node.js and Express.js to create RESTful services and perform backend operations with MongoDB and React.js to develop dynamic user interfaces and integrate them with backend APIs for full-stack web solutions (**Apply L3**)
- CO4**:** Improve individual / teamwork skills, communication & report writing skills with ethical values.

UNIT-I:
JDBC and Java Servlets (Weeks 1–3): Overview of Full Stack architecture, Introduction to JDBC: Driver types, Statement, Prepared Statement, Java Servlet architecture & lifecycle, Handling HTTP GET and POST requests, Servlet–JDBC integration, Session and Cookie management.
Lab Programs:
1. Write a JDBC program to perform CRUD (Create, Read, Update, Delete) operations on a database.
2. Create a Java Servlet to handle login form data using doPost() and display results.
3. Build a Servlet that connects to a database using JDBC and displays records.
4. Develop a Servlet to insert new student data into the database using Prepared Statement.
5. Implement a Servlet that uses sessions to track user login across pages.

UNIT-II:
JSP and MVC Architecture (Weeks 4–5) : Introduction to JSP,JSP Directives, Scriptlets, Expressions, Implicit objects: request, response, session, application, JavaBeans in JSP ,MVC architecture using Servlets, JSP, and Beans.
Lab Programs:
1. Create a JSP page to display user input (like calculator or form echo).
2. Develop a JSP page that retrieves and displays data from the database.
3. Use JavaBeans with JSP to encapsulate form data.
4. Create a login module using MVC (Servlet → Bean → JSP).
5. Build a student registration system using JSP, Servlet, and JDBC.

Mini Project (After Unit II)

Title: *Student Feedback System (Java + JSP + JDBC + MVC)*

Objective: Develop a Java web application that allows students to submit feedback and enables admin to view it, using the MVC model.
Development Tasks:

1. **Requirement Analysis & UI Design**

    - Create a basic design of student and admin interfaces.
    - Define fields like Student Name, Roll No, Course, and Feedback.

2. **Database Design**

    - Design MySQL tables: students, feedback.
    - Set up JDBC connection and write queries for insert and select operations.

3. **Servlet and JSP Setup**
    - Create a feedback form using JSP.
    - Handle form submission using a Servlet with doPost() method.

4. **Session Management**
    - Implement student login with session tracking.
    - Provide logout functionality for students/admin.

5. **Admin Module**
    - Build a JSP page for admin to log in and view submitted feedback.
    - Use PreparedStatement to retrieve and display data.

6. **MVC Architecture Implementation**
    - Separate business logic (Servlet), presentation (JSP), and data (Beans).
    - Use JavaBeans to encapsulate form data.

UNIT-III:

Node.js and Express.js (Weeks 6–8) : Introduction to Node.js and npm, Building basic server with Node.js and Express, RESTful APIs using Express, Routing, middleware, status codes, Using Postman for API testing

Lab Programs:
1. Write a Node.js program to return "Hello World" using Express.
2. Develop a REST API in Express to handle CRUD operations on a "Books" collection.
3. Add middleware for logging requests in Express.
4. Implement route parameter handling and dynamic URL processing.
5. Use Postman to test POST and GET routes for a student management API.

UNIT-IV: MongoDB with Express.js

Introduction to MongoDB and Mongoose, Data modeling with schemas, Connecting Express with MongoDB, Performing CRUD operations using Mongoose, Error handling and validation

Lab Programs:
1. Connect an Express.js app to MongoDB using Mongoose.
2. Create a student schema and perform insert operation.
3. Retrieve all documents from MongoDB and display in JSON.
4. Update a document based on ID using Express + MongoDB.
5. Delete a document using route parameter and Mongoose.

UNIT-V:

React.js and Full Stack Integration (Weeks 11–14): React.js basics: JSX, Components, Props, State, Handling events and forms, API communication with fetch() or Axios ,React Router for navigation, Integration with Express backend, End-to-end full stack deployment overview

Lab Programs:
1. Create a simple React app that displays a greeting using props.
2. Build a dynamic form using state and handle form submission in React.
3. Connect React frontend to Express API to fetch and display data.
4. Implement React Router to navigate between "Home" and "About" pages.
5. Build a mini full-stack app (CRUD) combining React (frontend) + Express + MongoDB.

Text Books:
1. "Head First Servlets and JSP" *By: Bryan Basham, Kathy Sierra, Bert Bates* Publisher: O'Reilly Media
2. "Learning Node.js Development" *By: Andrew Mead* Publisher: Packt Publishing
3. "MongoDB: The Definitive Guide" *By: Kristina Chodorow* Publisher: O'Reilly Media
4. "Learning React: Modern Patterns for Developing React Apps" *By: Alex Banks and Eve Porcello* Publisher: O'Reilly Media

Web References:

1. Oracle Java Documentation (JDBC & Servlets)
   https://docs.oracle.com/javase/tutorial/jdbc/
   https://docs.oracle.com/javaee/7/tutorial/servlets.htm
2. Mozilla Developer Network (HTML, JS, HTTP)
   https://developer.mozilla.org
3. Node.js Official Documentation
   https://nodejs.org/en/docs
4. Express.js Guide
   https://expressjs.com
5. MongoDB Documentation
   https://www.mongodb.com/docs/
6. React Official Docs
   https://reactjs.org
7. W3Schools Tutorials (JSP, JavaScript, Node.js)
   https://www.w3schools.com
8. TutorialsPoint (Full Stack topics)
   https://www.tutorialspoint.com

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B.Tech (V Sem.)   **23IT53 - User Interface Design using Flutter**

Pre-requisite: Basic Programming, Object-Oriented Programming

Course Educational Objective: The objective of this course are to

- Implement Flutter Widgets and Layouts, Understand Responsive UI Design and with Navigation in Flutter and Knowledge on Widges and customize widgets for specific UI elements, Themes

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

- CO1**:** Apply Flutter and Dart fundamentals to design and develop interactive user interfaces. (**Apply L3)**
- CO2**:** Implement UI layouts, navigation, state management, and responsive design principles for mobile applications. (**Apply L3**)
- CO3: Integrate animations, API data fetching, form validation, and debugging techniques to enhance application performance and usability. (**Apply L3**)
- CO4**:** Improve individual / teamwork skills, communication & report writing skills with ethical value

Lab Experiments:
Students need to implement the following experiments.
1. a) Install Flutter and Dart SDK.
b) Write a simple Dart program to understand the language basics.
2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.
b) Implement media queries and breakpoints for responsiveness.
4. a) Set up navigation between different screens using Navigator.
b) Implement navigation with named routes.
5. a) Learn about stateful and stateless widgets.
b) Implement state management using set State and Provider.
6. a) Create custom widgets for specific UI elements.
b) Apply styling using themes and custom styles.
7. a) Design a form with various input fields.
b) Implement form validation and error handling.
8. a) Create a scrollable List Widget in Form & Add items to it.
b) Implement the List View & Display the selected item in the prompt window.
9. a) Add animations to UI elements using Flutter's animation framework.
b) Experiment with different types of animations (fade, slide, etc.).
10.a) Fetch data from a REST APL
b) Display the fetched data in a meaningful way in the UI.

Reference Links:
1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.
2. Rap Payne, Beginning App Development with Flutter: Create Cross-Platform Mobile Apps 1st Edition, Apres.
E-resources:
1. Wireshark Official Documentation: https://www.wireshark.org/docs/
2. GeeksforGeeks – Computer Networks Programming: https://www.geeksforgeeks.org/computer-networks/computer-network-tutorials/

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B.Tech (VI Sem.)   23AM05 - Natural Language Processing

Pre-requisite: Knowledge on Python programming, Formal Language Theory.

Course Educational Objective: The main objective of the course is

- To introduce the core concepts and techniques of Natural Language Processing (NLP), covering both traditional and statistical approaches. Students will learn key algorithms, computational properties of language, and major aspects of syntactic, semantic, and pragmatic processing, enabling them to understand and describe NLP applications.

Course Outcomes: At the end of the course student will be able to
- CO1**:** Understand the basic components of NLP. (**Understand L2)**
- CO2**:** Apply N-grams models to predict a sequence of text. (**Apply L3**)
- CO3**:** Apply a grammar rule to write the syntax of a language. (**Apply L3**)
- CO4**:** Apply a grammar rule to write the semantic and pragmatics of a language. (**Apply L3**)
- CO5**:** Apply the Discourse Analysis and Lexical Resources of NLP. (**Apply L3**)

UNIT-I :
Introduction : Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT-II:
Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT-III:
Syntactic Analysis: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures

UNIT-IV:
Semantics And Pragmatics: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT-V:
Discourse Analysis And Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text books:

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2nd Edition, Daniel Jurafsky, James H. Martin -Pearson Publication,2014.
2. Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein and Edward Loper, OReilly Media,2009.

Reference books:

1. Handbook of Natural Language Processing, Second, Nitin Indurkhya and Fred J. Damerau, Chapman and Hall/CRC Press, 2010.Edition
2. Natural Language Processing and Information Retrieval, 3rd Edition, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press,2008.

E-resources:

1. https://web.stanford.edu/~jurafsky/slp3.pdf
2. https://nlp.stanford.edu/IR-book/html/infosem/finite-state-automata-1.html
3. https://www.nltk.org/book/ch03.html
4. https://www.nltk.org/_modules/nltk/metrics/distance.html

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B.Tech (VI Sem.)   **23AM06 - Deep Learning**

Pre-requisite: - Probability and Statistics, Machine Learning

Course Educational Objective: The main objective of the 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: At the end of the course student will be able to

- CO1: Explore feed forward networks and Deep Neural networks (**Apply L3**)

- CO2: Mathematically understand the deep learning approaches and paradigms (**Apply L3**)

- CO3: Apply the deep learning techniques for various applications (**Apply L3**)

- CO4: Apply the fundamental concepts and architectures of deep learning models such as CNNs, RNNs, and autoencoders. (**Apply L3**)

- CO5: Design and implement deep learning solutions for real-world problems using frameworks like TensorFlow and PyTorch. (**Apply L3**)

UNIT-I:
Basics- Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thresholding 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, auto encoders.
Deep Neural Networks: Difficulty of training deep neural networks, Greedylayer 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 problem in neural 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.

UNIT-V:

Recent trends-Variational Auto encoders, Transformers, GPT Applications: Vision, NLP, Speech

Text books:

1. Deep Learning, Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.

Reference books:

1. NeuralNetworks: ASystematic Introduction, RaúlRojas,1996
2. Pattern Recognition and Machine Learning, ChristopherBishop,2007
3. Deep Learning with Python, François Chollet, Manning Publications,2017

E -Resources:

1. Swayam NPTEL: https://onlinecourses.nptel.ac.in/noc22cs22/previewB.Tech.(Artificial Intelligence and Data Science) Deep Learning
2. https://www.geeksforgeeks.org/deep-learning/introduction-deep-learning/

L	T	P	Cr.
3	0	0	3

B.Tech (VI Sem.)　　　　**23AD05 - Data Visualization**

Pre-requisite: - Basic knowledge of data structures, programming concepts, and data analysis

Course Educational Objective: The main objective of the course is to

- Introduces the fundamentals of data visualization, covering visual perception, design principles, and various visualization techniques for different data types. Students will learn to apply and evaluate visualization methods for complex datasets, including networks and geographic data, to create clear and effective visual representations.

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

- CO1**:** Explain the visualization process and principles of visual perception including Gestalt principles to address information overload. (**Understand L2**)
- CO2**:** Apply visual mapping and reference models to design effective visualization applications. (**Apply L3**)
- CO3**:** Apply various visualization and interaction techniques to represent one, two, and multi-dimensional data accurately, while avoiding misleading visualizations. (**Apply L3**)
- CO4: Illustrate and apply visualization techniques for hierarchical and network data such as trees, graphs, and clusters. (**Apply L3**)
- CO5**:** Apply appropriate visualization techniques and data structures to represent volumetric data, GIS systems, and collaborative visualizations effectively. (**Apply L3**)

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:
1. WARD, GRINSTEIN, KEIM. Interactive Data Visualization: Foundations, Techniques, and Applications. Natick : A K Peters, Ltd.
2. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.

Reference books:
1. Data Visualization: Principles and Practice" by Alexandru C. Telea
2. "Information Visualization: Perception for Design" by Colin Ware

E-resources:
1. https://kdd.cs.ksu.edu/Courses/CIS536/Lectures/Slides/Lecture-34-Main_6up.pdf

	L	T	P	Cr.
B.Tech (VI Sem.) **23IT06 - Software Testing Methodology**	3	0	0	3

Pre-requisite: Software Engineering Fundamentals, Basic Data Structures and Algorithms

Course Educational Objective: The main objective of the course is
- To impart knowledge of software testing principles, techniques, and tools to ensure software quality and reliability and enable students to design, execute, and analyze various testing strategies for detecting and preventing software defects effectively.

Course Outcomes: At the end of the course student will be able to
- CO1: To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies**. (Understand L2**)
- CO2: Explain the fundamental concepts, purposes, and models of software testing, along with the classification and consequences of bugs. (**Understand L2**)
- CO3: To develop skills in software test automation and management using the latest tools. (**Apply L3**)
- CO4: Analyze transaction flow, domain, and interface testing methods to identify errors in system functionality and boundaries. (**Apply L3**)
- CO5: Apply path and data flow testing techniques using flow graphs, predicates, and instrumentation for effective test case design. (**Apply L3)**

UNIT-I: Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT-II: Transaction Flow Testing: transaction flows, transaction flow testing techniques.
Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.
Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT- III: Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.
Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT- IV: State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT-V: Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like Jmeter/selenium/soapUI/Catalon).

Text Books:
1. Software Testing techniques - BarisBeizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

Reference Books:

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

E-resources:

1. https://www.guru99.com/software-testing.html
2. https://softwaretestingfundamentals.com
3. https://smartbear.com/learn/automated-testing/software-testing-methodologies/

L	T	P	Cr.
3	0	0	3

B.Tech (VI Sem.)   **23CS13 - Cryptography & Network Security**

Pre-requisite: Computer Networks, Operating System, Parallel and Distributed Computing.

Course Educational Objective: The main objective of the course is
- To Explain the objectives of information security and the importance and application of each of confidentiality, integrity, authentication and availability, their basic categories of threats to computers and networks.

Course Outcomes: At the end of the course student will be able to
- CO1: Understand the core concepts of cryptography and network security, including encryption methods, cryptographic protocols, and security goals. **(Understand L2)**.
- CO2: Apply cryptographic algorithms such as DES, AES, RSA, and hash functions to secure data transmission and storage. **(Apply L3)**.
- CO3: Apply network security protocols (e.g., SSL/TLS, IPsec) to evaluate their strengths and vulnerabilities in protecting data confidentiality and integrity. **(Apply L3)**.
- CO4: Apply techniques for authentication, digital signatures, and key management in designing secure communication systems. **(Apply L3)**.
- CO5: Apply various network attacks, such as man-in-the-middle, denial-of-service, and replay attacks, and propose effective counter measures. **(Apply L3).**

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( ) fields, Polynomials.

Mathematics of Asymmetric cryptography: Primes, checking for Primness, Euler's 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, Blowfish, 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:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 7th Edition, 2017
2. Cryptography and Network Security: Behrouz A. ForouzanDebdeep, Mc Graw Hill, 3rd Edition, 2015

Reference Books:

1. Cryptography and Network Security: AtulKahate, Mc Graw Hill, 3rd Edition
2. Introduction to Cryptography with Coding Theory: Wade Trappe, Lawrence C. Washington, Pearson.
3. Modern Cryptography: Theory and Practice ByWenbo Mao. Pearson.

E-resources:

1. https://www.geeksforgeeks.org/computer-networks/cryptography-and-network-security-principles/
2. https://mrcet.com/downloads/digital_notes/CSE/III%20Year/CSIT_III-II_CRYPTOGRAPHY%20AND%20NETWORK%20SECURITY%20DIGITAL%20NOTES%20(1).pdf
3. https://vssut.ac.in/lecture_notes/lecture1428550736.pdf

L	T	P	Cr.
3	0	0	3

B.Tech (VI Sem.)　　　　　**23IT08 - DevOps**

Pre-requisites: Basic Knowledge of Programming Languages, Operating Systems, Software Engineering, Computer Networks and Software Testing**.**

Course Educational Objective: The objective of this course is to

- Describe the agile relationship between development and IT operations and understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability and implement automated system update and DevOps lifecycle.

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

- CO1: Understand the SDLC and Agile model life cycles, to introduce the DevOps architectures and features **(Understand L2).**
- CO2**:** Apply the Source Code Management tools to create repositories and implement the git commands. **(Apply L3).**
- CO3: Implement continuous Integration and build the automation by using Jenkins pipelines. **(Apply L3).**
- CO4**:** Implement Continuous Delivery and deployment process by using containerization with Docker. **(Apply L3).**
- CO5**:** Implement the deployment process by using Ansible and Containerization with Kubernetes and OpenShift. **(Apply L3).**

UNIT-I:
Introduction to DevOps: Introduction to SDLC, Agile Model. Introduction to DevOps. DevOps Features, DevOps Architecture, DevOps Lifecycle, Understanding Workflow and principles, Introduction to DevOps tools, Build Automation, Delivery Automation, Understanding Code Quality, Automation of CI/ CD. Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT-II:
 Source Code Management(GIT): The need for source code control, The history of source code management, Roles and code, source code management system and migrations. What is Version Control and GIT, GIT Installation, GIT features, GIT workflow, working with remote repository, GIT commands, GIT branching, GIT staging and collaboration.
UNIT TESTING-CODE COVERAGE: Junit, n Unit& Code Coverage with Sonar Qube, SonarQube - Code Quality Analysis.

UNIT-III:
 Build Automation - Continuous Integration (CI): Build Automation, what is CI Why Cl is Required, CI tools, Introduction to Jenkins (With Architecture), Jenkins workflow, Jenkins master slave architecture, Jenkins Pipelines.
PIPELINE BASICS - Jenkins Master, Node, Agent, and Executor Freestyle Projects& Pipelines, Jenkins for Continuous Integration, Create and Manage Builds, User Management in Jenkins Schedule Builds, Launch Builds on Slave Nodes**.**

UNIT-IV:
Continuous Delivery: Importance of Continuous Delivery, CONTINUOUS DEPLOYMENT CD Flow, Containerization with Docker: Introduction to Docker, Docker installation, Docker commands, Images & Containers, Docker File, running containers, working with containers and publish to

DockerHub. **Testing Tools:** Introduction to Selenium and its features, Java Scripttesting.

UNIT-V:
Configuration Management - **ANSIBLE:** Introduction to Ansible, Ansibletasks Roles, Jinja2 templating, Vaults, Deployments using Ansible.
CONTAINERIZATION USING KUBERNETES(OPENSHIFT): Introduction to
Kubernetes Namespace& Resources, CI/CD - On OCP, BC, DC & ConfigMaps, Deploying Apps on Openshift Container Pods. Introduction to Puppet master and Chef.

List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

Text Books

1. Joyner, Joseph., Devops for Beginners: Devops Software Development Method Guide for Software Developers and It Professionals, 1st Edition Mihails Konoplows, 2015.
2. Alisson Machado de Menezes., Hands-on DevOps with Linux,1st Edition, BPB Publications, India, 2021.

Reference Books

1. LenBass, IngoWeber,LimingZhu.DevOps:ASoftwareArchitect's Perspective. Addison Wesley; ISBN-10
2. Gene Kim Je Humble, Patrick Debois, John Willis. The DevOps Handbook, 1st Edition, IT Revolution Press, 2016.
3. Verona, Joakim Practical DevOps,1stEdition, Packt Publishing,2016.
4. Joakim Verona. Practical Devops,2ndEdition.Ingramshorttitle;2ndedition (2018). ISBN10: 1788392574
5. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint.Wiley publications.ISBN:9788126579952

E-resources:
1. https://www.geeksforgeeks.org/devops/devops-tutorial/
2. https://www.atlassian.com/devops

L	T	P	Cr.
3	0	0	3

B.Tech (VI Sem.)   **23AM08 - Recommender Systems**

Pre-requisite: Basic understanding of linear algebra, probability and statistics, and data structures.

Course Educational Objective: The objective of this course is to
- Cover the basic concepts of recommender systems, including personalization algorithms, evaluation tools and user experiences.

Course Outcomes: At the end of the course student will be able to
- CO1: Understand the fundamental concepts, functions, and challenges of recommender systems and their real-world applications. **(Understand L2)**
- CO2: Apply user-based, item-based, and model-based collaborative filtering techniques for recommendation generation. **(Apply L3)**
- CO3: Implement content-based and knowledge-based recommendation methods using appropriate algorithms and representations. **(Apply L3)**
- CO4: Design design hybrid recommender systems by integrating multiple recommendation strategies effectively. **(Apply L3)**
- CO5: Apply appropriate evaluation metrics and techniques to measure the performance of recommender systems in various domains. **(Apply L3)**

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:
User-based nearest neighbour recommendation, Item-based nearest neighbour 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:

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed.
2. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed.

Reference books:

1. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.

E-resources:

1. https://www.coursera.org/specializations/recommender-systems
2. https://www.edx.org/course/practical-recommender-systems

	L	T	P	Cr.
B.Tech (VI Sem.) **23IT07 - Software Project Management**	3	0	0	3

Pre-requisite: Software Engineering, Software Testing Methodologies, Object oriented Analysis and Design.

Course Educational Objective: The objective of this course is to
- Understand unique aspects of software project management at three levels: Organizational management, Infrastructure management and project management and measurement of the Project, and how these are applied to actual software projects.

Course Outcomes: At the end of the course student will be able to
- CO1: Explain the process of Conventional Software Management the Evolution and Improvement of Software Economics. **(Understand L2)**
- CO2: Explain the basic s/w processes, Cost estimation and improvement in s/w Economics. **(Understand L2)**
- CO3: Summarize Life cycle phases and Artifacts of the process in Software project management. **(Understand L2)**
- CO4: Apply Workflows and checkpoints in Iterative Process planning. **(Apply L3)**
- CO5: Illustrate Project Organizations, process automation building blocks and metrics in assessing Software Quality. **(Understand L2)**

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 artifactsets, 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 work flows, Iteration work flows.
Check points of the process: Major milestones, Minor Mile stones, Periodic status assessments.
Iterative Process Planning: Work break down 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, Metric sautomation.

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, DevOp secosystem. **DevOps adoption in projects:** Technology aspects, Agiling capabilities, Tool stack implementation, Peopleaspect, processes

Text books:

1. Software Project Management, Walker Royce, PEA,2005.Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
2. 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:

1. Software Project Management, BobHughes,3/e,Mike Cotterell, TMH
2. Software Project Management, Joel Henry, PEA
3. Software Project Management in practice, PankajJalote, PEA, 2005,
4. Effective Software Project Management, Robert K.Wysocki,Wiley,2006.
5. Project Management in IT,Kathy Schwalbe, Cengage.

E-resources:

1. https://www.geeksforgeeks.org/software-engineering/software-engineering-software-project-management-spm/
2. https://www.tutorialspoint.com/software_engineering/software_project_management.htm

B.Tech (VI Sem.)	**23CS14 - Mobile Adhoc & Sensor Networks**	**L**	**T**	**P**	**Cr.**
		3	0	0	3

Pre-requisite: Computer Networks Fundamentals, Wireless Communication Basics.

Course Educational Objective: The objective of this course is to
- To enable students to design, analyze, and evaluate routing, communication, and energy-efficient mechanisms in dynamic wireless environments.

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

- CO1: Explain the basic concepts, characteristics, and applications of mobile ad hoc and sensor networks**. (Understand L2)**
- CO2: Explain various routing protocols, MAC protocols, and architectures used in MANETs and WSNs. **(Understand L2)**
- CO3: Apply suitable routing techniques and clustering algorithms to solve real-time communication problems. (**Apply L3**)
- CO4: Apply network performance metrics such as throughput, delay, and energy efficiency under various scenarios. (**Apply L3**)
- CO5: Design and evaluate efficient protocols for secure and reliable data communication in MASN. (**Apply L3**)

UNIT-I: Introduction- Adhoc networks. Mobile Ad-Hoc networking with a View of 4G Wireless, Off-the-Shelf Enables of Ad Hoc, IEEE 802.11 in Ad Hoc Networks:

UNIT-II: Protocols, Performance and Open Issues, Scatternet Formation in Bluetooth Networks, Antenna Beamforming and Power Control for Ad Hoc Networks, Topology Control in Wireless Ad Hoc Networks, Broadcasting and Activity Scheduling in Ad Hoc Networks.

UNIT-III: Location Discovery, Routing Approaches in Mobile AdHoc Networks, Energy-Efficient Communication in AdHoc Wireless, AdHoc Networks Security, Self-Organized and Cooperative Ad Hoc Networking.

UNIT-IV: Simulation and Modeling of Wireless, Mobile, and AdHoc Networks, Modeling Cross-Layering Interaction Using Inverse Optimization Algorithmic Challenges in Ad Hoc Networks.

UNIT-V: Sensor Networks: Introduction to sensor network, Unique constraints and challenges, Localization and Tracking, Networking Sensors, Infrastructure establishment, Sensor Tasking and Control, Sensor network databases, Sensor Network Platforms and tools, Industrial Applications and Research directions.

Text books:
1. Mobile Adhoc Networks–Aggelou, George(McGraw-Hill).
2. Mobile Adhoc Networking –Stefano Basagni (Editor), Marco Conti(Editor), Silvia Giordano(Editor),Ivan Stojmenovi&Cacute (Editor) (Wiley-IEEE Press).

Reference books:

1. Wireless Sensor Networks: An Information Processing Approach–Feng Zhao,Leonidas Guibas(Elsevier).
2. Hand book of Sensor Networks: Algorithms and Architectures–Ivan Stojmenovi& Cacute(Wiley).

E-resources:

1. https://www.geeksforgeeks.org/computer-networks/introduction-of-mobile-ad-hoc-network-manet/
2. https://psiborg.in/wireless-sensor-networks-vs-ad-hoc-networks/
3. https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/Ad-hoc%20Sensor%20Networks.pdf

	L	T	P	Cr.
B.Tech (VI Sem.) **23AM07 - Computer Vision**	3	0	0	3

Pre-requisite: Concepts of Computer Graphics

Course Educational Objective: The objective of this course is to

- Help students understand the fundamental concepts of sources, shadows, and shading; the geometry of multiple views; and key topics in image processing, including image data structures, various encoding techniques, segmentation, and morphological image processing.

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

- CO1: Summarize the image fundamentals and mathematical transforms necessary for image processing **(Understand L2)**
- CO2: Apply image enhancement techniques (**Apply L3**)
- CO3: Demonstrate smoothing and sharpening and segmentation of color images (**Understand L2**)
- CO4: Apply image compression procedures (**Apply L3**)
- CO5: Demonstrate the concept of segmentation and Morphological image processing. (**Understand L2**)

UNIT-I:
CAMERAS: Pinhole Cameras Radiometry –Measuring Light: Lightin Space, Light Surfaces, Important Special Cases Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, inter reflections: 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 Texture0: 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 Get stalt, 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:
1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.

Reference books:
1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. 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.

E-resources:
1. https://opencv.org/university/computer-vision-and-deep-learning-applications/
2. https://vim.ustc.edu.cn/_upload/article/files/d4/87/71e9467745a5a7b8e80e94007d1b/4cd69b21-85d3-43ba- 9935-fd9ae33da82b.pdf
3. https://freecomputerbooks.com/Computer-Vision-Algorithms-and-Applications-2nd-Edition-by-Richard-Szeliski.html

L	T	P	Cr.
3	0	0	3

B.Tech (VI Sem.)   **23AD08 - NoSQL Databases**

Pre-requisite: Basic Computer Science Concepts, Database Fundamentals

Course Educational Objective: The objective of this course is to
- Develop students' ability to design, model, and implement data storage solutions using key-value, document, column-family, and graph-based NoSQL databases.

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

- CO1: Explain and compare different types of NoSQL Databases. **(Understand L2)**
- CO2**:** Compare and contrast RDBMS with different NoSQL databases. **(Understand L2**
- CO3**:** Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases. (**Apply L3)**
- CO4**:** Explain performance tune of Key-Value Pair NoSQL databases. **(Understand L2)**
- CO5**:** Apply NoSQL development tools on different types of NoSQL Databases. **(Apply L3)**

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, Multi operation 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:

1. Sadalage,P.&Fowler,NoSQLDistilled:ABriefGuidetotheEmergingWorldof PolyglotPersistence, Wiley Publications,1st Edition,2019.

E-resources:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp

B.Tech (VI Sem.)	23AM53 - Deep Learning Lab	L	T	P	Cr.
		0	0	3	1.5

Pre-requisite: Python / R

Course Educational Objectives: The objective of this course is to

- Provide practical, foundation level training that enables to handle various high dimensional data sets using various deep learning techniques.

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

- CO1: Implement deep neural networks to solve real world problems. (**Apply L3**)
- CO2: Choose appropriate pre-trained model to solve real time problem. (**Apply L3**)
- CO3: Interpret the results of two different deep learning models. (**Apply L3**)
- CO4: Improve individual / teamwork skills, communication & report writing skills With ethical values.

Software Packages required:

- Keras
- Tensorflow
- PyTorch

Lab Experiments:

1. Implement multi-layer perceptron algorithm for MNIST Handwritten Digit Classification.
2. Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
3. Design a neural Network for classifying news wires (Multi class classification) using Reuters dataset.
4. Design a neural network for predicting house prices using Boston Housing Price dataset.
5. Build a Convolution Neural Network for MNIST Handwritten Digit Classification.
6. Build a Convolution Neural Network for simple image(dogs and Cats) Classification
7. Use a pre-trained convolution neural network (VGG16) for image classification.
8. Implement one hoten coding of words or characters.
9. Implement word embedding's for IMDB dataset.
10. Implement a Recurrent Neural Network for IMDB movie review classification problem.

Text Books:

1. Reza ZadehandBharath Ram sundar, "Tensorflow for Deep Learning", O'Reilly publishers, 2018

References:

1. https://github.com/fchollet/deep-learning-with-python-notebooks

L	T	P	Cr.
0	0	3	1.5

B.Tech (VI Sem.)   **23AD54 - Data Visualization Lab**

Pre-requisite: - Statistics and Probability, Introduction to Programming (R or Python)

Course Educational Objective: The objective of this course is to

- Covers visualizing various datasets using histograms and line charts, exploring the purposes of bar charts and box plots, and understanding scatter plots and mosaic plots. It also includes an introduction to different types of map visualizations and delves into advanced graphs such as correlograms, heatmaps, and 3D graphs for deeper data analysis.

Course Outcomes: At the end of the course student will be able to
- CO1: Visualize the different datasets using histograms, line charts. **(Apply L3)**
- CO2: Apply and interpret bar charts, box plots, scatter plots, and mosaic plots in R to analyze and visualize different datasets effectively. **(Apply L3)**
- CO3: Apply various map visualizations and create advanced graphs such as correlograms, heatmaps, and 3D graphs in R for comprehensive data analysis. (**Apply L3**)
- CO4: Improve individual / teamwork skills, communication & report writing skills With ethical values.

Lab Experiments:
1. 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 dialy maximum temperature using histogram.

2. Load Air Passengers dataset in R and visualize the data using line chart that shows increase in air passengers over given time period.

3. 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.

4. 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.

5. Visualize iris dataset using simple scatter, multivariate scatter plot and also visualize scatter plot matrix to visualize multiple variables across each other.

6. 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

7. Load HairEyeColor dataset in R and plot categorical data using mosaic plot.

8. Load mtcars dataset in R and visualize data using heat map.

9. Install leaflet library in R and perform different map visualizations.

10. Visualize iris dataset using 3d graphs such as scatter3d, cloud, xyplot.

11. Make use of correlogram to visualize data in correlation matrices for iris dataset

12. Install maps library in R and draw different map visualizations.

Web References:

1. https://www.analyticsvidhya.com/blog/2015/07/guide-data-visualization-r/

2. https://www.geeksforgeeks.org/data-visualization-in-r/

E-resources:
1. https://www.wireshark.org/docs/
2. https://www.geeksforgeeks.org/computer-networks/computer-network-tutorials/

L	T	P	Cr.
0	1	2	2

B.Tech (VI Sem.) **23HSS1 - SOFT SKILLS**

Pre-requisite: Basic communication abilities, self-awareness, and the ability to work effectively in teams.

Course Educational Objective: The objective of this course are
- To equip the students with the skills to effectively communicate in English, train the students in interview skills, group discussions and presentation skills and motivate the students to develop confidence, interpersonal skills and writing skills

Course Outcomes: A student after completion of the course will be able to

- CO1**:** Understand the principles of effective communication, including verbal, non-verbal, and active listening techniques to enhance interpersonal skills **(Understand L2)**.
- CO2**:** Apply teamwork and collaboration skills to work effectively in diverse group settings and achieve common goals. **(Apply L3)**.
- CO3**:** Apply interpersonal conflicts and communication barriers, and propose appropriate strategies to resolve them constructively. **(Apply L3)**.
- CO4**:** Apply time management and organizational techniques to prioritize tasks and improve personal productivity. **(Apply L3)**.
- CO5**:** Apply emotional intelligence components and evaluate their impact on stress management and professional relationships. **(Apply L3)**.

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:
1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

Reference Books:
1. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand& Company Ltd., 2018.
2. Raman, Meenakshi& Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

E-resources:
1. https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01
2. https://www.investopedia.com/terms/s/soft-skills.asp
3. https://nationalcareers.service.gov.uk/careers-advice/how-to-develop-your-soft-skills

L	T	P	Cr.
2	0	0	--

B. Tech (VI Sem.)   **23MC04- Technical Paper Writing & IPR**

Pre-requisites: Fundamental & Scientific Technical Domain Skills & Programming.

Course Educational Objective: The objective of this course is

- 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: A student after completion of the course will be able to

- CO1: Understand the principles of technical writing and apply appropriate language, structure, and formatting to plan and draft professional technical reports. (**Understand L2)**
- CO2: Draft technical documents using illustrations and revise them through structured editing, focusing on clarity, grammar, and professional language. **(Apply L3)**
- CO3: Demonstrate effective proofreading and summarization techniques and present final technical documents both in written and verbal forms**. (Apply L3)**
- CO4: Use advanced word processing tools for formatting, editing, referencing, and securing technical documents efficiently. **(Apply L3)**
- CO5: Understanding the basics of intellectual Property Rights and the process of innovation, patenting, and international cooperation in IP protection. (**Understand L2)**

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:
1. Kompal Bansal & Parshit Bansal, "Fundamentals of IPR for Beginner's", 1st Ed., BS Publications, 2016.
2. William S. Pfeiffer and Kaye A. Adkins, "Technical Communication: A Practical Approach", Pearson.
3. Ramappa,T., "Intellectual Property Rights Under WTO", 2nd Ed., S Chand, 2015.

Reference Books:

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.
2. Day R, How to Write and Publish a Scientific Paper, Cambridge University Press(2006)

E-resources:
1. https://www.udemy.com/course/reportwriting/
2. https://www.udemy.com/course/professional-business-english-and-technical-report-writing/
3. https://www.udemy.com/course/betterbusinesswriting/