

**R23-COURSE STRUCTURE(AI&DS)****I SEMESTER**

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
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
<b>Laboratory Courses</b>									
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		
<b>Total</b>			<b>14</b>	<b>00</b>	<b>10</b>	<b>19</b>	370	630	1000

**II-SEMESTER**

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
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 and 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
<b>Laboratory Courses</b>									
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		
<b>Total</b>			<b>13</b>	<b>00</b>	<b>16</b>	<b>21</b>	370	630	1000

**III SEMESTER**

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
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	23CS03	Database Management Systems	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
<b>Laboratory Courses</b>									
6	23CS53	Advanced Data Structures & Algorithm Analysis lab	0	0	3	1.5	30	70	100
7	23CS54	Object Oriented Programming through Java lab	0	0	3	1.5	30	70	100
8	23CSS1	Python Programming	0	1	2	2	30	70	100
<b>Total</b>			<b>14</b>	<b>02</b>	<b>08</b>	<b>20</b>	<b>240</b>	<b>560</b>	<b>800</b>

**IV SEMESTER**

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
1	23HS02	Managerial Economics and Financial Analysis	2	0	0	2	30	70	100
2	23AD01	Statistical Methods for Data Science	3	0	0	3	30	70	100
3	23AD02	Artificial Intelligence	3	0	0	3	30	70	100
4	23AD03	Introduction to Data Science	3	0	0	3	30	70	100
5	23IT01	Digital Logic & Computer Organization	3	0	0	3	30	70	100
6	23MC01	Environmental Science	2	0	0	0	30	-	-
<b>Laboratory Courses</b>									
7	23AD51	Artificial Intelligence lab	0	0	3	1.5	30	70	100
8	23AD52	Data Science using Python Lab	0	0	3	1.5	30	70	100
9	23CSS2	Full Stack Development-I	0	1	2	2	30	70	100
10	23ME57	Design Thinking & Innovation	1	0	2	2	30	70	100
<b>Total</b>			<b>17</b>	<b>01</b>	<b>10</b>	<b>21</b>	<b>300</b>	<b>630</b>	<b>1000</b>
Mandatory Community Service Project Internship of 08 weeks' duration during summer vacation									

**R23-COURSE STRUCTURE(AI&DS)****V SEMESTER**

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
1	23AD04	Data Warehousing and Data Mining	3	0	0	3	30	70	100
2	23AM03	Principles of Machine Learning	3	0	0	3	30	70	100
3	23AD05	Data Visualization	3	0	0	3	30	70	100
<b>PROGRAM ELECTIVE-1</b>									
4	23IT03	Object Oriented Analysis and Design	3	0	0	3	30	70	100
	23AD06	Soft computing							
	23AM04	Internet of Things							
	23AD07	Exploratory Data Analysis with Python							
5		<b>OPEN ELECTIVE-1</b>	3	0	0	3	30	70	100
<b>Laboratory Courses</b>									
6	23AD53	Data Warehousing and Data Mining Lab	0	0	3	1.5	30	70	100
7	23AD54	Data Visualization 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
<b>Total</b>			<b>15</b>	<b>1</b>	<b>10</b>	<b>23</b>	<b>270</b>	<b>680</b>	<b>950</b>

## VI SEMESTER

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
1	23AD09	Big Data Analytics	3	0	0	3	30	70	100
2	23AM06	Deep Learning	3	0	0	3	30	70	100
3	23AM05	Natural Language Processing	3	0	0	3	30	70	100
4		<b>PROFESSIONAL ELECTIVE-II</b>	3	0	0	3	30	70	100
	23CS13	Cryptography & Network Security							
	23CS06	Operating Systems							
	23AM07	Computer Vision							
	23CS12	Automata Theory & Compiler Design							
5		<b>PROFESSIONAL ELECTIVE- III</b>	3	0	0	3	30	70	100
	23CS10	Quantum Computing							
	23AD08	NoSQL databases							
	23CS11	Cloud Computing							
	23AD10	Social Media Analytics							
6		<b>OPEN ELECTIVE-II</b>	3	0	0	3	30	70	100
<b>Laboratory Courses</b>									
7	23AD56	Deep Learning & Natural Language Processing Lab	0	0	3	1.5	30	70	100
8	23AD57	Big Data Analytics 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
<b>Total</b>			<b>20</b>	<b>1</b>	<b>8</b>	<b>23</b>	<b>300</b>	<b>630</b>	<b>930</b>
Mandatory Community Service Project Internship of 08 weeks' duration during summer vacation									

**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**  
**OPEN ELECTIVES**

<b>Course Code</b>	<b>Course Name</b>	<b>Offered to the branches</b>
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

B.Tech.(I Sem.)

23FE01-COMMUNICATIVE ENGLISH

L	T	P	Cr.
2	0	0	2

**Pre-requisites:** 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:** At the end of the course, the student will be able to

- CO1:** Understand the context, topic, and pieces of specific information from social or Transactional dialogues.(**Understand-L2**)
- CO2:** Apply grammatical structures to formulate sentences and correct word forms. (**Apply-L3**)
- CO3:** Use discourse markers to speak clearly on a specific topic in informal discussions. (**Apply-L3**)
- CO4:** Read/Listen the texts and write summaries based on global comprehension of these texts.(**Understand-L2**)
- CO5:** Prepare a coherent paragraph, essay, and resume.(**Apply-L3**)

**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;s canning 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 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. Path finder: Communicative English for Undergraduate Students, 1<sup>st</sup> 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.
3. Murphy, Raymond English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.

#### Web Resources:

##### GRAMMAR:

1. [www.bbc.co.uk/learningenglish](http://www.bbc.co.uk/learningenglish)
2. <https://dictionary.cambridge.org/grammar/british-grammar/>
3. [www.eslpod.com/index.html](http://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](https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA)

B.Tech (I Sem)

23FE02-CHEMISTRY

L	T	P	Cr.
3	0	0	3

**Pre-requisites:** 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, students will be able to,**CO1:** Understand the fundamentals of quantum mechanics and molecular orbital energy diagrams for molecules. **(Understand-L2)****CO2:** Summarize the suitability of advanced materials like semiconductors, superconductors, super capacitors and Nano materials, in advanced fields. **(Understand-L2)****CO3:** Apply Nernst equation in calculating cell potentials and understand conduct metric, potentiometric titrations, electrochemical sensors and compare batteries for different applications. **(Understand-L2)****CO4:** Outline the importance of polymers and conducting polymers in advanced technologies. **(Understand-L2)****CO5:** Understand the fundamentals of UV-Visible, IR spectroscopic techniques and basic principles of chromatographic techniques. **(Understand-L2)****UNIT-I:****Structure and Bonding Models:**

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of  $\Psi$  and  $\Psi^2$ , particle in one dimensional box, molecular orbital theory – bonding in homo- and hetero nuclear diatomic molecules – energy level diagrams of O<sub>2</sub> and CO, etc.  $\pi$ -molecular orbitals of butadiene and benzene, calculation of bond order.

**UNIT-II:****Modern Engineering materials:****Semi-conductors:** Introduction, basic concept, applications.**Super conductors:** Introduction basic concept, applications.**Super capacitors:** Introduction, Basic Concept, Classification and applications.**Nano materials:** Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nano particles.**UNIT-III:****Electro chemistry 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).

**Electro chemical 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 Thermo setting 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**–poly acetylene, polyaniline,–mechanism of conduction and applications.

Bio-Degradable polymers - Poly Glycolic Acid (PGA), Poly L 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.

**Text books:**

1. Jainand 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, 5thEdition,WileyPublications, Feb.2008
3. Text book of Polymer Science, Fred W.Billmayer Jr,3rdEdition

L	T	P	Cr.
3	0	0	3

**Pre-requisites:** Basics of Calculus

**Course Educational Objective:** 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 this course, the student will be able to

- CO1:** Apply matrix algebra techniques to solve engineering problems.(**Apply-L3**)
- CO2:** Use Eigen values and Eigen vectors concept to find nature of quadratic form,inverse and powers of matrix. (**Apply-L3**)
- CO3:** Expand various functions using Mean value theorems.(**Understand-L2**)
- CO4:** Understand the concepts of functions of several variables which are useful in optimization. (**Understand-L2**)
- CO5:** Evaluate areas and volumes by using double and triple integrals.(**Apply-L3**)

#### **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**

##### **Eigen values, Eigenvectors and Orthogonal Transformation**

Eigen values, 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 (Multivariable 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(Multivariable 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).

**Text books:**

1. Higher Engineering Mathematics, B. S.Grewal,KhannaPublishers,2017,44thEdition
2. Advanced Engineering Mathematics, Erwin Kreyszig,JohnWiley&Sons,2018,10th edition.

**Reference Books:**

1. Thomas Calculus, George B. Thomas, Maurice D. Weirand 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, Pears on publishers,2018, 5th edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, ,Pearson publishers, 9<sup>th</sup>edition
5. Higher Engineering Mathematics, H.K Das, Er. Rajnish Verma,S. Chand Publications, 2014, Third Edition (Reprint 2021)

B.Tech.(I Sem.)

**23CM01-BASIC CIVIL AND MECHANICAL  
ENGINEERING**

L	T	P	Cr.
3	0	0	3

**Prerequisite:** 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:** At the end of the course, the student will be able to:**CO1:** Describe various sub-divisions of Civil Engineering and to appreciate their role in societal development. **(Understand-L2)****CO2:** Outline the concepts of surveying and obtain the theoretical measurement of distances, angles and levels through surveying. **(Understand-L2)****CO3:** Classify the various materials used in construction and highway engineering and identify their appropriate usage as per the needs. **(Understand-L2)****CO4:** Illustrate the fundamental principles involved in transportation network system, their individual components and their engineering importance. **(Understand-L2)****CO5:** Explain the quality parameters of various water sources and functions of selected water storage and conveyance structures. **(Understand-L2)****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, Leveling instruments used for leveling -Simple problems on leveling 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).

**Text books:**

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 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-L1)**

**CO2:** Explain the basics of thermal engineering and its applications. **(Understand-L2)**

**CO3:** Illustrate the working of different mechanical power transmission systems and power plants **(Understand-L2)**.

**CO4:** Describe the basics of robotics and its applications **(Understand-L2)**

**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.)**

**Text books:**

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

**Reference Books:**

1. G.Shanmugam and M.S.Palanisamy,Basic Civil and the Mechanical Engineering,Tata McGraw Hill publications (India) Pvt. Ltd.
2. Thermal Engineering byMahesh MRathoreTata 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

L	T	P	Cr.
3	0	0	3

**Pre-requisite** : Mathematics, Basic Computer concepts

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

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

**CO1:** Understand basics of computers, concept of algorithms and flowcharts. (**Understand-L2**)

**CO2:** Understand the features of C language. (**Understand-L2**)

**CO3:** Interpret the problem and develop an algorithm to solve it. (**Apply-L3**)

**CO4:** Implement various algorithms using the C programming language. (**Apply-L3**)

**CO5:** Develop skills required for problem-solving and optimizing the code(**Apply-L3**)

### 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

**Text books:**

1. "The C Programming Language", Brian W.Kernighan and Dennis M.Ritchie, PrenticeHall, 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

L	T	P	Cr.
0	0	2	1

B.Tech.(I Sem.)

23IT51-ITWORKSHOP

Pre-requisite : NIL

**Course Objectives:**

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

**Course Outcomes(COs):**At the end of this course, the student will be ableto:**CO1:** Identify the components of a PC and trouble shooting the malfunctioning of PC.  
(Apply-L3)**CO2:**Develop presentation/documentation using Office to olsandLaTeX. (Apply-L3)**CO3:** Build dialogs and documents using ChatGPT. (Apply-L3)**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 (VM Ware) with bothWindows and Linux. Lab instructors should verify the installation and follow it up with a Viva**Task 5:** Every student should install BOSS on the computer. The system should be configured as dual boot (VM Ware) 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 LaTeX 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 LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

**Task2:** Using LaTeX 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 LaTeX 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?'"

**Reference Books:**

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dreamtech, 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 Hand book, KateJ. Chase, PHI(Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfinson 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

L	T	P	Cr.
0	0	2	1

**Pre-requisites:** 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 this course, the student will be able to

**CO1:** Understand the different aspect of the English language proficiency with emphasis on LSRW skills. (**Understand-L2**)

**CO2:** Apply Communication Skills through various language learning activities. (**Apply-L3**)

**CO3:** Identifying the English speech sounds, stress, rhythm,into nation and syllable division for better listening and speaking, comprehension. (**Understand-L2**)

**CO4:** Exhibit professionalism in participating in debates and group discussions. (**Apply-L3**)

**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:**

1. Walden Infotech
2. Young India Films

**Reference Books:**

1. Raman Meenakshi, Sangeeta-Sharma.Technical Communication.OxfordPress.2018.
2. Taylor Grant:English Conversation Practice,Tata McGraw-HillEducationIndia, 2016
3. Hewing's,Martin.Cambridge Academic English(B2).CUP, 2012.
4. J.Sethi & P.V.Dhamija. A Course in Phonetics and Spoken English,(2ndEd), Kindle, 2013

**Web Resources:****Spoken English:**

1. [www.esl-lab.com](http://www.esl-lab.com)
2. [www.englishmedialab.com](http://www.englishmedialab.com)
3. [www.englishinteractive.net](http://www.englishinteractive.net)
4. <https://www.britishcouncil.in/english/online>

5. <http://www.letstalkpodcast.com/>
6. [https://www.youtube.com/c/mmmEnglish\\_Emma/featured](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](https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw)

**Voice & Accent:**

1. <https://www.youtube.com/user/letstalkaccent/videos>
2. <https://www.youtube.com/c/EngLanguageClub/featured>
3. [https://www.youtube.com/channel/UC\\_OskgZBoS4dAnVUgJVexc](https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc)
4. [https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp\\_IA](https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA)

L	T	P	Cr.
0	0	2	1

**Pre-requisites:** 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 student shall be able to

**CO1:**Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus. **(Analyze-L4)**

**CO2:**Acquire practical knowledge related to preparation of Bakelite and nanomaterials. **(Apply-L3)**

**CO3:**Measure the strength of acid present in Pb-Acid battery. **(Apply-L3)**

**CO4:**Analyze important parameters of water to check its suitability for drinking purpose and industrial applications. **(Analyze-L4)**

**CO5:**Improve individual/teamwork skills,communication and report writings skills with ethical values.

**List of Experiments:**

- Measurement of 10Dq by spectro photometric method
- Conduct ometric titration of strong acid vs.strong base
- Conduct ometric titration of weak acid vs.strong base
- Determination of cell constant and conductance of solutions
- Potentiometry-determination of redoxpotentials and emfs
- Determination of Strength of an acidin Pb-Acid battery
- Preparation of a Bakelite
- Verify Lambert-Beer'slaw
- Wavelength measurement of sample through UV-Visible Spectroscopy
- Identification of simple organic compounds byIR
- Preparation of nano materials by precipitation method
- Estimation of Ferrous Iron by Dichrometry

**Reference:**

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

L	T	P	Cr.
0	0	3	1.5

**Pre-requisite:** Mathematics, Basic Computer Terminology

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

**Course Outcomes (CO):** At the end of this course, the student will be able to:

**CO1:** Read, understand, and trace the execution of programs written in C language.  
(Understand-L2)

**CO2:** Apply the right control structure for solving the problem. (Apply-L3)

**CO3:** Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, pointers and files in C. (Apply-L3)

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

## UNIT I

### WEEK1

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

**Suggested Experiments/ Activities:**

**Tutorial1:** 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()

### WEEK2

**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:**

**Tutorial2:** Problem-solving using Algorithms and Flowcharts.

**Lab2:** Converting algorithms/flowcharts 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

### WEEK3

**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:**

**Tutorial3:** Variable types and type conversions:

**Lab3:** Simple computational problems using arithmetic expressions.

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

**UNIT II****WEEK4**

**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 associativity:

**Lab4:** Simple computational problems using the operator's 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

**WEEK5**

**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:**

**Tutorial5:** Branching and logical expressions:

**Lab5:** Problems involving if-then-else structures.

- i) Write a C program to find the max and min of our 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.

**WEEK6**

**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:**

**Tutorial6:** Loops, while and for loops

**Lab6:** 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****WEEK7:**

**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:**

**Tutorial7:** 1D Arrays: searching.

**Lab7:** 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.

**WEEK8:**

**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:**

**Tutorial8:** 2D 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****WEEK9:**

**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation and 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:**

**Tutorial9:** Pointers, structures and dynamic memory allocation

**Lab9:** 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()

**WEEK10:**

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

**Suggested Experiments/Activities:**

**Tutorial10:** Bit fields, Self-Referential Structures, Linked lists

**Lab10:** Bit fields, linked lists

- i) Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields
- ii) Create and display a singly linked list using self-referential structure.
- iii) Demonstrate the differences between structures and unions using a C program.
- iv) Write a C program to shift/rotate using bit fields.
- v) Write a C program to copy one structure variable to another structure of the same type.

**UNIT V****WEEK11:**

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

**Suggested Experiments/Activities:**

**Tutorial11:** Functions, call by value, scope and extent,

**Lab11:** Simple functions using call by value, solving differential equations using Euler's 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

**WEEK12:**

**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:**

**Tutorial12:** 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 sum of series.

**WEEK13:**

**Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

**Suggested Experiments/Activities:**

**Tutorial13:** Call by reference, dangling pointers

**Lab13:** Simple functions using Call by reference, Dangling pointers.

- i) Write a C program to swap two numbers using call by reference.
- ii) Demonstrate Dangling pointer problem using a C program.
- iii) Write a C program to copy one string into another using pointer.
- iv) Write a C program of in no. of lowercase, uppercase, digits and other characters using pointers.

**WEEK14:**

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

**Suggested Experiments/Activities:**

**Tutorial14:** File handling

**Lab 14:** File operations

- i) Write a C program to write and read text in to a file.
- ii) Write a C program to write and read text into a binary file using fread() and fwrite()
- iii) Copy the 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. A jay Mittal, Programming in C:A practical approach,Pearson.
2. Byron Gottfried,Schaum's Outline of Programming with C, McGrawHill

**ReferenceBooks:**

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

B.Tech.(II Sem.)

23FE04-ENGINEERING PHYSICS

L	T	P	Cr.
3	0	0	3

**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:**Analyse the intensity variation of light due to interference, diffraction, and Polarization (Apply-L3)

**CO2:**Understand the basics of crystals and their structures (Understand-L2)

**CO3:**Summarize various types of polarization of dielectrics and classify the magnetic materials (Understand-L2)

**CO4:**Explain fundamentals of quantum mechanics and free electron theory of metals (Understand-L2)

**CO5:**Identify the type of semiconductor using Hall Effect (Apply-L3)

**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 –Halfwave 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 polarizations- 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 Textbook 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>

L	T	P	Cr.
3	0	0	3

**Pre-requisites:** 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-L3)
- CO2** Apply knowledge of partial differentiation in modeling and solving of Partial differential equations. (Apply-L3)
- CO3** Interpret the physical meaning of different operators such as gradient, curl and divergence. (Apply-L3)
- CO4** Evaluate the work done against a field, circulation and flux using Vector Calculus.  
(Apply-L3)

#### 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**

Line integral-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.

**Text books:**

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10<sup>th</sup> 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, 5<sup>th</sup> Edition.
4. Advanced Engineering Mathematics, R.K. Jain and S.R.K. Iyengar, Alpha Science International Ltd., 2021 5<sup>th</sup> Edition (9th reprint).
5. Higher Engineering Mathematics, B.V. Ramana, McGraw Hill Education, 2017

B.Tech.(II Sem.)

**23EE01-BASIC ELECTRICAL & ELECTRONICS  
ENGINEERING**

L	T	P	Cr.
3	0	0	3

**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-L2)**

**CO2:** Understand the operation of electrical machines and measuring instruments. **(Understand-L2)**

**CO3:** Classify various energy resources, safety measures and interpret electricity bill generation in electrical systems. **(Understand-L2)**

**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.

**Text books:**

1. Basic Electrical Engineering, D.C.Kulshreshtha, TataMcGrawHill, 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. Bhattacharya, 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 **(Understand-L2)**

**CO5:** Infer the operation of rectifiers, amplifiers. **(Understand-L2)**

**CO6:** Contrast various logic gates, sequential and combinational logic circuits. **(Understand-L2)**

**UNIT I**

**SEMICONDUCTOR DEVICES**

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

**UNIT II**

**BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION**

**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)

**Text books:**

1. R. L. Boylstad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R.P.Jain, Modern Digital Electronics, 4th Edition, Tata McGraw Hill, 2009

**Reference Books:**

1. R.S. Sedha, A Text book 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.

L	T	P	Cr.
1	0	4	3

**Pre-requisites:** 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- L2)**
- CO2:** Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. **(Apply- L3)**
- CO3:** Understand and draw projection of solids in various positions in first quadrant. **(Apply- L3)**
- CO4:** Able to draw the development of surfaces of simple objects. **(Apply-L3)**
- CO5:** Prepare isometric and orthographic sections of simple solids **(Apply- L3)**

**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, Cycloids, Involute, 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; plane inclined to both the reference planes.

**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.

### UNITIV

**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 radialline development. Development of a cube, prism, cylinder, pyramid and cone.

### UNITV

**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**).

### Text book:

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

### Reference Books:

1. Engineering Drawing, K.L.Narayana and P.Kannaiah,Tata McGrawHill,2013.
2. Engineering Drawing, M.B.Shahan dB.C.Rana, Pearson EducationInc,2009.
3. Engineering Drawing with an Introduction to Auto CAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

L	T	P	Cr.
3	0	0	3

B.Tech.(II Sem.)

23CS02-DATA STRUCTURES

**Course Objectives:**

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

**Course Outcomes:** At the end of the course, Student will be able to**CO1:** Understand the role of linear and nonlinear data structures in organizing and accessing data (**Understand-L2**)**CO2:** Implement abstract data type (ADT) and data structures for given application. (**Apply-L3**)**CO3:** Design algorithms based on techniques like linked list, stack, queue, tree etc. (**Apply-L3**)**CO4:** Apply the appropriate linear and non linear data structure techniques for solving a problem. (**Apply-L3**)**CO5:** Design hash-based solutions for specific problems. (**Apply-L3**)**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.

**Deque:** Introduction to deque (double-ended queue), Operations on deque 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.

**Text books:**

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 BasicTool box by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms byAlfred V.Aho,Jeffrey D.Ullman, and JohnE. Hopcroft
3. Problem Solving with Algorithms and DataStructures"by Brad Miller and David Ranum
4. Introduction to Algorithms byThomas H.Cormen,CharlesE. 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

B.Tech.(II Sem.)

23FE53-ENGINEERING PHYSICSLAB

L	T	P	Cr.
0	0	2	1

**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:** At the end of the course, the student shall be able to

**CO1:**Analyze the wave properties of light using optical instruments (**Apply-L3**).

**CO2:**Estimate the elastic moduli of various materials and acceleration due to gravity (**Apply- L3**).

**CO3:**Demonstrate the vibrations in stretched strings(**Understand-L2**).

**CO4:**Evaluate dielectric constant and magnetic field of circular coil carrying current (**Apply- L3**).

**CO5:**Examine the characteristics of semiconductor devices(**Apply-L3**).

**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 nonuniform 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.ChandPublishers, 2017.

**Web Resources**

- [www.vlab.co.in](http://www.vlab.co.in)
- <https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype>

L	T	P	Cr.
0	0	3	1.5

B.Tech.(II Sem.)

### 23EE51- ELECTRICAL&ELECTRONICS ENGINEERING WORKSHOP

**Course Objectives:**

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

**Course Outcomes:**

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

CO1. Compute voltage, current and power in an electrical circuit. **(Apply-L3)**

CO2. Compute medium resistance using Wheatstone bridge. **(Apply-L3)**

CO3. Discover critical field resistance and critical speed of DC shunt generators. **(Apply-L3)**

CO4. Estimate reactive power and power factor in electrical loads. **(Understand-L2)**

CO5. Plot the characteristics of semiconductor devices. **(Apply-L3)**

CO6. Demonstrate the working of various logic gates using ICs. **(Understand-L2)**

**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 Wheatstone 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 halfwave and fullwave 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, Multimeters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

**References:**

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

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

B.Tech.(II Sem.)

23ME51-ENGINEERING WORKSHOP

L	T	P	Cr.
0	0	3	1.5

**Pre-requisites** : Nil

**Course Objectives:**

To familiarize students with wood working, sheet metal operations, fitting, electrical housewiring skills, and basic repairs of two-wheeler vehicle.

**Course Outcomes:**

**CO1:** Identify workshop tools and their operational capabilities. **(Remember-L1)**

**CO2:** Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding. **(Understand-L2)**

**CO3:** Make various basic prototypes in fitting trade. **(Apply-L3)**

**CO4:** Apply basic electrical engineering knowledge for House Wiring Practice **(Apply-L3)**

**SYLLABUS**

1. Demonstration : Safety practices and precautions to be observed in workshop.
2. Wood Working: Familiarity with different types of woods and tools used in wood working and make following joints.
  - a) Half-Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. Sheet Metal Working: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
  - a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. Fitting: Familiarity with different types of tools used in fitting and do the following fitting exercises.
  - a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
5. Electrical Wiring: Familiarity with different types of basic electrical circuits and make the following connections.
  - a) Parallel and series b) Two-way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires
6. Foundry Trade: Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. Welding Shop: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. Plumbing: Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

9. Basic repairs of Two-wheeler vehicle–Demonstration of working of two-wheeler vehicle and its repairs.

**Textbooks:**

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019.
- Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

**Reference Books:**

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

L	T	P	Cr.
0	0	3	1.5

**Pre-requisites : Computer Programming Lab**

**Course Objectives:**

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

**CO1:** Apply Linear Data Structures for organizing the data efficiently (**Apply-L3**)

**CO2:** Apply Non-Linear Data Structures to organize data efficiently (**Apply-L3**)

**CO3:** Develop and implement hashing techniques for solving problems. (**Apply-L3**)

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

**List of Experiments:**

**Exercise1: 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

**Exercise2: 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.

**Exercise3: 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-end ed queue (deque) with essential operations.

**Exercise4: 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.

**Exercise5: 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.

**Exercise6: 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.

**Exercise7:Stack and QueueApplications**

- 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.

**Exercise8:Binary Search Tree**

- i) Implementing a BST using Linked List.
- ii) Traversing of BST.

**Exercise9: 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

**ReferenceBooks:**

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

B.Tech.(III Sem.)

**23FE11-DISCRETE MATHEMATICS &  
GRAPH THEORY**

L	T	P	Cr.
3	0	0	3

**Prerequisites:** 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 Inhomogeneous Recurrence Relations

**UNIT-IV: Graph Theory:**

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

**Unit-V: Multi Graphs**

Multi graphs, 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, 3<sup>rd</sup> Edition, Tata Mc Graw Hill.
3. Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3<sup>rd</sup> Edition, McGraw Hill.

**REFERENCEBOOKS:**

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2<sup>nd</sup> Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bern and 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, 7<sup>th</sup> Edition, Tata McGraw Hill.

**B.Tech.(III Sem.)**                      **23HS01- UHV 2-Understanding Harmony  
and Ethical Human Conduct**

L	T	P	Cr.
2	1	0	3

**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)

**CO3:** Relate human values with human relationship and human society. (L2)

**CO4:** Illustrate the need for universal human values and harmonious existence(L2)

**CO5:** 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

**Lecture 4:** 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 3tutorials 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 these lf and the body

**Tutorial 4:** PracticeSessionPS4Exploringthedifferenceof 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 these If with the body

**Lecture 12:** Programme to ensure self-regulation and Health

**Tutorial 6:** Practice Session PS 6 Exploring Harmony of self with the body

**UNIT III: Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)**

**Lecture 13:** Harmony in the Family – the Basic Unit of Human Interaction

**Lecture 14:** 'Trust' – the Foundational Value in Relationship

**Tutorial 7:** Practice Session PS7 Exploring the Feeling of **Trust**

**Lecture 15:** 'Respect' – as the Right Evaluation

**Tutorial 8:** Practice Session PS8 Exploring the Feeling of Respect

**Lecture 16:** Other Feelings, Justice in Human-to-Human Relationship

**Lecture 17:** Understanding Harmony in the Society

**Lecture 18:** Vision for the Universal Human Order

**Tutorial 9:** Practice Session PS 9 Exploring Systems to fulfil Human Goal

**UNIT IV: Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session) Lecture**

**19:** Understanding Harmony in the Nature

**Lecture 20:** Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

**Tutorial 10:** Practice Session PS10 Exploring the Four Orders of Nature

**Lecture 21:** Realizing Existence as Co-existence at All Levels

**Lecture 22:** The Holistic Perception of Harmony in Existence

**Tutorial 11:** Practice Session PS11 Exploring Co-existence in Existence.

**UNIT V: Implications of the Holistic Understanding –a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)**

**Lecture 23:** Natural Acceptance of Human Values

**Lecture 24:** Definitiveness of (Ethical) Human Conduct

**Tutorial 12:** Practice Session PS12 Exploring Ethical Human Conduct

**Lecture 25:** A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

**Lecture 26:** Competence in Professional Ethics

**Tutorial 13:** Practice Session PS13 Exploring Humanistic Models in Education

**Lecture 27:** Holistic Technologies, Production Systems and Management Models-Typical Case Studies

**Lecture 28:** Strategies for Transition towards Value-based Life and Profession

**Tutorial 14:** Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

**Practice Sessions for UNIT I–Introduction to Value Education**

PS1 Sharing about One self

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 these If

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 UNITV–Implications of the Holistic Understanding–a Look at Professional Ethics**

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

**READINGS:****Textbook and Teachers Manual****a. The Textbook**

R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1

**b. The Teacher’s Manual**

R R Gaur, R Asthana, G P Bagaria, Teachers’ Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

**Reference Books**

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, A markantak, 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 Karam chand Gandhi
5. Smallis Beautiful -E. F Schumacher.
6. Slow is Beautiful –Cecile Andrews
7. Economy of Permanence-JC Kumarappa
8. Bharat Mein Angreji Raj– Pandit Sunderlal
9. Rediscovering India-by Dharampal
10. Hind Swarajor 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.

### Online Resources:

1. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf>
2. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf>
3. <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf>
4. <https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%202023.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](https://onlinecourses.swayam2.ac.in/aic22_ge23/preview)

**23CS03-DATABASE MANAGEMENT  
SYSTEMS**

B.Tech.(III Sem.)

L	T	P	Cr.
3	0	0	3

**Prerequisites:** 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, subqueries, 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,3<sup>rd</sup> edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts,5<sup>th</sup> edition, Silberschatz, Korth, Sudarsan, TMH (For Chapter 1 and Chapter 5)

**Reference Books:**

1. Introduction to Database Systems,8<sup>th</sup> edition, CJ Date, Pearson.
2. Database Management System,6<sup>th</sup> edition, Ramez Elmasri, 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\\_01275806667282022456\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview)

B.Tech.(III Sem.)

**23CS04-ADVANCED DATA STRUCTURES &  
ALGORITHM ANALYSIS**

L	T	P	Cr.
3	0	0	3

**Prerequisites:** Data structures

**Course Objectives:** The main objectives of the course is to

1. Provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. 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 Tim 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 Bi-connected 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:**

**Back Tracking:** General Method, n-Queens Problem, Sum of Subsets problem, Graph Coloring.

**Branch and Bound:** The General Method, 0/1 Knapsack Problem, Travelling Sales person problem

**Introduction to Complexity classes:** P and NP Problems, NP-Complete Problems.

**Text books:**

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2<sup>nd</sup> Edition Universities Press
2. Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2<sup>nd</sup> 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, Mc Graw 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

**Online Learning Resources:**

1. [https://www.tutorialspoint.com/advanced\\_data\\_structures/index.asp](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  
THROUGH JAVA**

B.Tech.(III Sem.)

L	T	P	Cr.
3	0	0	3

**Prerequisites:** Introduction to Programming

**Course Objectives:** The learning objectives of this course are to:

1. Identify Java language components and how they work together in applications
2. Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3. Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4. Understand how to design applications with threads in Java
5. 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.

#### UNITII

**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 FXSceneBuilder, Java FXApp 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. JAVA9 for Programmers, Paul Deitel, Harvey Deitel, 4<sup>th</sup> Edition, Pearson.

**References Books:**

1. The complete Reference Java,11<sup>th</sup> edition, Herbert Schildt, TMH
2. Introduction to Java programming,7<sup>th</sup> Edition, Y Daniel Liang, Pearson

**Online Resources:**

1. <https://nptel.ac.in/courses/106/105/106105191/>
2. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_012880464547618816347\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview)

**23CS53-ADVANCED DATA STRUCTURES &  
ALGORITHM ANALYSIS LAB**

B.Tech.(III Sem.)

L	T	P	Cr.
0	0	3	1.5

**Prerequisites:** 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, back tracking and branch-and-bound techniques. (Apply - L3)

**CO4:** Improve individual/team work 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 costs panning 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 bi-connected 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, 2<sup>nd</sup> Edition, Universities Press
2. Computer Algorithms/C++Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2<sup>nd</sup> Edition, 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

**Online Learning Resources:**

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

**23CS54-OBJECT ORIENTED PROGRAMMING  
THROUGH JAVA LAB**

B.Tech.(III Sem.)

L	T	P	Cr.
0	0	3	1.5

**Prerequisites:** 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, JavaFXGUI

**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/team work 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 FXGUI

**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 are as 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 Run time 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 isAlive and join()
- c. Write a Program illustrating DaemonThreads.
- 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 Image View (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.

B.Tech.(III Sem.)

23CSS1-PYTHON PROGRAMMING

L	T	P	Cr.
0	1	2	2

**Prerequisites:** Introduction to Programming

**Course Objectives:** The main objectives of the course are to

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

**Course Outcomes:** 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/team work 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 large statement 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 sub string 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, Frozen set.

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

**Online Learning Resources/Virtual Labs:**

<https://www.coursera.org/learn/python-for-applied-data-science-ai>

<https://www.coursera.org/learn/python?specialization=python#syllabus>

B.Tech.(IV Sem.)

**23HS02-MANAGERIAL ECONOMICS AND  
FINANCIAL ANALYSIS**

L	T	P	Cr.
2	0	0	2

**Course Objectives:**

- To inculcate the basic knowledge of micro economics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

**Course Outcomes:**

**CO1:** Define the concepts related to Managerial Economics, Financial Accounting and Management. **(Understand-L2)**

**CO2:** Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets. **(Understand-L2)**

**CO3:** Apply the Concept of Production cost and revenues for effective Business decision **(Apply-L3)**

**CO4:** Evaluate the capital budgeting techniques **(Analyze-L4)**

**CO5:** Develop the accounting statements and evaluate the financial performance of business entity. **(Analyze-L4)**

**Unit-I**

**Introduction to Managerial Economics:** Economics-Managerial Economics-Nature and Scope. Demand-Law of Demand-Elasticity of Demand-Types of Elasticity of Demand-Demand Forecasting -Methods.

**Unit-II**

**Theory of Production and Cost analysis:** Production Function-Isoquant and Iso cost, Least Cost Combination of inputs. Law of Returns, Internal and External Economies of Scale. Cost Concepts & Break-even Analysis.

**Unit-III****Markets & Pricing Policies**

**Market structures:** Markets-Types of markets - Features and price out determinations under Perfect competition, Monopoly, Monopolistic Competition. Pricing-Pricing policies & its Objectives – Pricing Methods and its applications in business.

**Unit-IV**

**Capital and Capital Budgeting:** Nature and its Significance-Types of Capital - Sources of raising capital. Capital Budgeting-Significance –Process- Techniques of Capital Budgeting (non-discounted cash flow techniques and discounted cash flow of techniques).

**Unit-V**

**Financial Accounting and analysis:** Accounting –significance -- Book Keeping-Double entry system –Journal- Ledger- Trial Balance- Final Accounts with simple adjustments. Financial Statement Analysis through ratios.

**Textbooks:**

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

**Reference Books:**

1. Ahuja H Managerial Economics S Chand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

**Online Learning Resources:**

1. [https://www.slideshare.net/123ps/managerial- Economics-ppt](https://www.slideshare.net/123ps/managerial-Economics-ppt)
2. <https://www.slideshare.net/rossanz/production-and-cost-45827016>
3. <https://www.slideshare.net/darkyla/business-organizations-19917607>
4. <https://www.slideshare.net/balarajbl/market-and-classification-of-market>
5. <https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396>
6. <https://www.slideshare.net/ashu1983/financial-accounting>

**B.Tech.(IV Sem.) 23AD01-STATISTICAL METHODS FOR DATA SCIENCE**

L	T	P	Cr.
3	0	0	3

**Pre-requisite :** Mathematics.

**Course Educational Objective:**

- To know basic concepts of statistics like Data Visualization and Estimation.
- To understand Regression Models, Time-Series Data and testing of hypothesis concepts.

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

**CO1:** Analyze the Visualization & distribution of data (**Apply-L3**)

**CO2:** Apply the inference tests for data (**Apply-L3**)

**CO3:** Apply the various regression models for analyzing the data (**Apply-L3**)

**CO4:** Perform various growth curves, trend to measure seasonal indices (**Apply-L3**)

**CO5:** Understand the fundamentals of classification of Logistic Regression (**Understand-L2**)

**UNIT–I: Data Visualization and Distributions**

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

**Introduction to Data Distributions:** Probability Distributions - Discrete (Binomial, Poisson), Continuous Distributions (Normal, Exponential).

**UNIT – II: Hypothesis Testing**

**Introduction to Parametric Estimation** - Parametric Confidence Intervals - Choosing a Statistic - Hypothesis Testing - Parametric tests - the t-test - Applications to Hypothesis Testing - Pair wise comparisons.

**UNIT-III: Linear Regression and Multiple Regression**

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

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

**UNIT – IV: Time Series**

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

**UNIT – V: Logistic Regression**

The classification Problem-Logistic Regression Setup-Interpreting the Results- Comparing Models - Classification using Logistic Regression,

### **Text Books:**

1. Elizabeth Purdom,"Statistical methods for Data science" (08.05.2023)
2. K. Murugesan, P. Gurusamy"Probability,Statistics and Random Processes", Anuradha Publications (January-2009), ISBN-10(8189638289)/ISBN-13(978-8189638283).

### **References:**

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

L	T	P	Cr.
3	0	0	3

**Pre-requisite:**

- Knowledge in Computer Programming.
- A course on “ Mathematical Foundations of Computer Science”.
- Background in linear algebra, data structures and algorithms.

**Course Educational Objective:**

1. The student should be made to study the concepts of Artificial Intelligence.
2. The student should be made to learn the methods of solving problems using Artificial Intelligence.
3. To learn different knowledge representation techniques
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.
5. The student should be made to introduce the concepts of Expert Systems.

**Course Outcomes:** At the end of this course, the student 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 the 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 Dempster Shafer 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. Russel and P. Norvig “Artificial Intelligence–A Modern Approach”, Second Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B. “Artificial Intelligence (SIE)”, Mc Graw Hill

**Reference Books:**

1. David Poole, Alan Mack worth, Randy Goebel, “Computational Intelligence: a logical approach”, Oxford University Press.
2. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, Fourth Edition, Pearson Education.
3. J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers.
4. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning.

**Online Learning Resources:**

1. <https://ai.google/>
2. [https://swayam.gov.in/nd1\\_noc19\\_me71/preview](https://swayam.gov.in/nd1_noc19_me71/preview)

L	T	P	Cr.
3	0	0	3

**Prerequisite:** Knowledge of Computer fundamentals and Data structures

**Course Educational Objective (CEO):** To introduce students to the mathematical foundations of computation like automata theory, the theory of formal languages and grammars, the notion of algorithm, decidability, complexity, and computability. Understand the theory and practice of compiler implementation.

**Course Outcomes(COs): After the completion of this course, student will be able to:**

**CO1:** Understand the basic concepts of Data Science. (Understand-L2)

**CO2:** Apply the Machine Learning Activities on Data(Applied-L3)

**CO3:** Choose the appropriate databases for handling big data. (Understand-L2)

**CO4:** Enumerate the tools and applications on data science. (Understand-L2)

**CO5:** Understand the Visualization and development tools for data(Understand-L2)

**UNIT-I:** Introduction to Data science, benefits and uses, facets of data, data science process in brief, big data ecosystem and data science.

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

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

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

**UNIT-III: NoSQL movement for handling Big data:** Distributing data storage and processing with Hadoop frame work, case study on risk assessment for loan sanctioning, ACID principle of relational databases, CAP theorem, base principle of NoSQL databases, types of NoSQL databases, case study on disease diagnosis and profiling

**UNIT-IV: Tools and Applications of Data Science:** Introducing Neo4j for dealing with graph databases, graph query language Cypher, Applications graph databases, Python libraries like nltk and SQLite for handling Text mining and analytics, case study on classifying Reddit posts

**UNIT-V: Data Visualization and Prototype Application Development:** Data Visualization options, Cross filter, the Java Script Map Reduce library, Creating an interactive dashboard with dc.js, Dashboard development tools.

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

### **Textbooks**

- 1) Davy Cielen, Arno D.B. Meysman, and Mohamed Ali, “Introducing to Data Science using Python tools”, Manning Publications Co, Dream tech press, 2016
- 2) Prateek Gupta, “Data Science with Jupyter” BPB publishers,2019 for basics

### **References**

- 1) Joel Grus “Data Science From Scratch”, OReilly,2019
- 2) Doing Data Science: Straight Talk from the Frontline,1<sup>st</sup> Edition, Cathy O’ Neil and Rachel Schutt, O’Reilly, 2013

**B.Tech.(IV Sem.) 23IT01 - DIGITAL LOGIC & COMPUTER ORGANIZATION**

L	T	P	Cr.
3	0	0	3

**Prerequisites:** Fundamentals of Computer Knowledge

**Course Objectives:** The main objectives of the course is to

1. Provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals.
2. Describe memory hierarchy concepts.
3. 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, Carl Hamacher, Zvonko Vranesic, SafwatZaky, 6<sup>th</sup> edition, Mc Graw Hill
2. Digital Design, 6<sup>th</sup> Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11<sup>th</sup> Edition, Pearson.

**Reference Books:**

1. Computer Systems Architecture, M. Moris Mano, 3<sup>rd</sup> Edition, Pearson
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier
3. Fundamentals of Logic Design, Roth, 5<sup>th</sup> Edition, Thomson

**Online Learning Resources:**

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

B.Tech.(IV Sem.)

23MC01-ENVIRONMENTAL SCIENCE

L	T	P	Cr.
2	0	0	0

**Course Objectives:**

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

- Forest ecosystem.
- Grassland ecosystem
- Desert ecosystem
- Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**Biodiversity And Its Conservation:** Introduction 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-spots of biodiversity – Threats to biodiversity:habitatloss,poachingofwildlife,man-wildlifeconflicts–Endangered andendemic 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 landslides.

**UNIT-IV**

**Social Issues and the Environment:** From Unsustainable to Sustainable development– Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – **Environmental ethics:** Issues and possible solutions–Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Waste l 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.

**Textbooks:**

1. Erach Bharucha, Text book of Environmental Studies for Undergraduate Courses, University Grants Commission, Universities Press(India) Private Limited.2019.
2. Palaniswamy,“Environmental Studies”,2/e Pearson education,2014
3. S. Azeem Unnisa, “Environmental Studies” Academic Publishing Company,2021.
4. K. Raghavan Nambiar “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.2010.

**Reference Books:**

1. KVSG Murali Krishna, Text book of Environmental Studies, 2/e VGS Publishers, 2011.
2. Deeksha Dave and E. Sai Baba Reddy, “Text book of Environmental Science” Cengage Publications.
3. M. Anji Reddy,“Text book of Environmental Sciences and Technology”, B S Publication.2014.
4. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications.2006.
5. J. Glynn Henry and Gary W. Heinke “Environmental Sciences and Engineering”, Prentice Hall of India Private limited, 1988.
6. G. R. Chatwal “A Text Book of Environmental Studies” Himalaya Publishing House
7. Gilbert M. Masters and Wendel l P. Ela, “Introduction to Environmental Engineering and Science,1/e, Prentice Hall of India Private limited,1991.

B.Tech.(IV Sem.)

23AD51-ARTIFICIAL INTELLIGENCE LAB

L	T	P	Cr.
0	0	3	1.5

**Prerequisite:**

1. Knowledge in Computer Programming.
2. Background in linear algebra, data structures and algorithms.

**Course Educational Objective:**

1. The student should be made to study the concepts of Artificial Intelligence.
2. The student should be made to learn the methods of solving problems using Artificial Intelligence.
3. The student should be made to introduce the concepts of Expert Systems and machine learning.

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

**CO1:** Apply the basic concepts of Python libraries. **(Apply-L3)**

**CO2:** Perform various operations using Numpy & Pandas. **(Apply-L3)**

**CO3:** Implement different searching algorithms using python. **(Apply-L3)**

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

**List of Experiments:**

1. Pandas Library
  - a) Write a python program to implement Pandas Series with labels.
  - b) Create a Pandas Series from a dictionary.
  - c) Creating a Pandas Data Frame.
  - d) Write a program which makes use of the following Pandas methods
    - i) describe()
    - ii) head()
    - iii) tail()
    - iv) info()
2. Pandas Library: Visualization
  - a) Write a program which use pandas in built visualization to plot following graphs:
    - i) Bar plots
    - ii) Histograms
    - iii) Line plots
    - iv) Scatter plots
3. Write a Program to Implement Breadth First Search using Python.
4. Write a Program to Implement Depth First Search using Python
5. Write a program to implement Best First Searching Algorithm
6. Write a program to implement the Heuristic Search
7. Write a python program to implement A\*and AO\*algorithm. (Ex: find the shortest path)
8. Write a Program to Implement Water-Jug problem using Python
9. Write a Program to Implement Alpha-Beta Pruning using Python.

10. Write a Program to implement 8-Queens Problem using Python
11. Write a program to schedule a meeting among a 5 busy people using Default Reasoning the output should give the time, place and day of the meeting.
12. Write a program to implement the Unification algorithm.
13. Develop a knowledge base system consisting of facts and rules about some specialized knowledge Domain.
14. Write a program to implement 8 puzzle programs using different heuristics. Using it play the game.
14. Tic-Tac- Toe at the end the game the program should display the no. of nodes generated, cutoff values at each stage in the form of a table.

**Textbooks:**

1. Prateek Joshi, Artificial Intelligence with Python, Packt Publishing,2017.
2. Xiao, Perry. Artificial intelligence programming with Python: from zero to hero. John Wiley & Sons, 2022.

**Reference Books:**

1. Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach, Fourth Edition, Pearson, 2020
2. Martin C. Brown (Author), “Python: The Complete Reference” McGraw Hill Education, Fourth edition, 2018
3. R. Nageswara Rao, “Core Python Programming” Dream tech Press India Pvt Ltd 2018.

**Online Learning Resources:**

1. [https://onlinecourses.nptel.ac.in/noc19\\_cs40/preview](https://onlinecourses.nptel.ac.in/noc19_cs40/preview)
2. [https://onlinecourses.nptel.ac.in/noc19\\_cs41/preview](https://onlinecourses.nptel.ac.in/noc19_cs41/preview)

B.Tech.(IV Sem.)

23AD52-DATA SCIENCE USING PYTHON LAB

L	T	P	Cr.
0	0	3	1.5

**Prerequisite:**

1. Knowledge in Computer Programming.
2. Background in linear algebra ,data structures and algorithms.

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

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

**CO1:** Apply the basic concepts of Python libraries.(Apply-L3)

**CO2:** Perform various operations using Numpy & Pandas.(Apply-L3)

**CO3:** Apply the Advanced packages like NLTK,SciKit-Learn and Spicy.(Apply-L3)

**CO4:** Improve individual/teamwork skills, communicate & report writing skills with Ethical values.

**List of Experiments:**

1. Creating a NumPy Array
  - a. Basic ndarray
  - b. Array of zeros
  - c. Array of ones
  - d. Random numbers in ndarray
  - e. An array of your choice
  - f. Imatrix in NumPy
  - g. Evenly spaced ndarray
2. The Shape and Reshaping of NumPy Array
  - a. Dimensions of NumPy array
  - b. Shape of NumPy array
  - c. Size of NumPy array
  - d. Reshaping a NumPy array
  - e. Flattening a NumPy array
  - f. Transpose of a NumPy array
3. Expanding and Squeezing a NumPy Array
  - a. Expanding a NumPy array
  - b. Squeezing a NumPy array
  - c. Sorting in NumPy Arrays
4. Indexing and Slicing of NumPy Array
  - a. Slicing 1-D NumPy arrays
  - b. Slicing 2-D NumPy arrays
  - c. Slicing 3-D NumPy arrays
  - d. Negative slicing of NumPy arrays
5. Stacking and Concatenating Numpy Arrays
  - a. Stacking ndarrays
  - b. Concatenating ndarrays
  - c. Broadcasting in Numpy Arrays

6. Perform following operations using pandas
  - a. Creating data frame
  - b. concat()
  - c. Setting conditions
  - d. Adding a new column
7. Perform following operations using pandas
  - a. Filling NaN with string
  - b. Sorting based on column values
  - c. groupby()
8. Read the following file formats using pandas
  - a. Text files
  - b. CSV files
  - c. Excel files
  - d. JSON files
9. Read the following file formats
  - a. Pickle files
  - b. Image files using PIL
  - c. Multiple files using Glob
  - d. Importing data from database
10. Demonstrate web scraping using python
11. Perform following preprocessing techniques on loan prediction dataset
  - a. Feature Scaling
  - b. Feature Standardization
  - c. Label Encoding
  - d. One Hot Encoding
12. Perform following visualizations using matplotlib
  - a. Bar Graph
  - b. Pie Chart
  - c. Box Plot
  - d. Histogram
  - e. Line Chart and Subplots
  - f. Scatter Plot
13. Getting started with NLTK, install NLTK using PIP
14. Python program to implement with Python SciKit-Learn & NLTK
15. Python program to implement with Python NLTK/Spicy/PyNLPI

### Web References:

1. <https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-data-science-beginners/>
2. <https://www.analyticsvidhya.com/blog/2021/07/data-science-with-pandas-2-minutes-guide-to-key-concepts/>
3. <https://www.analyticsvidhya.com/blog/2020/04/how-to-read-common-file-formats-python/>
4. <https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessing-python-sci-kit-learn/>
5. <https://www.analyticsvidhya.com/blog/2020/02/beginner-guide-matplotlib-data-visualization-exploration-python/6>.
6. <https://www.nltk.org/book/ch01.html>

L	T	P	Cr.
0	1	2	2

B.Tech.(IV Sem.)

23CSS2-FULL SATCK DEVELOPMENT-I

**Course Objectives:** The main objectives of the course are to

- Make use of HTML elements and their attributes for designing static webpages
- Build a web page by applying appropriate CSS styles to HTML elements
- Experiment with JavaScript to develop dynamic webpages and validate forms

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

**CO1:** Design static webpages by using HTML elements. **(Apply-L3)**

**CO2:** Develop a webpage 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
- HTML5 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, row span, col span 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, check boxes, radio buttons, listboxes using <select>&<option> tags <textarea> 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. HTML5 and Cascading Style Sheets, Types of CSS**

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

**4. Selector forms**

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

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

- Write a program to demonstrate the various ways you can reference a color in CSS.
- Write a CSS rule that places a background image half way down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
- Write a program using the following terms related to CSS font and text:
  - font-size
  - font-weight
  - font-style
  - text-decoration
  - text-transformation
  - text-align
- Write a program to explain the importance of CSS Box model using
  - Content
  - Border
  - Margin
  - padding

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

- Write a program to embed internal and external JavaScript in a webpage.
- Write a program to explain the different ways for displaying output.
- Write a program to explain the different ways for taking input.
- Create a webpage which uses prompt dialog 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. JavaScript Pre-defined and User-defined Objects**

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

**8. JavaScript Conditional Statements and Loops**

- Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
- Write a program to display weekdays using switch case.
- Write a program to print 1 to 10 numbers using for, while and do-while loops.
- Write a program to print data in object using for-in, for-each and for-of loops
- Develop a program to determine whether a given number is an '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.,  $1^3 + 5^3 + 3^3 = 153$ ]
- Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (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. JavaScript Functions and Events

- a. Design an appropriate function should be called to display
  - i. Factorial of that number
  - ii. Fibonacci series upto that number
  - iii. Prime numbers upto that number
  - iv. palindrome or not
- b. Design a HTML having a textbox and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
  - i. Factorial of that number
  - ii. Fibonacci series upto that number
  - iii. Prime numbers upto 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)
  - ii. Mobile (only numbers and length 10 digits)
  - iii. E-mail (should contain format like [xxxxxxx@xxxxxx.xxx](mailto:xxxxxxx@xxxxxx.xxx))

### Text Books:

1. Programming the World Wide Web, 7<sup>th</sup> Edition, Robert W. Sebesta, Pearson, 2013.
2. Web Programming with HTML 5, 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, Vasanth Subramanian, 2<sup>nd</sup> edition, Apress, O'Reilly.

### Web Links:

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

B.Tech.(IV Sem.)

23ME57-DESIGN THINKING &amp; INNOVATION

L	T	P	Cr.
1	0	2	2

**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, customer, 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.

### Text books:

1. Tim Brown, Change by design,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, Kritina holden &Jillbutter, Universal principles of design,2/e, Rockport Publishers, 2010.
4. Chesbrough. H, Theera of open innovation, 2003.

### Online Learning Resources:

- <https://nptel.ac.in/courses/110/106/110106124/>
- <https://nptel.ac.in/courses/109/104/109104109/>
- [https://swayam.gov.in/nd1\\_noc19\\_mg60/preview](https://swayam.gov.in/nd1_noc19_mg60/preview)
- [https://onlinecourses.nptel.ac.in/noc22\\_de16/preview](https://onlinecourses.nptel.ac.in/noc22_de16/preview)

B.Tech.(V Sem.)

**23AD04- Data Warehousing and Data  
Mining**

L	T	P	Cr.
3	0	0	3

**Pre-requisites:** Data Structures, Algorithms, Probability & Statistics, Data Base Management Systems

**Course Educational Objectives:** The main objective of the course is to

- Introduce basic concepts and techniques of data warehousing and datamining
- Examine the types of data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

**Course Outcomes**

**CO1:** Design data warehouses to support effective data modeling, integration, and analytical processing.

**CO2:** Understand data preprocessing techniques required to convert raw data into a suitable format for effective machine learning applications.

**CO3:** Apply classification techniques using different algorithms to solve real-world problems and evaluate their performance.

**CO4:** Apply Apriori and FP-Growth algorithms to analyze frequent patterns and uncover insights from large datasets.

**CO5:** Understand clustering concepts and various cluster analysis methods to group similar data points effectively.

**Syllabus:**

**UNIT-I:** Data Warehousing and Online Analytical Processing: Basic concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Cloud Data Warehouse, Data Mining and Pattern Mining, Technologies, Applications, Major issues, Data Objects & Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity. (**Textbook- 1**)

**UNIT II:** Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization. (**Textbook- 1**)

**UNIT-III:** Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction, Visual Mining for Decision Tree Induction, Bayesian Classification Methods: Bayes Theorem, Naïve Bayes Classification, Rule-Based Classification, Model Evaluation and Selection. (**Textbook- 2**)

**UNIT-IV:** Association Analysis: Problem Definition, Frequent Itemset Generation, Rule Generation: Confident Based Pruning, Rule Generation in Apriori Algorithm, Compact Representation of frequent item sets, FP-Growth Algorithm. (**Textbook- 2**)

**UNIT-V:** Cluster Analysis: Overview, Basics and Importance of Cluster Analysis, Clustering techniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K Means, Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering

Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Textbook- 2)

**Textbooks:**

1. Data Mining concepts and Techniques, 3rd edition, Jiawei Han, MichelKamber, Elsevier, 2011.
2. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, VipinKumar, Pearson, 2012.

**Reference Books:**

1. Data Mining: Vikram Pudi and P. Radha Krishna, Oxford Publisher.
2. Data Mining Techniques, Arun K Pujari, 3rd edition, UniversitiesPress,2013.
3. (NPTEL course by Prof.PabitraMitra) [http://onlinecourses.nptel.ac.in/noc17\\_mg24/preview](http://onlinecourses.nptel.ac.in/noc17_mg24/preview)
4. [http://www.saedsayad.com/data\\_mining\\_map.htm](http://www.saedsayad.com/data_mining_map.htm)

B.Tech.(V Sem.)

**23AM03- Principles of Machine Learning**

L	T	P	Cr.
3	0	0	3

**Prerequisites :** Probability and Statistics, Data Warehousing and Data Mining

**Course Educational Objectives:** The objective of the course is to

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

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

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

**CO2:** Apply Nearest Neighbour-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:** Learn advanced learning techniques to deal with complex data. **(Apply-L3)**

### Syllabus:

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

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

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

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

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

**UNIT-V: Other Types of Learning:** Ensemble Learning- Bagging, Boosting, Stacking and its impact on bias and variance, AdaBoost, Gradient Boosting Machines, XGBoost. Reinforcement Learning - Introduction, Q Learning.

**Textbooks:**

1. “Machine Learning Theory and Practice”, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024.
2. Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das,“ Machine Learning”, Pearson Education India ,1st edition,2015.

**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.
4. Shai Shalev-Shwartz, ShaiBen David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge.

B.Tech.(V Sem.)

## 23AD05- Data Visualization

L	T	P	Cr.
3	0	0	3

**Prerequisite:** Computer Graphics, Image Processing.

**Course Educational Objectives:** To familiarize students with the basic and advanced techniques of information visualization and scientific visualization, learn key techniques of the visualization process, a detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques.

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

**CO1:** Explain the basic principles of Data Visualization. **(Understand-L2)**

**CO2:** Apply visualization techniques to a problem and its associated dataset. **(Apply-L3)**

**CO3:** Apply structured approach to create effective visualization. **(Apply-L3)**

**CO4:** Explain about the valuable insights from the massive dataset using visualization. **(Understand-L2)**

**CO5:** Build visualization dashboard to support decision making. **(Apply-L3)**

### Syllabus:

**UNIT-I: Introduction:** What Is Visualization? History of Visualization, Relationship between Visualization and Other Fields. The Visualization Process, Introduction of visual perception, visual representation of data, Gestalt principles, information overloads.

**UNIT-II:** Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications

**UNIT-III:** Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

**UNIT-IV:** Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

**UNIT-V:** Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations

**Recent trends** in various perception techniques, various visualization techniques, data structures used in data visualization.

### Textbooks:

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

### Reference Books:

1. Visualization Analytics & Design, Tamara Munzner, AK Peters Visualization Series, 1<sup>st</sup> Edition.
2. Interactive Data Visualization for the Web, Scott Murray, 2<sup>nd</sup> Edition.

**e-Resources:**

1. [https://kdd.cs.ksu.edu/Courses/CIS536/Lectures/Slides/Lecture-34-Main\\_6up.pdf](https://kdd.cs.ksu.edu/Courses/CIS536/Lectures/Slides/Lecture-34-Main_6up.pdf)
2. <https://elearn.nptel.ac.in/shop/iit-workshops/completed/data-visualization-with-r/?v=c86ee0d9d7ed>
3. <https://www.geeksforgeeks.org/data-visualization-and-its-importance>.

**23IT03- Object Oriented Analysis and Design**

L	T	P	Cr.
3	0	0	3

B.Tech.(V Sem.)

**Course Objectives:** The main objective is the students' to

- Become familiar with all phases of OOAD.
- Master the main features of the UML.
- Master the main concepts of Object Technologies and how to apply the mat work and develop the ability to analyze and solve challenging problems in various domains.
- Learn the Object design Principles and understand how to apply them towards Implementation.

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

**CO1:** Understand the structure and attributes of complex systems. **(Understand - L2)**

**CO2:** Understand the Unified Modeling Language (UML) and its significance in object-oriented software development. **(Understand - L2)**

**CO3:** Apply object-oriented modeling techniques to design class and object diagrams, including advanced structural concepts like interfaces, types, and packages. **(Apply - L3)**

**CO4:** Develop and interpret basic behavioral models such as use cases, interaction diagrams, and activity diagrams for real-world applications **(Apply - L3)**

**CO5:** Design advanced behavioral and architectural models using state machines and component diagrams to represent complex software systems. **(Apply - L3)**

### Syllabus:

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

**UNIT II: Introduction to UML:** Importance of modeling, principles of modeling, object-oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle.

**Basic Structural Modeling:** Classes, Relationships, common Mechanisms, and diagrams.

**Case Study:** Control System: Traffic Management.

**UNIT III: Class & Object Diagrams:** Terms, concepts, modeling techniques for Class & Object Diagrams.

**Advanced Structural Modeling:** Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Case Study: AI Cryptanalysis.

### UNIT IV:

**Basic Behavioral Modeling-I:** Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams. Case Study: Web Application: Vacation Tracking System

### UNIT V:

**Advanced Behavioral Modeling:** Events and signals, state machines, processes and Threads, time and space, state chart diagrams. **Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams. Case Study: Weather Forecasting

**Textbooks:**

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

**Reference Books:**

1. MeilirPage-Jones:FundamentalsofObjectOrientedDesigninUML,Pearson Education.
2. PascalRoques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3. AtulKahate:ObjectOrientedAnalysis&Design, TheMcGraw-HillCompanies.
4. ApplingUMLandPatterns:AnintroductiontoObject–OrientedAnalysisand Design and Unified Process, Craig Larman, Pearson Education.

B.Tech.(V Sem.)

23AD06- Soft computing

L	T	P	Cr.
3	0	0	3

**Pre-requisite** : Linear Algebra and Python.

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

**Course Outcomes:** The students will be able to

**CO1:** Learn soft computing techniques and their applications. **(Understand L2)**

**CO2:** Analyze various neural network architectures. **(Apply - L3)**

**CO3:** Define the fuzzy systems. **(Understand L2)**

**CO4:** Understand the genetic algorithm concepts and their applications. **(Understand L2)**

**CO5:** Identify and select suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution. **(Apply - L3)**

**Syllabus:**

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

**UNIT-II:** Perceptron networks, Learning rules, Training and testing algorithm, Adaptive Linear Neuron, Back propagation Network, Architecture, Training algorithm

**UNIT-III:** Fuzzy logic, fuzzy sets, properties, operations on fuzzy sets, fuzzy relations, operations on fuzzy relations, Fuzzy membership functions, fuzzification, Methods of membership, value assignments, intuition, inference, rank ordering, Lambda –Cuts for fuzzy sets, Defuzzification methods

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

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

**Textbooks:**

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

**Reference Books:**

1. N.K. Sinha and M.M. Gupta, Soft Computing & Intelligent Systems: Theory & Applications- Academic Press /Elsevier. 2009.
2. Simon Haykin, Neural Network-A Comprehensive Foundation-Prentice Hall International, Inc.1998.
3. R.Eberhart and Y. Shi, Computational Intelligence: Concepts to Implementation,

Morgan Kaufman/Elsevier, 2007.

4. Driankov D., Hellendoorn H.and Reinfrank M.,An Introduction to Fuzzy Control Narosa Pub., 2001.
  5. BartKosko, Neural Network and Fuzzy Systems-Prentice Hall,Inc.,Englewood Cliffs, 1992
- Goldberg D.E, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison Wesley, 1989

**Web References:**

1. <https://pypi.org/project/fuzzywuzzy/>
2. <https://archive.nptel.ac.in/courses/106/105/106105173/>

B.Tech.(V Sem.)

23AM04- Internet of Things

L	T	P	Cr.
3	0	0	3

**Pre-requisite:** Networking, Internet, Hardware, Programming, Cloud Services.

**Course Objectives:**

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

**Course Outcomes:** After completing this course, students will be able to:

**CO1:** Understand the fundamental concepts of Internet of Things (IoT), including its architecture and communication protocols.

**CO2:** Implement the business models, IoT/M2M communication, and standardization layers used in IoT systems.

**CO3:** Apply design principles for web connectivity for connected devices.

**CO4:** Analyze data acquiring in IoT/M2M, application, storage, business integration and enterprise systems.

**CO5:** Understand the use of cloud platforms and services for data collection, storage, and computing in IoT/M2M applications.

**Syllabus:**

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

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

**UNIT III:** Design Principles for the Web Connectivity for Connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for Connected-Devices.

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

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

**Textbooks:**

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

**Reference Books:**

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

B.Tech.(V Sem.)

**23AD07- Exploratory Data Analysis with Python**

L	T	P	Cr.
3	0	0	3

**Pre-requisite:** - Statistical methods for Data science, Data Science using Python

**Course Objectives:** The main objectives of the course are to

- Introducing the fundamentals of Exploratory Data Analysis
- Cover essential exploration techniques for understanding multivariate data by summarizing it through statistical methods and graphical methods.
- Evaluate the Models and select the best model

**Course Outcomes:** -

**CO1:** Understand the Fundamentals of EDA and Data Science.

**CO2:** Apply Visualization Techniques for Data Exploration.

**CO3:** Perform Data Transformation and Preprocessing.

**CO4:** Analyze Data Using Descriptive Statistics.

**CO5:** Develop and Evaluate Predictive Models.

**Syllabus:**

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

**Sample Experiments:** -

1. a) Download Dataset from Kaggle using the following link:  
<https://www.kaggle.com/datasets/sukhmanibedi/cars4u>
- b) Install python libraries required for Exploratory Data Analysis (NumPy, pandas, matplotlib, seaborn)
2. Perform NumPy Array basic operations and Explore NumPy Built-in functions.
3. Loading Dataset into pandas' data frame
4. Selecting rows and columns in the data frame

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

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

**Sample Experiments:**

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

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

**Sample Experiments:**

1. Perform the following operations
  - a) Merging Dataframes
  - b) Reshaping with Hierarchical Indexing
  - c) Data Deduplication
  - d) Replacing Values
2. Apply different Missing Data handling techniques
  - a) NaN values in mathematical Operations
  - b) Filling in missing data
  - c) Forward and Backward filling of missing values
  - d) Filling with index values
  - e) Interpolation of missing values
3. Apply different data transformation techniques
  - a) Renaming axis indexes
  - b) Discretization and Binning
  - c) Permutation and Random Sampling
  - d) Dummy variables

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

**Sample Experiments: -**

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

**UNIT-V: Model Development and Evaluation:** Unified machine learning workflow, Data pre-processing, Data preparation, Training sets and corpus creation, Model creation and training, Model evaluation, Best model selection and evaluation, Model deployment

Case Study: EDA on Wine Quality Data Analysis

**Sample Experiments: -**

1. Perform hypothesis testing using stats model's library
  - a) Z-Test
  - b) T-Test
2. Develop model and Perform Model Evaluation using different metrics such as prediction score, R2 Score, MAE Score, MSE Score.
3. Case Study: Perform Exploratory Data Analysis with Wine Quality Dataset

**Textbooks:**

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

**Reference Books:**

1. Ronald K. Pearson, Exploratory Data Analysis Using R, CRC Press, 2020
2. Radhika Datar, Harish Garg, Hands-On Exploratory Data Analysis with R: Become an expert in exploration data analysis using R packages, 1st Edition, Packet Publishing, 2019.

**Web References:**

1. <https://github.com/PacktPublishing/Hands-on-Exploratory-Data-Analysis-with-Python>
2. <https://www.analyticsvidhya.com/blog/2022/07/step-by-step-exploratory-dataanalysis-eda-using-python/#h-conclusion>
3. <https://github.com/PacktPublishing/Exploratory-Data-Analysis-with-Python-Cookbook>

B.Tech.(V Sem.)

**23AD53- Data Warehousing and Data  
Mining Lab**

L	T	P	Cr.
3	0	0	3

**Pre-requisites:** Data Base Management Systems, Python Programming/R Programming

**Course Objectives:** The main objective of the course is to

- Inculcate Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
- Design a data warehouse or data mart to present information needed by management in a form that is usable.

**Course Outcomes:**

1. Emphasize hands-on experience working with all real data sets.
2. Test real data sets using popular data mining tools such as WEKA, Python Libraries.
3. Develop ability to design various algorithms based on data mining tools.

**Software Requirements:** WEKA Tool/Python/R-Tool/Rapid Tool/Oracle Data mining

**List of Experiments:**

1. Creation of a Data Warehouse.
  - Build Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration Tool, Pentaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects, etc.,)
  - Design multi-dimensional data models namely Star, Snowflake and Fact Constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, manufacturing, Automobiles, sales etc).
  - Write ETL scripts and implement using data warehouse tools.
  - Perform Various OLAP operations such slice, dice, roll up, drill up and pivot
2. Explore machine learning tool “WEKA”
  - Explore WEKA Data Mining/Machine Learning Toolkit.
  - Downloading and/or installation of WEKA data mining toolkit.
  - Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.
  - Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel)
  - Study the arff file format Explore the available data sets in WEKA. Load a data set (ex. Weather dataset, Iris dataset, etc.)
  - Load each dataset and observe the following:
    1. List the attribute names and they types
    2. Number of records in each dataset
    3. Identify the class attribute (if any)
    4. Plot Histogram
    5. Determine the number of records for each class.
    6. Visualize the data in various dimensions
3. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
  - Explore various options available in Weka for preprocessing data and apply Unsupervised filters like Discretization, Resample filter, etc. on each dataset
  - Load weather. nominal, Iris, Glass datasets into Weka and run Apriori

Algorithm with different support and confidence values.

- Study the rules generated. Apply different discretization filters on numerical attributes and run the Apriori association rule algorithm. Study the rules generated.
- Derive interesting insights and observe the effect of discretization in the rule generation process.

#### 4. Demonstrate performing classification on data sets Weka/R

- Load each dataset and run 1d3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic.
- Extract if-then rules from the decision tree generated by the classifier, Observe the confusion matrix.
- Load each dataset into Weka/R and perform Naïve-bayes classification and k-Nearest Neighbour classification. Interpret the results obtained.
- Plot RoC Curves
- Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

#### 5. Demonstrate performing clustering of data sets

- Load each dataset into Weka/R and run simple k-means clustering algorithm with different values of k (number of desired clusters).
- Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights.
- Explore other clustering techniques available in Weka/R.
- Explore visualization features of Weka/R to visualize the clusters. Derive interesting insights and explain.

#### 6. Demonstrate knowledge flow application on data sets into Weka/R

- Develop a knowledge flow layout for finding strong association rules by using Apriori, FP Growth algorithms
- Set up the knowledge flow to load an ARFF (batch mode) and perform a cross validation using J48 algorithm
- Demonstrate plotting multiple ROC curves in the same plot window by using j48 and Random forest tree

#### 7. Demonstrate ZeroR technique on Iris dataset (by using necessary preprocessing technique(s)) and share your observations

8. Write a java program to prepare a simulated data set with unique instances.

9. Write a Python program to generate frequent item sets / association rules using Apriori algorithm

10. Write a program to calculate chi-square value using Python/R. Report your observation.

11. Write a program of Naive Bayesian classification using Python/R programming language.

12. Implement a Java/R program to perform Apriori algorithm

13. Write a R program to cluster your choice of data using simple k-means algorithm using JDK

14. Write a program of cluster analysis using simple k-means algorithm Python/R programming language.

15. Write a program to compute/display dissimilarity matrix (for your own dataset containing at least four instances with two attributes) using Python

16. Visualize the datasets using matplotlib in python/R.(Histogram, Box plot, Bar chart, Pie chart etc.,)

B.Tech.(V Sem.)

23AD54- Data Visualization Lab

L	T	P	Cr.
3	0	0	3

**Pre-Requisites:** R Tool, Engineering Graphics

**Course Objectives:**

- To visualize the different datasets using histograms, line charts.
- To understand the use of bar charts and box plots.
- To understand Scatter plots, mosaic plots
- To understand different Map visualizations
- To learn advanced graphs such as correlogram, heatmap and 3D graphs.

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

**CO1:** Apply different visualization techniques like plots and graphs in R on different datasets (**Apply-L3**)

**CO2:** Apply different Map visualizations in R (**Apply-L3**)

**CO3:** Develop advanced graphs such as correlogram, heatmap and 3D graphs in R (**Apply-L3**)

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

**List of Experiments:**

For the first 2 weeks R Programming Basics will be discussed

1. a) Load VADeaths(Death Rates in Virginia) dataset in R and visualize the data using different histograms.  
b) Load air quality dataset in R and visualize La Guardia Airport's daily maximum temperature using histogram.
2. Load AirPassengers 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/>

B.Tech.(V Sem.)

23CSS3- Full Stack Development-2

L	T	P	Cr.
3	0	0	3

**Pre-requisites:** Object oriented programming, Full stack development-I

**Course Objectives:**

The objective of this course is to equip students with hands-on skills in developing full stack web applications using Java, Node.js, and React. It focuses on building backend services using JDBC, Servlets, and Express.js, along with frontend development using React.js. Students will learn to integrate databases like MySQL and MongoDB for real-time data handling. The course emphasizes applying MVC architecture, REST APIs, and deployment practices for complete web solutions.

**Course Outcomes:**

**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. **(Apply-L3)**

**CO4:** Apply React.js to develop dynamic user interfaces and integrate them with backend APIs for full-stack web solutions. **(Apply-L4)**

**Syllabus:**

**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 PreparedStatement.
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 Prepared Statement 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.

### Textbooks:

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. **OracleJavaDocumentation(JDBC&Servlets)**  
<https://docs.oracle.com/javase/tutorial/jdbc/>  
<https://docs.oracle.com/javaee/7/tutorial/servlets.htm>
2. **MozillaDeveloperNetwork(HTML,JS,HTTP)**  
<https://developer.mozilla.org>
3. **Node.jsOfficialDocumentation**  
<https://nodejs.org/en/docs>
4. **Express.jsGuide**  
<https://expressjs.com>
5. **MongoDBDocumentation**  
<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(FullStacktopics)**  
<https://www.tutorialspoint.com>

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

L	T	P	Cr.
3	0	0	3

**Course Objectives:**

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widgets and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

**Course Outcomes:** At the end of this course, the 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

**List of 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.

**Textbooks:**

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 151 Edition, Apres
3. Richard Rose, Flutter & Dart Cookbook, Developing Full stack Applications for the Cloud, Oreilly.

B.Tech.(VI Sem.)

23AD09- Big Data Analytics

L	T	P	Cr.
3	0	0	3

**Course Objectives:**

- Optimize business decisions and create competitive advantage with Big Data analytics
- Introducing Java concepts required for developing map reduce programs
- Derive business benefit from unstructured data
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm
- To introduce programming tools PIG & HIVE in Hadoop ecosystem.

**UNIT-I: Data structures in Java:** Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

**UNIT-II: Working with Big Data:** Google File System, Hadoop Distributed File System (HDFS) Building blocks of Hadoop (Name node, Data node, Secondary Name node, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

**UNIT-III: Writing Map Reduce Programs:** A Weather Dataset, Understanding Hadoop API for Map Reduce Framework (Old and New), Basic programs of Hadoop Map Reduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner

**UNIT-IV: Stream Memory and Spark:** Introduction to Streams Concepts– Stream Data Model and Architecture , Stream computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Introduction to Spark Concept, Spark Architecture and components , Spark installation , Spark RDD(Resilient Distributed Dataset) – Spark RDD operations.

**UNIT-V: Pig:** Hadoop Programming Made Easier Admiring the Pig Architecture, going with the Pig Latin Application Flow, working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

**Applying Structure to Hadoop Data with Hive:** Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing data

**Textbooks:**

1. Wiley & Big Java 4th Edition, Cay Horstmann, Wiley John Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3<sup>rd</sup>.Edition, O'reilly

**Reference Books:**

1. Hadoop in Action by Chuck Lam, MANNING Publ.
2. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael Coss
3. Hadoop in Practice by Alex Holmes, MANNING Publ.

4. Big Data Analytics by Dr. A.Krishna Mohan and Dr.E.Laxmi Lydia
5. Hadoop Map Reduce Cookbook, SrinathPerera, ThilinaGunarathne

**Software Links:**

1. Hadoop:<http://hadoop.apache.org/>
2. Hive: <https://cwiki.apache.org/confluence/display/Hive/Home>
3. Piglatin: <http://pig.apache.org/docs/r0.7.0/tutorial.html>

B.Tech.(VI Sem.)

23AM06- DEEP LEARNING

L	T	P	Cr.
3	0	0	3

**Course Objectives:**

The objective of this course is to cover the fundamentals of neural networks as well as some advanced topics such as recurrent neural networks, long short-term memory cells and convolution neural networks.

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

- Explore feed forward networks and Deep Neural networks
- Mathematically understand the deep learning approaches and paradigms
- Apply deep learning techniques for various applications

**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, Greedy layer wise training.

**UNIT-III: Better Training of Neural Networks-**Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization).

**UNITIV: Recurrent Neural Networks-** Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs.

**Convolutional Neural Networks:** LeNet, AlexNet. Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.

**UNITV: Recent Trends-**Variational Auto encoders, Transformers, GPT Applications: Vision, NLP, Speech

**Textbooks:**

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

**Reference Books:**

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007
3. Deep Learning with Python, François Chollet, Manning Publications, 2017
- 4.

B.Tech.(VI Sem.)

23AM05- Natural Language Processing

L	T	P	Cr.
3	0	0	3

**Course Objectives:** This course introduces the fundamental concepts and techniques of natural language processing (NLP).

- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
- Enable students to be capable of describing the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

**Course Outcomes: After completion of this course**

**CO1:** Demonstrate a given text with basic Language features

**CO2:** To design an innovative application using NLP components

**CO3:** Explain a rule-based system to tackle morphology/syntax of a language

**CO4:** To design a tag set to be used for statistical processing for real-time applications

**CO5:** To compare the use of different statistical approaches for different types of NLP applications.

**Syllabus:**

**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.

**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).

**Textbooks:**

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2<sup>nd</sup> 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. Language Processing with Java and Ling Pipe Cookbook, 1<sup>st</sup> Edition, Breck Baldwin, Atlantic Publisher, 2015.
2. Natural Language Processing with Java, 2<sup>nd</sup> Edition, Richard M Reese, OReilly Media,2015.
3. Handbook of Natural Language Processing, Second, Nitin Indurkha and Fred J. Damerau, Chapman and Hall/CRC Press, 2010.Edition
4. Natural Language Processing and Information Retrieval, 3<sup>rd</sup> Edition, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press,2008.

B.Tech.(VI Sem.)

23CS13- Cryptography &amp; Network Security

L	T	P	Cr.
3	0	0	3

**Course Objectives:**

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand the basic categories of threats to computers and networks
- Discusses the Mathematics of Cryptography
- Discuss the fundamental ideas of Symmetric and Asymmetric Cryptographic Algorithms
- Discusses the Network layer, Transport Layer and Application Layer Protocols Enhanced security mechanisms

**UNIT – I: Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography. Classical Encryption Techniques-symmetric cipher model, Substitution techniques, Transposition techniques, Rotor Machines, Steganography.

**UNIT – II: Introduction to Symmetric Cryptography: Algebraic Structures-**Groups, Rings, Fields,  $GF(2^n)$  fields, Polynomials. **Mathematics of Asymmetric cryptography:** Primes, checking for Primness, 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.

**Textbooks:**

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

**Reference Books:**

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

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

L	T	P	Cr.
3	0	0	3

**Course Objectives:**

The main objectives of the course is to make student

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

**UNIT-I: Operating Systems Overview:** Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging

**UNIT-II: Processes:** Process Concept, Process scheduling, Operations on processes, Inter-process communication. Threads and Concurrency: Multithreading models, Thread libraries, Threading issues. CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

**UNIT-III: Synchronization Tools:** The Critical Section Problem, Peterson's Solution, Mutex Locks, semaphores, Monitors, Classic problems of Synchronization. Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

**UNIT-IV: Memory- Management Strategies:** Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping. Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement Allocation of frames, Thrashing Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

**UNIT-V: File System:** File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: Filesystem Mounting, Partitions and Mounting, File Sharing. Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access Matrix

**Textbooks:**

1. Operating System Concepts, Silberschatz A, GalvinPB, GagneG, 10<sup>th</sup> Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum AS, 4<sup>th</sup> Edition, Pearson ,2016

**Reference Books:**

1. Operating Systems -Internals and Design Principles, Stallings W, 9<sup>th</sup> edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D. M Dhamdhare, 3<sup>rd</sup> Edition, McGraw- Hill, 2013.

**Online Learning Resources:**

1. <https://nptel.ac.in/courses/106/106/106106144/>
2. <http://peterindia.net/OperatingSystems.html>.

## 23AM07- Computer Vision

B.Tech.(VI Sem.)

L	T	P	Cr.
3	0	0	3

**Course Objectives:**

- To understand the Fundamental Concepts related to sources, shadows and shading
- To understand the Geometry of Multiple Views

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

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

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

**UNIT IV: The Transport Layer:** The Transport Layer Services, Transport Layer Protocols: UDP, TCP and SCTP

**UNIT V: The Application Layer:** The World Wide Web, HTTP, Domain Name Space, Remote Loging, Electronic Mail and File Transfer

**Textbooks:**

1. “Computer Networks”, Andrew S Tanenbaum, David J Wetherall, 5<sup>th</sup> Edition, Pearson
2. “Data Communications and Networking”, Behrouz A Forouzan, 4<sup>th</sup> Edition, Tata McGraw Hill Education

**Reference Books:**

1. “Data and Computer Communication”, William Stallings, Pearson
2. “TCP/IP Protocol Suite”, Behrouz Forouzan, McGraw Hill.

B.Tech.(VI Sem.)

**23CS12- Automata Theory & Compiler  
Design**

L	T	P	Cr.
3	0	0	3

**Pre-requisites:** Discrete Mathematics, Programming Basics, Data Structures, Algorithms

**Course Objectives:**

1. Understand fundamental concepts of automata, formal languages, and computation.
2. Design finite automata, pushdown automata, and Turing machines.
3. Apply regular expressions and grammars for language processing.
4. Learn the structure and functioning of a compiler.
5. Implement lexical analysis, parsing, and intermediate code generation.

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

**CO1:** Understand and apply concepts of formal languages, alphabets, strings, and finite automata for modelling simple computational problems.

**CO2:** Construct and analyze regular expressions and context-free grammars for language definition and pattern matching.

**CO3:** Design pushdown automata and Turing machines and evaluate problems of decidability and language classification.

**CO4:** Explain the phases of compilation and implement lexical and syntax analysis techniques using tools and algorithms.

**CO5:** Apply syntax-directed translation and generate intermediate code with memory management for a target machine.

**Sylabus:**

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

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

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

**UNIT - IV Introduction:** The structure of a compiler, Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex, Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers R18 B.Tech. CS&D Syllabus JNTU Hyderabad

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

**Textbooks:**

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

**Reference Books:**

1. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
2. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
3. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
4. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

B.Tech.(VI Sem.)

23CS10- Quantum Computing

L	T	P	Cr.
3	0	0	3

**Course Objectives:**

- To introduce the fundamentals of quantum computing, the problem-solving approach using finite dimensional mathematics

**UNIT – I: History of Quantum Computing:** Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

**UNIT – II: Background Mathematics:** Basics of Linear Algebra, Hilbert space, Probabilities and measurements. **Background Physics:** Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. **Background Biology:** Basic concepts of Genomics and Proteomics (Central Dogma)

**UNIT – III: Qubit:** Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

**UNIT – IV: Quantum Algorithms:** Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

**UNIT – V: Noise and error correction:** Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

**Text Books:**

- Nielsen M. A., Quantum Computation and Quantum Information, Cambridge

**Reference Books:**

- Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
- Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.I: Basic Concepts, Vol II
- Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

B.Tech.(VI Sem.)

23AD08- NoSQL Databases

L	T	P	Cr.
3	0	0	3

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

**CO1:** Explain and compare different types of NoSQL Databases

**CO2:** Compare and contrast RDBMS with different NoSQL databases.

**CO3:** Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases.

**CO4 :** Explain performance tune of Key-Value Pair NoSQL databases.

**CO5:** Apply NoSQL development tools on different types of NoSQL Databases.

**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.

**Textbooks:**

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

**Web References:**

1. <https://www.ibm.com/cloud/learn/nosql-databases>
2. <https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp>
3. <https://www.geeksforgeeks.org/introduction-to-nosql/>
4. <https://www.javatpoint.com/nosql-databa>

B.Tech.(VI Sem.)

**23CS11- Cloud Computing**

L	T	P	Cr.
3	0	0	3

**Prerequisite:** Computer Networks, Operating System, Parallel and Distributed Computing.

**Course Objectives:**

- To explain the evolving utility computing model called cloud computing.
- To introduce the various levels of services offered by cloud.
- To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
- To emphasize the security and other challenges in cloud computing.
- To introduce the advanced concepts such as containers, serverless computing and cloud-centric Internet of Things.

**Course Outcomes:**

**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:** Analyze the advanced concepts of cloud computing for server-less-computing, fog, edge and quantum computing. (Analyze-L4)

**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, 2<sup>nd</sup> 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, 2<sup>nd</sup> edition, MK Elsevier, 2018.
2. Essentials of cloud Computing, K. Chandrasekhran, CRC press, 2014.
3. <https://www.ibm.com/cloud/learn/cloud-computing>
4. <https://www.youtube.com/watch?v=NzZXz3fJf6o&list=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J> -- NPTEL Cloud Computing
5. [https://www.youtube.com/watch?v=Rzzi\\_CGMIHc](https://www.youtube.com/watch?v=Rzzi_CGMIHc) Cloud Computing Videos
6. <https://www.youtube.com/watch?v=10jm7Waan8M&list=PLdpzxOOAlwvIcxgCUyBHVOcWs0Krjx9xR> -- Azure Course Videos

**23AD10- Social Media Analytics****B.Tech.(VI Sem.)**

L	T	P	Cr.
3	0	0	3

**Course Objectives:**

Knowledge on social media and its analytics Course

**Course Outcomes:**

**CO1:** Understanding characteristics and types of social media

**CO2:** Knowledge on layers of social media analytics

**CO3:** Apply text analysis tools on social media data

**CO4:** Understand the significance of action analytics

**CO5:** Detect viral topics on social media(YouTube)

**UNIT-I:** Introduction to Social Media World Wide Web, Web 1.0, Web 2.0, Web3.0, Social Media, Core Characteristics Of Social Media, Types Of social media, Social Networking Sites, Using Facebook For Business Purposes, Content Communities

**UNIT-II:** Social Media Analytics Overview Purpose Of Social Media Analytics, Social Media Vs. Traditional Business Analytics, Seven Layers Of Social Media Analytics, Types Of Social Media Analytics, Social Media Analytics Cycle, Challenges To Social Media Analytics, Social Media Analytics Tools.

Case Study: The Underground Campaign That Scored Big

**UNIT-III:** Social Media Text Analytics Types Of Social Media Text, Purpose Of Text Analytics, Steps In Text Analytics, Social Media Text Analysis Tools.

Case Study: Tapping Into Online Customer Opinions

**UNIT-IV:** Social Media Actions Analytics Introduction To Actions Analytics, Common Social Media Actions, Actions Analytics Tools.

Case Study: Cover-More Group

**UNIT-V:** Social Media Hyperlink Analytics Types Of Hyperlinks, Hyperlink Analytics, Types Of Hyperlink Analytics, Hyperlink Analytics Tools.

Case Study: Hyperlinks And Viral YouTube Videos.

**Textbooks:**

1. Seven Layers Of Social Media Analytics Mining Business Insights From Social Media Text, Actions, Networks, Hyperlinks, Apps, SearchEngine, And Location Data By Gohar F. Khan Isbn: 1507823207, Isbn-13: 9781507823200.

**Reference Books:**

1. Social Media Analytics: Techniques And Insights For Extracting Business Value Out Of Social Media By Matthew Ganis, Avinash Kohirkar, Pearson Education.
2. Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, Marshall Sponder, MGH.
3. Big Data And Analytics, Seema Acharya, Subhasinin Chellappan, Wiley Publications.
4. Big Data, Black Booktm,DreamtechPress,2015Edition.

B.Tech.(VI Sem.)

**23AD56- Deep Learning and Natural  
Language Processing Lab**

L	T	P	Cr.
3	0	0	3

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

- CO1: Design Neural networks to solve real world problems
- CO2: Build RNN, CNN models for classification
- CO3: Choose appropriate pre-trained model to solve real time problem
- CO4: Apply different NLP techniques using NLTK package.
- CO5: Design solutions to real-world problems using NLP

**Software Packages Required:**

- Keras
- Tensorflow
- PyTorch
- NLTK

**List of Experiments:**

1. Implement Multilayer Perceptron algorithm for MNIST Handwritten Digit Classification.
2. Design Neural Network for following problems
  - i). Movie reviews classification (Binary Classification) using IMDB dataset.
  - ii). News Wires classification (Multiclass Classification) using Reuters dataset.
3. Implement a Recurrent Neural Network(RNN) and LSTM for IMDB movie review classification problem.
4. Build a Convolution Neural Network for simple image (dogs and Cats) Classification
5. Use a Pre-trained Convolution Neural Network LeNet, AlexNet for image classification.
6. Implement One Hot Encoding and Word Embeddings on any real world dataset.
7. Create Sample list at least 10 words POS tagging and find the POS for any given word.
8. Write a Python program to
  - i). Perform Morphological Analysis using NLTK library
  - ii).Generate n-grams using NLTK N-Grams library
  - iii). Implement N-Grams Smoothing
9. Write a program to implement Named Entity Recognition(NER)for any corpus.
10. Using NLTK package to convert audio file to text and text file to audio files.
11. Write a program to perform Auto-Correction of spellings for any text.
12. Implement twitter sentiment analysis using NLP.

B.Tech.(VI Sem.)

23AD57- Big Data Analytics Lab

L	T	P	Cr.
3	0	0	3

**Software Requirements:**

1. **Hadoop:** <https://hadoop.apache.org/release/2.7.6.html>
2. **Java** : <https://www.oracle.com/java/technologies/javase/javase8u211-later-archive-downloads.html>
3. **Eclipse** : <https://www.eclipse.org/downloads/>

**List of Experiments:****Experiment 1: Week 1, 2:**

1. Implement the following Data structures in Java
  - a) Linked Lists
  - b) Stacks
  - c) Queues
  - d) Set
  - e) Map

**Experiment 2: Week 3:**

2. (i) Perform setting up and Installing Hadoop in its three operating modes: Standalone, Pseudo distributed, Fully distributed  
(ii) Use web-based tools to monitor your Hadoop setup.

**Experiment 3: Week 4:**

3. Implement the following file management tasks in Hadoop:
  - Adding files and directories
  - Retrieving files
  - Deleting files

**Hint:** A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

**Experiment 4: Week 5:**

4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

**Experiment 5: Week 6:**

5. Write a map reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record oriented.

**Experiment 6: Week 7:**

6. Use Map Reduce to find the shortest path between two people in a social graph.

**Hint:** Use an adjacency list to model a graph, and for each node store the distance from the original node, as well as a back pointer to the original node. Use the mappers to propagate the distance to the original node, and the reducer to restore the state of the graph. Iterate until the target node has been reached.

**Experiment 7: Week 8:**

7. Implement Friends-of-friends algorithm in MapReduce.

**Hint:** Two MapReduce jobs are required to calculate the FoFs for each user in a social network. The first job calculates the common friends for each user, and the second job sorts the common friends by the number of connections to your friends.

**Experiment 8: Week 9:**

8. Implement an iterative PageRank graph algorithm in MapReduce.

**Hint:** PageRank can be implemented by iterating a MapReduce job until the graph has converged. The mappers are responsible for propagating node PageRank values to their adjacent nodes, and the reducers are responsible for calculating new PageRank values for each node, and for re-creating the original graph with the updated PageRank values.

**Experiment 9: Week 10:**

9. Perform an efficient semi-join in MapReduce.

**Hint:** Perform a semi-join by having the mappers load a Bloom filter from the Distributed Cache, and then filter results from the actual MapReduce data source by performing membership queries against the Bloom filter to determine which data source records should be emitted to the reducers.

**Experiment 10: Week 11:**

10. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

**Experiment 12: Week 12:**

11. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes

B.Tech.(VI Sem.)

23HSS1- Soft skills

L	T	P	Cr.
3	0	0	3

**Course Objectives:**

- To equip the students with the skills to effectively communicate in English
- To train the students in interview skills, group discussions and presentation skills
- To motivate the students to develop confidence
- To enhance the students' interpersonal skills
- To improve the students' writing skills

**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](https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01)

B.Tech.(VI Sem.)

23MC04- Technical Paper Writing &amp; IPR

L	T	P	Cr.
3	0	0	3

**Course Objective:**

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

**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”, 1<sup>st</sup> 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”, 2<sup>nd</sup> 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/>.