MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE
MADANAPALLE
(UGC-AUTONOMOUS)
www.mits.ac.in

Estd 1998

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(DATA SCIENCE)
Course Structure
&
Detailed Syllabi
For the students admitted to

B. Tech. Regular Four Year Degree Programme from the Academic Year 2023-24

and

B. Tech. Lateral Entry Scheme from the Academic Year 2024-25

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(DATA SCIENCE)

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

B. Tech Four Year Curriculum Structure

Branch: COMPUTER SCIENCE & ENGINEERING

(DATA SCIENCE)

Total Credits	160 Credits for 2023(Regular) & 120 Credits 2024(Lateral Entry) Admitted Batch onwards

I.   Induction Program and Holistic Development Activities

Sl.No	Title	Duration
1	Induction Program (Mandatory)	Three weeks' duration at the start of First Year

Dept. of Computer Science & Engineering (Data Science)

R23 - Curriculum Structure
I Year I Semester

S. No.	Category	Course Code	Course Title	L	T	P	Total	Credits
				Hours Per Week				
1	HSMC	23ENG101	Communicative English	2	0	0	2	2
2	BSC	23MAT101	Linear Algebra and Calculus	3	0	0	3	3
3	BSC	23CHE102	Chemistry	3	0	0	3	3
4	ESC	23CME101	Basic Civil and Mechanical Engineering	3	0	0	3	3
5	ESC	23CSE101	Introduction to Programming	3	0	0	3	3
6	HSMC	23ENG201	Communicative English Laboratory	0	0	2	2	1
7	BSC	23CHE202	Chemistry Laboratory	0	0	2	2	1
8	ESC	23CSE201	Computer Programming Laboratory	0	0	3	3	1.5
9	ESC	23ME201	Engineering Workshop	0	0	3	3	1.5
10	HSMC	23HUM201	Health and Wellness, Yoga and Sports	-	-	1	1	0.5
Total				**14**	**0**	**11**	**25**	**19.5**

I Year II Semester

S. No.	Category	Course Code	Course Title	L	T	P	Total	Credits
				Hours Per Week				
1	BSC	23MAT102	Differential Equations and Vector Calculus	3	0	0	3	3
2	BSC	23PHY101	Engineering Physics	3	0	0	3	3
3	ESC	23EEE101	Basic Electrical and Electronics Engineering	3	0	0	3	3
4	ESC	23ME101	Engineering Graphics	1	0	4	5	3
5	PCC	23CSE102	Data Structures	3	0	0	3	3
6	BSC	23PHY201	Engineering Physics Laboratory	0	0	2	2	1
7	ESC	23EEE201	Electrical and Electronics Engineering Workshop	0	0	3	3	1.5
8	ESC	23CSE202	IT Workshop	0	0	2	2	1
9	PCC	23CSE203	Data Structures Laboratory	0	0	3	3	1.5
10	HSMC	23HUM202	NSS / NCC / Scouts and Guides / Community Service	-	-	1	1	0.5
Total				**13**	**0**	**15**	**28**	**20.5**

(L = Lecture, T = Tutorial, P = Practical, C = Credit

Dept. of Computer Science & Engineering (Data Science)

R23 - Curriculum Structure
II Year I Semester

S. No.	Category	Course Code	Course Title	L	T	P	Total	Credits
1	HSMC	23HUM101	Universal Human Values	2	1	0	3	3
2	HSMC	23HUM102	Economics and Financial Accounting For Engineers	2	0	0	2	2
3	BSC	23MAT107	Probability and Statistics for Computer Science	3	0	0	3	3
4	PCC	23CSD101	Database Systems	3	0	0	3	3
5	PCC	23CSD102	Design and Analysis of Algorithms	2	1	0	3	3
6	PCC	23CSD104	JAVA Programming	3	0	0	3	3
7	PCC	23CSD201	Database Systems Laboratory	0	0	3	3	1.5
8	PCC	23CSD202	JAVA Programming Laboratory	0	0	3	3	1.5
9	SEC	23CSD601	Python Programming	1	0	2	3	2
Total				**16**	**2**	**8**	**26**	**22**

II Year II Semester

S. No.	Category	Course Code	Course Title	L	T	P	Total	Credits
1	BSC	23MAT108	Discrete Mathematical Structures	3	0	0	3	3
2	ESC	23CSD103	Digital Logic and Computer Organization	3	0	0	3	3
3	ESC		Design Thinking and Innovation Related Courses (Refer ANNEXURE - II)	1	0	2	3	2
4	PCC	23CSD105	Introduction to Data Science	3	0	0	3	3
5	PCC	23CSD106	Data Engineering	3	0	0	3	3
6	PCC	23CSD203	Data Science Laboratory	0	0	3	3	1.5
7	PCC	23CSD204	Data Engineering Laboratory	0	0	3	3	1.5
8	SEC	23CSD602	Exploratory Data Analysis with Python	1	0	2	3	2
9	Audit Course	23CHE901	Environmental Science	2	0	0	2	-
Total				**16**	**0**	**10**	**26**	**19**

(L = Lecture, T = Tutorial, P = Practical, C = Credit

Dept. of Computer Science & Engineering (Data Science)

THREE WEEK MANDATORY INDUCTION PROGRAMME

- Yoga and Meditation
- Sports and Games
- NSS
- NCC
- MITS Social Responsibility Club
- Management module
- Design Thinking
- Spoken and Written Communication

- *Proficiency modules*

  - Basic Computer Proficiency
  - Interpersonal skills
  - Computer Graphics
  - Web programming
  - Mobile Apps
  - Vocabulary enhancement

HOLISTIC DEVELOPMENT ACTIVITIES

Description of Activities

1. Physical and Health
2. Culture
3. Literature and Media
4. Social Service
5. Self-Development
6. Nature and Environment
7. Innovation

Dept. of Computer Science & Engineering (Data Science)

<table>
<tr><td colspan="3">DESIGN THINKING AND INNOVATION RELATED COURSES
(To be offered under MOOC's Category from SWAYAM – NPTEL</td></tr>
<tr><td>Sl. No.</td><td>Course Code</td><td>Course Title</td></tr>
<tr><td>1</td><td>23IIC5M01</td><td>Design, Technology and Innovation</td></tr>
<tr><td>2</td><td>23IIC5M02</td><td>Introduction on Intellectual Properties to Engineers and Technologists</td></tr>
<tr><td>3</td><td>23IIC5M03</td><td>Product Engineering and Design Thinking</td></tr>
<tr><td>4</td><td>23IIC5M04</td><td>Intellectual Property Rights and Competition Law</td></tr>
<tr><td>5</td><td>23IIC5M05</td><td>Innovation, Business Model and Entrepreneurship</td></tr>
<tr><td>6</td><td>23IIC5M06</td><td>Understanding Incubation and Entrepreneurship</td></tr>
<tr><td colspan="3">Any new Innovation and Incubation Course offered by SWAYAM NPTEL can be appended in future.</td></tr>
</table>

I Year I Semester

Dept. of Computer Science & Engineering (Data Science)

B. Tech I Year I Semester

23ENG101 COMMUNICATIVE ENGLISH

L T P C
2 0 0 2

Pre-requisite: None

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.

UNIT I   Lesson: HUMAN VALUES: Gift of Magi (Short Story)   9 hours

Listening: Identifying the topic, the context and specific pieces of information by listeningto short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home,family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces ofinformation.
Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar: Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II   Lesson: NATURE: The Brook by Alfred Tennyson (Poem)   9 hours
Listening: Answering a series of questions about main ideas and supporting ideas afterlistening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by short structuretalks.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to linkthe ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

UNIT III   Lesson: BIOGRAPHY: Elon Musk   9 hours
Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what

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

Vocabulary: Compound words, Collocations

UNIT IV   Lesson: INSPIRATION: The Toys of Peace by Saki   9 hours
 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   9 hours
               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 andusage (articles, prepositions, tenses, subject verb agreement)
 Vocabulary: Technical Jargons

Course Outcomes:

CO1: Understand the topic, context, and pieces of specific information from personal , professional and social situations

CO2: Apply discourse markers to speak clearly in formal discussions

CO3: Analyze and apply grammatical structures to formulate contextualized phrases and sentences

CO4: Analyze texts and images to write summaries based on global comprehension

CO5: Draft coherent paragraphs and structured essays

Text Books:

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

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

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

VOCABULARY

1   https://www.youtube.com/c/DailyVideoVocabulary/videos

2   https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

Dept. of Computer Science & Engineering (Data Science)

B. Tech I Year I Semester

23MAT101 LINEAR ALGEBRA AND CALCULUS

L T P C
3 0 0 3

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

UNIT I   MATRICES   9 hours

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT II   EIGENVALUES, EIGENVECTORS AND ORTHOGONAL   9 hours
**   TRANSFORMATION**
Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem,Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonicalforms by Orthogonal Transformation.

UNIT III   CALCULUS   9 hours
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   9 hours
**   (MULTI VARIABLE CALCULUS)**
Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functionsof two variables, method of Lagrange multipliers.

UNIT V   MULTIPLE INTEGRALS (MULTI VARIABLE CALCULUS)   9 hours
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).

Course Outcomes:
At the end of the course, the student will be able to
CO1: Solve the system of linear equations and apply the matrix algebra techniques in practical applications.
CO2: Utilize the Eigenvalues, Eigenvectors and applications of diagonalization in the field of Science and Technology.
CO3: Relate the results of mean value theorems in real life problems.
CO4: Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.
CO5: Compute the area and volume by interlinking them to appropriate double and triple integrals.

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition

2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

Dept. of Computer Science & Engineering (Data Science)

B. Tech I Year I Semester

23CHE102 CHEMISTRY

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Course Objectives:
- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches.

UNIT I   STRUCTURE AND BONDING MODELS   9 hours

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and $\Psi 2$, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of N2, O2 and NO, CO π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT II   MODERN ENGINEERING MATERIALS   9 hours

Semiconductors – Introduction, basic concept, role of doping agents, applications
Super conductors -Introduction, basic concept, applications.
Supercapacitors: Introduction, Basic Concept-Classification – Applications.
Nano materials: Introduction, classification, properties and applications of Fullerenes,
carbon nano tubes and Graphene nanoparticles.

UNIT III   ELECTROCHEMISTRY AND APPLICATIONS   9 hours

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).
Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.
Primary cells – Zinc-air battery, Sodium-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   9 hours

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation, Poly Dispersity Index (PDI) & it's significance
Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.
Elastomers–Buna-S, Buna-N–preparation, properties and applications.
Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications.
Bio-Degradable polymers - Poly Glycolic Acid (PGA), Poly Lactic Acid (PLA).

UNIT V   INSTRUMENTAL METHODS AND APPLICATIONS   9 hours
Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopy, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

Course Outcomes:
At the end of the course, the students will be able to:
CO1: Explain the foundations of Quantum mechanics and concept of bonding in homo and hetero diatomic molecules like O2, CO etc.
CO2: Apply the principle of Band diagrams in the application of conductors and semiconductors. Properties and applications of nanomaterials.
CO3: Compare the materials of construction for battery, its working principles, fuel cells & electrochemical sensors.
CO4: Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.
CO5: Explain the principles of spectrometry, technique of HPLC in separation of solid and liquid mixtures. Summarize the concepts of Instrumental methods.

Text Books:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.

2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e,Oxford University Press, 2010.

3. G V Subba Reddy, K N Jayaveera, C Ramachandraiah, Engineering Chemistry, McGraw-Hill; First Edition, 2019.

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008

3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year I Semester

23CME101 BASIC CIVIL AND MECHANICAL ENGINEERING

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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.

PART A: BASIC CIVIL ENGINEERING

UNIT I   BASICS OF CIVIL ENGINEERING   8 hours

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   8 hours

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

UNIT III   TRANSPORTATION ENGINEERING   8 hours

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).

Course Outcomes:

CO1: Identify various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.

CO2: Measure of distances, angles and levels through surveying.

CO3: Identify various transportation infrastructures, sources of water and various water conveyance, storage structures like 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. FifthEdition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, KhannaPublishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, KhannaPublishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand andBrothers 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.

UNIT I   **8 hours**

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries andSociety- 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   **8 hours**

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   **8 hours**

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)

Course Outcomes:

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

CO1: Understand the role and importance of mechanical engineering and engineering materials

CO2: Identify the different manufacturing processes for engineering applications and explain the basics of thermal engineering and its applications.

CO3: Explain the working of different mechanical power transmission systems, power plants and robotics.

Text Books:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India)Pvt. Ltd.

2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications,(India) Pvt. Ltd.

3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengagelearning India Pvt. Ltd.

Reference Books:

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak MPandey, Springer publications

3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, TataMcGraw Hill publications (India) Pvt. Ltd.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

Dept. of Computer Science & Engineering (Data Science)

B. Tech I Year I Semester

23CSE101 INTRODUCTION TO PROGRAMMING

L   T P C
3   0 0 3

Course Objectives:
- Comprehensive knowledge to computer systems, programming languages, and problem-solving techniques.
- Know the concept of control structures and their usage in programming.
- Introduce to the arrays, memory models, and basic string concepts
- Gain a knowledge from the concept of functions, including declaration, definition, and various aspects of function usage.
- Acquire the advanced programming concepts, including user-defined data types, pointers, and file handling.

**UNIT I   INTRODUCTION TO PROGRAMMING AND PROBLEM   9 hours
         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   9 hours

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

UNIT III   ARRAYS AND STRINGS   9 hours

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings, String Operations and String functions.

UNIT IV   POINTERS & USER DEFINED DATA TYPES   9 hours

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions, Dynamic memory allocation.

UNIT V   FUNCTIONS & FILE HANDLING   9 hours

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

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

Course Outcomes:

A student after completion of the course will be able to

CO1: Illustrate the basic computer concepts and programming principles of C language.

CO2: Develop programs using various control structures in 'C'.

CO3: Design applications using arrays and basic string manipulation.

CO4: Demonstrate the applications of pointers, user-defined types and dynamic memory allocation.

CO5: Design various applications using functions and file concepts.

Text Books:

1. C Programming, A Problem Solving Approach, Forouzan, Gilberg,Prasad, CENGAGE, 3rd edition.

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-HillEducation, 2008.

2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition

3. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988

4. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education,1996

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year I Semester

23ENG201 COMMUNICATIVE ENGLISH LABORATORY

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L  T  P  C
0  0  2  1
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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.

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

Course Outcomes:

CO1: Understand the English speech sounds, stress, rhythm, intonation and syllabic division for better listening and speaking
CO2: Apply communication strategies and implement them in language learning activities.
CO3: Analyze and enhance job-relevant writing skills
CO4: Evaluate and exhibit professionalism in debates and group discussions.
CO5: Make effective presentations by developing public speaking abilities

Suggested Software:

1. Walden Infotech
2. Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.

2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India,2016

3. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed),Kindle, 2013

Web Resources:

Spoken English:
1. www.esl-lab.com
2. www.englishmedialab.com

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

Voice & Accent:
1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year I Semester

23CHE202 CHEMISTRY LABORATORY

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Course Objectives:

- Verify the fundamental concepts with experiments.

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method

2. Conductometric titration of strong acid vs. strong base

3. Conductometric titration of weak acid vs. strong base

4. Determination of cell constant and conductance of solutions

5. Potentiometry - determination of redox potentials and emfs

6. Determination of Strength of an acid in Pb-Acid battery

7. Preparation of a Bakelite

8. Verify Lambert-Beer's law

9. Wavelength measurement of sample through UV-Visible Spectroscopy

10. Identification of functional groups in simple organic compounds by IR

11. Preparation of nanomaterials by precipitation method

12. Estimation of Ferrous Iron by Dichrometry

Course Outcomes:

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

CO1: Determine the cell constant and conductance of solutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Measure the strength of an acid present in secondary batteries.
CO4: Measure the wavelength of absorption of some organic compounds using UV-Vis spectroscopy.
CO5: Determine the EMF & redox potentials using potentiometric titrations.

Reference Books:

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

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

Dept. of Computer Science & Engineering (Data Science)

B. Tech I Year I Semester
23CSE201 COMPUTER PROGRAMMING LABORATORY

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Course Objectives:
- Provide hands-on experience in programming fundamentals, algorithm design, and basic problem-solving techniques.
- Enable students to implement control structures for program flow control in practical scenarios.
- Reinforce understanding of arrays, memory models, and string manipulation through practical exercises
- Provide hands-on practice with functions, function calls, and parameter manipulation using pointers.
- Offer practical exposure to advanced programming concepts, including user-defined data types, file handling, and pointer operations.

UNIT I

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

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

WEEK 2
Objective: Getting familiar with how to formally describe a solution to a problem in a seriesof finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:
Tutorial 2: Problem-solving using Algorithms and Flow charts.
Lab 1: Converting algorithms/flow charts into C Source code.
Developing the algorithms/flowcharts for the following sample programs
  i) Sum and average of 3 numbers
  ii) Conversion of Fahrenheit to Celsius and vice versa
Simple interest calculation

WEEK 3
Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:
Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.
Problems to Practice:
  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

WEEK 4
Objective: Explore the full scope of expressions, type-compatibility of variables & constantsand operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:
Lab4: Write C program to solve Simple computational problems using the operator' precedence and associativity
Problems to Practice:
  i) Evaluate the following expressions.
      a. A+B*C+(D*E) + F*G
      b. A/B*C-B+A*D/3
      c. A+++B---A
      d. J= (i++) + (++i)
  ii) Find the maximum of three numbers using conditional operator
  iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5
Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:
Tutorial 5: Branching and logical expressions:
Lab 5: Write C program for Problems involving if-then-else structures.
Problems to Practice:
  i) Write a C program to find the max and min of four numbers using if-else.
  ii) Write a C program to generate electricity bill.
  iii) Find the roots of the quadratic equation.
  iv) Write a C program to simulate a calculator using switch case.
  v) Write a C program to find the given year is a leap year or not.

WEEK 6

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

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Write a C program for Iterative problems e.g., the sum of series

Problems to Practice:
   i)   Find the factorial of given number using any loop.
   ii)   Find the given number is a prime or not.
   iii) Compute sine and cos series
   iv)   Checking a number palindrome
   v)   Construct a pyramid of numbers.

UNIT III

WEEK 7:

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

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7:Write a C program to solve 1D Array manipulation, linear search

Problems to Practice:
   i)   Find the min and max of a 1-D integer array.
   ii)   Perform linear search on1D array.
   iii) The reverse of a 1D integer array
   iv)   Find 2's complement of the given binary number.
   v)   Eliminate duplicate elements in an array.

WEEK 8:

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

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Write a C program to solve Matrix problems, String operations, Bubble sort

Problems to Practice:
   i)   Addition of two matrices
   ii)   Multiplication two matrices
   iii) Sort array elements using bubble sort
   iv)   Concatenate two strings without built-in functions
   v)   Reverse a string using built-in and without built-in string functions

UNIT IV

WEEK 9:

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

Suggested Experiments/Activities:
Tutorial 9: Pointers, structures and dynamic memory allocation
Lab 9: Write a C program for Pointers and structures, memory dereference.
Problems to Practice:
  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 alongwith the total.
  v) Write a C program to implement realloc()

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

Suggested Experiments/Activities:
Tutorial 10: Bitfields, Self-Referential Structures, Linked lists
Lab10 : Bitfields, linked lists
Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the samewithout using bit- fields
  i) Create and display a singly linked list using self-referential structure.
  ii) Demonstrate the differences between structures and unions using a C program.
  iii) Write a C program to shift/rotate using bitfields.
  iv) Write a C program to copy one structure variable to another structure of the same type.

UNIT V

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

Suggested Experiments/Activities:
Tutorial 11: Functions, call by value, scope and extent,
Lab 11: Write a C program to solve Simple functions using call by value, solving differential equations using Eulerstheorem.
Problems to Practice:
  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'smethod

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

Suggested Experiments/Activities:
Tutorial 12: Recursion, the structure of recursive calls
Lab 12: Write C program for Recursive functions.
Problems to Practice:
   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.

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

Suggested Experiments/Activities:
Tutorial 13: Call by reference, dangling pointers
Lab 13: Write a C program to solve Simple functions using Call by reference, Dangling pointers.
Problems to Practice:
   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 to find no of lowercase, uppercase, digits and othercharacters using pointers.

WEEK14:
Objective: To understand data files and file handling with various file I/O functions. Explore thedifferences between text and binary files.

Suggested Experiments/Activities:
Tutorial 14: File handling
Lab 14: Write a C program to handle File operations.
Problems to Practice:
   i) Write a C program to write and read text into a file.
   ii) Write a C program to write and read text into a binary file using fread() andfwrite()
   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-linearguments.
   v) Find no. of lines, words and characters in a file.
Write a C program to print last n characters of a given file.

Course Outcomes:

CO1: Implement coding and debugging the simple programs, create algorithms, and practice problem solving strategies using programming languages.

CO2: Demonstrate programs that incorporate conditional statements, loops, and break/continue statements to control program execution.

CO3: Apply coding for real time examples with arrays, array indexing, and manipulate strings in programming tasks.

CO4: Create, call, and debug functions, modify function parameters using pointers, and gain practical knowledge of variable scope within functions.

CO5: Apply user-defined data types, manipulate files, pointer operations to solve real-world programming challenges.

Textbooks:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.

2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

Reference Books:

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

2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw Hill

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year I Semester

23ME201   ENGINEERING WORKSHOP

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Course Objectives:

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

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 Bridlejoint
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 punctureand 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.

Course Outcomes:

CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice

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, MediaPromoters 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.; AtulPrakashan, 2021-22.

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year I Semester

23HUM201   HEALTH AND WELLNESS, YOGA AND SPORTS

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

UNIT I   **5 hours**

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

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

UNIT II   **5 hours**

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

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

UNIT III   **5 hours**

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

Activities:
i)   Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
ii) Practicing general and specific warm up, aerobics
iii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Course Outcomes:
After completion of the course the student will be able to
CO1: Understand the importance of yoga and sports for Physical fitness and sound health.
CO2: Demonstrate an understanding of health-related fitness components.
CO3: Compare and contrast various activities that help enhance their health.
CO4: Assess current personal fitness levels.
CO5: Develop Positive Personality

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning,2022

2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice

3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993

4. Wiseman, John Lofty,

5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. HumanKinetics, Inc.2014

General Guidelines:

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

Evaluation Guidelines:

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

I Year II Semester

B. Tech I Year II Semester

23MAT102 DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

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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.

**UNIT I   DIFFERENTIAL EQUATIONS OF FIRST ORDER AND   9 hours
                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   9 hours
                (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   9 hours

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   9 hours

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   9 hours

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.

Course Outcomes:

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

CO1: Find the solution of engineering problems formulated in the form of linear first order differential equations.

CO2: Solve the linear higher order differential equations related to various engineering fields.

CO3: Determine the solutions for linear partial differential equations that model the physical processes.

CO4: Interpret the physical meaning of different operators such as gradient, curl and divergence.

CO5: Estimate the work done against field, circulation and flux using vector calculus.

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition

2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10thEdition.

Reference Books:

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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year II Semester

23PHY101 ENGINEERING PHYSICS

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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.

UNIT I   WAVE OPTICS   9 hours

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

UNIT II   CRYSTALLOGRAPHY AND X-RAY DIFFRACTION   9 hours

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   QUANTUM MECHANICS AND FREE ELECTRON THEORY   9 hours

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 IV   SEMICONDUCTORS   9 hours

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.

UNIT V   DIELECTRIC AND MAGNETIC MATERIALS   9 hours

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.

Course Outcomes:

CO1: Apply the knowledge of Interference, Diffraction and Polarization techniques for materials testing and explore their applications in both science and technology.

CO2: Explain the crystal structure in terms of atomic positions, unit cells, and crystal symmetry and also relate the crystal symmetry to the symmetry observed in a diffraction pattern.

CO3: Evaluate the Schrodinger wave equations for simple potentials and explain the concept of conductivity of different types of materials.

CO4: Distinguish the semiconductors using Fermi level and identify the type of semiconductors using Hall effect.

CO5: Explain the origin of fundamental magnetic phenomena and types of magnetic materials. Understand the induced fields in dielectrics, and electrical behaviour of dielectrics.

Text Books:

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS ArunMurthy, 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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year II Semester
23ME101 ENGINEERING GRAPHICS
L T P C
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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.

UNIT I   9 hours

Introduction: Lines, Lettering   and   Dimensioning,Geometrical   Constructions   and Constructing regular polygons by general methods.
Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.
Scales: Plain scales, diagonal scales and vernier scales.

UNIT II   9 hours
Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.
Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes
Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III   9 hours
Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV   9 hours
Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.
Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V **9 hours**

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

Computer graphics: Creating 2D&3D drawings ofobjects including PCB and Transformations using Auto CAD (Not for end examination).

Course Outcomes:

Students will use the Auto CAD software and will be able to

CO1: Construct the geometrical constructions, engineering curves and scales.

CO2: Draw the projections of points, straight lines and planes

CO3: Draw the projections of solids in various positions

CO4: Sketch the sections of solids and developments of surfaces

CO5: Draw the conversion of the isometric views to orthographic views and vice versa.

Text Books:

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

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.

2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.

3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, TataMcGraw Hill, 2017.

Mode of Evaluation: Day-to-day Evaluation, Mid Term Tests and End Semester Examination.

B. Tech I Year II Semester

23EEE101 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P	C
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.

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I   DC & AC CIRCUITS   8 hours

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   8 hours
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   8 hours
**   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 electricitytariff, 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

Course Outcomes:
  After the completion of the course students will be able to
  CO1: Infer the basic AC and DC electrical circuits.
  CO2: Analyze construction and operation of AC and DC machines, different electrical measuring
       instruments.
  CO3: Illustrate operation of various power generating stations, energy consumption and electrical
       safety.

Text Books:

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

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, ThirdEdition

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. Mehta, S.Chand Technical Publishers, 2020

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

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

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.

UNIT I   SEMICONDUCTOR DEVICES   8 hours

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   8 hours
**   INSTRUMENTTAION**

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

UNIT III   DIGITAL ELECTRONICS   8 hours

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 BooleanAlgebra, Truth Tables

and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Course Outcomes:

After the completion of the course students will be able to

CO1: Explain the theory, construction, and operation of electronic devices.

CO2: Apply the concept of science and mathematics to explain the working of diodes, transistors, and their applications.

CO3: Analyze logic gates and its applications in design of combinational circuits.

Text Books:

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

Reference Books:

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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

Dept. of Computer Science & Engineering (Data Science)

B. Tech I Year II Semester

23CSE102 DATA STRUCTURES

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L  T  P  C
3  0  0  3
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Course Objectives:
- To attain proficiency in essential knowledge and skills for effectively employing linear data structures and making informed decisions when utilizing them to tackle real-world practical challenges.
- To gain a comprehensive understanding of linked lists, including their different types, operations, and practical applications.
- To explore stacks properties, operations and how stacks are utilized for the evaluation of mathematical expressions, including infix, postfix, and prefix notations.
- To understand the concepts of queues, their operations, and their applications in areas like breadth-first search and scheduling.
- To Provide an overview of Trees and Hashing as a technique for data organization.

UNIT I   9 hours

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   9 hours
Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists
Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists

UNIT III   9 hours
Applications of stacks in expression evaluation, backtracking, reversing list etc.
Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.
Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

UNIT IV   9 hours
Trees: Introduction to Trees, Binary Tree, Tree Traversal, Binary Search Tree – Insertion, Deletion & Traversal, Height Balanced Trees, Heap Tree, Heap Sort

UNIT V   9 hours
Graphs: Representations, Biconnected components, Topological sort.
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.

Course Outcomes:

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

CO1: Apply their knowledge and skills in the context of linear data structures, algorithmic analysis, searching, and sorting, enabling them to solve practical problems.

CO2: Implement linked lists, stack and their applications.

CO3: Implement queues and its applications.

CO4: Implement tree operations for binary tree, binary search tree, height balanced trees and heap tree.

CO5: Design graph and analyse various collision resolution techniques for hashing.

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 Basic Toolbox by Kurt Mehlhorn and PeterSanders

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 DavidRanum

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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech I Year II Semester

23PHY201 ENGINEERING PHYSICS LABORATORY

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0  0  2  1
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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.

List of Experiments:

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

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

Course Outcomes:

CO1: Know the various phenomena of light practically and gain knowledge about various optical technique methods.

CO2: Verify the theoretical concepts of optics, magnetism and dielectrics by hands on experiment.

CO3: Apply the scientific process in the conduct of semiconductor experiments and report the experimental findings.

CO4: Understand mechanical phenomena by instruments and apply them in real time applications.

CO5: Acquire and interpret experimental data to examine the physical laws.

Web Resources:

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

Reference Books:

1. A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; AtulPrakashan, 2021-22.

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year II Semester
    23EEE201 ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP

                                                               L T P C
                                                               0 0 3 1.5

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

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 usedby 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 thestudents.
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 LABORATORY

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

Note: Minimum Six Experiments to be performed.

Course Outcomes:
At the end of the course, the student will be able to
CO1: Analyze basic DC circuits.
CO2: Understand the usage of common electrical & electronic measuring instruments.
CO3: Understand the basic characteristics of electrical machines and perform energy calculations.

PART B: ELECTRONICS ENGINEERING LABORATORY

Course Objectives:

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

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifier.
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 gatesusing ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

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

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

Course Outcomes:

At the end of the course, the student will be able to
CO1: Plot and discuss the characteristics of various electron devices.
CO2: Explain the operation of a digital circuit.

Reference Books:

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

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech I Year II Semester

23CSE202 IT WORKSHOP

L T P C
0 0 2 1

Course Objectives:
- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSSTo 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.

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

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

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

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

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

Internet & World Wide Web
Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finallystudents should demonstrate, to the instructor, how to access the websites and email. If there isno internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

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

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

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

LaTeX and WORD

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

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

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

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

EXCEL

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

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

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

LOOKUP/VLOOKUP

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

POWER POINT

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

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

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

AI TOOLS – ChatGPT

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

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

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
• Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
• Ex:Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Course Outcomes:
CO1: Gain expertise in computer hardware, assembly, and dual-boot OS configuration, enhancing their ability to manage and troubleshoot computer systems effectively.
CO2: Learn to connect to the LAN, configure browsers, use search engines effectively, and practice cyber hygiene for secure internet use.
CO3: Create well-formatted documents and presentations using Microsoft Office and Latex
CO4: Gain proficiency in using Excel or its FOSS equivalent for tasks like scheduling, GPA calculation, data manipulation, and formatting.
CO5: Craft effective and tailored inputs to obtain desired responses from AI tools like ChatGPT.

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

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

Dept. of Computer Science & Engineering (Data Science)

B. Tech I Year II Semester
23CSE203 DATA STRUCTURES LABORATORY

L	T	P	C
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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.

List of Experiments:

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

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

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

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

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

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

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

Exercise 8: Binary Tree & Binary Search Tree
   i) Implement Binary tree using array and linked list.
   ii) Implement BST using Linked List.
   iii) Traversing of BST.

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

Course Outcomes:

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

CO1: Implement different types of sorting and searching algorithms using array.

CO2: Demonstrating the different types of linked lists with its basic operations and applications.

CO3: Develop programs using stacks to handle evaluating expressions and solve related problems.

CO4: Apply queue-based algorithms for efficient task scheduling and other related real world problems.

CO5: Implement trees, graph and recognize scenarios where hashing is advantageous and design hash-based solutions for specific problems.

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 Basic Toolbox by Kurt Mehlhorn and PeterSanders

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 DavidRanum

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.

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

Dept. of Computer Science & Engineering (Data Science)

B. Tech I Year II Semester
      23HUM202 NSS/NCC/SCOUTS AND GUIDES/COMMUNITY SERVICE

              L   T   P   C
              0   0   1   0.5

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

UNIT I   ORIENTATION   5 hours

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

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

UNIT II   NATURE & CARE   5 hours
Activities:
i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III   COMMUNITY SERVICE   5 hours
Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Surveyin the village, identification of problems- helping them to solve via media-authorities-experts-etc.

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

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

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

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

Course Outcomes:

After completion of the course the students will be able to

CO1: Understand the importance of discipline, character and service motto.

CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.

CO3: Explore human relationships by analyzing social problems.

CO4: Determine to extend their help for the fellow beings and downtrodden people.

CO5: Develop leadership skills and civic responsibilities.

Reference Books:

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

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

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

II Year I Semester

Dept. of Computer Science & Engineering (Data Science)

B. Tech II Year I Semester
23HUM101 UNIVERSAL HUMAN VALUES

L	T	P	C
2	1	0	3

Course Prerequisite: None or Universal Human Values – I (desirable)

Course Description :
The course has 28 lectures and 14 tutorials in 5 Units. 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.

Course Objectives: None. Universal Human Values-I (desirable)
The main objectives of the course is to
1. help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure happiness and prosperity in continuity, which are the core aspirations of all human beings.
2. facilitate the development of a Holistic perspective among students towards life and profession based on right understanding of the Human reality, family, society and the rest of nature. Such holistic perspective forms the basis of Universal Human Values (UHV) and movement towards value-based living in a natural way.
3. highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
4. aid the students to realize their full human potential and act accordingly.
5. assist the students to live with feeling of relationship, harmony and co-existence.

UNIT I   INTRODUCTION TO VALUE EDUCATION   8 hours
Lecture 1: Understanding Value Education
Lecture 2: self-exploration as the Process for Value Education
Tutorial 1: Practice Session PS1 - Sharing about Oneself
Lecture 3: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of 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   8 hours
Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 - Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 - Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 - Exploring Harmony of self with the body

UNIT III HARMONY IN THE FAMILY AND SOCIETY   **10 hours**
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 - Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 - Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 - Exploring Systems to fulfil Human Goal

UNIT IV HARMONY IN THE NATURE/EXISTENCE   **8 hours**
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 –   **8 hours**
           A LOOK AT PROFESSIONAL ETHICS
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

Course Outcomes:

At the end of this course students will demonstrate the ability to
CO1: Understand the Natural Acceptance and basic human aspiration.
CO2: Aware of themselves and self-regulation.
CO3: Recognize human-human relationship (Justice) and identify human goals in the society.
CO4: Appreciate the harmony in the nature and existence.
CO5: Develop as socially and ecologically responsible engineers in handling problems with sustainable
        solutions (user-friendly and eco-friendly).

Text Books:

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

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

Online Learning 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
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

10. https://uhv.org.in/

11. https://www.youtube.com/@UniversalHumanValues/playlists

12. https://fdp-si.aicte-india.org/index.php

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

Dept. of Computer Science & Engineering (Data Science)

B. Tech II Year I Semester
    23HUM102 ECONOMICS AND FINANCIAL ACCOUNTING FOR ENGINEERS

L	T	P	C
2	0	0	2

Course Prerequisite: NIL

Course Description:
The Engineering Economics and Financial Accounting aims to provide an insight into production, cost analysis, market structure, Accounting Basic concepts and financial Statement Analysis. The course is designed to give emphasis on the application of real life examples on various fundamental issues of economics and accounts. This course introduces the accounting system, principles, types of accounts, and financial statements etc. The ratio analysis and financial analysis are useful to know the positions of financial statements are explained to know the analysis of financial matters.

Course Objectives:
This course enables students to
1. Describe the nature of engineering economics in dealing with the issues of scarcity;
2. Know the supply, demand, production and cost analysis to analyze the impact of economic events on markets;
3. Explain the different market structures and price determination in various market conditions.
4. Explain the accounting principles, types of accounting and preparation of final accounts; and
5. Describe the financial statement analysis and investment evaluation through ratios and capital budgeting techniques.

UNIT I   DEMAND ANALYSIS   **7 hours**
Scope and Significance of Economics- Elements of market Economy: Demand, Supply and Market Equilibrium- Theory of Demand, Elasticity of Demand, Supply and Law of Supply.

UNIT II   PRODUCTION AND COST ANALYSIS   **7 hours**
Production Function – Short-run and long-run production – Cost Analysis: Cost concepts - Cost Structure of Firms and Output Decision- Break-Even Analysis (BEA) – significance and Limitations of BEA - Determination of Break Even Point (Simple Problems).

UNIT III MARKET STRUCTURE AND PRICING   **6 hours**
Classification of Markets - General Equilibrium and efficiency of Perfect competition, Monopoly, Monopolistic – Price determination under Perfect, Monopoly, and Monopolistic Competition, Pricing objectives- Pricing Strategies.

UNIT IV BASICS OF ACCOUNTING   **7 hours**
Accounting - Double Entry System - Accounting Principles - Classification of Accounts - Rules of Debit & Credit- Accounting Cycle: Journal, Ledger, Trial Balance. Final Accounts: Trading Account - Profit & Loss Account - Balance Sheet with Adjustments, (Simple Problems).

UNIT V   FINANCIAL RATIO ANALYSIS AND CAPITAL BUDGETING   **7 hours**
Ratio Analysis - Liquidity, Solvency, Activity and Profitability Ratios - Capital Budgeting. (Simple Problems).

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Understand Engineering economics basic concepts,

CO2: Analyze the concepts of demand, elasticity, supply, Production, Cost Analysis and its essence in floating of an organization,

CO3: Compare various different market structures and identify suitable market,

CO4: Demonstrate an understanding and analyzing the accounting statements, and

CO5: Exhibit the ability to apply knowledge of ratio analysis and capital budgeting techniques in financial statement analysis and investment evaluation respectively.

Text Books:

1. Case E. Karl & Ray C. Fair, "Principles of Economics", Pearson Education, 8th Edition, 2007

2. Aryasri: Business Economics and Financial Analysis, 4/e. MGH.

3. Financial Accounting, S. N. Maheshwari, Sultan Chand, 2009

4. Varshney & Maheswari: Management Economics, Sultan Chand

5. Financial Statement Analysis, Khan and Jain, PHI, 2009

6. Financial Management, Prasanna Chandra, T.M.H, 2009

Reference Books:

1. Lipsey, R. G. & K. A. Chrystal , "Economics", Oxford University Press, 11th Edition, 2007

2. Samuelson P. A. & Nordhaus W. D. "Economics", Tata McGraw-Hill 18th Edition, 2007

3. Financial Management and Policy, Van Horne, James, C., Pearson, 2009.

4. Financial Management, I. M. Pandey, Vikas Publications

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech II Year I Semester
   23MAT107 PROBABILITY AND STATISTICS FOR COMPUTER SCIENCE

	L	T	P	C
	3	0	0	3

Course Prerequisite: **23MAT101, 23MAT102**

Course Description:

This course provides an introduction to probability, distributions and statistics with applications. Topics include: Conditional probability, Random variables, Probability distributions, Joint densities, Bayesian inference, descriptive statistics, Correlation and Regression, Estimation, Confidence intervals, Hypothesis testing.

Course Objectives:

This course enables students to

1. To extend and formalize knowledge of the theory of probability and random variables.
2. To solve real time problems in engineering and science by using discrete and continuous distributions
3. To analyze and interpret basic summary and modeling techniques for Multi-variate data
4. To analyze the data by using descriptive statistics for decision making
5. To apply the statistical inference involving confidence interval and hypothesis testing in data analysis.

UNIT I   PROBABILITY   9 hours

Introduction to Probability, Sample space and events, axioms of probability, theorems on probability, conditional probability, multiplication theorem and independence of events, Baye's theorem.

Random variables (discrete and continuous), probability density functions, distribution function, mathematical expectation, properties. moment generating function.

UNIT II   PROBABILITY DISTRIBUTIONS   9 hours

Discrete probability distributions - Binomial, Poisson, Geometric and their properties

Continuous probability distributions - Uniform, Exponential, Gamma, Normal distributions and their properties, Chebychev's inequality.

UNIT III JOINT DISTRIBUTIONS   9 hours

Joint densities and Independence - Marginal distributions (discrete & continuous)- Expectation and Covariance, Correlation, Conditional densities and Regression, Curves of regression, Transformation of random variables.

UNIT IV STATISTICS FOR DATA ANALYSIS   9 hours

Data Visualization, Moments, skewness, kurtosis, correlation, correlation coefficient, rank correlation, principle of least squares, lines of regression, regression coefficients and their properties.

UNIT V   STATISTICAL INFERENCE   9 hours

Population, sampling, Estimation, Point estimation, MLE, formulation of null hypothesis, alternative hypothesis, level of significance, types of errors and power of the test. Large Sample Tests: Test for single mean, single proportion, difference of means, difference of proportions, Confidence interval for parameters in one sample and two sample problems, t test for single mean, difference of means, test for ratio of variances.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Understand the probability concepts and their importance in engineering.

CO2: Apply discrete and continuous probability distributions to solve various engineering problems.

CO3: Get an idea about joint density functions, distribution functions to the random variables and analyse the multivariate problems in engineering

CO4: Apply the method of least squares to estimate the parameters of a regression model.

CO5: Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.

Text Books:

1. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.
2. Dr.B.S.Grewal, " Higher Engineering Mathematics", Khanna Publications, 42nd Edition.

Reference Books:

1. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2012.
3. Dean G. Duffy, "Advanced Engineering Mathematics with MATLAB", CRC Press, Third Edition 2013.

E Books:

1. http://nptel.ac.in/courses/IIT-MADRAS/Principles_of_Communication1/Pdfs/1_5.pdf
2. https://www.khanacademy.org

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

Dept. of Computer Science & Engineering (Data Science)

B. Tech II Year I Semester

23CSD101 DATABASE SYSTEMS

L   T   P   C

3   0   0   3

Course Objectives:

1. To understand the concept of DBMS and ER Modeling.
2. To explain the normalization, Query optimization and relational algebra.
3. To have an introductory knowledge about the storage and query processing techniques and the basic concepts of Information retrieval techniques
4. To learn about the internal storage structures using different file and indexing techniques which will help in physical DB design
5. To apply the concurrency control, recovery, security and indexing for the real time data.

UNIT I   DATABASE SYSTEMS CONCEPTS AND DATA MODELING   9 hours

Introduction to Databases- File System Vs Database System - Data Models- Schemas and Instances - DBMS Architecture- Centralized - Client Server - Database Applications, Types of Databases.

Entity Relationship Model: Types of Attributes, Entities and Entity set, Relationship, Structural Constraints - Relational Model, Relational model Constraints - Mapping ER model to a relational schema - Integrity Constraints, Specialization and generalization using ER Diagrams.

UNIT II   SQL   9 hours

The Database Language SQL – Simple Queries in SQL – Queries Involving Morethan One Relation, SQL functions(Data & Time, String conversion, Sub Queries, aggregate operators, null values, complex integrity constraints, triggers, views and indexes, Dynamic SQL, Cursors, Introduction to JDBC, Stored Procedures.

UNIT III   NORMALIZATION   9 hours

Translating SQL Queries into Relational Algebra and Relational Calculus, Guidelines for Relational Schema – Functional dependency; Normalization, Boyce Codd Normal Form, Multi-valued dependency and Fourth Normal form; Join dependency and Fifth Normal form

UNIT IV   DATA STORAGE AND TRANSACTION MANAGEMENT   9 hours

Storage strategies: Indices, B-trees, B+-trees, hashing. Two-Phase Locking Techniques for Concurrency Control -ACID Property– Concurrency Control based on timestamp – Recovery Concepts – Recovery based on deferred update – Recovery techniques – Buffer management

UNIT V   SECURITY AND RECENT TRENDS   9 hours

Database Authentication, Authorization and access control, DAC, MAC and RBAC models, SQL injection. Introduction, Need of NoSQL, CAP Theorem and Recent trends.

Course Outcomes:

   Upon successful completion of the course, students will be able to
   CO1: Construct an ER model and derive the relational schemas from the model.
   CO2: Understand the conceptual and logical database design using SQL queries.
   CO3: Apply Normalization to improve database design.
   CO4: Interpret the basic issues of storage and transaction management.
   CO5: Analyse the fundamental security concepts for database

Text Books:

1. A. Silberschatz, H. F. Korth S. Sudershan, Database System Concepts, McGraw Hill, 7th Edition 2021.

2. R. Elmasri S. B. Navathe, Fundamentals of Database Systems, Addison Wesley, 2015

Reference Books:

1. Raghu Ramakrishnan,Database Management Systems,Mcgraw-Hill,4th edition,2015.

2. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation and Management,6th Edition,2012.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

Dept. of Computer Science & Engineering (Data Science)

B. Tech II Year I Semester

23CSD102 DESIGN AND ANALYSIS OF ALGORITHMS

L T P C

3 0 0 3

Course Objectives:

The main objectives of the course are to
1. Introduce the concepts of algorithm analysis, Tree and Graph applications.
2. Discuss various algorithm design strategies with examples.
3. Introduce NP-Hard and NP-Complete problem concepts

UNIT I   9 hours

Introduction to Algorithm Analysis, Space and Time Complexity Analysis, Asymptotic Notations. AVL Trees – Creation, Insertion, Deletion Operations and Applications, B-Trees – Creation, Insertion, Deletion operations and Applications, Graphs – Basic search and Traversals

UNIT II   9 hours

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication. Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees

UNIT III   9 hours

Dynamic Programming: General Method, Allpairs shortest paths, Single Source Shortest Paths– General Weights (Bellman-Ford Algorithm), 0/1 Knapsack, Travelling Salesperson problem

UNIT IV   9 hours

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring.

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

UNIT V   9 hours

NP-Hard and NP-Complete Problems: Basic Concepts, Cook's theorem. NP-Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP). NP-Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

Course Outcomes:

After completion of the course, students will be able to

CO1: Illustrate the working of the advanced tree and graph data structures and their applications.

CO2: Design Divide and Conquer strategy and Greedy method for different problems.

CO3: Demonstrate Dynamic programming method to solve problems.

CO4: Apply Backtracking and Branch & bound strategy to solve problems.

CO5: Understand NP-Hard and NP-Complete problems

Text Books:

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

2. Computer Algorithms in C++, Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition University Press

3. Financial Accounting, S. N. Maheshwari, Sultan Chand, 2009

4. Varshney & Maheswari: Management Economics, Sultan Chand

5. Financial Statement Analysis, Khan and Jain, PHI, 2009

6. Financial Management, Prasanna Chandra, T.M.H, 2009

Reference Books:

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

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

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

4. Data Structures using C & C++: Langsam, Augenstein&Tanenbaum, Pearson, 1995

5. Algorithms + Data Structures & Programs:, N.Wirth, PHI

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

Online Resources:

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

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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech II Year I Semester

23CSD104 JAVA PROGRAMMING

L	T	P	C
3	0	0	3

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 interfaces in Java applications.
4. Understand how to use Java packages, Exceptions and I/O Streams for program development.
5. Understand how to design applications with threads in Java.

UNIT I   FUNDAMENTAL BUILDING BLOCKS   9 hours

Object Oriented Programming: Basic concepts, Program Structure in Java: Introduction, Writing Simple Java Programs, Data types, Type casting, Tokens in Java Programs, Java Statements –Control statements, Looping Statements, Break Statement, Continue Statement. Command Line Arguments, User Input to Programs, Escape Sequences, Comments, Programming Style.
Arrays: one dimensional and multi-dimensional array.

UNIT II   CLASSES AND METHODS   9 hours

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, this and static keywords.
Methods: Introduction, Defining Methods, Overloaded Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods.

UNIT III   INHERITANCE   9 hours

Inheritance: Basics, Types of Inheritances, Usage of Super, Method Overriding, Abstract Classes, Final Keyword.
Interfaces: Creating, Implementing, Using, Extending, and Nesting of interfaces.

UNIT IV   PACKAGES AND STREAMS   9 hours

Packages: Defining, Finding and Importing packages, Member Access.
Exception Handling: Fundamentals, Types, Multiple catch clauses, Nested try blocks, Thrown Class, Using Finally and Throws, Built-in exceptions, User-defined exceptions.
I/O Streams: Byte Stream Classes and Character Stream Classes.

UNIT V   MULTITHREADED PROGRAMMING   9 hours

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.
Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Course Outcomes:
After completion of the course, students will be able to
  CO1: Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.
  CO2: Design and implement classes to model real-world entities, with a focus on attributes, behaviours, and relationships between objects.
  CO3: Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and interface concept.
  CO4: Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.
  CO5: Develop multithreaded applications with synchronization.

Text Books:
1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.

2. Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.

Reference Books:
1. The complete Reference Java, 11thedition, Herbert Schildt,TMH

2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

3. JAVA for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, 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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech II Year I Semester
23CSD201 DATABASE SYSTEMS LABORATORY

	L	T	P	C
	0	0	3	1.5

Course Objectives:
1. To understand the components of DBMS and to study the database design.
2. To study the retrieval of data using relational algebra and calculus and the concept of normal forms in the design of database.
3. To comprehend the structure of SQL Queries to query, update, and manage a database.
4. To understand all constraints to develop a business application using cursors, triggers and stored procedures.
5. To provide sufficient skill to utilize the DBMS concept in real time applications.

List of Programs:
1. Design Conceptual database schema using ER Modelling Software Tools.
2. Development of Relational Database Schemas for Deposit/Customer/ borrow/ branch using DDL Constructs of SQL.
3. To perform various data manipulation commands such as select, insert, update etc. of SQL on Relational Database.
4. To perform various DCL and TCL construct of SQL on Relational Database.
5. Implement different types of referential and integrity constraints on Relation Database.
6. To apply the concept of Aggregating Data using Group functions.
7. To retrieve the queries using Group by, Having and Order by clauses of SQL.
8. Design and development of Banking database and perform various type of JOIN operations.
9. Insert the Data into table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL
10. Write a trigger that automatically deletes students when they graduate
11. Develop programs using features parameters in a CURSOR for UPDATE
12. a) Create a cursor to update the salary of employees in EMP table.

    b) Write a PL/SQL program to raise an Exception when the bonus exceeds salary.
13. Design and implementation real time project with database connection.

Course Outcomes:
Upon successful completion of the course, students will be able to
   CO1: Perform table creation, maintain, and manipulate a relational database using SQL.
   CO2: Implement complex queries using SQL.
   CO3: Apply Queries using Advanced Concepts of SQL.
   CO4: Build PL/SQL programs including stored procedures, functions, cursors and triggers.
   CO5: Develop a real-world application to access and render data.

Reference Books:

1. NetworkAnalysis–MEVanValkenburg,PrenticeHallofIndia,revised3rdEdition,2019.
2. EngineeringCircuitAnalysisbyWilliamH.Hayt,JackKemmerly,JamiePhillips,StevenM.Durbin,9th Edition2020.

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech II Year I Semester

23CSD202 JAVA PROGRAMMING LABORATORY

L	T	P	C
0	0	3	1.5

Course Objectives:

The aim of this course is to

1. Practice object-oriented programming in the Java programming language
2. Implement Classes, Objects, Methods, Inheritance and interfaces concepts.
3. Illustrate implement Packages and Exception handling mechanism.
4. Construct Threads and various states.

List of Experiments:

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

2. Write a Java program that checks whether a given string is a palindrome or not.
   Ex: MADAM is a Palindrome.

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

4. Write a JAVA program to implement constructor overloading.

5. Write a JAVA program implement method overloading.

6. Write a JAVA program to implement multi level Inheritance

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

8. Write java program to create a super class called Figure that receives the dimensions of two dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub class overridden area() so that it returns the area of a rectangle and a triangle respectively.

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

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

11. Write a JAVA program that import and use the user defined packages

12. Write a JAVA program that describes exception handling mechanism

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

    c) Write a Program illustrating Daemon Threads.

    d) Write a JAVA program Producer Consumer Problem

Course Outcomes:

After completion of the course, students will be able to

CO1: Demonstrate a solid understanding of Java syntax, including data types, control structures, methods, classes, objects, inheritance, polymorphism, and exception handling.

CO2: Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively.

CO3: Familiar with commonly used Java Packages and exception handling in real time applications.

CO4: Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges.

CO5: Proficiently construct multi-threading applications.

Reference Books:

1. P. J. Deitel, H. M. Deitel, "Java for Programmers", Pearson Education, PHI, 4th Edition, 2007.

2. P. Radha Krishna, "Object Oriented Programming through Java", Universities Press, 2nd Edition, 2007.

3. Bruce Eckel, "Thinking in Java", Pearson Education, 4th Edition, 2006.

4. Sachin Malhotra, Saurabh Chaudhary, "Programming in Java", Oxford University Press, 5th Edition, 2010.

Online Resources:

1. https://java-iitd.vlabs.ac.in/

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

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

Dept. of Computer Science & Engineering (Data Science)

B. Tech II Year I Semester
Skill Enhancement Course - I

23CSD601 PYTHON PROGRAMMING

L	T	P	C
1	0	2	3

Course Objectives:

The main objectives of the course are to
1. Introduce core programming concepts of Python programming language.
2. Learn to solve problems using Python conditional and loops.
3. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
4. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications.
5. Demonstrate to do input/output with files in Python.

UNIT I	**DATA TYPES, EXPRESSIONS AND CONTROL FLOW STATEMENTS**	**6 hours**

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

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

Sample Experiments:
1. Write a program to find the largest element among three Numbers.
2. Write a program to swap two numbers without using a temporary variable.
3. Demonstrate the following Operators in Python with suitable examples.
   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operatorsiv) Logical Operators
   v) Bit wise Operators vi) Ternary Operator vii) Membership Operatorsviii) Identity Operators

UNIT II	**LISTS & DICTIONARIES**	**6 hours**

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Sample Experiments:
4. Write a program to perform the given operations on a list:
   i. Addition ii. Insertion iii. slicing
5. Write a program to perform any 5 built-in functions by taking any list.
6. Write a program to sum all the items in a given dictionary.

UNIT III   TUPLES AND SETS   6 hours

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:
7.   Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
8.   Write a program to count the number of vowels in a string (No control flow allowed).
9.   Write a program to check if a given key exists in a dictionary or not.

UNIT IV   FUNCTIONS & STRINGS   6 hours

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.
Sample Experiments:
10.   Write a program to define a function with multiple return values.
11.   Write a program to define a function using default arguments.
12.   Write a program to find the length of the string without using any library functions.

UNIT V   FILES HANDLING IN PYTHON   6 hours

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.
Sample Experiments:
13.   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.
14.   Implement a Python program to print each line of a file in reverse order.
15.   Write a Python program to compute the number of characters, words and lines in a file.

Course Outcomes:
Upon successful completion of the course, students will be able to
  CO1: Understand to adept command of Python syntax, deftly utilizing variables, data types, and control structures.
  CO2: Interpret Strings, functions, modules, exception handling to engineer robust and efficient code solutions.
  CO3: Apply Python programming concepts like Lists and Dictionaryto solve a variety of computational problems.
  CO4: Build and manipulate fundamental data structures such as tuples and sets.
  CO5: Demonstrate file handling concepts in python.

Text Books:

1. Gowri 77hankar S, Veena A., Introduction to Python Programming, CRC Press.

2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024.

Reference Books:

1. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

2. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.

Online Resources:

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

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

II Year II Semester

B. Tech II Year II Semester

23MAT108 DISCRETE MATHEMATICAL STRUCTURES

	L	T	P	C
	3	0	0	3

Course Prerequisite: 23MAT101

Students should have a solid understanding of high school-level algebra, including Set notions, Relations, Functions, Permutations-Combinations, equations, and inequalities.

Course Description:

Discrete Mathematical Structures is a foundational course designed to introduce students to the essential concepts and structures of discrete mathematics. This course is crucial for students in computer science, information technology, computing, and related fields, providing the mathematical framework necessary for the analysis and design of algorithms, data structures, learning and intelligent systems.

Course Objectives:

This course enables students to

1. Develop a strong foundation in propositional and predicate logic, enabling the analysis and construction of logical arguments and proofs.
2. Master various counting techniques and understand the properties of algebraic structures such as groups and binary operations.
3. Gain a deep understanding of relations, equivalence classes, order relations, lattices, and Boolean algebras.
4. Learn to model and solve problems using sequences and recurrence relations, both homogeneous and nonhomogeneous.
5. Study the fundamental concepts of graph theory, including paths, cycles, trees, and the various types of graphs and their properties.

UNIT I   LOGICAL STRUCTURES   9 hours

Introduction- Propositions and Truth Values- Logical Connectives and Truth Tables-Tautologies and Contradictions -Logical Equivalence and Logical Implication -The Algebra of Propositions - Arguments - Formal Proof of the Validity of Arguments -Predicate Logic - Arguments in Predicate Logic (Theory of Inference).

UNIT II   COUNTING TECHNIQUES AND ALGEBRAIC STRUCTURES   9 hours

Counting Techniques- Pigeonhole principle- Inclusion-exclusion principle- Binary Operations and Their Properties- Algebraic Structures- Groups in Modular Arithmetic - Cyclic Groups- Groups of Permutations- Substructures-Morphisms.

UNIT III ORDERED STRUCTURES   9 hours

Relations and Their Representations- Equivalence Classes and Partitions- Order Relations- - Hasse Diagrams-Lattices- Properties of Lattices- Boolean Algebras – Properties of Boolean Algebras-Boolean Functions- Minimization of Boolean Expressions.

UNIT IV RECURRENCE RELATIONS   9 hours

Sequences - Recurrence Relations- Applications of Recurrence Relations- Modeling with Recurrence Relations- Solving Linear Recurrence Relations- Solving Linear Homogeneous Recurrence Relations with Constant Coefficients- Linear Nonhomogeneous Recurrence Relations with Constant Coefficients-Generating Functions- Useful facts about Power Series- Using Generating Functions to Solve

Recurrence Relations

UNIT V   GRAPH STRUCTURES   9 hours
Graphs-Graph Terminology and Special Types of Graphs-Representing Graphs and Graph Isomorphism-Connectivity-Euler and Hamilton Paths-Shortest-Path Problems-Planar Graphs -Graph Coloring-Introduction to Trees-Spanning Trees-Minimum Spanning Trees.

Course Outcomes:
At the end of this course students will demonstrate the ability to
CO1: Evaluate the elementary logical arguments and identify the fallacious reasoning for the syntax of programming languages.
CO2: Utilize counting principles in computing techniques and algorithm analysis, and learn the properties of various algebraic structures.
CO3: Analyze various types of relations, equivalence classes, partitions using Hasse diagrams, and the properties of lattices and Boolean algebra.
CO4: Apply recurrence relations to model and solve many computational problems by generating functions.
CO5: Identify the special types of graphs for analyzing the connectivity models, and also study the properties of trees.

Text Books:

1. Rowan Garnier and John Taylor, Discrete Mathematics (Proof, Structures and Applications), CRC Press, an informa business, 3rd Edition, 2009.
2. Kenneth H. Rosen, Discrete Mathematics and its applications, 6th Edition, Tata McGraw Hill, 2011.

Reference Books:

1. J.P. Trembley and R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill – 13th reprint, 2012.
2. U.S. Gupta, ''Discrete Mathematical Structures'', 1st Edition, Pearson Education India, 2014.
3. Kevin Ferland, ''Discrete Mathematical Structures'', 1st Edition, Cengage Learning, 2009.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech II Year II Semester
23CSD103 DIGITAL LOGIC AND COMPUTER ORGANIZATION

	L	T	P	C
	3	0	0	3

Course Objectives:

The main objectives of the course is to
1. Provide a comprehensive understanding of digital logic design principles and computer organization fundamentals
2. Illustrate Computer Arithmetic Operations and Processor Organization
3. Explain the fundamentals of Memory and Input/output (I/O) systems

UNIT I   **9 hours**

Data Representation: Signed and Unsigned Binary Arithmetic – Fixed and Floating Point Binary Number representations – Hamming Code - Error Detection and Correction

Digital Logic & Combinational Circuits: Boolean Algebra, Minimization of Logic expressions, Quine–McCluskey Method - K-Map Simplification - Combinational Circuits: - Adders, Multiplexers, De-Multiplexers, Encoders and Decoders – Code Converters

UNIT II   **9 hours**

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

Introduction to Computer Architecture: Computer Types, Functional units, Bus structures, Software, Technology, Computer Generations, Von- Neumann Architecture, Eight Great Ideas

UNIT III   **9 hours**

Computer Arithmetic: Fixed Point and Floating Point Arithmetic - Addition, Subtraction, Unsigned and Signed Multiplication, Division Algorithms - Floating Point Arithmetic Operations

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction Cycle – CISC and RISC Processors – x86 and ARM Addressing Modes and Instruction set

UNIT IV   **9 hours**

Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memory, Elements of Cache – Memory Mapping Techniques, Cache Performance - Redundant Array of Independent Disks.

UNIT V   **9 hours**

Pipelining and Parallelism: Pipelining Strategy, Pipeline performance, Pipeline Hazards. Parallel Architecture - Flynn's classification – Multicore Architecture – Clusters – GPU Architecture

Input/output Organization: Data Transfer Schemes: - Programmed I/O, Interrupt Driven I/O, Direct Memory Access.

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1:Demonstrate the fundamental principles of digital system design and design combinational logic circuits.

CO2: Design sequential logic circuits and explain the functional units of computer

CO3: Apply algorithms for Arithmetic Operations and understand Instruction Set Architectures

CO4: Explain memory hierarchy and Concepts of Cache

CO5: Understand the concepts of Pipelining, Parallelism and I/O

Text Books:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th edition, McGraw Hill

2. William Stallings, "Computer Organization and Architecture Designing for Performance",11th Edition, Pearson Publications.

3. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.

Reference Books:

1. Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson

2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier

3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson

Online Learning Resources

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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

Dept. of Computer Science & Engineering (Data Science)

B. Tech II Year II Semester

23CSD105 INTRODUCTION TO DATA SCIENCE

	L	T	P	C
	3	0	0	3

Course Objectives:
From the course the student will learn
1. Knowledge and expertise to become a data scientist.

2. Essential concepts of statistics and machine learning that are vital for data science;
3. Significance of exploratory data analysis (EDA) in data science.
4. Critically evaluate data visualizations presented on the dashboards
5. Suitability and limitations of tools and techniques related to data science process

UNIT I 9 hours

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 9 hours

Applications of machine learning in Data science, role of ML in DS, Python tools like sklearn, modelling process for feature engineering, model selection, validation and prediction, types of ML, semi-supervised learning
Handling large data: problems and general techniques for handling large data, programming tips for dealing large data, case studies on DS projects for predicting malicious URLs, for building recommender systems

UNIT III 9 hours

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

UNIT IV 9 hours

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 **9 hours**

Data Visualization and Prototype Application Development: Data Visualization options, Crossfilter, the JavaScript MapReduce 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.

Course Outcomes:

After completion of the course, students will be able to

  CO1: Understand the fundamental concepts and applications of data science.
  CO2: Apply machine learning techniques to solve data science problems.
  CO3: Compare and contrast relational and NoSQL databases.
  CO4: Utilize graph databases for data analysis.
  CO5: Create interactive data visualizations.

Text Books:

1. Davy Cielen, Arno D.B.Meysman, and Mohamed Ali, "Introducing to Data Science using Python tools", Manning Publications Co, Dreamtech press, 2016

2. Prateek Gupta, "Data Science with Jupyter" BPB publishers, 2019 for basics

Reference Books:

1. Joel Grus, "Data Science From Scratch", OReilly, 2019

2. Doing Data Science: Straight Talk From The Frontline, 1 st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech II Year II Semester

23CSD106 DATA ENGINEERING

L	T	P	C
3	0	0	3

Course Objectives:
1. Explain basic concepts of Data Engineering
2. Discuss bout Data Engineering Life Cycle
3. How to design Good Data Architecture

UNIT I **9 hours**

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

UNIT II **9 hours**

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

UNIT III **9 hours**

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

UNIT IV **9 hours**

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

UNIT V **9 hours**

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

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

Course Outcomes:

After completion of the course, students will be able to

CO1: Understand data engineering fundamentals, differentiate from data science, and identify key data engineer roles and responsibilities.

CO2: Grasp the data engineering lifecycle, including security, management, and operational aspects.

CO3: Design effective data architectures based on data sources, models, and architectural principles.

CO4: Select optimal storage and ingestion methods for efficient data pipelines.

CO5: Master querying, modeling, and transformation techniques to deliver valuable data products.

Text Books:

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

Reference Books:

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

2. Ralph Kimball, Margy Ross, The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling, Wiley, 3rd Edition, 2013

3. James Densmore, Data Pipelines Pocket Reference: Moving and Processing Data for Analytics, O'Reilly Media, 1st Edition, 2021

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech II Year II Semester

23CSD203 DATA SCIENCE LABORATORY

L	**T**	**P**	**C**
0	**0**	**3**	**1.5**

Course Objectives:

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

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 dataframe
   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 Sci Kit-Learn & NLTK
Python program to implement with Python NLTK/Spicy/Py NLPI

Course Outcomes:
After completion of the course, students will be able to
  CO1; Master NumPy and Pandas for efficient data manipulation and computation.
  CO2; Excel at data import, cleaning, preparation, and web scraping.
  CO3: Create effective data visualizations using Matplotlib.
  CO4: Grasp foundational machine learning concepts and data preparation techniques.
  CO5: Develop a solid understanding of Natural Language Processing (NLP) fundamentals.

Reference Books:

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-scikit-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

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

Dept. of Computer Science & Engineering (Data Science)

B. Tech II Year II Semester

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23CSD204 DATA ENGINEERING LABORATORY

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	L	T	P	C
	0	0	3	1.5

Course Objectives:

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

Experiments:

1. Installing and configuring Apache NiFi, Apache Airflow
2. Installing and configuring Elasticsearch, Kibana, PostgreSQL, pgAdmin
3. Reading and Writing files
   a. Reading and writing files in Python
   b. Processing files in Airflow
   c. NiFi processors for handling files
   d. Reading and writing data to databases in Python
   e. Databases in Airflow
   f. Database processors in NiFi
4. Working with Databases
   a. Inserting and extracting relational data in Python
   b. Inserting and extracting NoSQL database data in Python
   c. Building database pipelines in Airflow
   d. Building database pipelines in NiFi
5. Cleaning, Transforming and Enriching Data
   a. Performing exploratory data analysis in Python
   b. Handling common data issues using pandas
   c. Cleaning data using Airflow
6. Building the Data Pipeline
7. Building a Kibana Dash Board
8. Perform the following operations
   a. Staging and validating data
   b. Building idempotent data pipelines
   c. Building atomic data pipelines
9. Version Control with the NiFi Registry
   a. Installing and configuring the NiFi Registry
   b. Using the Registry in NiFi
   c. Versioning your data pipelines
   d. Using git-persistence with the NiFi Registry
10. Monitoring Data Pipelines

    a. Monitoring NiFi in the GUI
    b. Monitoring NiFi using processors
    c. Monitoring NiFi with Python and the REST API

11. Deploying Data Pipelines
    a. Finalizing your data pipelines for production
    b. Using the NiFi variable registry
    c. Deploying your data pipelines

12. Building a Production Data Pipeline
    a. Creating a test and production environment
    b. Building a production data pipeline
    c. Deploying a data pipeline in production

Course Outcomes:

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

CO1: Master data engineering fundamentals using NiFi, Airflow, Python, and databases.

CO2: Build robust, efficient, and reliable data pipelines for various data scenarios.

CO3: Utilize cloud-native technologies for data exploration, visualization, and monitoring.

CO4: Implement effective data governance strategies for data versioning, metadata management, and pipeline lifecycle management.

CO5: Optimize data pipeline performance and scalability for handling increasing data volumes and complexity

Reference Books:

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

Mode of Evaluation: Continuous Internal Evaluation, Model Test and End Semester Examination

B. Tech II Year II Semester
Skill Enhancement Course - II
23CSD602 EXPLORATORY DATA ANALYSIS USING PYTHON

L	T	P	C
0	1	2	2

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

UNIT I   **6 hours**

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 dataframe
4. Selecting rows and columns in the dataframe

UNIT II   **6 hours**
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:
5. Apply different visualization techniques using sample dataset
a) Line Chart b) Bar Chart c) Scatter Plots d)Bubble Plot
6. Generate Scatter Plot using seaborn library for iris dataset
7. Apply following visualization Techniques for a sample dataset
a) Area Plot b) Stacked Plot c) Pie chart d) Table Chart
8. Generate the following charts for a dataset.
a) Polar Chart b)Histogram c)Lollipop chart
9. Case Study: Perform Exploratory Data Analysis with Personal Email Data

UNIT III   6 hours

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

Sample Experiments:
10. Perform the following operations
     a) Merging Dataframes
    b) Reshaping with Hierarchical Indexing
    c) Data Deduplication
    d) Replacing Values
11.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
12. Apply different data transformation techniques
     a) Renaming axis indexes
b)Discretization and Binning
    c) Permutation and Random Sampling
    d) Dummy variables

UNIT IV   6 hours

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:
13.Study the following Distribution Techniques on a sample data
         a) Uniform Distribution
  b) Normal Distribution
c) Gamma Distribution
d) Exponential Distribution
        e) Poisson Distribution
         f) Binomial Distribution
14. Perform Data Cleaning on a sample dataset.
15. Compute measure of Central Tendency on a sample dataset
    a) Mean b)Median c)Mode
16. Explore Measures of Dispersion on a sample dataset
  a) Variance b) Standard Deviation c) Skewness   d) Kurtosis

17. a) Calculating percentiles on sample dataset
    b) Calculate Inter Quartile Range(IQR) and Visualize using Box Plots
18. Perform the following analysis on automobile dataset.
    a) Bivariate analysis b)Multivariate analysis
19. Perform Time Series Analysis on Open Power systems dataset

UNIT V   6 hours

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

Case Study:EDA on Wine Quality Data Analysis

Sample Experiments:

20. Perform hypothesis testing using statsmodels library
    a) Z-Test   b)T-Test
21.Develop model and Perform Model Evaluation using different metrics such as prediction score, R2 Score, MAE Score, MSE Score.
22. Case Study: Perform Exploratory Data Analysis with Wine Quality Dataset

Course Outcomes:

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

CO1; Enumerate the fundamentals of Exploratory Data Analysis.

CO2: Visualize the data using basic graphs and plots.

CO3: Apply different Data Transformation Techniques.

CO4: Summarize the data using descriptive statistics.

CO5: Evaluate the Models and select the best model

Text Books:

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. RadhikaDatar,HarishGarg, Hands-On Exploratory Data Analysis with R: Become an expert in exploratory data analysis using R packages, Ist Edition, Packt Publishing, 2019

Online Resources:

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

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.

B. Tech II Year II Semester
Audit Course
23CHE901 ENVIRONMENTAL SCIENCE

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Course Objectives:
This course enables students to
1. To make the students to get awareness of the environment.
2. To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
3. To save the earth from the inventions by the engineers.

UNIT I   MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES   6 hours
Definition, Scope, and Importance – Need for Public Awareness.
Natural Resources: Energy resources- Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

UNIT II   ECOSYSTEMS   7 hours
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:
a) Forest ecosystem.
b) Grassland ecosystem
c) Desert ecosystem.
d) Aquatic ecosystems (freshwater - ponds, streams, lakes, rivers, marine ecosystem- 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: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Specific case studies.

UNIT III ORDERED STRUCTURES   6 hours
Definition, Cause, effects, and control measures of:
Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards
Pollution case studies - Role of an individual in the prevention of pollution

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes
Disaster management: floods, earthquakes, cyclones and landslides.

UNIT IV   SOCIAL ISSUES AND THE ENVIRONMENT $\qquad$ **5 hours**

Sustainable Development Goals, From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rainwater harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT V   HUMAN POPULATION AND THE ENVIRONMENT $\qquad$ **6 hours**

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

Course Outcomes:

At the end of this course students will demonstrate the ability to

CO1: Exploring different types of renewable and non-renewable energy sources.

CO2: Students will learn about the structure and function of different ecosystems.

CO3: Students will learn about different types of pollution (air, water, soil) and their sources, effects, and control measures.

CO4: Exploring the science behind climate change, its evidence, and its impacts on ecosystems and human societies.

CO5: Understanding demographic factors and their environmental implications.

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press, Third Edition, 2021.

2. Palaniswamy, "Environmental Studies", Pearson Education, Second Edition, 2014.

3. S. Azeem Unnisa, "Environmental Studies" Academic Publishing Company

4. K. Raghavan Nambiar, "Textbook of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd. Second Edition, 2008.

5. A. Koushik & C. P. Koushik, Perspectives in Environmental Studies, New Age International, Fourth Edition, 2006.

Reference Books:
1. Deeksha Dave and E. Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications, Second Edition, 2012.
2. M. Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, Second Edition, 2023.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, Third Edition, 2009.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice Hall of India Private Limited, Second Edition, 2004.
5. G.R. Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House, Fourth Edition, 2014.
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private Limited, Third Edition, 2007.

Online Resources:

1. Atika Qazi; Fayaz Hussain; Nasrudin ABD. Rahim; Glenn Hardaker; Daniyal Alghazzaw, "Towards sustainable energy: a systematic review of renewable energy sources, technologies, and public opinions," 10.1109/ACCESS.2019.2906402, IEEE Access, vol. 7, pp. 63837-63851, 2019.
2. Gina Garland, Samiran Banerjee, Anna Edlinger, Emily Miranda Oliveira, Chantal Herzog, Raphaël Wittwer, Laurent Philippot, Fernando T. Maestre, Marcel G. A. van der Heijden, "A closer look at the functions behind ecosystem multifunctionality: A review," https://doi.org/10.1111/1365-2745.13511, Journal of Ecology, vol. 109, no. 2, pp. 600-613, 2021.
3. Siddiqua, A, Hahladakis, J.N. and Al-Attiya, "An overview of the environmental pollution and health effects associated with waste landfilling and open dumping," https://doi.org/10.1007/s11356-022-21578-z, Environmental Science and Pollution Research, 29(39), pp.58514-58536, 2022.
4. Seddon N, Chausson A, Berry P, Girardin C.A, Smith A. and Turner B, "Understanding the value and limits of nature-based solutions to climate change and other global challenges," https://doi.org/10.1098/rstb.2019.0120, Philosophical Transactions of the Royal Society B, 375(1794), p.20190120, 2020.
5. Hannes Weber and Jennifer Dabbs Sciubba, "The effect of population growth on the environment: evidence from European regions," https://doi.org/10.1007/s10680-018-9486-0, European Journal of Population, vol. 35, pp. 379-402, 2019.

Mode of Evaluation: Assignments, Mid Term Tests and End Semester Examination.