B.Tech. I Year I Semester

S.No.	Category	Title	L/D	T	P	Credits
1.	BS&H	Engineering Physics	3	0	0	3
2.	BS&H	Linear Algebra & Calculus	3	0	0	3
3.	Engineering Science	Basic Electrical & Electronics Engineering	3	0	0	3
4.	Engineering Science	Engineering Graphics	1	0	4	3
5.	Engineering Science	Introduction to Programming	3	0	0	3
6.	Engineering Science	IT Workshop	0	0	2	1
7.	BS&H	Engineering Physics Lab	0	0	2	1
8.	Engineering Science	Electrical & Electronics Engineering Workshop	0	0	3	1.5
9.	Engineering Science	Computer Programming Lab	0	0	3	1.5
10.	BS&H	NCC/Scouts & Guides/Community Service	-	-	1	0.5
		Total	**13**	**00**	**15**	**20.5**

B.Tech. I Year II Semester

S.No.	Category	Title	L/D	T	P	Credits
1.	BS&H	Communicative English	2	0	0	2
2.	BS & H	Engineering Chemistry/Chemistry/Fundamental Chemistry	3	0	0	3
3.	Engineering Science	Differential Equations & Vector Calculus	3	0	0	3
4.	Engineering Science	Basic Civil& Mechanical Engineering	3	0	0	3
5.	Professional Core	Engineering Mechanics/Network Analysis/Data structures	3	0	0	3
6.	BS&H	Communicative English Lab	0	0	2	1
7.	BS&H	Engineering Chemistry Lab / Chemistry lab	0	0	2	1
8.	Engineering Science	Engineering Workshop	0	0	3	1.5
9.	Professional Core	Engineering Mechanics Lab /Network Analysis Lab/ Data Structures Lab	0	0	3	1.5
10.	BS&H	Health and wellness, Yoga and Sports	-	-	1	0.5
		Total	**14**	**00**	**11**	**19.5**

B.Tech. II Year I Semester

S.No.	Category	Title	L/D	T	P	Credits
1.	BS&H	Discrete Mathematics & Graph Theory	3	0	0	3
2.	BS&H	Universal Human Values-Understanding Harmony and Ethical Human Conduct	2	1	0	3
3.	Engineering Science	Introduction to Data Science	3	0	0	3
4.	Professional Core	Advanced Data Structures and Algorithms	3	0	0	3
5.	Professional Core	Object Oriented Programming Through Java	3	0	0	3
6.	Professional Core	Data Science Lab	0	0	3	1.5
7.	Professional Core	Object Oriented Programming Through Java Lab	0	0	3	1.5
8.	Skill Enhancement course	Python Programming	0	1	2	2
9.	Audit Course	Environmental Science	2	0	0	-
Total			**16**	**02**	**08**	**20**

B.Tech. II Year II Semester

S.No.	Category	Title	L/D	T	P	Credits
1.	Management Course- I	Optimization Techniques	2	0	0	2
2.	Engineering Science/ Basic Science	Statistical methods for Data science	3	0	0	3
3.	Professional Core	Data Engineering	3	0	0	3
4.	Professional Core	Database management Systems	3	0	0	3
5.	Professional Core	Computer Organization and Architecture	3	0	0	3
6.	Professional Core	Data Engineering Lab	0	0	3	1.5
7.	Professional Core	Database management Systems Lab	0	0	3	1.5
8.	Skill Enhancement course	Exploratory Data Analysis with Python	0	1	2	2
9.	BS&H	Design Thinking & Innovation	1	0	2	2
Total			**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code 24BS1T03	**Engineering Physics** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

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

Course Outcomes

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

CO1	Analyze the intensity variation of light due to polarization, interference and diffraction.
CO2	Familiarize with the basics of crystals and their structures.
CO3	Summarize various types of polarization of dielectrics and classify the magnetic materials.
CO4	Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.
CO5	Identify the type of semiconductor using Hall effect.

Unit-I: Wave Optics CO1 12L

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 CO2 8L

Crystallography

Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices, separation between successive (hkl) planes.

X-ray diffraction

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

Unit-III: Dielectric and Magnetic Materials CO3 10L

Dielectric Materials

Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation – complex dielectric constant – Frequency dependence of polarization – dielectric loss.

Magnetic Materials

Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro&Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

Unit-IV: Quantum Mechanics and Free electron Theory CO4 10L

Quantum Mechanics

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

Free Electron Theory

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

Unit-V: Semiconductors CO5 10L

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

Textbooks:

1. A Textbook of Engineering Physics, M. N. Avadhanulu, P. G. Kshirsagar& TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D. K. Bhattacharya and Poonam Tandon, Oxford press (2015).
3. Engineering Physics – P.K. Palanisamy, Scitechpublishers(2011).

Reference book(s)

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 –Dr. M. Armugam, anuradhaPublications , 2015.
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press
5. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

Web reference(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code 24BS1T02	**Linear Algebra and Calculus** (Common to all branches of Engineering)	L	T	P	C
Prerequisites	Nil	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.

Course Outcomes

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

CO1	Develop and use of matrix algebra techniques that are needed by engineers for Practical applications.
CO2	Applications of Eigen values and Eigen Vectors in Communication Engineering.
CO3	Utilize mean value theorems to real life problems.
CO4	Familiarize with functions of several variables which is useful in optimization. Learn important tools of calculus in higher dimensions in partial differentiation.
CO5	Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using Cylindrical and spherical coordinates.

Unit-I: Matrices CO1 12L

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, Gauss Jordan method and Gauss SeidelIteration Methods.

Unit-II: Eigenvalues, Eigen vectors and Orthogonal Transformation CO2 12L

Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, Cayley- Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley- Hamilton Theorem, quadratic forms and Nature of the Quadratic Forms Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

Unit-I II: Calculus CO3 11L

Infinite series tests, Ratio, comparison nth root test, Alternating series Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with Remainders (without proof), Problems and applications on the above theorems.

Unit- IV: Partial differentiation and Applications (Multi variable calculus) CO4 13L

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Mac laurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange Multipliers.

Unit-V: Multiple Integrals(Multi variable Calculus) CO5 12L

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

Text book(s)

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

Reference book(s)

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

Web reference(s)

1. https://www.loc.gov/rr/scitech/selected-internet/mathematics.html

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code 24ES1T03	**Basic Electrical & Electronics Engineering** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	3	0	0	3

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

Course Outcomes

After the completion of the course students will be able to

CO1	Describe fundamental laws, operating principles of motors/generators, MC/MI instruments.
CO2	Demonstrate the working of electrical machines, measuring instruments and power generation stations.
CO3	Calculate electrical load and electricity bill of residential and commercial buildings.
CO4	Demonstrate fundamental of semiconductor devices.
CO5	Demonstrate Rectifiers and power supplies, Amplifiers and Conversion of number systems, Describe logic gates.

Unit-I: DC & AC Circuits CO1 10L

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.

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.

Unit-II: Measuring xInstruments CO2 7L

Measuring Instruments

Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge, Energy meter, Phantom loading, Absolute instruments, Standardization of meter.

Unit-III: Energy Resources, Electricity Bill CO3 10L

Energy Resources:

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

Electricity Bill

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

Unit-IV: Semiconductor Devices CO4 8L

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-V: Basic Electronic Circuits and Digital Electronics CO5 10L

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. Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra.

Textbook(s)

1. R. L. Boylestad& Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009.
3. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition.
4. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013.
5. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.

Reference book(s)

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. SantiramKal, 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.
4. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition.
5. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020.
6. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.
7. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017.

Web reference(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code 24ES1T04	**Engineering Graphics** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

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

Course Outcomes	
After completion of this course, the learners will be able to	
CO1	Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
CO2	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
CO3	Understand and draw projection of solids in various positions in first quadrant.
CO4	Explain principles behind development of surfaces.
CO5	Prepare isometric and perspective sections of simple solids

Unit-I: Introduction, Curves and Scales CO1 9L

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 scale

Unit-II: Orthographic Projections- Projection of Points, Straight Lines and Planes CO2 9L

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: Projection of Solids CO3 12L

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: Section of Solids and Development of Surfaces CO4 10L

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

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

Unit-V: Conversion of Views and Computer Graphics CO5 10L

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

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

Textbook(s)

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

Reference book(s)

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

Web reference(s)

1. https://onlinecourses.nptel.ac.in/noc21_me128/preview
2. https://www.sdcpublications.com/Textbooks/Engineering-Graphics/85/
3. https://fractory.com/engineering-drawing-basics/
4. https://omicstutorials.com/engineering-graphics-and-design/
5. https://onlinecourses.nptel.ac.in/noc24_mg131/preview
6. https://onlinecourses.swayam2.ac.in/aic22_ts42/preview

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code 24ES1T02	**Introduction to Programming** (Common for All Engineering Branches)	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

To Familiarize students with programming concepts such as data types, control structures, functions, and arrays. Gain knowledge of the operators, selection and repetition statements in C. Understand and Apply different programming concepts to deal with real world problems.

Course Outcomes	
After completion of this course, the learners will be able to	
CO1	Explain fundamentals of computer, programming languages. Use appropriate data types for storing data and choose the operators for writing complex expressions in C.
CO2	Make use of Decision Making and Looping statements to Solve various problems in C.
CO3	Solve problems using Arrays and Strings for efficiently accessing homogenous data.
CO4	Develop programs using pointers, structures and unions.
CO5	Develop programs to handle functions for reusability and redundancy. Apply file-handling functions to read/write data to files.

Unit-I: Introduction CO1 10L

Introduction to Computer and Computer Languages

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Flow charts; Algorithms, Pseudo code

Introduction to C Programming

Data types, Key words; Variables and Constants; Format-Specifies, basic input and output statements; Operators: Arithmetic, relational, logical operators; Assignment, increment, decrement, conditional operators; Bitwise and special operators, operator precedence and associativity, type conversion.

Unit-II: Control Structures CO2 10L

Decision Making statements

Simple if, if-else; nested if, else-if ladder; Switch-Case.

Looping Statements

While loop, Do-while loop, For loop, Comparison of while, dowhile and for; Nested loops, Break and continue.

Unit-III: Arrays and Strings CO3 10L

Arrays

Introduction to Arrays, one dimensional Arrays, two dimensional Arrays, Applications of 1D-Arrays: Bubble Sort, Insertion Sort; Selection Sort; Linear Search and Binary Search, Applications of 2D-Arrays: Matrix Addition; Matrix Multiplication and Transpose.

Strings

Introduction to Strings; string handling functions; Implementation of string copy and string concatenation without using string library functions.

Unit-IV: Structures, Unions and PointersCO4 10L

Structures and Unions

Structures, Accessing elements of a structure, Array of structures; pointer to structure; Unions, Compare structures and unions; Bit fields.

Pointers

Pointers, dereferencing and address operators, Pointer arithmetic; Accessing array elements using pointers.

Unit-V: Functions and File Handling CO5 10L

Functions

Functions, Declaration, Definition, call; Actual and formal parameters, return values; Call by value, call by reference; passing and returning pointers through functions; Passing arrays to functions; Dynamic memory allocation, malloc(), calloc(), realloc(), free(), storage classes; Command line arguments.

File Handling

Files, File streams, File types, File modes of operation, Functions for reading from a file, Functions to write data to a file; Random file access functions, Macros.

Textbook(s)

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

Reference book(s)

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

Web Reference(s)

1. https://www.w3schools.com/c/c intro.php
2. https://www.geeksforgeeks.org/c-programming-language/
3. https://www.hackerrank.com/domains/c

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code 24ES1L03	**IT WORKSHOP** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	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, BOSS
- To teach basic command line interface commands on Linux
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools

Course Outcomes

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

CO1	Perform Hardware troubleshooting.
CO2	Understand Hardware components and inter dependencies
CO3	Safeguard computer systems from viruses/worms
CO4	Document/ Presentation preparation
CO5	Perform calculations using spreadsheets

List of Experiment(s)

PC Hardware & Software Installation

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

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

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a VivaVirtual Machine setup

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

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

Internet & World Wide Web

Task 1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

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

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

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

LaTeX and WORD

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

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

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

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

EXCEL

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

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

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

LOOKUP/VLOOKUP

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

POWER POINT

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

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

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

AI TOOLS – ChatGPT

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

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

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

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

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

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

Reference(s)

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.

Web Resource(s)

1. https://assembleyourpc.net
2. https://www.latex-tutorial.com/tutorial
3. http://www.teachmsoffice.com/
4. https://www.geeksforgeeks.org/top-12-most-used-git-commands-for-developers/

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code 24BS1L02	**Engineering Physics Lab** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	0	0	2	1

Course Objectives

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

Course Outcomes

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

CO1	Operate optical instruments like travelling microscope and spectrometer.
CO2	Estimate the wavelengths of different colours using diffraction grating.
CO3	Plot the intensity of the magnetic field of circular coil carrying current with distance.
CO4	Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
CO5	Calculate the band gap of a given semiconductor.
CO6	Identify the type of semiconductor using Hall effect.

List of Experiment(s)

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.

Reference(s)

1. A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

Web Resource(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code 24ES1L04	**Electrical & Electronics Engineering Workshop** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	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.

Course Outcomes

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

CO1	Measure voltage, current and power in an electrical circuit.
CO2	Measure of Resistance using Wheat stone bridge
CO3	Discover critical field resistance and critical speed of DC shunt generators.
CO4	Investigate the effect of reactive power and power factor in electrical loads.
CO5	Identify & testing of various electronic components.
CO6	Understand the usage of electronic measuring instruments.
CO7	Plot and discuss the characteristics of various electron devices.
CO8	Explain the operation of a digital circuit

List of Experiment(s)

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
8. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
9. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
10. Implementation of half wave and full wave rectifiers
11. Plot Input & Output characteristics of BJT in CE and CB configurations
12. Frequency response of CE amplifier.
13. Simulation of RC coupled amplifier with the design supplied
14. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gate using ICs.

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

Reference(s)

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition .
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition
4. R. L. Boylestad& Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
5. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

Web reference(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code 24ES1L02	**Computer Programming Lab** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	0	0	3	1.5

Course Objectives

To be familiar with the programming concepts of C Language. To provide hands on experience with coding and debugging and to foster logical thinking and problem-solving skills using programming

Course Outcomes

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

CO1	Develop C Programs with utilize memory efficiently using various programming constructs.
CO2	Select appropriate control structure to Solve real world problems.
CO3	Solve various complex problems using Modular Programming skills.
CO4	Develop, Debug and Execute programs that demonstrate the applications of arrays, functions, basic concepts of pointers in C.

List of Experiment(s)

1. 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().
2. Converting algorithms/flow charts into C Source code.Developing the algorithms/flowcharts for the following sample programs.
   i) Sum and average of 3 numbers
   ii) Conversion of Fahrenheit to Celsius and vice versa
   iii) Simple interest calculation Verification of Brewster's law.
3. Simple computational problems using arithmetic expressions.
   i) Finding the square root of a given number
   ii) Finding compound interest
   iii) Area of a triangle using heron's formulae
   iv) Distance travelled by an object
4. Simple computational problems using the operator' precedence and associativity
   i) Evaluate the following expressions.
      a. A+B*C+(D*E) + F*G
      b. A/B*C-B+A*D/3
      c. A+++B---A
      d. J= (i++) + (++i)
   ii) Find the maximum of three numbers using conditional operator
   iii) Take marks of 5 subjects in integers, and find the total, average in float

5. Problems involving if-then-else structures.
    i) Write a C program to find the max and min of four numbers using if-else.
    ii) Write a C program to generate electricity bill.
    iii) Find the roots of the quadratic equation.
    iv) Write a C program to simulate a calculator using switch case.
    v) Write a C program to find the given year is a leap year or not.
6. Iterative problems e.g., the sum of series
    i) Find the factorial of given number using any loop.
    ii) Find the given number is a prime or not.
    iii) Compute sine and cos series
    iv) Checking a number palindrome
    v) Construct a pyramid of numbers.
7. 1D Array manipulation, linear search
    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 Determination of temperature coefficients of a thermistor.
8. Matrix problems, String operations, Bubble sort
    i) Addition of two matrices
    ii) Multiplication two matrices
    iii) Sort array elements using bubble sort
    iv) Concatenate two strings without built-in functions
    v) Reverse a string using built-in and without built-in string functions.
9. Pointers and structures, memory dereferences.
    i) Write a C program to find the sum of a 1D array using malloc()
    ii) Write a C program to find the total, average of n students using structures
    iii) Enter n students data using calloc() and display failed students list
    iv) Read student name and marks from the command line and display the student details along with the total.
    v) Write a C program to implement realloc() .
10. Bitfields, linked lists Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields
    i) Create and display a singly linked list using self-referential structure.
    ii) Demonstrate the differences between structures and unions using a C program.
    iii) Write a C program to shift/rotate using bitfields.
    iv) Write a C program to copy one structure variable to another structure of the same type.
11. Simple functions using call by value, solving differential equations using Eulers theorem.
    i) Write a C function to calculate NCR value.
    ii) Write a C function to find the length of a string.
    iii) Write a C function to transpose of a matrix.

iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method.

12. Recursive functions
    i) Write a recursive function to generate Fibonacci series.
    ii) Write a recursive function to find the lcm of two numbers.
    iii) Write a recursive function to find the factorial of a number.
    iv) Write a C Program to implement Ackermann function using recursion.
    v) Write a recursive function to find the sum of series.
13. Simple functions using Call by reference, Dangling pointers.
    i) Write a C program to swap two numbers using call by reference.
    ii) Demonstrate Dangling pointer problem using a C program.
    iii) Write a C program to copy one string into another using pointer.
    iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.
14. File operations
    i) Write a C program to write and read text into a file.
    ii) Write a C program to write and read text into a binary file using fread() and fwrite()
    iii) Copy the contents of one file to another file.
    iv) Write a C program to merge two files into the third file using command-line arguments.
    v) Find no. of lines, words and characters in a file
    vi) Write a C program to print last n characters of a given file.

Textbook(s)

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

Reference(s)

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

Web Resource(s)

1. https://www.w3schools.com/c/index.php
2. https://www.geeksforgeeks.org/c-programming-language/?ref=lbp

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code 24HS1L03	**NSS/ Community Service** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	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.

Course Outcomes

After completion of this course, the learners 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.

Unit-I: Orientation CO1 5L

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

Activities:

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

Unit-II: Nature & Care CO2,CO4 4L

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.

Unit-III: Community Service CO3,CO5 6L

Activities:

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

Health, Mental health, Spiritual Health, HIV/AIDS.

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

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

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

Reference book(s)

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

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General Guidelines:

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

Web reference(s)

1. Evaluated for a total of 100 marks.
2. 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.
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. II Sem. (2nd Semester)			
Course Code 24HS2T01	**Communicative English** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	3	0	0	2

Course Objectives

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

Course Outcomes

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

CO1	Understand the context, topic, and pieces of specific information from social or Transactional dialogues.
CO2	Apply grammatical structures to formulate sentences and correct word forms.
CO3	Analyze discourse markers to speak clearly on a specific topic in informal discussions.
CO4	Evaluate reading / listening texts and to write summaries based on global comprehension of these texts.
CO5	Create a coherent paragraph, essay, and resume.

UNIT-I

Lesson: Human Values: Gift of Magi (Short Story) CO1 10L

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

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

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

Writing: Mechanics of Writing

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) CO2 8L

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

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

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

Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

UNIT-III

Lesson: Biography: Elon Musk CO3 8L

Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.
Reading: Readinga text in detail by making basic inferences.
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 CO4 8L

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).
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, Jargon.

UNIT-V

Lesson: Motivation: The Power of Intrapersonal Communication (An Essay) CO6 8L

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

Textbook(s)

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 book(s)

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

Web reference(s)

Grammar:

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

Vocabulary :

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

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. II Sem. (2nd Semester)			
Course Code 24BS2T01	**Chemistry** (Common to ECE, CSE, IT & allied branches)	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

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

Course Outcomes

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

CO1	Compare the materials of construction for battery and electrochemical sensors.
CO2	Explain the preparation, properties, and applications of thermoplastics & thermosetting &elastomers conducting polymers.
CO3	Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.
CO4	Apply the principle of Band diagrams in the application of conductors and semiconductors.
CO5	Summarize the concepts of Instrumental methods.

Unit-I: Structure and Bonding Models CO4 8L

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

Unit-II: ModernEngineeringmaterials CO4 10L

Semiconductors – Introduction, basic concept, application
Super conductors - Introduction basic concept, applications.
Super capacitors : Introduction, Basic Concept-Classification – Applications.
Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

Unit-III: ElectrochemistryandApplications CO1 10L

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

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries-

working of the batteries including cell reactions; Fuel cells, hydrogen-oxygenfuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

Unit-IV: Polymer Chemistry CO2 12L

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

Unit-V: Instrumental Methods and Applications CO3,CO5 10L

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

Textbook(s)

1. Jain and Jain, EngineeringChemistry,16/e, Dhanpat Rai Publishers,2013.
2. Peter Atkins, Juliode Paula and James Keeler, Atkins' Physical Chemistry , 10/e, Oxford University Press, 2010.

Reference book(s)

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

Web reference(s)

1. https://nptel.ac.in
2. https://www.azdocuments.in/2022/02/engineering-chemistry-21che1222.html
3. http://www.tndte.gov.in/site/wp-content/uploads/2016/08/Engineering Chemistry.pdf
4. https://archive.nptel.ac.in/courses/122/101/122101001/

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. II Sem. (2nd Semester)			
Course Code 24BS2T04	**Differential Equations and Vector Calculus** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

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

Course Outcomes

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

CO1	Solve the system of Homogeneous and non Homogeneous equations by using Matrices.
CO2	Solve the differential equations related to various engineering fields.
CO3	Identify solution methods for partial differential equations that model physical processes.
CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence
CO5	Estimate the work done against a field, circulation and flux using vector calculus..

Unit-I: Differential equations of first order and first degree CO1 12L

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

Unit-II: Linear differential equations of higher order Constant Coefficients) CO2 12L

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

Unit-III: Partial Differential Equations CO3 11L

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 **CO4** **13L**

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, Force conservative

Unit-V: Vector Integration **CO5** **12L**

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.

Textbook(s)

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 book(s)

1. Advanced Engineering Mathematics, Micheael Greenberg,,Pearson publishers,9thdition.
2. Higher Engineering Mathematics, H.K Das ,Er.RajnishVerma,S.ChandPublications,2014, Third Edition (Reprint 2021).

Web reference(s)

https://www.loc.gov/rr/scitech/selected-internet/mathematics.html

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. II Sem. (2nd Semester)			
Course Code 24ES2T01	**Basic Civil and Mechanical Engineering** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

Upon course completion, students should be able to recognize the significance and breadth of mechanical engineering across various sectors and industries, articulate knowledge of different engineering materials and manufacturing processes, and provide a comprehensive overview of thermal and mechanical transmission systems while introducing the fundamentals of robotics and their practical applications.

Course Outcomes

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

CO1	Upon course completion, students will demonstrate a comprehensive understanding of the role of mechanical engineering in society and industry, including its application across various sectors. They will also exhibit knowledge of fundamental engineering materials and their properties.
CO2	Upon course completion, students will be able to explain the fundamental principles of manufacturing processes, including casting, forming, joining, and machining, and demonstrate knowledge of thermal engineering concepts such as combustion cycles, refrigeration, and air conditioning, as well as an introduction to electric and hybrid vehicles.
CO3	Upon course completion, students will be able to explain the working principles of various power plants (steam, diesel, hydro, and nuclear), analyze different mechanical power transmission systems, and demonstrate a basic understanding of robotics, including its components and applications..

Unit-I: Introduction to Mechanical Engineering, Engineering Materials CO1 9L

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

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

Unit-II: Introduction to Mechanical Engineering, Engineering Materials CO2 9L

Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3Dprinting, 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: Introduction to Mechanical Engineering, Engineering Materials CO3 9L

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.

Textbook(s)

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

Reference book(s)

1. G.Shanmugam and M.S.Palanisamy ,Basic Civil and the Mechanical Engineering,Tata McGraw Hill publications (India) Pvt. Ltd.
2. Thermal Engineering by Mahesh Mrathore Tata McGraw Hill publications (India) Pvt.Ltd.
3. 3D printing&Additive Manufacturing Technology-L.JyothishKumar, Pulak M Pandey, Springer publications
4. Appuu Kuttan KK, Robotics, I.K. International Publishing HousePvt. Ltd.Volume-I
5. Nuclear Energy- Fundamentals and Concepts, Dr YarrapragadaSubba Rao, Volume-1, Scientific international publishing House
6. A Text Book of Engineering Thermodynamics, Dr YarrapragadaSubba Rao, Volume-1, Alpha International Publication

Web reference(s)

1. https://onlinecourses.nptel.ac.in/noc24_me104/preview
2. https://archive.nptel.ac.in/courses/112/103/112103108/

Part B: Basic Civil Engineering

Course Objectives

Students will develop an understanding of the breadth and significance of civil engineering disciplines. The course will introduce foundational concepts of surveying and the critical role of transportation in national economic growth. Students will also gain an appreciation for the importance of water quality, conveyance, and storage. Finally, the course will provide a basic overview of civil engineering materials and construction methods.

Course Outcomes

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

CO1	Upon successful completion of this course, students will demonstrate a comprehensive understanding of the civil engineering profession, including its diverse disciplines, the role of civil engineers in society, and fundamental knowledge of construction materials and techniques.
CO2	Upon completion of this course, students will be able to apply fundamental surveying techniques to accurately determine horizontal and vertical distances, angles, and elevations, and produce basic topographic maps.
CO3	Upon completion of this course, students will be able to evaluate the significance of transportation infrastructure in economic development and possess foundational knowledge of highway pavements, as well as a basic understanding of key transportation systems (harbors, tunnels, airports, and railways). Additionally, students will be introduced to water resources engineering concepts, including water sources, quality, and basic water management structures.

Unit-I: Basics of Civil Engineering, Hydraulics and Water Resources Engineering CO1 9L

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of CivilEngineering-StructuralEngineering-Geo-technicalEngineering-TransportationEngineering

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 Pre fabricated construction Techniques.

Unit-II:Surveying CO2 9L

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

Unit-III: TransportationEngineering, Water Resources and Environmental Engineering: **CO3 9L**

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

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

Textbook(s)

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

Reference book(s)

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

Web reference(s)

1. https://onlinecourses.nptel.ac.in/noc24_ce111/preview
2. https://archive.nptel.ac.in/courses/105/106/105106201/
3. https://www.nptelvideos.com/discipline.php?name=civil-engineering
4. https://onlinecourses.nptel.ac.in/noc22_ce42/preview

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. II Sem. (2nd Semester)			
Course Code 24CS2PCT01	**DATA STRUCTURES** (Common to CSE,IT,AIML,DS)	L	T	P	C
Prerequisites	C Language	3	0	0	3

Course Objectives

The main objectives of the course is to

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

Course Outcomes

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

CO1	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
CO2	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
CO3	Develop programs using stacks to handle recursive algorithms, manage program states,and solve related problems.
CO4	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.
CO5	Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.
CO6	Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

Unit-I: CO1 9L

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: CO2 9L

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

Unit-III: CO3 12L

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

Unit-IV: **CO4 10L**

Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.
Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

Unit-V: **CO5,CO6 10L**

Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal
Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.

Textbook(s)

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

Reference book(s)

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

Web reference(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. II Sem. (2nd Semester)			
Course Code 24HS2L01	**Communicative English Lab** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	0	0	2	1

Course Objectives

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

Course Outcomes

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

CO1	Understand the different aspects of the English language proficiency with emphasis on LSRW skills.
CO2	Apply communication skills through various language learning activities.
CO3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
CO4	Evaluate and exhibit professionalism in participating in debates and group discussions.
CO5	Create effective Course Objectives.

List of Topics:

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

Suggested Software:

1. Walden Infotech
2. Young India Films

Reference Book(s)

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 Resource(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. II Sem. (2nd Semester)			
Course Code 24BS2L01	**Chemistry Lab** (Common to ECE, CSE, IT & Allied Branches)	L	T	P	C
Prerequisites	Nil	0	0	3	1

Course Objectives

Verify the fundamental concepts with experiments.

Course Outcomes

At the end of the course, the learners 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	Analyse the IR spectra of some organic compounds
CO5	Calculate strength of acid in Pb-Acid battery.

List of Experiment(s)

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

Reference(s)

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

Web Resource(s)

1. https://byjus.com/chemistry/conductometric-titration/
2. https://www.sciencedirect.com/topics/chemistry/potentiometric-titration
3. https://www.slideshare.net/slideshow/fundamentals-of-volumetric-analysispdf/253855292

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. II Sem. (2nd Semester)			
Course Code 24ES2L01	**Engineering Workshop Lab** (Common for all branches of Engineering)	L	T	P	C
Prerequisites	Nil	0	0	3	1.5

Course Objectives

To impart practical knowledge to learners on wood working, sheet metal operations, fitting, residential electrical wiring, and basic two-wheeler maintenance.

Course Outcomes

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

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

List of Experiment(s)

1. **Demonstration**:Safety practices and precautions to be observed in workshop.
2. **Wood Working:**Familiarity with different types of woods and tools used in woodworking and make following joints.
   a) Half–Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**:Familiarity with different types of tools used in sheet metal working,Developments of following sheet metaljob 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) Square fit c)Semi-circular fit
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)God own 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 forgiven Patterns.
7. **Welding Shop**:Demonstration and practice on Arc Welding and Gas welding.Preparation of Lap joint and Butt joint.
8. **Plumbing:**Demonstration and practice of Plumbing tools,Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.
9. **Basic repairs of Two-wheeler vehicle**–Demonstration of working of two-wheeler vehicle and its repairs.

Textbooks:

1. Basic Workshop Technology:Manufacturing Process, FelixW.; Independently Published, 2019.Workshop Processes, Practices and Materials; BruceJ.Black,Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghu wanshi, Dhanpath Rai &Co., 2015 & 2017.

Reference(s)

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

Web Resource(s)

1. https://www.youtube.com/c/EngineersWorkshop
2. https://www.vlab.co.in/
3. https://www.vlab.co.in/broad-area-mechanical-engineering

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. II Sem. (2nd Semester)			
Course Code 24CS2PCL01	**Data Structures Lab** (Common to CSE,IT,AIML,DS)	L	T	P	C
Prerequisites	C programming	0	0	3	1.5

Course Objectives

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

Course Outcomes

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

CO1	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
CO2	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
CO3	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
CO4	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.
CO5	Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

List of Experiment(s)

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:Implementation Binary Search Tree

i) Binary Search Tree
ii) Implementing a 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.

Reference(s)

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

Web Resource(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	I B. Tech. II Sem. (2nd Semester)			
Course Code 24HS2L02	**Health and Wellness,Yoga and Sports** (Common to All branches of Engineering)	L	T	P	C
Prerequisites	Nil	0	0	1	0.5

Course Objectives

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

Course Outcomes

After completion of this course, the learners 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

Unit-I: **CO2,C04 7L**

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.

Unit-II: **CO1,CO3 5L**

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 **C04,CO5 5L**

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

Activities:

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

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

Textbook(s)

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

General Guidelines:

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

Evaluation Guidelines:

1. Evaluated for a total of 100 marks.
2. 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.
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code 24BS3T03	**Discrete Mathematics & Graph Theory**	L	T	P	C
Prerequisites	Understanding of algebra, geometry, and precalculus.	3	0	0	3

Course Objectives

To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.

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

Course Outcomes

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

CO1	Comprehend mathematical principles and logic (L4)
CO2	Build skills in solving mathematical problems (L3)
CO3	Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software (L6)
CO4	Manipulate and analyze data numerically and/or graphicallysing appropriate Software (L3)
CO5	How to communicate effectively mathematical ideas/results verbally or in writing (L1)

Unit-I: Mathematical Logic CO1,CO5 12L

Propositional Calculus

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

Unit-II: Set Theory CO2 10L

Sets

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

Unit-III: Combinatorics and Recurrence Relations CO2,CO3 12L

Combinatorics

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

Recurrence Relations

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

Unit-IV: Graph Theory CO4 9L

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

Unit-V: Multi Graphs CO4 9L

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

Textbook(s)

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

Reference book(s)

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

Web reference(s)

1. https://onlinecourses.nptel.ac.in/noc22_cs123/preview
2. https://www.javatpoint.com/discrete-mathematics-tutorial

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code 24BS3T04	**Universal Human Values** (Common for All Engineering Branches)	L	T	P	C
Prerequisites	Nil	2	1	0	3

Course Objectives

To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.

To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Outcomes

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

CO1	Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)
CO2	Identify one's self, and one's surroundings (family, society nature) (L1, L2)
CO3	Apply what they have learnt to their own self in different day-to-day settings in real life (L3)
CO4	Relate human values with human relationship and human society. (L4)
CO5	Justify the need for universal human values and harmonious existence (L5)

Course Topics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration.

Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

Unit-I: Introduction to Value Education **CO1** **10L**

(6 lectures and 3 tutorials for practice session)

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

Unit-II: Harmony in the Human Being **CO2** **10L**

(6 lectures and 3 tutorials for practice session)

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

Unit-IV: Harmony in the Nature/Existence **CO4** **10L**

(4 lectures and 2 tutorials for practice session)

Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

Unit-V: Implications of the Holistic Understanding – a Look at Professional Ethics CO5 10L

(6 lectures and 3 tutorials for practice session)

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

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

Practice Sessions for UNIT II – Harmony in the Human Being
PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body

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

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

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

Textbook(s)

1. RR 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. RR 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 book(s)

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 - JC Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics
at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.
While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.
Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.
Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions

commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

Web Reference(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. ISem. (3rd Semester)			
Course Code 24ES3T01	**Introduction to Data Science**	L	T	P	C
Prerequisites	Nil	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

Course Outcomes

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

CO1	Understand Data Science Fundamentals and Comprehend the Data Science Process
CO2	Utilize Machine Learning Tools and Libraries
CO3	Understand Distributed Data Storage and Processing and Apply NoSQL Databases to Case Studies
CO4	Integrate Graph and Text Data for Enhanced Insights
CO5	Understand the Principles of Data Visualization, Prototype Development, Optimize Performance and Usability

Unit-1: CO1 10L

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-2: CO2 12L

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-3: NoSQL movement for handling Bigdata CO3 12L

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-4: Tools and Applications of Data Science CO4 10L

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

Unit-5: Data Visualization and Prototype Application Development CO5 10L

Data Visualization options, Cross filter, the JavaScript Map Reduce library, Creating an interactive dashboard with dc.js, Dashboard development tools. Applying the Data Science process for real world problem solving scenarios as a detailed case study.

Textbook(s)

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 book(s)

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

Web reference(s)

1. https://www.w3schools.com/datascience/ds_introduction.asp

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code 24IT3PCT01	**Advanced Data Structures & Algorithms** Common to CSE, IT, AIML & DS	L	T	P	C
Prerequisites	C,Data Structures	3	0	0	3

Course Objectives

The main objectives of the course is to

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

Course Outcomes

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

CO1	To design, analyze, and implement efficient algorithms, understand the importance of algorithmic efficiency in software development, and apply self-balancing tree data structures like AVL and B-trees in practical applications.
CO2	To implement and analyze advanced data structures like heaps, understand and apply graph algorithms for various applications, and effectively utilize the divide and conquer strategy to solve complex computational problems.
CO3	To design and analyze algorithms using both greedy methods and dynamic programming techniques, apply these strategies to a variety of computational problems, and evaluate the efficiency and correctness of their solutions.
CO4	To design and analyze algorithms using backtracking and branch and bound methods, apply these strategies to a variety of combinatorial and optimization problems, and evaluate the efficiency and correctness of their solutions.
CO5	To understand and explain the concepts of NP-Hard and NP-Complete problems, implement approximation algorithms for various NP-Hard problems, and analyze the efficiency and correctness of their solutions. Additionally, students will gain insight into the complexity of real-world problems and the challenges of finding optimal solutions in reasonable time.

Unit-I: AVL Trees, B-Trees CO1 9L

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

Unit-II: Heap Trees, Graphs, Divide and Conquer CO2 9L

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

Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix

multiplication, Convex Hull Crystallography

Unit-III: Greedy Method, Dynamic Programming **CO3 12L**

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

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

Unit-IV: Backtracking, Branch and Bound **CO4 10L**

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

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

Unit-V: NP Hard and NP Complete Problems, NP Hard Graph Problems **CO5 10L**

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem

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

NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

Textbook(s)

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, 2 nd Edition University Press

Reference book(s)

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

Web reference(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code 24CS3PCT03	**Object Oriented Programming Through JAVA**	L	T	P	C
Prerequisites	Basic Programming Concepts	3	0	0	3

Course Objectives

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

Course Outcomes

By the end of the course, the learner will be

CO1	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
CO2	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
CO3	Apply the concept of exception handling and Input/ Output operations
CO4	Able to design the applications of Java & Java applet
CO5	Able to Analyze& Design the concept of Event Handling and Abstract Window Toolkit
CO6	Able to realize the concept of Object Oriented Programming & Java Programming Constructs

Unit-I: Object Oriented Programming CO1,CO2,C06 15L

Object Oriented Programming

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

Data Types, Variables, and Operators:

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

Control Statements:

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

Unit-II: Classes and Objects and Methods CO2 10L

Classes and Objects

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

Methods

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

Unit-III: Arrays, Inheritance and Interfaces CO2 15L

Arrays

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

Inheritance

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

Interfaces

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

Unit-IV: Packages and Java Library CO2,CO3,CO4 10L

Packages and Java Library

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

Exception Handling

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

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

Unit-V: String Handling in Java CO4,CO5 15L

String Handling in Java

Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.
Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.
Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set
Interface Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Textbook(s)

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

Reference book(s)

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

Web reference(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code 24CD3PCL01	**Data Science Lab**	L	T	P	C
Prerequisites	Nil	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.

Course Outcomes

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

CO1	Perform various operations on numpy arrays
CO2	Importing data from different file formats using pandas
CO3	Draw different types of charts using matplotlib
CO4	Install and Configure NLP Libraries
CO5	Implement NLP Techniques with NLTK and scikit-learn

List of Experiment(s)

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

Web Resource(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code 24CS3PCL03	**Object Oriented Programming Through JAVA Lab**	L	T	P	C
Prerequisites	Basic Programming Concepts	0	0	3	1.5

Course Objectives

The aim of this lab is to

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

Course Outcomes

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

CO1	Evaluate default value of all primitive data type, Operations, Expressions, Controlflow, Strings
CO2	Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
CO3	Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
CO4	Construct Threads, Event Handling, implement packages, developing applets .

List of Experiment(s)

1. Write a JAVA program to display default value of all primitive data type of JAVA
2. Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root..
3. Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
4. Write a JAVA program to sort for an element in a given list of elements using bubble sort .
5. Write a JAVA program using String Buffer to delete, remove character.
6. Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
7. Write a JAVA program implement method overloading. .
8. Write a JAVA program to implement constructor. .
9. Write a JAVA program to implement constructor overloading.
10. Write a JAVA program to implement Single Inheritance
11. Write a JAVA program to implement multi level Inheritance
12. Write a JAVA program for abstract class to find areas of different shapes
13. Write a JAVA program give example for “super” keyword.
14. Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

15. Write a JAVA program that implements Runtime polymorphism pendulum.
16. Write a JAVA program that describes exception handling mechanism.
17. Write a JAVA program Illustrating Multiple catch clauses
18. Write a JAVA program for creation of Java Built-in Exceptions
19. Write a JAVA program for creation of User Defined Exception
20. 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)
21. Write a program illustrating is Alive and join ()
22. Write a Program illustrating Daemon Threads.
23. Write a JAVA program Producer Consumer Problem
24. Write a JAVA program that import and use the user defined packages
25. Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
26. Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI
27. Write a java program that connects to a database using JDBC
28. Write a java program to connect to a database using JDBC and insert values into it.
29. Write a java program to connect to a database using JDBC and delete values from it

Reference(s)

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

Web Resource(s)

1. https://www.javatpoint.com/
2. https://www.w3schools.com/

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code 24CS3SCL01	**Python Programming**	L	T	P	C
Prerequisites	Nil	0	1	2	2

Course Objectives

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

Course Outcomes

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

CO1	Develop essential programming skills in computer programming concepts like data types, basics of programming in the Python language, Solve coding tasks related conditional execution, loops.
CO2	Solve coding tasks related to Functions and Strings, Lists.
CO3	Solve coding tasks related to Dictionaries, Tuples and Sets.
CO4	Solve coding tasks related to the fundamental notions and techniques used in objectoriented programming
CO5	Develop essential programming skills in computer programming concepts like•NumPy with Python, Pandas.

List of Experiment(s)

UNIT-1:

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

UNIT-2:

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

UNIT-3:

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

UNIT-4:

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
   Write a program to create, display, append, insert and reverse the order of the items in the array.
4. Write a program to add, transpose and multiply two matrices.
5. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-5:

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

Reference Book(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code 24AC3T01	**Environmental Science** (Common to ALL Branches)	L	T	P	C
Prerequisites	Nil	2	0	0	0

Course Objectives

The main objectives of the course is to

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

Course Outcomes

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

CO1	Grasp multidisciplinary nature of environmental studies and various renewable and non-renewable resources.
CO2	Understand flow and bio-geo-chemical cycles and ecological pyramids.
CO3	Underst and various causes of pollution and solid waste management and related preventive measures
CO4	About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
CO5	Casus of population explosion, value education and welfare programmes.

Unit-I: CO1 9L

Multidisciplinary Nature Of Environmental Studies: – Definition, Scope and Importance – Need forPublicAwareness

Natural Resources:Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timberextraction – Mining, dams and other effects on forest and tribal people – Water resources – Use andover 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,casestudies.–Energy resources:

Unit-II: CO2 9L

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

a. Forest ecosystem.

b. Grassl and ecosystem

c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
Biodiversity And Its Conservation: Introduction Definition: genetic, species and ecosystem diversity–Bio-geographical classification of India–Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and locallevels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss,poaching of wildlife, man-wildlife conflicts.Endangered and endemic species of India –Conservation of biodiversity:In-situand Ex-situ conservation of biodiversity.

Unit-III: **CO3** **12L**

Environmental Pollution: Definition, Cause, effects and control measures of:
a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards
Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods,earthquake,cycloneandlandslides.

Unit-IV: **CO4** **10L**

Social Issues and the Environment: From Unsustainable to Sustainable development–Urban problems related to energy – Water conservation, rain water harvesting, watershed management –Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions–Climate change, global warming, acidrain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wastel and reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act–Wild life Protection Act–Forest Conservation Act–Issues involved inenforcement of environment allegislation–Public awareness.

Unit-V: **CO5** **10L**

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education–HIV/AIDS–Women and Child Welfare–Role of information Technology in Environment and human health–Case studies. Field Work:Visit to a local area to document environmental assets River/ forest grassland/ hill/ mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants,insects, and birds–river, hills lopes,etc..

Textbook(s)

1. Text book of Environmental Studies for Undergraduate Courses ErachBharucha for University Grants Commission,Universities Press.
2. Palaniswamy,“Environmental Studies”, Pearson education
3. S.AzeemUnnisa,“Environmental Studies”Academic Publishing Company
4. K.RaghavanNambiar,“Text book of Environmental Studies UndergraduateCourses as per UGC model syllabus”, Scitech Publications (India), Pvt.Ltd.

Reference book(s)

1. DeekshaDave and E.SaiBabaReddy, “Text book of Environmental cience”,Cengage Publications.
2. M.AnjiReddy,“ Text book of Environmental Sciences and Technology”,BSPublication.
3. J.P.Sharma,Comprehensive Environmental studies,Laxmi publications.
4. J.GlynnHenryandGaryW.Heinke,“Environmental Sciences and Engineering”,Prentice Hall of India Private limited
5. G.R.Chatwal,“A Text Book of Environmental Studies”Himalaya Publishing House.
6. Gilbert M.Masters and WendellP. Ela,“ Introduction to Environmental Engineering and Science,Prentice Hall of India Private limited.

Web reference(s)

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview https://www.edx.org/learn/environmental-science/rice-university-ap-r
2. environmental-science-part-3-pollution-and- resources?index=product&objectID=course-3a6da9f2-d84c-4773-83881b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science++Part+3%3A+Pollution+and+Resources&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmental science http://ecoursesonline.iasri.res.in/Courses/Environmental%20ScienceI/Data%20Files/pdf/lec07.pdf
3. https://www.youtube.com/watch?v=5QxxaVfgQ3

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code 24HS4T05	**OPTIMIZATION TECHNIQUES** (Common to IT,AIML,DS)	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

The objectives of the course is to

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

Course Outcomes

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

CO1	State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
CO2	Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
CO3	Apply and Solve transportation and assignment problem by using Linear programming Simplex method.
CO4	Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions
CO5	Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

UNIT I: Introduction and Classical Optimization Techniques CO1 9L

Introduction and Classical Optimization Techniques: Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems. Classical Optimization Techniques: Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions

UNIT-II: Linear Programming CO2 9L

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

UNIT-III: Transportation Problem CO3 12L

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

UNIT-IV: Nonlinear Programming CO4 10L

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

UNIT-V: Dynamic Programming CO5 10L

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

Text Books:

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

Reference Books:

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

Web Reference :

1. https://www.geeksforgeeks.org/optimization-techniques-set-1-modulus/

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code 24ES4T11	**Statistical Methods for Data Science**	L	T	P	C
Prerequisites		3	0	0	3

Course Objectives

To provide knowledge on basic concepts of Statistics, Estimation and testing of hypotheses for large and small samples

Course Outcomes

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

CO1	Analyze data and draw conclusion about collection of data and fitting of distributions
CO2	Analyzing the testing of hypothesis for Large and Small samples.
CO3	Develop skills in problem solving of the regression analysis
CO4	Understanding the significance of Time Series data in various fields
CO5	Understanding the classification using Logistic Regression

Unit-1: Data Visualization and Distributions CO1 9L

Data Visualization Techniques:

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

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

Unit-2: Hypothesis Testing CO2 9L

Introduction to Parametric Estimation-Parametric Confidence Intervals:

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

Unit-3: Linear Regression and Multiple Regression CO3 12L

Regression:

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

Practical Examples - The nature of the ‘relationship’ - Multiple Linear Regression – Important measurements of the regression estimate - Multiple Regression with Categorical ExplanatoryVariables-InferenceinMultipleRegression-VariableSelection.

Unit-4: Time Series CO4 10L

Time series:

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

moving average method, Link relative method.
(Textbook: K.Murugesan, P.Gurusamy, “Probability, Statistics and Random Processes”**)**

Unit-5: Logistic Regression CO5 10L

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

Textbook(s)

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

Reference book(s)

1. Manoj Kumar Srivastava and Namita Srivastava,Statistical Inference–Testing of Hypotheses, PrenticeHall of India,2014.
2. Robert VHogg, Elliot ATannis and DaleL. Zimmerman, Probability and Statistical Inference,9th edition, Pearson publishers,2013.
3. Chris Chatfield, “The analysis of time series an introduction, ”5th edition, Chapman & Hall / CRC.
4. Peter J.Brockwell, Richard A. Davis, “Introduction to Time series and Forecasting,” Second edition, Springer.

Web reference(s)

1. epurdom.github.io/Stat131A/Rsupport/index.html

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code 24CD4PCT01	**Data Engineering**	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

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

Course Outcomes

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

CO1	Explain Basic Concepts of Data Engineering
CO2	Exemplify Data Engineering Life Cycle
CO3	Analyze various storage methods to efficiently store and process data
CO4	Apply querying and Transformation on given data.
CO5	Apply Data Engineering for real world Problem.

Unit-1: Introduction to Data Engineering CO1 9L

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-2: Data Engineering Life Cycle: CO2 9L

Data Life Cycle Versus Data Engineering Life Cycle, Generation: Source System, Storage, Ingestion, Transformation, Serving Data.

Major under currents across the Data Engineering Life Cycle:

Security, Data Management, Data Ops, Data Architecture, Orchestration, Software Engineering

Unit-3: Designing Good Data Architecture CO3 12L

Enterprise Architecture, Data Architecture, Principles of Good Data Architecture, Major Architecture Concepts

Data Generation in Source Systems:

Sources of Data, Files and Unstructured Data, APIs, Application Databases (OLTP), OLAP, Change Data Capture, Logs, Database Logs, CRUD, Source System Practical Details

Unit-4: Storage CO4 10L

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-5: Queries, Modeling and Transformation CO5 10L

Quantum Mechanics

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.

Textbook(s)

1. JoeReis,Matt Housley, Fundamentals of Data Engineering, O'Reilly Media, Inc., June 2022, ISBN:9781098108304
2. James Dens more, Data Pipe lines Pocket Reference: Moving and Processing Data for Analytics, O' Reilly Media, 1st Edition.

Reference book(s)

1. Paul Crickard, Data Engineering with Python, Packt Publishing, October.
2. Ralph Kimball, Margy Ross, The Data Ware house Tool kit: The Definitive Guide to Dimensional Modeling, Wiley, 3rdEdition.

Web reference(s)

1. https://365datascience.com/projects/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013862914237513728 5/overview

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. II Sem. (4rth Semester)			
Course Code 24CS4PCT05	**Database Management Systems**	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

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

Course Outcomes

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

CO1	Understand the basic principles of database management Systems
CO2	Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL
CO3	Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data
CO4	Discuss normalization techniques with simple examples
CO5	Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing

Unit-I: Introduction to DBMS CO1,CO2 12L

Introduction:

Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database

Entity Relationship Model:

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

Unit-II: Relational Model CO3 10L

Relational Model:

Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL:Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update)

Unit-III: SQL CO3 10L

SQL:

Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non updatable), relational set operations

Unit-IV: Schema Refinement (Normalization) CO4 10L

Schema Refinement:

Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF)

Unit-V: Transaction Concept CO5 10L

Transaction Concept:

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

Textbook(s)

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

Reference book(s)

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

Web reference(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code 24CD4PCT02	**Computer Organization and Architecture**	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

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

Course Outcomes

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

CO1	Relate Postulates of Boolean algebra and minimize combinational functions
CO2	Design and analyze and sequential circuits
CO3	Understanding the signed operations ,arithmetic operations, processor organization of computers,
CO4	Demonstrate the RAM Memories, performance considerations
CO5	Recall the Interrupts and Input/Output devices accessing and the relations between its main components

Unit-1: CO1 10L

Digital Computers and Data Representation:
Introduction, Numbering Systems, Decimal to Binary Conversion, Binary Coded Decimal Numbers, Weighted Codes, SelfComplementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCI Code.

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

Unit-2: **CO2** **10L**

Digital logic circuits:

Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Implementation using universal gates, Multi-bit adder, Multiplexers, Demultiplexers, Decoders

Sequential Switching Circuits: Latches and Flip-Flops, Ripple counters using T flip-flops.

Synchronous counters:

Shift Registers; Ring counters

Unit-3: **CO3** **15L**

Computer Arithmetic:

Addition and subtraction, multiplication Algorithms, Booth multiplication algorithm, Division Algorithms, Floating – point Arithmetic Operations.

Register Transfer language and microinstructions:

Bus memory transfer, arithmetic and logical micro-operations, shift and rotate micro-operations Basic Computer Organization and Design: Stored program concept, computer Registers, common bus system, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input–Output configuration and program Interrupt.

Unit-4: **CO4** **10L**

Microprogrammed Control:

Control memory, Address sequencing, microprogram example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation .

Program Control:

conditional Flags and Branching .

Unit-5: **CO5** **10L**

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Input-Output Organization:

Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Textbook(s)

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

Reference book(s)

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

Web reference(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. II Sem. (4rth Semester)			
Course Code 24CD4PCL02	**Data Engineering Lab**	L	T	P	C
Prerequisites	Nil	0	0	3	1.5

Course Objectives

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

Course Outcomes

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

CO1	Build our Data Engineering Infrastructure
CO2	Demonstrate Reading and Writing files
CO3	Build Data Pipe lines and integrate with Dashboard
CO4	Deploy the Data Pipe line in production

List of Experiment(s)

1. Installing and configuring Apache Ni Fi, Apache Air flow
2. Installing and configuring Elastic search, Kibana, Postgre SQL, pgAdmin4
3. Reading and Writing files
    a. Reading and writing files in Python
    b. Processing files in Airflow
    c. Ni Fi processors for handling files
    d. Reading and writing data to data bases in Python
    e. Data bases in Air flow
    f. Data base processors in Ni Fi
4. Working with Data bases
    a. Inserting and extracting relational data in Python
    b. Inserting and extracting No SQL database data in Python
    c. Building data base pipe lines in Air flow
    d. Building data base pipe lines 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 pipe lines

9. Version Control with the Ni Fi Registry
    a. Installing and configuring the Ni Fi Registry
    b. Using the Registry in Ni Fi
    c. Version in gyour data pipelines
    d. Using git-persistence with the Ni Fi Registry
10. Monitoring Data Pipelines
    a. Monitoring Ni Fi in the GUI
    b. Monitoring Ni Fi using processors
    c. Monitoring Ni Fi with Python and the RESTAPI

11. Deploying Data Pipelines
    e. Finalizing your data pipe lines for production
    f. Using the Ni Fi variable registry
    g. Deploying your data pipe lines
12. Building a Production Data Pipe line
    a. Creating a test and production environment
    b. Building a production data pipeline
    c. Deploying a data pipe line in production

Reference(s)

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

Web Resource(s)

1. https://www.analyticsvidhya.com/blog/2020/04/theultimatenumpytutorialfordatasciencebeginners/

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. II Sem. (4rth Semester)			
Course Code 24CS4PCL05	**Database Management Systems Lab** (Common to CSE, IT, AIML & DS)	L	T	P	C
Prerequisites	Nil	0	0	3	1.5

Course Objectives

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

Course Outcomes

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

CO1	Gain practical knowledge on designing and creating relational database systems
CO2	Apply database language commands to create simple database
CO3	Apply integrity constraints on a database using RDBMS
CO4	Understand various advanced queries execution such as joins, set operations, aggregate functions, trigger, views and embedded SQL
CO5	design and implement database applications on their own

List of Experiment(s)

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

9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non indexing techniques.
13. Write a Java program that connects to a database using JDBC
14. Write a Java program to connect to a database using JDBC and insert values into it
15. Write a Java program to connect to a database using JDBC and delete values from it

Reference(s)

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007 Publishers, 2017.

Web Resource(s)

1. http://nptel.ac.in/courses/106106093/6
2. http://www.tutorialspoint.com/plsql/
3. https://www.plsql.co/
4. https://www.w3schools.com/sql/

Regulation	GIET Engineering College (Autonomous)	II B. Tech. II Sem. (4rd Semester)			
GEBT24					
Course Code	**Exploratory Data Analysis Using Python**				
24CD4SCL01		L	T	P	C
Prerequisites	Basic Programming Concepts	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.

Course Outcomes

By the end of the course, the learner will be

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

Unit-1:

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-2:

Visual Aids for EDA:

Technical requirements, Line chart, Bar charts, Scatter plot using seaborn, Polar chart, Histogram, Choosing the best chart

Case Study:

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

Sample Experiments:

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

Unit-3:

Data Transformation:

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

Sample Experiments:

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

Unit-4: Packages and Java Library

Descriptive Statistics:

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

Sample Experiments:

1. Study the following Distribution Techniques on a sample data

a) Uniform Distribution

b) Normal Distribution

c) Gamma Distribution

d) Exponential Distribution

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

Unit-5:

Model Development and Evaluation:

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

Case Study: EDA on Wine Quality Data Analysis

Sample Experiments:

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

Case Study: Perform Exploratory Data Analysis with Wine Quality Dataset

Textbook(s)

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

Reference book(s)

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

Web reference(s)

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

Regulation GEBT24	GIET Engineering College (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code 24ES4L01	**Design Thinking & Innovation**	L	T	P	C
Prerequisites	Nil	1	0	2	2

Course Objectives

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

Course Outcomes

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

CO1	Define the concepts related to design thinking
CO2	Explain the fundamentals of Design Thinking and innovation
CO3	Apply the design thinking techniques for solving problems in various sectors
CO4	Analyse to work in a multidisciplinary environment
CO5	Evaluate the value of creativity

Unit-I: Introduction to Design Thinking CO1 10L

Introduction:

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

Unit-II: Design Thinking Process CO2 12L

Design Thinking Process:

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

Activity:

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

Unit-III: Innovation CO3 10L

Innovation:

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

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

Unit-IV: Product Design CO4 10L

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

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

Unit-V: Design Thinking in Business Processes CO5 12L

Design Thinking in Business Processes:
Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes

Activity:
How to market our own product, about maintenance, Reliability and plan for startup.

Textbook(s)

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

Reference book(s)

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

Web reference(s)

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview