CURRICULUM OF

4 YEAR DEGREE B. Tech. PROGRAM
in
COMPUTER SCIENCE AND ENGINEERING (AIML)
COURSE STRUCTURE

SEMESTER-I						
Sl. No.	**Course Code**	**Course**	**L**	**T**	**P**	**Credits**
3 WEEKS COMPULSORY INDUCTION PROGRAM						
1	25MA101BS	Mathematics – I (Calculus & Linear Algebra)	3	1	0	4
2	25CH102BS	Engineering Chemistry	3	0	0	3
3	25CS103ES	Programming for Problem Solving	3	0	0	3
4	25EN104HS	Communication Skills	1	0	0	1
5	25EC105ES	Electronics Devices and Circuits	2	0	0	2
6	25CH106BS	Engineering Chemistry Laboratory	0	0	2	1
7	25CS107ES	Programming for Problem Solving Lab using C	0	0	2	1
8	25CS108ES	IT Workshop	1	0	2	2
9	25EN109HS	Communication Skills Laboratory	0	0	2	1
10	25DT110HS	Design Thinking	0	1	2	2
		Total	**13**	**2**	**10**	**20**

^ represents related to Audit Course.

SEMESTER-II						
Sl. No.	**Course Code**	**Course**	**L**	**T**	**P**	**Credits**
1	25MA201BS	Mathematics–II (Ordinary Differential Equations and Vector Calculus)	3	1	0	4
2	25PH202BS	Applied Physics	3	0	0	3
3	25EE203ES	Basic Electrical Engineering	2	0	0	2
4	25CS204PC	Discrete Mathematics	3	1	0	4
5	25CS205ES	Fundamentals of Python Programming	3	0	0	3
6	25ME206ES	Computer Aided Engineering Graphics	1	0	4	3
7	25PH207BS	Applied Physics Laboratory	0	0	2	1
8	25CS208ES	Python Programming Laboratory	0	0	2	1
9	25EE209ES	Basic Electrical Engineering Laboratory	0	0	2	1
10	25PE210AU	Sports and Yoga	3^	0	0	0
		Total	**15+3^**	**2**	**10**	**22**

First Semester Syllabus

Sl. No.	Course Code	Course	L	T	P	Credits
1	25MA101BS	**Mathematics - I (Calculus & Linear Algebra)**	3	1	0	4

Course Objectives: To learn

1. To develop a strong foundation in matrix theory, including techniques to determine the rank and inverse of matrices, and to solve systems of linear equations.
2. Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form
3. Geometrical approach to the mean value theorems and their application to the mathematical problems
4. Evaluation of surface areas and volumes of revolutions of curves.
5. Evaluation of improper integrals using Beta and Gamma functions.
6. Partial differentiation, concept of total derivative
7. Finding maxima and minima of function of two and three variables.
8. Evaluation of multiple integrals and their applications

Course outcomes: After learning the contents of this paper the student must be able to

1. Apply matrix techniques such as Gauss elimination and Gauss−Seidel methods to solve homogeneous and non−homogeneous systems of linear equations and compute matrix rank and inverse.
2. Compute eigenvalues and eigenvectors, apply the Cayley−Hamilton Theorem, and reduce quadratic forms to canonical form using orthogonal transformations.
3. Demonstrate understanding of mean value theorems and Taylor's series, and apply definite and improper integrals (including Beta and Gamma functions) to solve problems involving areas and volumes of revolution.
4. Use partial differentiation techniques, compute total derivatives and Jacobians, and solve optimization problems of multivariable functions using Lagrange multipliers.
5. Evaluate double and triple integrals in various coordinate systems, change the order of integration, and apply these techniques to calculate areas and volumes in engineering problems

COURSE CONTENTS:

UNIT 1: Matrices

Types of Matrices – Symmetric, Skew symmetric, Hermitian, Skew Hermitian, Orthogonal and Unitary matrices, Rank of a matrix by Echelon form and Normal form, 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.

UNIT 2: Eigen values and Eigen vectors

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

UNIT 3: Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series.

Applications of definite integrals to evaluate surface areas (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT 4: Multivariable Calculus (Partial Differentiation and applications)

Definitions of Limit and continuity. Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT 5: Multivariable Calculus (Integration)

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.
3. G. Strang, *Linear Algebra and Its Applications*, 5th ed. Boston, MA: Cengage Learning, 2016.

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

Alternative NPTEL/SWAYAM Course:

S. No.	NPTEL Course Name	Instructor	Host Institute
1	ENGINEERING MATHEMATICS – I	PROF. JITENDRA KUMAR	IIT KGP

Sl. No.	Course Code	Course	L	T	P	Credits
2	25CH102BS	**Engineering Chemistry**	3	0	0	3

Course Objectives:

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

Course Outcomes:

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineering materials.
4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

COURSE CONTENTS:

UNIT 1: Water and its treatment: [8]

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications − Steps involved in the treatment of potable water − Disinfection of potable water by chlorination and break − point chlorination. Defluoridation− Removal of F^- ion by Nalgonda method.

Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water − Calgon conditioning − Phosphate conditioning − Colloidal conditioning, External treatment methods − Softening of water by ion− exchange processes. Desalination of water – Reverse osmosis.

UNIT 2: Battery Chemistry & Corrosion [8]

Introduction − Classification of batteries− primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn−air and Lithium ion battery, Applications of Li−ion battery to electrical vehicles. Fuel Cells− Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells − Introduction and applications of Solar cells.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water−line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods− Cathodic protection – Sacrificial anode and impressed current methods.

UNIT 3: Polymeric materials: [8]

Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene

Plastics: Definition and characteristics− thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP).

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna−S, Butyl and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples−mechanism of conduction in trans−polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages − Polylactic acid and poly vinyl alcohol and their applications.

UNIT 4: Energy Sources: [8]

Introduction, Calorific value of fuel – HCV, LCV− Dulongs formula. Classification− solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol − Fischer− Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

UNIT 5: Engineering Materials: [8]

Cement: Portland cement, its composition, setting and hardening.

Smart materials and their engineering applications

Shape memory materials− Poly L− Lactic acid. Thermoresponse materials− Polyacryl amides, Poly vinyl amides

Lubricants: Classification of lubricants with examples−characteristics of a good lubricants − mechanism of lubrication (thick film, thin film and extreme pressure)− properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. axminarayana and K. Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS:

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

Sl. No.	Course Code	Course	L	T	P	Credits
3	25CS103ES	Programming for Problem Solving	3	0	0	3

Course Objectives:

1. To introduce the fundamental concepts of computer systems and the process of writing and executing a program using algorithms and flowcharts.
2. To develop logical thinking through problem−solving using conditional statements, loops, and arrays, and to implement basic algorithms for searching and sorting.
3. To familiarize students with modular programming techniques using functions, including recursion and parameter passing methods.
4. To explain structured data handling using structures and pointers, including the basics of dynamic memory allocation and the concept of linked data structures.
5. To introduce file handling and preprocessor directives in C, enabling students to manage data input/output through files and use macros and conditional compilation.

Course Outcomes: The student will learn following through lectures:

1. Understand the components of a computer system, explain how a program is stored, compiled, and executed, and design algorithms using flowcharts or pseudocode for solving simple problems.
2. Write C programs using control structures (conditional statements and loops), perform operations on arrays and strings, and implement basic algorithms for searching and sorting.
3. Implement modular programming using functions, including recursion, and pass parameters using call by value and call by reference.
4. Define and use structures and pointers in C, apply dynamic memory allocation techniques, and understand the concept of self−referential structures and linked lists.
5. Use preprocessor directives effectively and perform file operations for both text and binary files, including random access and handling of structured data.

COURSE CONTENTS:

UNIT 1: Introduction to Programming**;** Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart / Pseudocode with examples.
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

UNIT 2:

Arithmetic expressions and precedence.
Conditional Branching and Loops. Writing and evaluation of conditionals and consequent branching. Iteration and loops.
Arrays, Arrays (1−D, 2−D), Character arrays and Strings
Basic Algorithms, Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT 3:

Function, Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference Recursion, Recursion as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Merge sort.
Structures, Defining structures and Array of Structures

UNIT 4:

Pointers, Idea of pointers, Defining pointers, Use of Pointers in self−referential structures, notion of linked list (no implementation), Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

UNIT 5:

Preprocessor and File handling in C:

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions

TEXT/REFERENCE BOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw−Hill.
2. R.S. Salaria, Programming for Problem Solving, Khanna Publishing House.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw−Hill.
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

Alternative NPTEL/SWAYAM Course:

S. No.	NPTEL Course Name	Instructor	Host Institute
1	INTRODUCTION TO PROGRAMMING IN C	PROF. SATYADEV NANDAKUMAR	IITK
2	PROBLEM SOLVING THROUGH PROGRAMMING IN C	PROF. ANUPAM BASU	IIT KGP

Sl. No.	Course Code	Course	L	T	P	Credits
4	25EN104HS	**Communication Skills**	**1**	**0**	**0**	**1**

Course Objective:

1. To develop students' proficiency in technical and professional communication, with a focus on clarity, conciseness, and accuracy.
2. To equip students with essential written communication skills, including technical reports, emails, proposals, and formal documentation.
3. To enhance verbal communication skills, including presentations, group discussions, and interviews.
4. To improve students' confidence and fluency in English, supporting both academic success and professional effectiveness.
5. To prepare students for real−world communication scenarios, including job interviews, workplace interactions, and public speaking.

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

1. Understand various technical writing skills and
2. Apply the technical writing and communication skills in their academic and professional life.
3. Gain self−confidence with improved command over English.
4. Understand the technical aspects of communication for better performance in extra−curricular activities, recruitment process and prospective jobs.

COURSE CONTENTS:

UNIT 1:
Fundamentals of Communication Skills: Scope and Significance of Communication Skills, Listening, Speaking, Reading and Writing, Technical Communication, Tools of Effective Communication.

UNIT 2:
Writing Skills:Basics of Grammar – Placing of Subject and Verb, Parts of Speech, Uses of Tenses, Active− Passive, Narration.

UNIT 3:
Vocabulary Building and Writing:Word Formation & Synonyms, Antonyms, Words Often Confused, One−Word Substitutes, Idioms and Phrasal Verbs, Abbreviations of Scientific and Technical Words.

UNIT 4:
Speaking Skills:Introduction to Phonetic Sounds & Articulation, Word Accent, Rhythm and Intonation, Interpersonal Communication, Oral Presentation, Body Language and Voice Modulation (Para linguistics and Non− Verbal), Negotiation and Persuasion, Group Discussion, Interview Techniques (Telephonic and Video Conferencing).

UNIT 5:
Technical Writing:Job Application, CV Writing, Business Letters, Memos, Minutes, Notices, Report Writing & Structure, E−mail Etiquette, Blog Writing.

Sl. No.	Course Code	Course	L	T	P	Credits
5	25EC105ES	**Electronic Devices and Circuits**	**2**	**0**	**0**	**2**

Course Objectives:

1. To introduce components such as diodes, BJTs and FETs.
2. To know the applications of devices.
3. To know the switching characteristics of devices.

Course Outcomes: Upon completion of the Course, the students will be able to:

1. Acquire the knowledge of various electronic devices and their use on real life.
2. Know the applications of various devices.
3. Acquire the knowledge about the role of special purpose devices and their applications.

COURSE CONTENTS:

UNIT 1:

Diodes: Diode − Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V−I Characteristics, Diode as a switch− switching times.

UNIT 2:

Diode Applications: Rectifier − Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers−Clipping at two independent levels, Clamper−Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

UNIT 3:

Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times,

UNIT 4:

Junction Field Effect Transistor (FET): Construction, Principle of Operation, Pinch− Off Voltage, Volt− Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSTET as a capacitor.

UNIT 5:

Special Purpose Devices: Zener Diode **-** Characteristics, Zener diode as Voltage Regulator, Principle of Operation − SCR, Tunnel diode, UJT, Varactor Diode, Photo diode, Solar cell, LED, Schottky diode.

TEXT BOOKS:

1. Jacob Millman − Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, Louis Nashelsky− Electronic Devices and Circuits theory, 11th Edition, 2009, Pearson**.**

REFERENCE BOOKS:

1. Horowitz −Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly − Basic Electronics− Principles and Applications, Cambridge, 2018.

Sl. No.	Course Code	Course	L	T	P	Credits
6	25CH106BS	**Engineering Chemistry Laboratory**	0	0	2	1

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

1. Estimation of hardness of water to check its suitability for drinking purpose.
2. Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
3. Students will learn to prepare polymers such as Bakelite and nylon−6 in the laboratory.
4. Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Course Outcomes: The experiments will make the student gain skills on:

- Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
- Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and nylon−6.
- Estimations saponification value, surface tension and viscosity of lubricant oils.

List of Experiments:

1. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.
2. **Conductometry:** Estimation of the concentration of an acid by Conductometry.
3. **Potentiometry:** Estimation of the amount of Fe^{+2} by Potentiomentry.
4. **pH Metry:** Determination of an acid concentration using pH meter.
5. Preparations:
    1. Preparation of Bakelite.
    2. Preparation Nylon – 6.
6. Lubricants:
    1. Estimation of acid value of given lubricant oil.
    2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.
7. **Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
8. Virtual lab experiments
    1. Construction of Fuel cell and its working.
    2. Smart materials for Biomedical applications
    3. Batteries for electrical vehicles.
    4. Functioning of solar cell and its applications.

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

Sl. No.	Course Code	Course	L	T	P	Credits
7	25CS107ES	Programming for Problem Solving Laboratory using C	0	0	2	1

The student will learn following through Lab:

1. To formulate the algorithms for simple problems.
2. To translate given algorithms to a working and correct program.
3. To be able to correct syntax errors as reported by the compilers.
4. To be able to identify and correct logical errors encountered at run time.
5. To be able to write iterative as well as recursive programs.
6. To be able to represent data in arrays, strings and structures and manipulate them through a program.
7. To be able to declare pointers of different types and use them in defining self− referential structures.
8. To be able to create, read and write to and from simple text files.

List of Experiments:

1. Familiarization with programming environment
2. Simple computational problems using arithmetic expressions
3. Problems involving if−then−else structures
4. Iterative problems e.g., sum of series
5. 1D Array manipulation
6. Matrix problems, String operations
7. Simple functions
8. Programming for solving Numerical methods problems
9. Recursive functions
10. Pointers and structures
11. File operations

Sl. No.	Course Code	Course	L	T	P	Credits
8	25CS108ES	IT Workshop	**1**	0	2	2

Course Objectives:

1. To impart fundamental skills in computer usage, operating systems, productivity tools, and the internet.
2. To enable students to handle basic hardware and networking tasks.
3. To promote digital fluency, cyber hygiene, and collaborative working using cloud tools.

Course Outcomes:

1. Understand the structure and functionality of computer systems and operating systems
2. Use productivity tools for document processing, data analysis, and presentations
3. Set up and manage basic networking and internet usage with awareness of cybersecurity
4. Identify hardware components and perform basic troubleshooting
5. Collaborate using cloud platforms and apply basic version control using Git/GitHub

Course Content:

Note: Students are expected to work hands−on and submit a lab report for each of the following tasks/modules.

Unit I: Computer Fundamentals & Operating System Basics

- Overview of computer components: CPU, RAM, storage devices, I/O devices
- Operating Systems: Role, types, and functions
- Installation of Windows and Linux
- Boot process and BIOS/UEFI introduction
- File/folder operations and system settings
- Hands−on practice: Basic commands in Windows (CMD) and Linux (Terminal)

Unit II: Office Productivity Tools Word Processing

- Document creation and formatting
- Use of tables, images, headers/footers, and footnotes
- Preparation of resumes and academic reports

Spreadsheets

- Data handling, formatting, and formulas
- Functions: SUM, AVERAGE, IF, VLOOKUP
- Charts, graphs, and case studies (e.g., grade sheet)

Presentations

- Slide design, transitions, animations
- Embedding multimedia elements
- Creating short presentations with proper layout

Document Preparation Using LaTeX

- Introduction to LaTeX: why and where it is used
- Structure of a LaTeX document
- Creating documents with sections, equations, lists, and tables
- Typesetting mathematical expressions and references
- Use of Overleaf or local LaTeX editors (TeXstudio, TeXmaker)

Unit III: Networking, Internet & Cyber Hygiene

- Basic networking terms: LAN, WAN, Wi−Fi, Router
- Understanding IP addresses and DNS
- Setting up local networks and internet connectivity
- Commands: ping, ipconfig, ifconfig, speed tests
- Effective internet usage and search techniques
- Email usage and etiquette
- Cyber hygiene: Passwords, phishing awareness, malware, updates, antivirus

Unit IV: Hardware Essentials

- Internal components: motherboard, CPU, RAM, HDD/SSD, power supply
- Demo or supervised hands−on: PC assembly/disassembly
- Common hardware issues and troubleshooting tips Cloud

Unit V: Platforms & Collaboration Tools

- Cloud storage basics: Google Drive, OneDrive
- Uploading, organizing, and sharing files
- Real−time document collaboration (Docs, Sheets, Slides)
- Introduction to Git & GitHub:
- Creating repositories, basic Git commands, version control principles

REFERENCE BOOKS:

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

Sl. No.	Course Code	Course	L	T	P	Credits
9	25EN109HS	**Communication Skills Laboratory**	0	0	2	1

List of Experiments

1. Introducing Oneself, Exercise on Parts of Speech & Exercise on Tense.
2. Exercise on Agreement, Narration, Active Passive Voice & Dialogue Conversation.
3. Exercise on Writing Skills and Listening Comprehension (Audio CD).
4. Practice of Phonemes, Word Accent, Intonation, JAM Session.
5. Individual Presentation, Extempore and Picture Interpretation.
6. Vocabulary Building Exercises (One Word Substitute, Synonyms, Antonyms, Words Often Confused etc.) & Group Discussion.

Alternative NPTEL/SWAYAM Course:

Sl. No.	NPTEL Course Name	Instructor	Host Institute
1.	Communication Skills – Video course	Dr. T. Ravichandran	IIT Kanpur
2.	Communication Skills	Dr. Zuchamo Yanthan	Indira Gandhi National Open University

Text Books/Suggested References:

1. The Essence of Effective Communication", Ludlow R. and Panton F., Pubs: Prentice Hall, 1992
2. "Effective Communication Skills", Kulbhushan Kumar, Khanna Publishing House, 2019.
3. "A University Grammar of English", Quirk R. and Sidney G., 3rd Edition, Pubs: Pearson Education, 2008
4. "High School English Grammar", Wren and Martin, Pubs: S. Chand & Company Ltd, 2007
5. "Essentials of Business Communication", Guffrey M.E., 8th Edition, Pubs: South−Western College Publishing, 2009
6. "Technical Communication: Principles and Practice", Raman M. and Sharma S., 2nd Edition, Pubs: Oxford University Press, 2012
7. "Effective Business Communication", Rodrigues M.V., Pubs: Concept Publishing Company, Delhi, 2003
8. "English Vocabulary in Use", McCarthy M. and Felicity O' Dell, 2nd Edition, Pubs:2010

Sl. No.	Course Code	Course	L	T	P	Credits
10	25DT110HS	**Design Thinking**	**0**	**1**	**2**	**2**

COURSE OBJECTIVE:

1. To introduce the foundational concepts of learning, memory, and emotional intelligence as essential tools for personal and professional development.
2. To cultivate empathy and emotional awareness as central to understanding user needs and enhancing team collaboration.
3. To provide a comprehensive understanding of the Design Thinking process and its application in solving real−world, user−centric problems.
4. To develop creative and critical thinking skills for innovative problem− solving through brainstorming, prototyping, and iterative testing.
5. To encourage appreciation of individual differences and promote inclusive thinking while aligning customer expectations with product design.

Course Outcomes (CO):

Student will able to

1. Compare and classify the various learning styles and memory techniques and Apply them in their engineering education
2. Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products
3. Develop new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products
4. Propose real−time innovative engineering product designs and Choose appropriate frameworks, strategies, techniques during prototype development
5. Perceive individual differences and its impact on everyday decisions and further Create a better customer experience

COURSE CONTENTS:

UNIT 1:

An Insight to Learning:Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting

Remembering Memory:Understanding the Memory process, Problems in retention, Memory enhancement techniques

UNIT 2:

Emotions: Experience & Expression:Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers

Basics of Design Thinking: Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test

UNIT 3:

Being Ingenious & Fixing Problem:Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving

Process of Product Design:Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Assignment – Engineering Product Design

UNIT 4:

Prototyping & Testing: What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, Sample Example, Test Group Marketing

Celebrating the Difference: Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences

UNIT 5:

Design Thinking & Customer Centricity: Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design

Feedback, Re−Design & Re−Create: Feedback loop, Focus on User Experience, Address "ergonomic challenges, User focused design, rapid prototyping & testing, final product, Final Presentation – "Solving Practical Engineering Problem through Innovative Product Design & Creative Solution".

Second Semester Syllabus

Sl. No.	Course Code	Course	L	T	P	Credits
1	25MA201BS	Mathematics−II (Ordinary Differential Equations and Vector Calculus)	3	1	0	4

Pre-requisites: Mathematical Knowledge at pre−university level

Course Objectives: To learn

1. Methods of solving the differential equations of first and higher order.
2. Concept, properties of Laplace transforms
3. Solving ordinary differential equations using Laplace transforms techniques.
4. The physical quantities involved in engineering field related to vector valued functions
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course outcomes: After learning the contents of this paper the student must be able to

1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real world problems.
3. Use the Laplace transforms techniques for solving ODE's.
4. Evaluate the line, surface and volume integrals and converting them from one to another

COURSE CONTENTS:

UNIT1: First Order ODE

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT 2: Ordinary Differential Equations of Higher Order

Second order linear differential equations with constant coefficients: Non− Homogeneous terms of the type e^{ax}, sin ax , cos ax, polynomials in x, $e^{ax}V(x)$ and $x\,V(x)$, method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy−Euler equation. Applications: Electric Circuits

UNIT 3: Laplace transforms

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof).

Applications: solving Initial value problems by Laplace Transform method.

UNIT 4: Vector Differentiation

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT 5: Vector Integration

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Sl. No.	Course Code	Course	L	T	P	Credits
2	25PH202BS	Applied Physics	3	0	0	3

Pre-requisites: 10 + 2 Physics

Course Objectives: The objectives of this course for the student are to:

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibers.

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

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
4. Appreciate the features and applications of Nanomaterials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

COURSE CONTENTS:

UNIT 1: QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan−Boltzmann's law, Wein's and Rayleigh−Jean's law, Planck's radiation law − photoelectric effect − Davisson and Germer experiment –Heisenberg uncertainty principle − Born interpretation of the wave function – time independent Schrodinger wave equation − particle in one dimensional potential box.

Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) − Fermi-Dirac distribution − Bloch's theorem −Kronig−Penney model – E−K diagram− effective mass of electron−origin of energy bands− classification of solids.

UNIT 2: SEMICONDUCTORS AND DEVICES

Intrinsic and extrinsic semiconductors – Hall effect − direct and indirect band gap semiconductors − construction, principle of operation and characteristics of P−N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT 3: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS

Dielectric Materials: Basic definitions− types of polarizations (qualitative) − ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials: Hysteresis−soft and hard magnetic materials − magnetostriction, magnetoresistance − applications − bubble memory devices, magnetic field sensors and multiferroics. Energy Materials: Conductivity of liquid and solid electrolytes− superionic conductors − materials and electrolytes for super capacitors − rechargeable ion batteries, solid fuel cells.

UNIT 4: NANOTECHNOLOGY

Nanoscale, quantum confinement, surface to volume ratio, bottom−up fabrication: sol−gel, combustion methods – top−down fabrication: ball milling − physical vapor deposition (PVD) − chemical vapor deposition (CVD) − characterization techniques − XRD, SEM &TEM − applications of nanomaterials.

UNIT 5: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics−three quantum processes−Einstein coefficients and their relations− lasing action − pumping methods− ruby laser, He−Ne laser , CO2 laser, semiconductor laser−applications of laser.
Fiber Optics: Introduction to optical fiber− advantages of optical Fibers − total internal reflection− construction of optical fiber − acceptance angle − numerical aperture− classification of optical fibers− losses in optical fiber − optical fiber for communication system − applications.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"− S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices− Basic Principle – Donald A, Neamen, Mc Graw Hill, 4th Edition, 2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition, 2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya − Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

Sl. No.	Course Code	Course	L	T	P	Credits
3	25EE203ES	Basic Electrical Engineering	2	0	0	2

Prerequisites: Mathematics

Course Objectives:

1. To understand DC and Single & Three phase AC circuits
2. To study and understand the different types of DC, AC machines and Transformers.
3. To import the knowledge of various electrical installations and the concept of power, power factor and its improvement.

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

1. Understand and analyze basic Electrical circuits
2. Study the working principles of Electrical Machines and Transformers
3. Introduce components of Low Voltage Electrical Installations.

UNIT-I:

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II:

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III:

Transformers: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV:

Electrical Machines: Construction and working principle of dc machine, performance characteristics of dc shunt machine. Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Single-phase induction motor, Construction and working. Construction and working of synchronous generator.

UNIT-V:

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, “Basic Electrical Engineering”, S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, “Basic Electrical Engineering”, 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
6. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
7. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989

Sl. No.	Course Code	Course	L	T	P	Credits
4	25CS204PC	**Discrete Mathematics**	**3**	**1**	**0**	**4**

Course Objectives:

1. Introduces elementary discrete mathematics for computer science and engineering.
2. Topics include formal logic notation, methods of proof, induction, sets, relations, algebraic structures, elementary graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

Course Outcomes:

1. Understand and construct precise mathematical proofs
2. Apply logic and set theory to formulate precise statements
3. Analyze and solve counting problems on finite and discrete structures
4. Describe and manipulate sequences
5. Apply graph theory in solving computing problems

COURSE CONTENTS:

UNIT 1:

Mathematical logic: Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT 2:

Set theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

UNIT 3:

Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

UNIT 4:

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

UNIT 5:

Graph Theory: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi−graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four−Color Problem.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw−Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE BOOKS:

1. Discrete and Combinatorial Mathematics − an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

Sl. No.	Course Code	Course	L	T	P	Credits
5	25CS205ES	Fundamentals of Python Programming	**3**	**0**	**0**	**3**

Prerequisites: Basic knowledge on C Programming.

Course Objectives:

1. Introduce the fundamentals of Python programming language, including syntax, data types, operators, and control structures.
2. Develop problem-solving skills using conditional and iterative statements in Python.
3. Provide practical knowledge of arrays, strings, and numerical computing using NumPy.
4. Enable students to design modular programs using functions, lists, tuples, dictionaries, and modules.
5. Familiarize students with file handling, exception handling, and persistent storage for building robust Python applications.

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

1. Understand the basics of Python programming, including variables, data types, operators, input/output statements, and solve computational problems effectively using control statements and looping constructs.
2. Demonstrate the use of arrays and matrices using NumPy and perform string manipulation operations for data processing tasks.
3. Design and implement modular programs using functions, recursion, lists, and tuples.
4. Utilize dictionaries and modules to organize, manage, and reuse Python code efficiently.
5. Develop Python programs involving file handling, exception handling, and persistent storage with proper error management.

UNIT–I

Introduction to Python: History, Features, Applications, First Python Program, Variables, Data Types, Numbers, Operators, Input and Output statements.

Control Statements: Conditional Statements, A Word on Indentation, Looping Statements, the else Suite, break, continue, pass, assert, return.

UNIT–II

Arrays in Python: Arrays, Types of Arrays, Working with Arrays using numpy, Creating Arrays, Operations on Arrays, Attributes of an Array, The reshape() Method, The flatten() Method, Matrices in numpy, Matrix Addition and Multiplication.

Strings and Characters: Creating Strings, Operations on Strings, Working with Characters, Sorting Strings, Searching Strings.

UNIT–III

Functions in Python: Defining a Function, Calling a Function, Parameters, Recursive Functions.

List: Creating Lists using range() Function, Operations on Lists, Methods to Process List, Sorting the List Elements.

Tuple: Creating Tuples, Accessing the Tuple Elements, Operations on Tuple, Functions to Process Tuples.

UNIT–IV

Dictionaries: Operations on Dictionaries, Dictionary Methods, Sorting the Elements of a Dictionary using Lambdas, Converting Lists into Dictionary, Converting Strings into Dictionary, Passing Dictionaries to Functions.

Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules.

UNIT–V

Files in Python: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules.

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, *Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, *Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules.

TEXT BOOKS:

1. Wesley J. Chun, Core Python Programming, Second Edition, Pearson, 2006.
2. R. Nageswara Rao Core Python Programming, Dream Tech Press, 2018.

REFERENCE BOOKS:

1. Python Programming using problem solving approach, Reema thareja, Oxford University Press, 2019.
2. Dietel and Dietel, Python How to Program, 2002.

WEB LINKS:

1. https://nptel.ac.in/courses/106106145
2. https://onlinecourses.nptel.ac.in/noc20_cs83/preview
3. https://www.visualpathedu.com/home/course/core-python/1
4. https://www.visualpathedu.com/home/course/advanced-python/3
5. https://www.udemy.com/topic/python/free/
6. https://www.coursera.org/specializations/python

Sl. No.	Course Code	Course	L	T	P	Credits
6	25ME206ES	Computer Aided Engineering Graphics	1	0	4	3

Course Objectives:

1. To develop the ability of visualization of different objects through technical drawings
2. To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products

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

1. Apply computer aided drafting tools to create 2D and 3D objects
2. sketch conics and different types of solids
3. Appreciate the need of Sectional views of solids and Development of surfaces of solids
4. Read and interpret engineering drawings
5. Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting

COURSE CONTENTS:

UNIT 1 : Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

UNIT 2: Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes

UNIT 3: Projections of Regular Solids: Projections of Solids − Sectional view of– Cylinder, Auxiliary views, Computer aided projections of solids.

UNIT 4: Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

UNIT 5: Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non− isometric lines.

Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice−versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.

REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

Sl. No.	Course Code	Course	L	T	P	Credits
7	25PH207BS	Applied Physics Laboratory	0	0	2	1

Course Objectives: The objectives of this course for the student to

1. Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B−H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

Course Outcomes: The students will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n−type or p−type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Carried out data analysis.

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co−efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V−I characteristics of a p−n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. V−I and L−I characteristics of light emitting diode (LED)
7. V−I Characteristics of solar cell
8. Determination of Energy gap of a semiconductor.
9. Determination of the resistivity of semiconductor by two probe method.
10. Study B−H curve of a magnetic material.
11. Determination of dielectric constant of a given material
12. Determination of the beam divergence of the given LASER beam
13. Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
14. Understanding the method of least squares – torsional pendulum as an example.

REFERENCE BOOK:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"− S Chand Publishers, 2017.

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Sl. No.	Course Code	Course	L	T	P	Credits
8	25CS208ES	Python Programming Laboratory	**0**	**0**	**2**	**1**

Course Objectives:

- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

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

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Verify programs using modular approach, file I/O, Python standard library
- Implement Digital Systems using Python

1. Read name, address, email and phone number of a person through keyboard and print the details.
2. Start a Python interpreter and use it as a Calculator.
3. Write a Python Program to Find ASCII value of a character.
4. Write a program to calculate compound interest when principal, rate and number of periods are given.
5. Given coordinates (x1, y1), (x2, y2) find the distance between two points.
6. Write a Python program to find the area of a triangle.
7. Write a Python program to swap two variables without temp variable.
8. Write a Python program to convert Celsius to Fahrenheit.
9. Write a Python program to display calendar.
10. Write a Python program to solve quadratic equation.
11. Write a Python Program to Check if a Number is Odd or Even.
12. Write a Python Program to Check Leap Year.
13. Write a Python Program to Check Prime Number.
14. Write a Python Program to Print all Prime Numbers in an Interval.
15. Print the below triangle using for loop.

```
5
4 4
3 3 3
2 2 2 2
1 1 1 1 1
```

16. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)
17. Write a Python Program to Make a Simple Calculator with 4 basic mathematical operations.
18. Python program to print all prime numbers in a given interval (use break)
19. Write a Python Program to Find the Factorial of a Number.
20. Write a Python Program to Display the multiplication Table.
21. Write a Python Program to Print the Fibonacci sequence.
22. Write a program to convert a list and tuple into arrays.
23. Write a program to find common values between two arrays.
24. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
25. Write a Python Program to Find LCM and HCF.

26. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.
27. Write a Python program for removing *i*th character from a string.
28. Write a Python program to split and join a string.
29. Write a Python program to find and display uncommon words from two Strings.
30. Write a Python program to find and display all duplicate characters in string.
31. Write a function called has duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
32. Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
33. Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.
34. Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e' .
35. Remove the given word in all the places in a string?
36. Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
37. Write a Python Program to Display Fibonacci Sequence Using Recursion.
38. Write a Python Program to Find Factorial of Number Using Recursion.
39. Write a Python Program to find sum of elements of an array.
40. Write a Python Program to find largest element in an array.
41. Write a Python Program for array rotation.
42. Write a python program that defines a matrix and prints.
43. Write a python program to perform addition of two square matrices.
44. Write a python program to perform multiplication of two square matrices.
45. Write a Python Program to Transpose a Matrix.
46. Write a program which takes 2 digits, X,Y as input and generates a 2-dimensional array. The element value in the i-th row and j-th column of the array should be i*j.
47. Write a Python Program to Sort Words in Alphabetic Order.
48. Write a Python program to find sum of elements in the list.
49. Write a Python program to Multiply all numbers in the list.
50. Write a Python program to find smallest and largest number in a list.
51. Write a Python program to print even and odd numbers in a list.
52. Write a Python program to Remove empty List from List.
53. Write a Python program to Count occurrences of an element in a list.
54. Write a Python program to find words which are greater than given length k.
55. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
56. Use the structure of exception handling all general purpose exceptions.
57. Write a Python program to Extract Unique dictionary values.
58. Write a Python program to find the sum of all items in a dictionary.
59. Write a Python program to Merging two Dictionaries.
60. Write a Python program to convert key-values list to flat dictionary.
61. Write a Python program to insertion at the beginning in OrderedDict.
62. Write a Python program to check order of character in string using OrderedDict().
63. Write a Python program to sort Python Dictionaries by Key or Value.
64. Write a python code to read a phone number and email-id from the user and validate it for correctness.
65. Write a Python code to merge two given file contents into a third file.
66. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

67. Write a Python code to Read text from a text file, find the word with most number of occurrences.
68. Write a function that reads a file *file1* and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.
69. Import numpy, Plotpy and Scipy and explore their functionalities.
70. Install NumPy package with pip and explore it.

Sl. No.	Course Code	Course	L	T	P	Credits
9	25EE209ES	Basic Electrical Engineering Laboratory	0	0	2	1

Course Objectives:

1. To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.
2. To study the transient response of various R, L and C circuits using different excitations.
3. To determine the performance of different types of DC, AC machines and Transformers.

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

1. Verify the basic Electrical circuits through different experiments.
2. Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
3. Analyze the transient responses of R, L and C circuits for different input conditions.

List of experiments:

1. Verification of KVL and KCL
2. Verification of Thevenin's and Norton's theorem
3. Transient Response of Series RL and RC circuits for DC excitation
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single−Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Torque−Speed Characteristics of a Three−phase Induction Motor.
9. Verification of Superposition theorem.
10. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star−Delta, Delta−Delta, Delta−star, Star−Star)
11. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
12. Measurement of Active and Reactive Power in a balanced Three−phase circuit
13. No−Load Characteristics of a Three−phase Alternator

Sl. No.	Course Code	Course	L	T	P	Credits
10	25PE210AU	**Sports and Yoga**	**3^**	**0**	**0**	**0**

Course Objectives:

1. To make the students understand the importance of sound health and fitness principles as they relate to better health.
2. To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.
3. To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury.
4. To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

Course Outcomes: On successful completion of the course the students will be able to:

1. Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
2. Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
3. Learn breathing exercises and healthy fitness activities
4. Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
5. Perform yoga movements in various combination and forms.
6. Assess current personal fitness levels.
7. Identify opportunities for participation in yoga and sports activities.
8. Develop understanding of health−related fitness components: cardiorespiratory endurance, flexibility and body composition etc.
9. Improve personal fitness through participation in sports and yogic activities.
10. Develop understanding of psychological problems associated with the age and lifestyle.
11. Demonstrate an understanding of sound nutritional practices as related to health and physical performance.
12. Assess yoga activities in terms of fitness value.
13. Identify and apply injury prevention principles related to yoga and physical fitness activities.
14. Understand and correctly apply biomechanical and physiological principles elated to exercise and training.

COURSE CONTENTS:

Introduction to Physical Education

- Meaning & definition of Physical Education
- Aims & Objectives of Physical Education
- Changing trends in Physical Education

Olympic Movement

- Ancient & Modern Olympics (Summer & Winter)
- Olympic Symbols, Ideals, Objectives & Values
- Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

Physical Fitness, Wellness & Lifestyle

- Meaning & Importance of Physical Fitness & Wellness
- Components of Physical fitness
- Components of Health related fitness
- Components of wellness

- Preventing Health Threats through Lifestyle Change
- Concept of Positive Lifestyle

Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga

- Define Anatomy, Physiology & Its Importance
- Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro−Muscular System etc.)

Kinesiology, Biomechanics & Sports

- Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
- Newton's Law of Motion & its application in sports.
- Friction and its effects in Sports.

Postures

- Meaning and Concept of Postures.
- Causes of Bad Posture.
- Advantages & disadvantages of weight training.
- Concept & advantages of Correct Posture.
- Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis.
- Corrective Measures for Postural Deformities

Yoga

- Meaning & Importance of Yoga
- Elements of Yoga
- Introduction − Asanas, Pranayama, Meditation & Yogic Kriyas
- Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana)
- Relaxation Techniques for improving concentration − Yog−nidra

Yoga & Lifestyle

- Asanas as preventive measures.
- Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana.
- Obesity: Procedure,Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.
- Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.
- Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana.
- Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.

Training and Planning in Sports

- Meaning of Training
- Warming up and limbering down
- Skill, Technique & Style
- Meaning and Objectives of Planning.
- Tournament – Knock−Out, League/Round Robin & Combination.

Psychology & Sports

- Definition & Importance of Psychology in Physical Edu. & Sports
- Define & Differentiate Between Growth & Development
- Adolescent Problems & Their Management
- Emotion: Concept, Type & Controlling of emotions
- Meaning, Concept & Types of Aggressions in Sports.
- Psychological benefits of exercise.
- Anxiety & Fear and its effects on Sports Performance.

- Motivation, its type & techniques.
- Understanding Stress & Coping Strategies.

Doping

- Meaning and Concept of Doping
- Prohibited Substances & Methods
- Side Effects of Prohibited Substances

Sports Medicine

- First Aid – Definition, Aims & Objectives.
- Sports injuries: Classification, Causes & Prevention.
- Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

Sports / Games

Following subtopics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.

- History of the Game/Sport.
- Latest General Rules of the Game/Sport.
- Specifications of Play Fields and Related Sports Equipment.
- Important Tournaments and Venues.
- Sports Personalities.
- Proper Sports Gear and its Importance.

Text Books/References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga by B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes).