Study Scheme of B. Tech. All Programmes-1st Year

Programme Name B. Tech. All Programmes
Curriculum applicable to AY 2025-26 onwards
Curriculum Version: 1.0
Approved by / Date BoS / 21-May-2025

SEMESTER 1st (Group 1)		Contact Hours/Week			Maximum Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
25C1CHU-101	Chemistry-I	3	1	0	40	60	100	4
25C1CHU-111	Chemistry-I Lab	0	0	2	30	20	50	1
25C1EMU-101	Engineering Mathematics-I	3	1	0	40	60	100	4
25C1CSU-102	*Programming for Problem Solving using Python	3*	0	0	40*	60*	100*	3*
25C1CSU-112	*Programming for Problem Solving Lab using Python	0	0	2*	30*	20*	50*	1*
25C1MEU-101	# Elements of Mechanical Engineering	3#	0	0	40#	60#	100#	3#
25C1EPU-101	English & Professional Communication	3	0	0	40	60	100	3
25C1EPU-111	English & Professional Communication Lab	0	0	2	30	20	50	1
25C1MEU-113	Workshop/Manufacturing Practices Lab	0	0	4	60	40	100	2
Total		**12**	**2**	**10*/8#**	**310*/280#**	**340*/320#**	**650*/600#**	**19*/18#**
Total Contact Hours/Week = 24*/22#								
***For circuit Branches** **#For Non-Circuit Branches**								
Total number of credits for the program will be as per guidelines given by AICTE/UGC/ IKGPTU								

SEMESTER 1st (Group 2)		Contact Hours/Week			Maximum Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext**	**Total**	
25C1PHU-101	Engineering Physics	3	1	0	40	60	100	4
25C1PHU-111	Engineering Physics Lab	0	0	2	30	20	50	1
25C1EMU-101	Engineering Mathematics-I	3	1	0	40	60	100	4
25C1ECU-101	Basic Electrical and Electronics Engineering	3	1	0	40	60	100	4
25C1ECU-111	Basic Electrical and Electronics Engineering Lab	0	0	2	30	20	50	1
25C1CSU-101	Programming for Problem Solving using C	3	0	0	40	60	100	3
25C1CSU-111	Programming for Problem Solving Lab using C	0	0	2	30	20	50	1
25C1MEU-111	*Engineering Graphics & Design	0	0	2*	30	20	50	1*
25C1MEU-112	#Engineering Graphics & Design	0	0	4#	30	20	50	2#
25C1ESU-101	Environmental Sciences	2	0	0	100	…	100	Non-Credit
Total		**14**	**3**	**8*/10#**	**380**	**320**	**700**	**19*/20#**
Total Contact Hours/Week = 25* / 27#								
***For circuit Branches** **#For Non-Circuit Branches**								
Total number of credits for the program will be as per guidelines given by AICTE/UGC/ IKGPTU								

SEMESTER 2nd (Group 1)		Contact Hours/Week			Maximum arks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
25C1PHU-101	Engineering Physics	3	1	0	40	60	100	4
25C1PHU-111	Engineering Physics Lab	0	0	2	30	20	50	1
25C1EMU-201	Engineering Mathematics-II	3	1	0	40	60	100	4
25C1ECU-101	Basic Electrical and Electronics Engineering	3	1	0	40	60	100	4
25C1ECU-111	Basic Electrical and Electronics Engineering Lab	0	0	2	30	20	50	1
25C1CSU-102	*Programming for Problem Solving using Python	3*	0	0	40*	60*	100*	3*
25C1CSU-112	*Programming for Problem Solving Lab using Python	0	0	2*	30*	20*	50*	1*
25C1MEU-111	*Engineering Graphics & Design	0	0	2*	30	20	50	1*
25C1MEU-112	#Engineering Graphics & Design	0	0	4#	30	20	50	2#
25C1ESU-101	Environmental Sciences	2	0	0	100	…	100	Non-Credit
Total		**14**	**3**	**8*/10#**	**380**	**320**	**700**	**19*/20#**
Total Contact Hours/Week = 25* / 27# ***For circuit Branches** **#For Non-Circuit Branches**								
Total number of credits for the program will be as per guidelines given by AICTE/UGC/ IKGPTU								

SEMESTER 2nd (Group 2)		Contact Hours/Week			Maximum Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
25C1CHU-101	Chemistry-I	3	1	0	40	60	100	4
25C1CHU-111	Chemistry-I Lab	0	0	2	30	20	50	1
25C1EMU-201	Engineering Mathematics-II	3	1	0	40	60	100	4
25C1CSU-101	Programming for Problem Solving using C	3	0	0	40	60	100	3
25C1CSU-111	Programming for Problem Solving Lab using C	0	0	2	30	20	50	1
25C1MEU-101	# Elements of Mechanical Engineering	3#	0	0	40#	60#	100#	3#
25C1EPU-101	English & Professional Communication	3	0	0	40	60	100	3
25C1EPU-111	English & Professional Communication Lab	0	0	2	30	20	50	1
25C1MEU-113	Workshop/Manufacturing Practices Lab	0	0	4	60	40	100	2
Total		**12**	**2**	**10*/8#**	**310*/280#**	**340*/320#**	**650*/600#**	**19*/18#**
Total Contact Hours/Week = 24*/22# ***For circuit Branches** **#For Non-Circuit Branches**								
Total number of credits for the program will be as per guidelines given by AICTE/UGC/ IKGPTU								

Study Scheme of Bridge Courses for B. Tech. All Programmes

Programme Name	B. Tech. All Programmes
Curriculum applicable to	AY 2025-26 onwards
Curriculum Version:	1.0
Approved by / Date	BoS / 21-May-2025

BRIDGE COURSES*		**Contact Hours/Week**			**Maximum Marks**			**Credits**
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
25C1PHU-B1	Bridge Course Physics	2	0	0	40	60	100	0
25C1MEU-B3	Bridge Course for Engineering Drawing	0	0	2	40	60	100	0
25C1EMU-B2	Bridge Course - Mathematics	3	1	0	40	60	100	0

*Note: The college will offer suitable bridge courses such as Mathematics, Physics, Engineering Drawing, etc., for the students coming from diverse backgrounds to prepare Level playing field and desired learning outcomes of the programme.

Course title	**Chemistry-I**
Course Code:	**25C1CHU-101**
Scheme and Credits	**L T P C** **Semester – I/II** **3 1 0 4**
Pre-requisite (if any)	-
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

Course Outcomes:

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

CO1	interpret concepts related to atomic and molecular structure at orbital level as well as categorize various intermolecular forces.
CO2	infer about thermodynamic functions, chemical equilibria, water chemistry and corrosion.
CO3	interpretation of data by using different spectroscopic techniques.
CO4	explain and distinguish different periodic properties of elements such as ionization energy, electron affinity, electronegativity, oxidation state and polarizability.
CO5	classify major organic chemical reactions used for the synthesis of molecules as well as drugs.
CO6	Illustrate three dimensional arrangements and isomers possible for a molecule and their properties.

Detailed contents:

Unit 1: Atomic and molecular structure (12 hours)

Schrodinger equation. Particle in 1-D box, solution and their applications for conjugated molecules, Eigen values and Eigen functions, Quantum numbers. Molecular orbitals and energy level diagrams of diatomic molecules. π Molecular orbitals of butadiene and benzene and aromaticity up to 6π elctrons (Huckel rule). Coordination numbers and geometries, Crystal field theory and the energy level diagrams for transition metal ions (octahedral and tetrahedral environment) and their magnetic properties. Band structure of solids and the role of doping on band structures.

Unit 2: Intermolecular forces and Hydrogen bonding (6 hours)

Ionic, dipolar, van Der Waals interactions. Hydrogen bonding and its types. Deviations of real gases from ideal behavior, equations of state of real gases (van der Waals equation of state), and critical phenomena (critical constants and their relation with van der Waals constants).

Unit 3: Periodic properties (7 hours)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, hard soft acids and bases, molecular geometries (up to 6 electron pairs) by VSEPR theory.

Unit 4: Use of free energy in chemical equilibria Thermodynamic functions (11 hours)

Energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry: Hardness of water, units of hardness, problems associated with hardwater, softening of hardwater (zeolite process and Ion exchange Process). Corrosion: Introduction, electrochemical & dry corrosion (mechanism & their comparison), rusting of iron, factors affecting the rate of corrosion, protective measures.

Unit 5: Spectroscopic techniques and its applications (11 hours)

Electronic spectroscopy: Principle and instrumentation, electronic transitions, Chromophores and auxochromes, factors affecting the value of max and intensity of spectral lines. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules: selection rules, expression for energies. Nuclear magnetic resonance (1H NMR): Principle, instrumentation, chemical shift, coupling (spin-spin coupling), splitting of peaks, and interpretation of 1 H NMR of simple molecules (up to 6 carbon atoms: cyclic and acyclic).

Unit 6: Stereochemistry (6 hours)

Representations of 3 dimensional structures (Fischer, wedge, sawhorse and Newman projections) structural isomers and stereoisomers; Diastereomers, chirality and its types, enantiomers, optical activity, specific rotation, absolute configurations, determination of R/S configuration for simple molecules (one chiral center) and E & Z configuration, conformational analysis by Newman projection (ethane, propane & butane molecules).

Unit 7: Unit Organic reactions and synthesis of a drug molecule (7 hours)

Introduction; types of organic reactions, Reactive intermediates (carbocation, carbanion and free radicals). Introduction to electrophiles and nucleophiles. Aliphatic and aromatic Substitution reactions: Electrophilic, Nucleophilic (SN1 & SN2) and free radical substitution reactions, Friedel Craft alkylation reaction, Halogenation of alkanes; Addition reactions: Electrophilic, Nucleophilic and free radical addition reactions, Markovnikov's addition, Anti-Markovnikov' addition; Elimination (E1 & E2); Synthesis of a commonly used drug molecule (Aspirin and Paracetamol).

Suggested Readings/Books:

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R.A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp.
7. Conceptual chemistry by S. K. Bhasin (Ed. 2018).
8. Interactive Engineering Chemistry BE/B.Tech. PTU by Grewal R.P. Singh.

Course title	**Chemistry-I Lab**
Course Code:	**25C1CHU-111**
Scheme and Credits	**L T P C** **Semester – I/II** **0 0 2 1**
Pre-requisite (if any)	**-**
Internal Marks	**30**
External Marks	**20**
Total Marks	**50**

Course Outcomes:

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

CO1	rephrase interactions among molecules on the basis of surface tension, viscosity and partition coefficient.
CO2	develop polymer and drug molecule.
CO3	estimate hardness and acidity present in water/oil sample.
CO4	acquire practical skills to measure the conductance of various electrolytic solutions and analyse their conductive behaviour.
CO5	evaluate adsorption isotherm and extent of adsorption using TLC.

List of Experiments:

Note: Students are expected to perform at least 10-12 experiments from the following list.

1. Determination of Surface tension and viscosity.
2. Separation of amino acids using TLC.
3. Potentiometry-determination of redox potentials and emf
4. Determination of Partition coefficient of two immiscible liquids.
5. Saponification/acid value of an oil
6. Chemical oscillations- Iodine clock reaction.
7. Ion exchange column for removal of hardness of water.
8. Synthesis of polymer/drug
9. Adsorption of acetic acid by charcoal.
10. Determination of cell constant and conductance of solutions.
11. Colligative properties using freezing point depression.
12. Determination of the rate constant of a reaction
13. Chemical analysis of a salt
14. Lattice structures and packing of spheres

Suggested References/Books:

1. Vogel A-I, Quantitative Inorganic Analysis, Oxford ELBS

2. Vogel A-I, Quantitative Organic Analysis, Oxford ELBS 34

3. dst.gov.in/green-chem.pdf experiments) (monograph of green chemistry laboratory

Course title	**Engineering Mathematics - I**
Course Code:	**25C1EMU-101**
Scheme and Credits	**L T P C** **Semester – I** **3 1 0 4**
Pre-requisite (if any)	**Calculus of One Variable Functions**
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

Course Outcomes:

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

CO1	apply various tests to examine convergence or divergence of sequences and infinite series, including power series.
CO2	evaluate the curves using integral calculus and analyse improper integrals to determine their convergence or divergence.
CO3	build the concept of partial derivatives and examine the functions of several variables that are essential in most branches of engineering.
CO4	use multiple integrals to solve real-world problems in calculus of several variables.

Detailed contents:

Unit 1: Sequences and Series (14 hours)
Sequences, Limits of sequences, Infinite series, series of positive terms, Convergence and divergence of sequence and series, Integral test, Comparison test, Ratio test, Root test, Alternating series, Absolute and Conditional Convergence, Leibnitz test, Power series, radius of convergence of power series, Taylor and Maclaurin's series of one variable (without proof).

Unit 2: Integral Calculus: (14 hours)
Length of curves, Volume (disk and washer method) and surface areas of revolution.
Improper Integrals: Improper integrals of the First kind, Improper integrals of the second kind, Absolute convergence of Improper integrals, Beta and Gamma functions, their properties, relationship among beta and gamma functions.

Unit 3: Functions of Several Variables (18 hours)
Concept of limit and continuity of a function of two and three variables: Limits along different paths, Non-existence of limits (path dependency), Partial derivatives, total derivative and differentiability, approximation by total differentials, derivatives of composite function and implicit function, chain rule, homogenous functions, Euler's theorem for homogenous functions, Maxima and minima for function of two variables.

Unit 4: Multiple Integral (14 hours)
Double and triple integrals, change of order of integration, Change of variables in integration, Applications to area and volumes.

Suggested Readings/Books:

1. G.B. Thomas, R.L. Finney "Calculus and Analytic Geometry" 9th edition, Pearson Education.
2. R.K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics" Narosa Publications.
3. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill.
4. E. Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley.
5. Michael D. Greenberg, "Advanced Engineering Mathematics", 2nd edition, Pearson Education.
6. R. Garg, "Mathematics – I", Khanna Book Publishing Co. (P) Ltd.

Course title	**Programming for Problem Solving using Python**
Course Code:	**25C1CSU-102**
Scheme and Credits	**L T P C** **Semester – I/II** **3 0 0 3**
Pre-requisite (if any)	
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

Course Outcomes:

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

CO1	interpret the syntax and semantics of Python Programming Language.
CO2	apply Python functions for manipulating, indexing, and slicing of strings & arrays and use of control statements in Python.
CO3	utilize the process of structuring the data using Python collections like strings, lists, tuples, dictionaries.
CO4	apply user defined functions, modules, packages, exception handling methods and file handing.
CO5	design and develop basic GUI applications in Python.

Detailed contents:

Unit 1: Basic Python's Constructs (8 Lectures)

Introduction to Python Programming Language: Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages.

Python Data Types & Input/Output: Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command.

Operators and Expressions: Operators in Python, Expressions, Precedence, Associativity of Operators, Non-Associative Operators.

Unit 2: Control Statements and Native Data types in Python (10 Lectures)

Control Structures: Decision making statements, Python loops, Python control statements.

Python Native Data Types: Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).

Unit 3: Functions and Modules in Python (12 Lectures)

Python Functions: Functions, Advantages of Functions, Built-in Functions, User defined

functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables.

Python Modules: Module definition, need of modules, creating a module, importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages.

Python packages- Introduction, writing python packages, using standard packages (NumPy, matplotlib) and user defined package statements.

Unit 4: Exception Handling in Python (3 Lectures)

Exception Handling: Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python.

Unit 5: File Processing (4 Lectures)

Concept of Files, File opening in various modes and closing of a file, reading from a file, Writing onto a file. File handling functions e.g open (), close (), read (), read line (), write (), tell (), seek () methods. Renaming & deleting files in Python, directories in Python.

Unit 6: Creating the GUI Form and Adding Widgets using Tkinter library: (8 Lectures)

Widgets: Button, Canvas, Check button, Entry, Frame, Label, List box, Menu button, Menu, Message, Radio button, Scale, Scrollbar, text, Top level, Spin box, Paned Window, Label Frame, tk Message box. Handling Standard attributes and Properties of Widgets

Layout Management: Designing GUI applications with proper Layout Management features

Look and Feel Customization: Enhancing Look and Feel of GUI using different appearances of widgets.

Suggested Readings/Books:

1. Kenneth Lambert, “Fundamentals of Python: First Programs”, Cengage Learning, 2019
2. Martin C Brown, “The Complete Reference with Python”, McGraw Hill, 2018.

Suggested Reference Books

1. John Zelle, Python Programming: An Introduction to Computer Science, Franklin Associates, Third Edition, 2016
2. Mark Lutz, “Learning Python”, Fifth Edition, O’Reilly, 2013.
3. Programming in Python, Pooja Sharma, BPB Publications, 2017.
4. Core Python Programming, R. Nageswara Rao, 2nd Edition, Dreamtech, 2021
5. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY., 2023

Course title	**Programming for Problem Solving Lab using Python**
Course Code:	**25C1CSU-112**
Scheme and Credits	**L T P C** **Semester – I/II** **0 0 2 1**
Pre-requisite (if any)	
Internal Marks	**30**
External Marks	**20**
Total Marks	**50**

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

CO1	solve basic engineering problems using Python programs
CO2	demonstrate the basic data types and operators in Python.
CO3	apply the use of selection control statements, iteration control statements and loop control statements in Python.
CO4	analyse user defined functions, modules, and packages for solving basic engineering problems.
CO5	build python programs for file handling, exception handling methods. and creating GUI in Python.

List of Experiments:

Note: Students are expected to perform at least 10 experiments from the following list.

Experiment 1:
a) Install and configure Python IDE.
b) Write a Python program to display messages on screen.
c) Write a Python program to input a string from a user and display it on the screen.

Experiment. 2:
a) Write a program to check whether entered frequency is radio frequency or audio frequency.
b) Write a program to display various radio frequency bands using if. Else if ladder.
c) Write a program to display resistor colour code using a switch statement.

Experiment. 3:
a) Write a simple Python program to demonstrate use of control loops:
   i) while
   ii) do while
b) Create a simple program, to demonstrate use of: for loop in Python (e.g.: various pattern building, printing multiplication table, checking palindrome number etc.)

Experiment. 4:
Write Python program to perform following operations on List:
a) Create

b) Access
c) Update
d) Delete elements from list.

Experiment. 5:
Develop Python program to perform following operations on Tuples:
a) Create
b) Access
c) Update
d) Delete elements from list.

Experiment. 6:
Write Python program to perform following operations on Set:
a) Create
b) Access
c) Update
d) Delete elements from list.

Experiment. 7:
Create a program to perform following operations on Dictionaries in Python:
a) Create
b) Access
c) Update
d) Delete elements from list.
e) Looping through Dictionary

Experiment. 8:
a) Create a python program to demonstrate use of math built-in function.
b) Create a python program to demonstrate the use of string built-in function.

Experiment. 9:
Write a program to define a function with default arguments.

Experiment. 10:
Write Python Program to Count the Number of words and lines in a Text File.
Write Python Program to Read a String from the User and Append It into a File.

Experiment. 11:
Create an array using NumPy.
Find the dimension of the array using NumPy inbuilt methods.

Experiment. 12:
Write Python program to create Widgets using Tkinter.

Course title	**Elements of Mechanical Engineering**
Course Code:	**25C1MEU-101**
Scheme and Credits	**L T P C** **Semester – I/II** **3 0 0 3**
Pre-requisite (if any)	**-**
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

Course Outcomes:

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

CO1	outline the basic concepts of simple, compound stresses, strains and strain energy.
CO2	explain the concept of simple mechanisms and different types of kinematic pairs.
CO3	apply static and dynamic force analysis to determine forces, couples, and inertia effects in mechanical systems.
CO4	interpret the physical significance of fluids with their properties.
CO5	demonstrate the concept of Hydraulic Turbines, Pumps and Hydraulic devices.

Detailed contents:

Chapter 1: Simple, Compound Stresses and Strains (8 Hrs.)
Stress and Strain and their types, Hook's law, longitudinal and lateral strain, Poisson's ratio, stress-strain diagram for ductile and brittle materials, stress in a bar, elastic constants and their significance, relation between elastic constants, Young's modulus of elasticity, modulus of rigidity and bulk modulus. Introduction to strain energy, energy of dilation and distortion. Resilience, stress due to suddenly applied loads.

Chapter 2: Kinematics of Machines (8 Hrs.)
Basic Concepts of Machines: Link, Mechanism, Kinematic Pair, and Kinematic Chain, Principles of Inversion: Inversion of a Four-Bar Chain, Slider-Crank Chain, and Double Slider- Crank Chain, Lower and Higher Pairs: Universal Joint, Calculation of Maximum Torque, Steering Mechanisms (Ackerman and Davis Approximate Steering Mechanisms).

Chapter 3: Dynamics of Machines (10 Hrs.)
Static Force Analysis: Concept of Force and Couple, Free Body Diagram, Condition of Equilibrium, Static Equilibrium of Mechanisms, Methods of Static Force Analysis of Simple Mechanisms. Dynamic Force Analysis, Dynamically Equivalent System.

Chapter 4: Fundamentals of Fluid Mechanics (9 Hrs.)
Concept of fluid, Difference between solids, liquids and gases, Concept of continuum, Ideal and real fluids, Fluid properties: density, specific volume, specific weight, specific gravity, viscosity (dynamic and kinematic), vapour pressure, compressibility, bulk modulus, Mach number, surface

tension and capillarity, Newtonian and non-Newtonian fluids. Concept of static fluid pressure, Pascal's law and its engineering applications.

Chapter 5: Hydraulic Turbines, Pumps and Hydraulic devices (10 Hrs.)
Introduction to turbine, types of turbines, Component parts and operation and applications of various turbines. Introduction to pump, classification of pump, Centrifugal Pumps, Main elements and their functions. Introduction to hydraulic devices, Construction, operation and utility of simple and differential accumulator, intensifier, Hydraulic lift, Hydraulic crane, Hydraulic press.

Suggested References/Books:

1. R. K. Bansal, A Text Book of Strength of Materials. New Delhi: Laxmi Publications, 2010.
2. S. Ramamurtham and R. Narayan, Strength of Materials. New Delhi: Dhanpat Rai Publishing Company (P) Ltd., 2008.
3. S. S. Rattan, Strength of Materials. New Delhi: Tata McGraw Hill, 2011.
4. V. P. Singh, Theory of Machines. New Delhi: Dhanpat Rai and Company, 2006.
5. S. S. Rattan, Theory of Machines. New Delhi: Tata McGraw Hill, 2014.
6. D. S. Kumar, Fluid Mechanics and Fluid Power Engineering, 1st ed. New Delhi: S.K. Kataria and Sons Publishers, 2009.
7. R. K. Bansal, A Text Book of Fluid Mechanics and Hydraulic Machines, Revised 9th ed. New Delhi: Laxmi Publications, 2015.

Course title	**English & Professional Communication**
Course Code:	**25C1EPU-101**
Scheme and Credits	**L T P C** **Semester – I/II** **3 0 0 3**
Pre-requisite (if any)	**Nil**
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

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

CO1	improve their vocabulary to use different words and phrases in formulating meaningful sentences.
CO2	identify and ascertain knowledge about the basic grammatical aspects and sentence structures for developing effective communication.
CO3	interpret the given text and employ effective writing techniques for organizing and producing clear and coherent forms of expression.
CO4	identify and interpret the literal and contextual meaning of the given text to compose their responses accordingly.
CO5	apply their point of view effectively for developing and generating their ideas in creative written form.
CO6	compose varied forms of business correspondence and professional documents for the purpose of informing, recognizing, analysing and official reporting.

Detailed contents:

Unit 1: Mechanics of Writing (7 hours)
1. Writing introduction and conclusion
2. Describing
3. Defining
4. Classifying
5. Providing examples or evidence
6. Content writing (short speech, blogs, social media posts etc)
7. Writing practices on the lives of prominent Engineers

Unit-2 Identifying Common Errors in Writing (13 hours)
1. Subject-verb agreement
2. Noun-pronoun agreement
3. Misplaced modifiers
4. Articles
5. Prepositions
6. Redundancies

7. Clichés
8. Verbal Aptitude- Error Analysis based on corpus of Exercises: Spotting Errors, Selecting Words, Ordering of words

Unit 3: Vocabulary Building & Basic Writing Skills (12 Hours)

1. The concept of Word Formation
2. Root words from foreign languages and their use in English
3. Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
4. Synonyms, antonyms, and standard abbreviations.
5. Vocabulary Quiz
6. Sentence Structures
7. Use of phrases and clauses in sentences
8. Importance of proper punctuation
9. Creating coherence
10. Organizing principles of paragraphs in documents
11. Techniques for writing precisely

Unit-4 Professional Communication & Writing Practices (13 hours)

1. Comprehension
2. Precis
3. Cohesive Devices
4. Essay Writing
5. Professional Communication, its need and importance, barriers to effective communication
6. Presentation skills**,** its importance*,* Time management during presentations, Audience analysis and engagement tactics
7. Business Writing-Business letters, Business Emails, Report Writing, Resume/CV

Suggested Readings/Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
7. Objective General English by Dr. R S Aggarwal (S. Chand, Revised Edition 2023)

Course title	**English & Professional Communication Lab**
Course Code:	**25C1EPU-111**
Scheme and Credits	**L T P C** **Semester – I/II** **0 0 2 1**
Pre-requisite (if any)	**Nil**
Internal Marks	**30**
External Marks	**20**
Total Marks	**50**

Course Outcomes:

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

CO1	build their listening and speaking skills by acquiring new forms of expressions for lucid communications.
CO2	formulate structured conversation and put forth their point of view fluently on a variety of topics.
CO3	overcome their inhibition and feel confident while demonstrating their language skills to make the transitions clear.
CO4	interpret, analyse and use correct language in general, academic and professional environment.
CO5	understand and function as per the expectations of the industry to prepare themselves for future interviews.
CO6	design presentation on a given topic, learn to modulate their voice along with exhibiting the right body language.

List of Practicals:

1. Listening Comprehension
2. Self-Introduction
3. Group Discussion
4. Role Play
5. Common Everyday Situations: Conversations and Dialogues
6. Communication at Workplace
7. Interviews
8. Formal Presentations

Suggested References/Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
3. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course title	**Workshop/Manufacturing Practices Lab**
Course Code:	**25C1MEU-113**
Scheme and Credits	**L T P C** **Semester – I/II** **0 0 4 2**
Pre-requisite (if any)	**-**
Internal Marks	**60**
External Marks	**40**
Total Marks	**100**
	Common to all branches

Course Outcomes:

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

CO1	interpret the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials
CO2	construct different jobs in various shops manually.
CO3	interpret the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
CO4	develop small projects of their interest.

List of Experiments:

Note: Students must prepare one job for each shop listed below and maintain a practical file

1. Machine shop (10 Hrs.)
2. Fitting shop (8 Hrs.)
3. Carpentry (6 Hrs.)
4. Electrical & Electronics (8 Hrs.)
5. Welding shop (8 Hrs.)
   Arc welding (4 Hrs.) + Gas welding (4 Hrs.)
6. Casting (8 Hrs.)
7. Smithy (6 Hrs.)
8. Plastic Moulding & Glass Cutting (6 Hrs.)

Suggested References/Books:

1. S. K. Hajra Choudhury, A. K. Hajra Choudhury, and S. K. Nirjhar Roy, Elements of Workshop Technology, Vol. Vol. II, 2010, Media Promoters and Publishers Pvt. Ltd.
2. S. Kalpakjian and S. S. Schmid, Manufacturing Engineering and Technology, 4th ed., Pearson Education India, 2002.
3. P. Gowri, K. Hariharan, and A. Suresh Babu, Manufacturing Technology – I, Pearson Education, 2008.
4. P. N. Rao, Manufacturing Technology, Vol. I and II, Tata McGraw-Hill, 2017.
5. B. S. Raghuwanshi, A Course in Workshop Technology – Vol. 1: Manufacturing Processes, 13th ed. New Delhi, India: Dhanpat Rai Publications, 2013.

Course title	**Engineering Physics**
Course Code:	**25C1PHU-101**
Scheme and Credits	**L T P C** **Semester – I/II** **3 1 0 4**
Pre-requisite (if any)	**High School Education**
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

Course Outcomes:

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

CO1	apply crystallography to analyse crystal structures with X-ray diffraction and infer the behaviour of semiconductor devices like p-n junctions and special diodes.
CO2	interpret the properties of superconductors and apply Maxwell's equations to explain electromagnetic wave propagation and energy transfer in various media.
CO3	examine quantum principles to understand nanoscale behaviour and evaluate the synthesis, properties, and applications of nanomaterials like CNTs and nanocomposites.
CO4	explain the principles of laser operation and fibre optics, and analyse their applications in communication and technology.

Detailed contents:

PART-A

Unit 1: Elements of crystallography (6 hours)

Unit cell, Basis, Space lattice, Crystal Systems, Miller Indices of Planes: notation system and calculation method, Origin of X-rays, Continuous & Characteristic X- Rays, X-Ray Diffraction & Bragg's law in Crystals, Bragg's spectrometer

Unit 2: Semiconductor materials (8 hours)

Bonding in semiconductors, Origin of bands in solids (Qualitative idea), Metals, semiconductors & insulators, intrinsic and extrinsic semiconductors, p-type, and n-type semiconductors; Fermi level in semiconductors; Current conduction in semiconductors, I-V characteristics of p-n junction diode, Some special p-n diodes: Zener diode, Tunnel diode, Photo diode, and Light emitting diode.

Unit 3: Superconductivity (6 hours)

Superconductivity; Superconductors as ideal diamagnetic materials, Signatures of Superconducting state, Meissner Effect, Type I & Type II superconductors, London Equations.

Unit 4: EM waves (8 hours)

Electromagnetic Spectrum (Basic ideas of different region). Physical significance of Gradient, Divergence & Curl, Maxwell's Equations, electromagnetic wave propagation in free space and isotropic dielectric medium, Poynting vector.

PART-B

Unit 5: Quantum Theory (8 hours)

Need and origin of quantum concept, Wave - particle duality, Matter waves, Group & Phase velocities; Wave function and Born interpretation;(energy and momentum operator), uncertainty Principle; Schrodinger wave equations (time independent & dependent); Particle in a box Problem.

Unit 6: Lasers (8 hours)

Concepts of laser, Spontaneous & Stimulated emissions, Einstein's Coefficients, Population Inversion, Pumping Mechanisms, Components of a laser System, Three & four level laser systems; Ruby, He -Ne, and semiconductor Lasers, Application of Lasers.

Unit 7: Fiber Optics (8 hours)

Introduction, Acceptance Angle, Numerical Aperture, Normalized frequency, Modes of propagation, material dispersion & pulse broadening in optical fibres, fibre connectors, splices and couplers, Applications of optical fibres.

Unit 8: Nanomaterials (8 hours)

Nanoscale, Classifications of nanomaterials (3D, 2D, 1D and 0D), electron confinement, Nanocomposites, Carbon nanotubes (CNTs), Properties of nanomaterials.

Suggested Readings/Books:

1. Physics for Scientists & Engineers (Vol I &II), Serway&Jewett,6thEdition., Cengage Learning.
2. Engineering Physics, Malik H K, Singh A K, 2nd Edition, Tata McGraw Hill,
3. Materials Science & Engg. Raghvan V,6th Edition, Prentice Hall of India.
4. University Physics with Modern Physics, Young Hugh D and Freedman RogerA.,4th Edition, Pearson
5. Concepts of Modern Physics, Beiser; A Mahajan; S Choudhary; SR, 7th Edition, Tata McGraw Hill.
6. Solid State Physics, Dan Wei,1st Edition, Cengage Learning.
7. Introduction to Solids, Azaroff LV, Indian edition, Tata McGraw Hill.
8. Introduction to Electrodynamics, Griffiths; DJ,4th Edition, Prentice Hall.
9. Lasers & Optical engineering, Dass;P, Springer.
10. Optical Fibre system, Technology, Design &Applications, Kao;CK, Mc GrawHill.
11. Laser Fundamentals & Applications, Thygrajan K, Ghatak; AK, 2nd Edition, Laxmi Publications.
12. Solid-state Physics and Electronics, Ashok Sharma, Modern's Pub.
13. Introductory Engineering Physics, Devraj Singh, Vol. I, 4th Edition Dhanpat Rai & Co.

Course title	**Engineering Physics Lab**
Course Code:	**25C1PHU-111**
Scheme and Credits	**L T P C** **Semester – I/II** **0 0 2 1**
Pre-requisite (if any)	**High School Education**
Internal Marks	**30**
External Marks	**20**
Total Marks	**50**

Course Outcomes:

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

CO1	demonstrate some of the theoretical concepts learnt in the theory courses.
CO2	analyzing and applying precise measurements and handling sensitive equipment.
CO3	propose the methods used for estimating and dealing with experimental uncertainties and systematic "errors."
CO4	interpret conclusions from data and develop skills in experimental design.
CO5	outline technical reports which communicate scientific information in a clear and concise manner.

List of Experiments:

Note: Students are expected to perform about 8-10 experiments from the proposed list of 12 experiments, selecting minimum of 6-7 from the Physical Lab and 2-3 from the Virtual lab.

1. To study the characteristic of different p-n junction diode - Ge and Si.
2. To analyze the suitability of a given Zener diode as voltage regulator.
3. To find out the intensity response of a solar cell/Photo diode/LED/Tunnel diode.
4. To study the laser beam characteristics like; wavelength and grating element using diffraction grating & divergence.
5. To determine numerical aperture, attenuation & propagation losses in optical fibres.
6. To find out the frequency of AC mains using electric vibrator/sonometer.
7. To find the refractive index of a material/liquid using spectrometer.
8. To find the velocity of ultrasound in liquid.
9. To determine the grain size of a material using optical microscope.
10. To determine energy band gap of Semiconductor.
11. To determine the resistivity of semiconductors by Four probe Method.
12. To understand the phenomenon Photoelectric effect and determine Planck's constant.

Suggested Readings/Books:

1. Practical Physics, C.L. Arora, S. Chand & Co.
2. Practical Physics, R.S. Sirohi, Wiley Eastern.
3. Introductory Engineering Physics with laboratory manual, Devraj Singh, Dhanpat Rai & Co.

Course title	**Engineering Mathematics - II**
Course Code:	**25C1EMU-201**
Scheme and Credits	**L T P C** **Semester – II** **3 1 0 4**
Pre-requisite (if any)	**Algebra of matrices, differentiation and integration**
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

Course Outcomes:

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

CO1	apply the concepts of matrices to check the consistency of system of linear equations.
CO2	explain the concept of vector spaces and determine the eigen values and eigen vectors of square matrix to examine its diagonalization.
CO3	solve the ordinary differential equations using suitable methods with their physical significance.
CO4	formulate and solve linear partial differential equations using appropriate methods.

Detailed contents:

Unit 1: System of Linear Equations (14 hours)

Rank of a matrix, Echelon form of matrix, Homogenous and Non-homogenous system of linear equations, consistency and inconsistency of system of equations, Gauss elimination method, Inverse of a matrix, Gauss-Jordon method.

Unit 2: Vector Spaces (14 hours)

Vector spaces, Subspaces, Linear independence and Linear dependence of vectors, Dimension and basis, Eigen values, Eigen vectors and their properties, Cayley-Hamilton theorem, algebraic multiplicity, geometric multiplicity, similar and diagonalizable matrices.

Unit 3: Ordinary Differential Equations (18 hours)

Formation of Differential Equations, Solution of Differential Equations, Initial and Boundary value problems, Solution of equations in separable form, equations reducible to separable form, Exact differential equations, integrating factors, Linear first order equations, Bernoulli equation, Higher order differential equation with constant coefficients and variable coefficients, Method of variation of parameters, Method of undetermined coefficients, finding particular integrals, Applications to electric RLC circuit and Simple harmonic Motion.

Unit 4: Partial Differential Equations (14 hours)

Formation of first and second order equations, solution of first order equations: Lagrange's equation, Higher order Linear equations with constant coefficients.

Suggested Readings/Books:

1. E. Kreyszig, “Advanced Engineering Mathematics”, 8th Edition, John Wiley.
2. R.K. Jain and S.R.K. Iyengar, “Advanced Engineering Mathematics” Narosa Publications.
3. B. V. Ramana, “Higher Engineering Mathematics”, Tata McGraw Hill.
4. Michael D. Greenberg, “Advanced Engineering Mathematics”, 2nd edition, Pearson Education.
5. R. Garg, “Mathematics – I”, Khanna Book Publishing Co. (P) Ltd.

Course title	**Basic Electrical and Electronics Engineering**
Course Code:	**25C1ECU-101**
Scheme and Credits	**L T P C** **Semester – I/II** **3 1 0 4**
Pre-requisite (if any)	**Nil**
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

Course Outcomes:

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

CO 1	apply the fundamental principles of theorems/laws to analyse the DC circuits.
CO 2	analyse the single phase and three phase AC circuits.
CO 3	interpret magnetic circuits and their role in transformers and identify key LT switchgear components.
CO 4	identify the components and characteristics of diode, BJT and sensors.

Detailed contents:

Unit 1: DC Circuits (10 hours)
Electrical circuit elements (R, L and C), voltage and current sources, Star-delta transformation, Kirchhoff's laws, analysis of simple circuits with dc excitation. Superposition, Thevenin's and Norton's Theorems. Transient response of first order RL and RC circuits.

Unit 2: AC Circuits (11 hours)
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, Three- phase balanced circuits, voltage and current relations in star and delta connections.

Unit 3: Electrical Machines (17 hours)
Magnetic materials, BH characteristics, need of a transformer, Construction and working of Single-phase transformer, losses in transformers, regulation and efficiency, Components of LT Switchgear: Switch Fuse Unit (SFU), Miniature Circuit Breaker (MCB), MCCB, Earth Leakage Circuit Breaker (ELCB), Types of Wires and Cables, Earthing. Types of Batteries and its characteristics.

Unit 4: Basic of Electronic Devices (7 hours)
Diodes: P-n junction diode, V-I Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of Operation, characteristics, **Sensors** –Basic sensors type –thermal, motion, gas and smart sensors, operation and working principle, Upcoming trends in electronics.

Suggested References/Books:

1. D. P. Kothari and l. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. T.K. Nagsarkar and M.S. Sukhija, “Basic Electrical Engineering”, Oxford University Press, 2017.
3. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
4. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
5. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
6. B. L.Theraja, “Electrical Technology”, S Chand Publishing.2007
7. J. B. Gupta, “Basic Electrical and Electronics Engineering”, Katson Books, 2013
8. “Sensors and Transducers - D. Patranabis” –PHI Learning Private Limited., 2003

Course title	**Basic Electrical and Electronics Engineering Lab**
Course Code:	**25C1ECU-111**
Scheme and Credits	**L T P C** **Semester – I/II** **0 0 2 1**
Pre-requisite (if any)	**Nil**
Internal Marks	**30**
External Marks	**20**
Total Marks	**50**

Course Outcomes:

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

CO 1	experiment with different measuring instruments to verify the fundamentals of electrical engineering.
CO 2	examine electrical connections and measure power, power factor using appropriate equipment's.
CO 3	apply basic principles of magnetism to analyse the operation of transformers.
CO 4	demonstrate the operational principle of diode and transistor.

List of Experiments:

Note: Students are expected to perform at least 10 experiments from the following list.

1. To verify Ohm's Law and its limitations.
2. To verify Kirchhoff's Laws.
3. To measure the resistance and inductance of a coil by ammeter-voltmeter method.
4. To find voltage-current relationship in a R-L series circuit and to determine the power factor of the circuit.
5. To verify the voltage and current relations in star and delta connected systems.
6. To measure power and power factor in a single- phase AC circuit.
7. To observe the B-H loop of ferromagnetic core material on CRO.
8. To use a bridge rectifier for full- wave rectification of AC supply and to determine the relationship between RMS and average values of the rectified voltage.
9. To perform open- and short circuit tests on a single- phase transformer and calculate its efficiency.
10. To study the characteristics of PN junction diode.
11. To study the characteristics of BJT.
12. To measure the minimum operating voltage, current drawn, power consumed, and the power factor of a fluorescent tube light, Bulb, CFL and LED.

Course title	**Programming for Problem Solving using C**
Course Code:	**25C1CSU-101**
Scheme and Credits	**L T P C** **Semester – I/II** **3 0 0 3**
Pre-requisite (if any)	
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

Course Outcomes:

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

CO1	define the fundamentals of a computer system with its input and output devices.
CO2	apply the syntax and semantics of the C programming language to write basic programs.
CO3	evaluate conditional branching, iteration statements and recursion process.
CO4	examine 1-D and 2-D arrays and perform operations using matrix operations & inbuilt functions.
CO5	analyse and apply basic searching and sorting algorithms, and understand their computational efficiency.
CO6	build programming concepts to implement pointers, structures, file handling & recursive functions.

Detailed contents:

Unit 1: Introduction to Programming (4 lectures)

Introduction to Computer Fundamentals: - Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) (1 lecture)

Basics of C Programming: - Structure and Life cycle of a C Program, Data types, Identifiers, Variables, Keywords, Constants, input/output statements, type casting. (1 lecture)

From algorithms to programs: - representation of algorithm: flowchart and pseudocode, source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- (2 lectures**)**

Unit 2: Arithmetic expressions and precedence (14 Lectures)

Operators in C – Arithmetic, Relational, Logical, Assignment, Increment, Decrement, Unary, Bitwise, Ternary Operators, Type conversion. Decision making- if, if-else, Nested if-else, Multiple if, else if, switch, Handling multiple conditions (9 lectures)

Iteration and Loops- (while, do-while, for), Nesting of Loops, break, continue and goto statements (3 lectures)

Unit 3: Arrays and Strings (6 lectures)

Arrays: - 1-D and 2-D array with arithmetic operations,
Strings: - Input and output operations of a string, string inbuilt functions, Character arrays.

Unit 4: Searching and Sorting (6 lectures)
Searching- Linear and Binary Searching
Sorting- Basic Sorting Algorithms (Bubble, Insertion and Selection), notion of order of complexity through example programs (no formal definition required).

Unit 5: Function (5 lectures)
Functions types, Parameter passing in functions, call by value, call by reference. Passing of array into a function.

Unit 6: Recursion (4 lectures)
Recursion: Recursion study as Direct and indirect recursion. Example of programs, such as Finding Factorial, Fibonacci series, Ackerman function, Quick Sort, Merge Sort.

Unit 7: Structures (4 lectures)
Structure declaration, Initialization of structures, accessing structure elements using (.) operator, Array of structure variables, comparison of Structure and Union.

Unit 8: Pointers (2 lectures)
Introduction to Pointers, Pointer arithmetic, Passing arguments to a function using pointer (understanding call by reference), Use of pointer in Self-referential structure, Dynamic memory allocation (malloc(), calloc(), realloc() and free()).

Unit 9: File Handling
File handling (only if time is available, otherwise should be done as part of the lab)

Suggested Readings/Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill, 1996
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill, 2019

Suggested Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India, 2015
2. Ivor Horton, Beginning C, 5th Edition, Apress, 2013
3. Learn C Programming from Scratch: A step-by-step methodology with problem solving approach, BPB Applications, M. S. Mir, 2023.
4. Let us C: Authentic guide to C Programming Language, Yashavant Kanetkar, BPB Publications, 2024.

Course title	**Programming for Problem Solving Lab using C**
Course Code:	**25C1CSU-111**
Scheme and Credits	**L T P C** **Semester – I/II** **0 0 2 1**
Pre-requisite (if any)	
Internal Marks	**30**
External Marks	**20**
Total Marks	**50**

Course Outcomes:

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

CO1	demonstrate the ability to write, compile, and execute basic C programs using arithmetic expressions, type conversions, and input/output operations.
CO2	identify syntax errors and logical errors at compile and run time for debugging.
CO3	develop iterative as well as recursive programs.
CO4	examine data in arrays, strings and structures and manipulate them through a program.
CO5	apply pointer concepts and pointer-based function calling in practical scenarios.
CO6	explain file handling operations to perform reading from and writing to files in C.

List of Experiments:

Note: Students are expected to perform at least 10 experiments from the following list.

S. No.	Name of the Experiment
1	Familiarization with programming environment.
2	Simple computational problems using arithmetic expressions and Type Conversions.
3	Problems involving if-then-else structures 1. Write a Program to find the entered number is even or odd. 2. Write a Program to find the largest among three numbers. 3. Write a Program to find the roots of quadratic equation.
4	Iterative problems like 1. Write a Program to find factorial of given number by using while loop. 2. Write a Program to check whether the entered number is palindrome or not by using do-while.
5 & 6.	Program to perform arithmetic operation on 1-D Array & 2-D Array, Matrix Functions, Linear Search, Binary Search, Bubble Sort, Selection Sort and Insertion Sort.
7	Write a Program to perform string manipulation function.
8	Write a Program to swap two numbers using call by value and call by reference.

9 & 10	1. Problems involving Recursive Functions 2. Write a Program to find Fibonacci series using recursion. 3. Write a Program to sort list of elements using quick sort. 4. Write a Program to sort list of elements using merge sort.
11	Write a Program to implement operations of pointers using function.
12	Write a Program to perform file handling operations using C.

Course title	**Engineering Graphics & Design**
Course Code	**25C1MEU-111**
Scheme and Credits	**L T P C** **Semester – I/II** **0 0 2 1**
Pre-requisite (if any)	**-**
Internal Marks	**30**
External Marks	**20**
Total Marks	**50**

Course Outcomes:

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

CO 1	apply basic CAD tools to draw lines, shapes, and scales as per standards.
CO 2	create front, top, and side views of different objects using CAD software.
CO 3	use CAD software to generate planes and solids in different positions using various tools.
CO 4	create three dimensional models into two-dimensional isometric and orthographic drawings of various parts with dimensions.

Detailed Content:

Unit 1: Introduction to Engineering Drawing Concepts in CAD (4 Hrs.)
Significance and industrial applications of engineering drawing, BIS drawing standards: types of lines, Introduction to User Coordinate System, Basic geometrical constructions (line division, angles, polygons, arcs) using CAD tools, Scales: creation and use of plain and diagonal scales (CAD-based exercises).

Unit 2: Practice Using CAD Tools (10 Hrs.)
Use of draw tool bar (line, rec, circle etc), modify tools (copy, mirror, trim, extend, offset, rotate, array). Layer control, dimensioning styles, text and annotation tools, Plotting setup: page layout, viewports, and scale control. Use of layers and UCS (User Coordinate System) for complex orientations.

Unit 3: Orthographic Projections using CAD (4 Hrs.)
Orthographic view creation: front, top, and side views of different objects, Projection of points and lines in quadrants using layers and colour codes, Determining true length and angle of inclination using CAD drafting tools.

Unit 4: Projection of Planes and Solids (6Hrs.)
2D projection of lamina (plane surfaces) in various orientations, Projections of standard solids (prism, pyramid, cone, cylinder) with axis: Parallel to HP/VP, Inclined to one and perpendicular to the other.

Unit 5: Isometric Projections using CAD (6Hrs.)

Understanding isometric views and isometric scale in CAD, Use of isometric snap/grid and isoplane switching, Drawing isometric projections of solids: cube, prism, cylinder, cone. Practice of 2D drawing assignments combining orthographic and isometric concepts, Develop complete drawing (2D orthographic + isometric) for a mechanical component.

Suggested References/Books:

1. T. Jeyapoovan, Engineering Drawing and Graphics Using AutoCAD. New Delhi: S. Chand Publishing, 2014.
2. B. C. Benton and G. Omura, Mastering AutoCAD 2021 and AutoCAD LT 2021. Indiana: Sybex – John Wiley and Sons, 2021.
3. P. S. Gill, Engineering Drawing. New Delhi: S.K. Kataria & Sons, 2013.
4. K. R. Mohan, Engineering Graphics. New Delhi: Dhanpat Rai Publishing Company (P) Ltd., 2012.
5. S. Tickoo, AutoCAD 2024 for Engineers and Designers. Purdue, IN: CADCIM Technologies, 2024.

Course title	**Engineering Graphics & Design**
Course Code	**25C1MEU-112**
Scheme and Credits	**L T P C** **Semester – I/II** **0 0 4 2**
Pre-requisite (if any)	**-**
Internal Marks	**30**
External Marks	**20**
Total Marks	**50**

Course Outcomes:

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

CO 1	apply basic principles of engineering drawing to create accurate 2D sketches including scales.
CO 2	analyse projections of geometric entities, including points, lines, planes and solids, in different orientations using projection principles.
CO 3	use CAD software to generate 2D and 3D drawings of various objects (plane, solids etc).
CO 4	create 3D models into 2D orthographic and isometric projections, applying proper conventions and dimensional accuracy using CAD tools.

Detailed Content:

Unit 1: Introduction to Engineering Drawing (8 Hrs.)
Principles of engineering drawing / engineering graphics / technical drawing and their significance –Drawing Instruments: their Standard and uses – symbols and conventions in drawing practice – lettering & numbering – BIS conventions. Types of lines and their uses, Drawing Sheets: sizes and layout, methods of folding drawing sheet, Grades of pencils used, Dimensioning: definition, types and methods of dimensioning, geometrical construction, concept of scales in drawing, types of scales, construction of plane and diagonal scales.

Unit 2: Projection of Geometric Entities (12 Hrs.)
Concept, relevance and Principles of projection: first angle and third angle, Projection of points, Projection of lines with respect to reference plane and Projection of Planes with respect to reference plane.

Unit 3: Computer Aided Drafting (16 Hrs.)
CAD interface, basic commands and toolbars (line, circle, arc, polygon, fillet, chamfer, trim, mirror, copy, array, etc.), layer management, text commands, dimensioning and annotations, basic and advanced 2D drawings, basics of 3D modelling, 3D commands (extrude, revolve, sweep etc.), Creating basic and advanced 3D drawings.

Unit4: Orthographic Projections (12 Hrs.)

Application of CAD software to create orthographic views, measure true lengths and visualize projections, Creating 2D Orthographic Views from 3D Models. Practice on various drawings of orthographic projections using CAD software.

Unit 5: Isometric Projections (12 Hrs.)

Application of CAD software to create isometric drawing and isometric scale, Conventions in isometric drawings, Isometric projections of cube, prism, pyramid, cylinder, cone. Practice on various drawings of Isometric projections using CAD software.

Suggested References/Books:

1. T. Jeyapoovan, Engineering Drawing and Graphics Using AutoCAD. New Delhi: S. Chand Publishing, 2014.
2. B. C. Benton and G. Omura, Mastering AutoCAD 2021 and AutoCAD LT 2021. Indiana: Sybex – John Wiley and Sons, 2021.
3. P. S. Gill, Engineering Drawing. New Delhi: S.K. Kataria & Sons, 2013.
4. R. K. Dhawan, Engineering Drawing. New Delhi: S. Chand Publishing, 2010.
5. K. R. Mohan, Engineering Graphics. New Delhi: Dhanpat Rai Publishing Company (P) Ltd., 2012.
6. S. Tickoo, AutoCAD 2024 for Engineers and Designers. Purdue, IN: CADCIM Technologies, 2024.

Course title	**Environmental Sciences**
Course Code:	**25C1ESU-101**
Scheme and Credits	**L T P C** **Semester – I/II** **2 0 0 0**
Pre-requisite (if any)	**-**
Internal Marks	**100**
External Marks	**-**
Total Marks	**100**

Course Outcomes:

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

CO1	apply the knowledge on various natural resources, their utilization for sustainable lifestyles and their repercussions.
CO2	describe the types and the functions of an ecosystem, including food chain, ecological pyramids and energy flow.
CO3	discuss the values, threats and conservation of biodiversity.
CO4	demonstrate individuals to conduct activities on social issues and to arrange environmental awareness campaigns.

Detailed contents:

Module 1: Natural Resources: Renewable and non-renewable resources (8 hours)
Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non- renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.

Module 2: Ecosystems (6 hours)
Concept of an ecosystem. Structure and function of an ecosystem. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems: a. Forest ecosystem b. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 3: Biodiversity and its conservation (5 hours)
Introduction – Definition: genetic, species and ecosystem diversity, Biodiversity at global,

National and local levels. 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

Module 4: Social Issues and the Environment (5 hours)

From Unsustainable to Sustainable development, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Public awareness

ACTIVITIES (6 hours)

Nature club (bird watching, recognizing plants at institute/at home, recognizing local animals, appreciating biodiversity Impart knowledge and inculcate the habit of taking interest and understanding biodiversity in and around the college campus. The students should be encouraged to take interest in bird watching, recognizing local plants, herbs and local animals. The students should be encouraged to appreciate the difference in the local biodiversity in their hometown, in the place of their study and other places they visit for vacation/breaks etc. Following activities must be included. Identify a tree fruit flower peculiar to a place or having origin from the place. Making high resolution big photographs of small creatures (bees, spiders, ants. mosquitos etc.) especially part of body so that people can recognize (games on recognizing animals/plants). Videography/ photography/ information collections on specialties/unique features of different types of common creatures. Search and explore patents and rights related to animals, trees etc. Studying miracles of mechanisms of different body systems.

Awareness Activities:

1. small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
2. Slogan making event
3. Poster making event
4. Cycle rally
5. Lectures from experts
6. Plantation
7. Gifting a tree to see its full growth
8. Cleanliness drive: Drive for segregation of waste
9. To live with some eminent environmentalist for a week or so to understand his work
10. To work in kitchen garden for mess
11. To know about the different varieties of plants
12. Shutting down the fans and ACs of the campus for an hour or so
13. Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain/ lake/Estuary/Wetlands
14. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
15. Visit to a Wildlife sanctuary, National Park or Biosphere Reserve

Suggested Readings/Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email: mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopaedia, Jaico Publ. House, Mumbai, 1196p
6. Hawkins R.E., Encyclopaedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
9. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
10. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
11. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
12. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards, Vol I and II, Enviro Media (R)
13. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
14. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

Course title	**Bridge course Physics**
Course Code:	**25C1PHU-B1**
Scheme and Credits	**L T P C** **Semester – I/II** **2 0 0 0**
Pre-requisite (if any)	
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

Course Outcomes:

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

CO1	examine the rotational motion of extended bodies and explain the mechanical properties of solids and fluids along with their practical applications.
CO2	analyse different types of motion and waves, and evaluate the concepts of electricity and magnetism to construct Maxwell's equations and understand the nature of electromagnetic waves.
CO3	explain the functioning of various optical systems based on interference, diffraction and polarization and their applications in our daily life.
CO4	identify different semiconducting materials, electronic devices, and simple circuits.
CO5	apply the concepts of particle-wave duality and atomic theory to explain quantum phenomena.

Detailed contents:

Unit 1: Classical Mechanics (2 hours)

Centre of Mass, Motion of Centre of mass, Pure Translational and Rotational motion, Torque and angular momentum, Principle of moments (Moment of Inertia), Radius of Gyration, Generalized Motion, Kinematics of rotational motion about a fixed axis.

Unit 2: Mechanical Properties of Solids and Fluids (3 hours)

Elastic behaviors of solids, Hooke's Law, Young's Modulus, Shear Modulus, Bulk Modulus, Applications of Elastic behaviors of materials, Compressibility, Viscosity, Relative density, Pascal's Law, Streamline Flow, Bernoulli's Principle, Surface Tension, Drops and Bubbles.

Unit 3: Waves and Oscillations (3 hours)

Rectilinear motion, Oscillations or Vibrations, Simple Harmonic Motion, Damped Harmonic motion: Real oscillatory system, Forced or Driven oscillation, TYPES OF WAVES, Superposition of Waves, Reflection and Refraction, Standing Waves and Normal Modes, Beats, Resonance, Doppler's Effect.

Unit 4: Electricity and Magnetism (3 hours)
Physical concepts of gradient, divergence, and curl; Laplacian operator, Concept of electricity and magnetism, Coulomb's law, Electrostatics, Magnetostatics, The Lorentz force, Maxwell's equations.

Unit 5: Electromagnetic Signal (2 hours)
Introduction to Maxwell's equations, The dynamical magnetic field, The dynamical electric field, Electromagnetic Waves

Unit 6: Wave Optics (2 hours)
Interference of light, Photons, Young's Double Slit Experiment, Huygens's Principle, Diffraction, Diffraction Grating, Polarization

Unit 7: Semiconductor Electronics (3 hours)
Classification of metals, conductors and semiconductors, Fermi Level, Intrinsic Semiconductor, Extrinsic Semiconductor, p-n junction, Semiconductor Diode, Half-Wave Rectifier, Full-Wave Rectifier, Zener diode, Photodiode, Light emitting diode, Junction Transistor

Unit 8: Modern Physics (2 hours)
Wave nature of light, Particle nature of light: the photon, De Broglie Hypothesis, Experimental confirmation of de Broglie hypothesis (Davisson and Germer's Experiment)

Unit 9: Atomic and Nuclear Physics (2 hours)
Matters, Atoms, Atomic Theory: Atomic Theory by John Dolton, Atomic Theory by J. J Thompson, Atomic Theory by Ernest Rutherford, Atomic Theory by James Chadwick, Discovery of the Neutron, Bohr's Postulates, Proton, Neutron, Electron, Limitations of Bohr's Theory

Suggested Readings/Books:

1. Classical Mechanics: H. Goldstein
2. General Properties of Matter: C. J. Smith
3. Oscillations and waves: S. Bharadwaj
4. Electricity and Magnetism: E. M. Purcell and D. J. Morin
5. Introduction to Electrodynamics: D J Griffith
6. Optics: Ajoy Ghatak
7. Solid State Physics: C. Kittel
8. Quantum Mechanics: Ajoy Ghatak
9. Physics of Atoms and Molecules: B. Brandsden
10. NCERT Textbook Physics Part I & II

Course title	**Bridge Course for Engineering Drawing**
Course Code	**25C1MEU-B3**
Scheme and Credits	**L T P C** **Semester – I/II** **0 0 2 0**
Pre-requisite (if any)	**-**
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

Course Outcomes:

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

CO 1	identify and use basic engineering drawing instruments, lines, symbols, and conventions.
CO 2	draw basic geometric shapes and simple figures using instruments and freehand sketching.
CO 3	explain and draw sectional views and orthographic projections using first and third angle methods.
CO 4	convert orthographic views into isometric views of simple 3D objects.

Detailed contents:

UNIT 1 **(4 Hrs.)**

Introduction to engineering drawing, their applications, uses, detailed introduction of basic engineering drawing instruments such as drawing boards, drawing sheets, different grades of pencils, drawing instruments. Different types of lines as per BIS specifications and their applications, various symbols and conventions used in engineering drawing.

UNIT 2 **(6 Hrs.)**

Practice of making various geometrical shapes such as triangles, rhombus, pentagon, hexagon. Practice of vertical, horizontal and inclined lines, Dimensioning practice on simple geometrical figures using engineering instruments, Practice of free hand sketching of various simple drawings and engineering drawings.

UNIT 3 **(4 Hrs.)**

Free hand practice of alphabets in upper case and lower case, numerals, roman, free hand practice for writing different motivational quotes.

UNIT 4 **(4 Hrs.)**

Concept of sectioning, cutting plane lines, practice of full sectioned and half-sectioned views of simple examples

UNIT 5 **(8 Hrs.)**

Introduction about orthographic projections, practice of simple orthographic projections, identification and drawing first angle projection and third angle projection symbols, difference between first angle projection and third angle projection.

UNIT 6 **(4 Hrs.)**

Concept of true length and isometric length, conversion of orthographic views into isometric views of simple objects such as cube, slab, cylinder, cone.

Suggested References/Books:

1. P. S. Gill, Engineering Drawing, 17th ed., Ludhiana, India: S. K. Kataria & Sons, 2014.
2. N. D. Bhatt, Engineering Drawing, 53rd ed., Anand, India: Charotar Publishing House, 2016.
3. Surjit Singh, A Textbook of Engineering Drawing, New Delhi, India: Dhanpat Rai & Co., 2008.
4. W. J. Luzadder and J. M. Duff, Fundamentals of Engineering Drawing, 11th ed., Upper Saddle River, NJ, USA: Prentice Hall, 1993.

Course title	**Bridge Course - Mathematics**
Course Code:	**25C1EMU-B2**
Scheme and Credits	**L T P C** **Semester – I/II** **3 1 0 0**
Pre-requisite (if any)	Elementary calculus of matric level
Internal Marks	**40**
External Marks	**60**
Total Marks	**100**

Course Outcomes:

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

CO1	understand the basic concepts of differential, integral calculus, matrices and vector algebra.
CO2	visualize all concepts geometrically.
CO3	apply the knowledge of derivatives in finding the extreme values of the functions and definite integrals to find the area under the curve and dot product to find projection of a vector.
CO4	explain the concept of limit, continuity, derivatives of the functions and their applications.
CO5	utilize the concept of parallelogram law, triangle inequality, linear system of equations and their consistency.

Detailed contents:

Unit 1

Functions of single variable, Simple examples of limit, continuity, differentiability. Derivative of elementary functions (t - ratios, logarithmic functions, exponential functions), Higher order derivatives. Statement of Mean Value Theorems and simple applications. Applications of derivative: increasing, decreasing functions, extreme values of functions.

Unit 2

Integration as an inverse process of differentiation. Finding integrals by partial fractions, by parts. Statement of Fundamental Theorem of Calculus. Finding definite integrals by method of substitution. Applications of definite integrals in finding length of an arc, area under simple curves, area enclosed between two curves.

Unit 3

Definitions of Scalars, Vectors, position vector, unit vector, types of vectors. Addition of vectors: Parallelogram law, triangle law. Direction ratios, direction cosines, multiplication by a scalar,

components of a vector. Dot product, cross product of vectors. Projection of vectors on a line, area of triangle and parallelogram. Cauchy-Schwarz inequality, Solenoidal vectors, orthogonality.

Unit 4

Matrices: Introduction to matrix, different kinds of matrices, Addition, Multiplication, Symmetric and Skew-symmetric matrix. Transpose of matrix, trace of a matrix.

Determinants: Determinant of matrix, properties of determinant, Singular and non-singular matrices, Adjoint and inverse of a matrix. Echelon form, Rank of a matrix.

Linear System of Equations: Introduction to system of linear equations. Condition of consistency of system of linear equations. Homogeneous and non-homogeneous system of linear equations. Solution of trigonometric equations.

Suggested References/Books:

1. Mathematics, A Text Book for Class XII (Parts I & II), New Delhi, NCERT, , 2003.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 4th Edition, 2015.
3. James Stewart, Calculus, 5th Edition, Brooks/Cole (Thomson), 2003.