

**OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)
COURSE CATALOGUE
REGULATIONS B.TECH – GR - 24
MECHANICAL ENGINEERING
I SEMESTER**

Course Code	Course Name	Subject Area	Category	Periods Per Week			Credits	Scheme of Examination Max Marks		
				L	T	P		CIA	SEE	Total
INDUCTION PROGRAM										
THEORY										
MA101BS	Matrices and Calculus	BSC	Foundation	3	1	0	4	40	60	100
PH102BS	Applied Physics	BSC	Foundation	3	1	0	4	40	60	100
ME103ES	Engineering Mechanics	ESC	Foundation	2	1	0	3	40	60	100
CS104ES	Problem Solving through C	ESC	Foundation	3	0	0	3	40	60	100
PRACTICAL										
PH105BS	Applied Physics Lab	BSC	Foundation	0	0	2	1	40	60	100
ME106ES	Elements of Mechanical Engineering	ESC	Foundation	0	0	2	1	40	60	100
CS107ES	Problem Solving through C Lab	ESC	Foundation	0	1	3	2	40	60	100
CS108ES	Python Programming Lab	ESC	Foundation	0	0	2	1	40	60	100
ME109ES	Engineering Workshop	ESC	Foundation	0	0	2	1	40	60	100
MANDATORY COURSE										
*MC110	Environmental Science	MC	MC - I	Ref: Academic Regulations B.Tech GR 24						
Total Credits						20				

COURSE CONTENT

Matrices and Calculus								
I Semester: Common to All Branches								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
MA101BS	Foundation	L	T	P	C	CIA	SEE	Total
		3	1	-	4	40	60	100
Contact Classes: 48	Tutorial Classes: 16	Practical Classes: Nil				Total Classes: 64		
Prerequisite: Mathematical Knowledge at the pre-university level								

1. COURSE OVERVIEW

This course Matrices and Calculus is a foundation course of mathematics for all engineering branches. The concepts of Matrices, Eigen Values, Eigen Vectors, Functions of Single and Several Variables, Fourier Series and Multiple Integrals. This course is applicable for simulations, colour imaging process, finding optimal solutions in all fields of industries.

2. COURSE OBJECTIVE

The students will try to Learn:

1. Types of matrices and their properties.
2. The concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form.
4. A geometrical approach to the mean value theorems and their application to the mathematical problems.
5. Evaluation of surface areas and volumes of revolutions of curves.
6. Evaluation of improper integrals using Beta and Gamma functions.
7. Partial differentiation, the concept of total derivative.
8. Finding maxima and minima of a function of two and three variables.
9. Evaluation of multiple integrals and their applications.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Write the matrix representation of a set of linear equations and analyse the solution of the system of equations.
CO 2	Find the Eigen Values and Eigenvectors. Reduce the quadratic form to canonical form using orthogonal transformations. To do verification and Application of Cayley Hamilton Theorem.
CO 3	Solve the applications on the mean value theorems. Evaluate the improper integrals using Beta and Gamma functions.
CO 4	Find the extreme values of functions of two variables with / without constraints and to apply Lagrange's Multipliers.
CO 5	Evaluate the multiple integrals, change the order and apply the concept to find areas, volumes.

COURSE CONTENT

APPLIED PHYSICS								
I Semester: CE, ME, ECE, CSM, CSD								
II Semester: CSE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
PH102BS	FOUNDATION	L	T	P	C	CIA	SEE	Total
		3	1	-	4	40	60	100
Contact Classes: 48	Tutorial Classes: 16	Practical Classes: Nil				Total Classes: 64		
Prerequisite: Basic principles of physics								

1. COURSE OVER VIEW

Applied Physics, is designed to explain the fundamental concepts and basic principles in the subject. A step-by-step build-up of the concepts makes this book student-friendly. The structure of each chapter redefines the parameters of conceptual learning through solved examples, theoretical questions, and objective questions. Conceptual arguments lead to the mathematical formulae providing a coherent mix of Physics and Mathematics.

2. COURSE OBJECTIVE

The students will try to Learn:

- i. Understand the basic principles of quantum physics and band theory of solids.
- ii. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
- iii. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
- iv. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
- v. Study the characteristics of lasers and optical fibres.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 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.
CO 2	Identify the role of semiconductor devices in science and engineering Applications.
CO 3	Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
CO 4	Appreciate the features and applications of Nano materials.
CO 5	Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

4. COURSE CONTENT

UNIT - I

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 - II

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 - III

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 - IV

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

UNIT - V

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, Argon ion Laser, Nd: YAG 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.

5. TEXT BOOKS

- i. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy” A Text book of Engineering Physics”- S. Chand Publications, 11th Edition 2019.
- ii. K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition, 2022.

6. REFERENCE BOOKS

- i. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
- ii. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley & Sons, 11th Edition, 2018.
- iii. A.K. Bhandhopadhyaya - Nano Materials, New Age International, 1st Edition, 2007.

CO-PO-PSO Mapping

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COURSE CONTENT

ENGINEERING MECHANICS								
I Semester: ME and CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
ME103ES	Foundation	L	T	P	C	CIA	SEE	Total
		2	1	-	3	40	60	100
Contact Classes: 32	Tutorial Classes: 16	Practical Classes: Nil				Total Classes: 48		
Prerequisite:								

1. COURSE OVER VIEW:

The course introduces the basic concepts of engineering mechanics which is the foundation for all subjects of the mechanical engineering and civil engineering. It includes the basic fundamental laws of mechanics with an emphasis on forces, resultant and equilibrium, Friction and its application and moment of inertia. Further this course provides kinetics and kinematics of body in motion to apply in real-time applications.

2. COURSE OBJECTIVE

The students will try to Learn:

- i. Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
- ii. Perform analysis of bodies lying on rough surfaces.
- iii. Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
- iv. Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies002E
- v. Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces
CO 2	Solve problem of bodies subjected to friction
CO 3	Find the location of centroid and calculate moment of inertia of a given section
CO 4	Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion
CO 5	Solve problems using work energy equations for translation, fixed axis rotation and plane motion and solve problems of vibration

4. COURSE CONTENT

UNIT-I:

Introduction to Engineering Mechanics - Force Systems: Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.

UNIT-II:

Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;

Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. – Theorem of Pappus.

UNIT-III:

Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem

Mass Moment of Inertia: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

UNIT-IV:

Review of particle dynamics - Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

UNIT-V:

Kinetics of Rigid Bodies -Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work Energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation, Virtual Work.

5. TEXT BOOKS

- i. Shames and Rao (2006), Engineering Mechanics, Pearson Education.
- ii. Reddy Vijay Kumar K. and J. Suresh Kumar (2010), Singer's Engineering Mechanics – Statics & Dynamics

6. REFERENCE BOOKS

- i. Beer F.P & Johnston E.R Jr., Vector Mechanics for Engineers – Statics and Dynamics, Mc Graw Hill, 12th Edition.
- ii. Dumir P.C, Sengupta, Srinivas, Engineering Mechanics- Universities Press, 2020.
- iii. Hibbeler R.C, Engineering Mechanics, Pearson, 14th Edition.
- iv. Arshad Noor, Zahid & Goel, Engineering Mechanics, Cambridge University Press, 2018.
- v. Khurmi R.S, Khurmi N., Engineering Mechanics, S. Chand, 2020.
- vi. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press

CO-PO-PSO Mapping

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COURSE CONTENT

PROBLEM SOLVING THROUGH C PROGRAMMING								
I Semester: CSE, CSM, CSD, ECE, CE, ME								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS104ES	FOUNDATION	L	T	P	C	CIA	SEE	Total
		3	-	-	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 48		
Prerequisite: There are no prerequisites to take this course								

1. COURSE OVER VIEW

This course is designed to introduce B.Tech first-year students to fundamental programming concepts using the C language. It aims to build a strong foundation in computer science through essential programming techniques and problem-solving strategies.

2. COURSE OBJECTIVE

The students will try to Learn:

- i. To learn the fundamentals of computers.
- ii. To understand the various steps in program development.
- iii. To learn the syntax and semantics of the C programming language.
- iv. To learn the usage of structured programming approaches in solving problems.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Develop simple applications in C using basic constructs.
CO 2	Design and implement applications in C using Arrays and Strings.
CO 3	Design applications using sequential and random-access file processing.
CO 4	Design and implement applications in C using Functions and Pointers.
CO 5	Design and implement applications in C using Sorting and Searching.

4. COURSE CONTENT

UNIT-I: Introduction to Programming

10L

- **Compilers:** Compiling and executing a program.
- **Representation of Algorithm:** Algorithms for finding roots of quadratic equations, finding minimum and maximum numbers of a given set, checking if a number is prime. Flowchart / Pseudocode with examples, Program design, and structured programming.
- **Introduction to C Programming Language:** Variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static, and register), type conversion, The main method and command line arguments, Bitwise operations: Bitwise AND, OR, XOR, and NOT operators.
- **Conditional Branching and Loops:** Writing and evaluation of conditionals and consequent branching with it, if-else, switch-case, ternary operator, go to. Iteration with for, while, do-while loops.
- **I/O:** Simple input and output with scan f and printf, formatted I/O, Introduction to stdin, std out, and stderr. Command line arguments.

UNIT - II: Arrays, Strings, Structures, and Pointers:**10L**

- **Arrays:** One and two-dimensional arrays, creating, accessing, and manipulating elements of arrays.
- **Strings:** Introduction to strings, handling strings as an array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings.
- **Structures:** Defining structures, initializing structures, unions, Array of structures.
- **Pointers:** Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked lists (no implementation), Enumeration data type.

UNIT - III: Preprocessor and File Handling in C:**10L**

- **Preprocessor:** Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef.
- **Files:** Text and Binary files, Creating, 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.

UNIT - IV: Function and Dynamic Memory Allocation:**10L**

- **Functions:** Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, Passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries.
- **Recursion:** Simple programs such as Finding Factorial, Fibonacci series, etc., Limitations of Recursive functions.
- **Dynamic Memory Allocation:** Allocating and freeing memory, Allocating memory for arrays of different data types.

UNIT - V: Searching and Sorting:**8L**

- **Basic Searching:** Basic searching in an array of elements (linear and binary search techniques).
- **Basic Sorting Algorithms:** Basic algorithms to sort an array of elements (Bubble, Insertion, and Selection sort algorithms).
- **Order of Complexity:** Basic concept through example programs.

5. TEXT BOOKS

- i. Jeri R. Hanly and Elliot B.Koffman, *Problem Solving and Program Design in C*, 7th Edition, Pearson.
- ii. B.A. Forouzan and R.F. Gilberg, *C Programming and Data Structures*, Cengage Learning, 3rd Edition.

6. REFERENCE BOOKS

- i. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, Prentice Hall of India.
- ii. E. Balagurusamy, *Computer Fundamentals and C*, 2nd Edition, McGraw-Hill.
- iii. Yashavant Kanetkar, *Let Us C*, 18th Edition, BPB.
- iv. R.G. Dromey, *How to Solve It by Computer*, Pearson, 16th Impression.
- v. Stephen G. Kochan, *Programming in C*, 4th Edition, Pearson Education.
- vi. Herbert Schildt, *C: The Complete Reference*, McGraw Hill, 4th Edition.
- vii. Byron Gottfried, *Schaum's Outline of Programming with C*, McGraw-Hill.

COURSE CONTENT

APPLIED PHYSICS LABORATORY								
I Semester: CE, ME, ECE, CSM, CSD								
II Semester: CSE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
PH105BS	FOUNDATION	L	T	P	C	CIA	SEE	Total
		-	-	2	1	40	60	100
Contact Classes:	Tutorial Classes: Nil	Practical Classes: 32				Total Classes: 32		
Prerequisite: Basic Principles of Physics								

1. COURSE OVER VIEW

This course is designed to introduce B.Tech first-year students to fundamental programming concepts using the C language. It aims to build a strong foundation in computer science through essential programming techniques and problem-solving strategies.

2. COURSE OBJECTIVE

The students will try to Learn:

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.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 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.
CO 2	Appreciate quantum physics in semiconductor devices and optoelectronics.
CO 3	Gain the knowledge of applications of dielectric constant.
CO 4	Understand the variation of magnetic field and behavior of hysteresis curve.
CO 5	Carried out data analysis.

4. COURSE CONTENT

LIST OF EXPERIMENTS:

1. Understanding the method of least squares – torsional pendulum as an example.
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. a) V-I and L-I characteristics of light emitting diode (LED).
b) V-I Characteristics of solar cell.
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.

9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material.
11. a) Determination of the beam divergence of the given LASER beam.
b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
12. Determination of work function and Planck's constant using photoelectric effect.

Note: Any 8 experiments are to be performed.

5. REFERENCE BOOK

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

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	2		2	1			1			1	2	1
CO 2	2			1					1			1	2	1
CO 3		2	3		3	1			3			1	2	1
CO 4	3	2	2		2	1			1			1	2	1
CO 5	1	1							1			1		1

COURSE CONTENT

ELEMENTS OF MECHANICAL ENGINEERING								
I Semester: ME								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
ME106ES	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				Total Classes: 32		
Prerequisite: Basic Principles of Physics								

1. COURSE OVERVIEW:

This course serves as a foundation course on mechanical engineering. It covers a broad range of fundamental mechanical instruments and devices. The concepts of metrology and measuring devices and their application in more complex mechanical systems are imparted to the students.

2. COURSE OBJECTIVES:

- Make the student to experimentally measure the common geometric properties like length, diameter, flatness, curvature, volume and moment of inertia etc.
- Give a practical knowledge to evaluate the friction between surfaces and also to evaluate the natural frequency of the system.
- Correlate between theory and experimental results, directly observe the proof of principles and theories through practical knowledge
- Introduce students to the basic concepts of manufacturing through the demonstration of various processes.
- Understand the commonly used mechanical components like gear box, working of boilers and IC engine etc.

3. COURSE OUTCOMES:

- CO 1: Understand the operation, usage and applications of different measuring instruments and tools.
- CO 2: Examine the different characteristics of instruments like accuracy, precision etc.
- CO 3: Prepare simple composite components and joining different materials using soldering process.
- CO 4: Identify tools & learn practically the process of turning, milling, grinding on mild steel pieces.
- CO 5: Understand the basic components of IC engine, Gear box and boiler

4. LIST OF EXPERIMENTS / DEMONSTRATIONS:

1. Measurement of length, height, diameter by vernier calipers.
2. To measure diameter of a given wire and sphere, thickness of a given sheet and volume of an irregular lamina using micrometer screw gauge.
3. Use of straight edge and spirit level in finding the flatness of surface plate.
4. Determination of time period and natural frequency of simple pendulum.
5. Determination of time period and natural frequency of compound pendulum.
6. To measure the coefficients of static and kinetic friction between a block and a plane using various combination of materials.
7. To determine the radius of curvature of a given spherical surface.
8. The experimental determination of the Moment of Inertia of regular and irregular solids.
9. Metal joining process–soldering of metal alloys to any PCB board
10. A simple composite geometry preparation by hand layup method.
11. Grouping of Dry cells for a specified voltage and current and its measurement using ammeters and voltmeters etc.

12. Demonstration of lathe, milling, drilling, grinding machine operations.
13. Study of transmission system –gear box
14. Assembly /disassembly of Engines
15. Study of Boilers

Note: Perform any 10 out of the 15 Exercises.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	1						1			1	2	1
CO 2	3	3	1						1			1	2	1
CO 3	3	3	1						1			1	2	1
CO 4	3	3	1						1			1	2	1
CO 5	3	3	1						1			1	2	1

COURSE CONTENT

PROBLEM SOLVING THROUGH C LAB								
I Semester: CSE, CSM, CSD, ECE, CE, ME								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS107ES	FOUNDATION	L	T	P	C	CIA	SEE	Total
		-	1	3	2	40	60	100
Contact Classes: Nil	Tutorial Classes: 16	Practical Classes: 48				Total Classes: 64		
Prerequisite:								

1. COURSE OVER VIEW

The Programming for Problem Solving Laboratory for B.Tech. I Year I Sem focuses on foundational programming skills using C. Students learn to create, debug, and execute programs using an IDE, addressing various numeric and algorithmic problems. The course emphasizes the use of arrays, pointers, functions, and file operations to develop modular and efficient code. It also covers string manipulations, sorting, and searching algorithms. The lab sessions provide practical experience in problem-solving and code optimization.

2. COURSE OBJECTIVE

The students will try to Learn:

- To work with an IDE to create, edit, compile, run, and debug programs.
- To analyze various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C, such as operators and control statements.
- To develop modular, reusable, and readable C programs using concepts like functions and arrays.
- To write programs using dynamic memory allocation concepts.
- To create, read from, and write to text and binary files.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to

CO 1	Develop and debug C programs using an IDE.
CO 2	Solve basic numeric and algorithmic problems with C
CO 3	Implement and manage arrays, pointers, and functions in C.
CO 4	Handle file operations in C for reading, writing, and processing.
CO 5	Perform string manipulations and various sorting/searching algorithms.

4. COURSE CONTENT

Practice Sessions:

Basics:

- Write a program that prints the results of all operators available in C (including pre/post increment, bitwise AND/OR/NOT, etc.). Read required operand values from standard input.
- Write a program that converts one data type to another using auto conversion and casting. Take the values from standard input.

Simple Numeric Problems:

- Find the maximum and minimum of three numbers.
- Calculate simple and compound interest.

- Determine the class awarded based on percentage marks:
 - $< 40\%$ = Failed
 - 40% to $< 60\%$ = Second class
 - 60% to $< 70\%$ = First class
 - $< 70\%$ = Distinction
- Print a multiplication table for a given number and the number of rows.
- Show the binary equivalent of a positive number between 0 and 255.

Expression Evaluation:

- Calculate the time taken by a ball to reach each floor of a 10-floor building using the formula $s = ut + \frac{1}{2}at^2$.
- Write a program to perform operations (+, -, *, /, %) based on user input and print the result using a switch statement.
- Determine if a given number is prime.
- Find the sum of individual digits of a positive integer and check if the number is a palindrome.
- Generate the first nnn terms of the Fibonacci sequence.
- Generate all prime numbers between 1 and nnn , where nnn is supplied by the user.
- Find the roots of a quadratic equation.
- Calculate the expression $1 - x^2 + x^4 - x^6 + \dots + x^{2n}$.
- Compute the sum of the geometric progression $1 + x + x^2 + x^3 + \dots + x^n$.

Arrays, Pointers, and Functions:

- Find the minimum, maximum, and average in an array of integers.
- Write functions to compute mean, variance, standard deviation, and sort nnn elements in a one-dimensional array.
- Perform matrix operations using functions:
 - Addition
 - Multiplication
 - Transpose (dynamically allocated matrix)
- Implement both recursive and non-recursive functions:
 - Factorial of a given integer
 - Greatest Common Divisor (GCD) of two integers
 - Power x^n
- Use pointers to:
 - Read elements into an array and display values
 - Display values in reverse order
 - Calculate the sum of nnn elements from an array

Files:

- Display the contents of a file to the standard output device.
- Copy one file to another, replacing all lowercase characters with uppercase equivalents.
- Count occurrences of a character in a text file (filename and character are command line arguments).
- Create a binary file to store 10 integers. Modify a value at a specified index, then read and print all values.
- Merge two files into a third file.

Strings:

- Convert a Roman numeral (I to L) to its decimal equivalent.
- Convert a number (1 to 50) to its Roman equivalent.
- Perform operations using functions:
 - Insert a substring into a given main string at a specified position.
 - Delete nnn characters from a given position in a string.

- Determine if a string is a palindrome.
- Display the position of a character in a string or -1 if not found.
- Count lines, words, and characters in a text.

Miscellaneous:

- Write a menu-driven program to:
 - Enter nnn numbers and choose between finding the smallest, largest, sum, or average. Use functions and a switch statement.
- Construct a number pyramid with different patterns.

Sorting and Searching:

- Implement linear search in an unsorted list using a non-recursive function.
- Implement binary search in a sorted list using a non-recursive function.
- Implement Bubble Sort to sort integers in ascending order.
- Implement Selection Sort to sort integers in descending order.
- Implement Insertion Sort to sort integers in ascending order.
- Sort an array of names.

5. TEXT BOOKS

- Jeri R. Hanly and Elliot B.Koffman, *Problem Solving and Program Design in C*, 7th Edition, Pearson.
- B.A. Forouzan and R.F. Gilberg, *C Programming and Data Structures*, Cengage Learning, 3rd Edition.

6. REFERENCE BOOKS

- Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, Prentice Hall of India.
- E. Balagurusamy, *Computer Fundamentals and C*, 2nd Edition, McGraw-Hill.
- Yashavant Kanetkar, *Let Us C*, 18th Edition, BPB.
- R.G. Dromey, *How to Solve It by Computer*, Pearson, 16th Impression.
- Stephen G. Kochan, *Programming in C*, 4th Edition, Pearson Education.
- Herbert Schildt, *C: The Complete Reference*, McGraw Hill, 4th Edition.
- Byron Gottfried, *Schaum's Outline of Programming with C*, McGraw-Hill.

7. ELECTRONIC RESOURCES

- <https://codelite.org/>
- <http://www.codeblocks.org/>
- <http://www.bloodshed.net/devcpp>
- <http://www.eclipse.org>

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3						3					3		
CO 2		3	3	2										
CO 3				3		3	3		3					3
CO 4			3		3						3			3
CO 5						3				3	3	3		3

COURSE CONTENT

PYTHON PROGRAMMING LABORATORY								
I Semester: CSM, CSD, ECE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CS108ES	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				Total Classes: 32		
Prerequisite:								

1. COURSE OVER VIEW

The course focuses on practical Python programming skills through a series of progressively challenging tasks. In the initial weeks, students get familiar with Python basics, including using the interpreter, writing simple programs, and understanding basic functions. As the course advances, students work on more complex problems like matrix operations, file handling, and implementing algorithms. They also explore object-oriented programming concepts, exception handling, and basic GUI development. The course culminates with applications in numerical computing and digital logic, preparing students for real-world problem-solving scenarios.

2. COURSE OBJECTIVE

The students will try to Learn:

1. The implications of disruption and the role of innovation.
2. The various frameworks, tools, and techniques of design thinking.
3. How to design, develop, and implement an innovation product or service or process.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Develop the application specific codes using python.
CO 2	Understand Strings, Lists, Tuples and Dictionaries in Python.
CO 3	Verify programs using modular approach.
CO 4	Verify programs using file I/O, Python standard library.
CO 5	Implement Digital Systems using Python.

4. COURSE CONTENT

Week -1:

1. i) Use a web browser to go to the Python website <http://python.org>. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
ii) Start the Python interpreter and type `help ()` to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
- 3.i) Write a program to calculate compound interest when principal, rate and number of periods are given.
ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points.
4. Read name, address, email and phone number of a person through keyboard and print the details.

Week - 2:

1. Print the below triangle using for loop.

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

2. 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).
3. Python Program to Print the Fibonacci sequence using while loop.
4. Python program to print all prime numbers in a given interval (use break).

Week - 3:

1.
 - i) Write a program to convert a list and tuple into arrays.
 - ii) Write a program to find common values between two arrays.
2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
3. 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.

Week - 4:

1. Write a function called is sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
2. 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.
3.
 - i). 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.
 - ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
 - iii). 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.
4.
 - i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
 - ii) Remove the given word in all the places in a string?
 - iii) 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?
4. Writes a recursive function that generates all binary strings of n-bit length.

Week - 5:

1.
 - i) Write a python program that defines a matrix and prints.
 - ii) Write a python program to perform addition of two square matrices.
 - iii) Write a python program to perform multiplication of two square matrices.
2. 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.
3. Use the structure of exception handling all general purpose exceptions.

Week-6:

1. a. Write a function called draw rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
- b. Add an attribute named color to your Rectangle objects and modify draw rectangle so that it uses the color attribute as the fill color.
- c. Write a function called draw point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.
- d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw circle that draws circles on the canvas.
2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritances.
3. Write a python code to read a phone number and email-id from the user and validate it for correctness.

Week- 7:

1. Write a Python code to merge two given file contents into a third file.
2. 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.
3. Write a Python code to Read text from a text file, find the word with most number of occurrences.
4. 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.

Week - 8:

1. Import numpy, Plotpy and Scipy and explore their functionalities.
2. a) Install NumPy package with pip and explore it.
3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder.
5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

5. TEXT BOOKS

- i. Supercharged Python: Take your code to the next level, Overland.
- ii. Learning Python, Mark Lutz, O'reilly.

6. REFERENCE BOOKS

- i. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
- ii. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson.
- iii. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition.
- iv. Think Python, Allen Downey, Green Tea Press.
- v. Core Python Programming, W. Chun, Pearson.
- vi. Introduction to Python, Kenneth A. Lambert, Cengage.

7. ELECTRONIC RESOURCES

- i. Python Interpreter - <https://www.python.org/>
- ii. <https://www.python.org/downloads/release/python-3110/>

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3						3					3		
CO 2		3	3	2										
CO 3				3		3	3		3					3
CO 4			3		3						3			3
CO 5						3				3	3	3		3

COURSE CONTENT

ENGINEERING WORKSHOP								
I Semester: ME								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
ME109ES	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				Total Classes: 32		
Prerequisite:								

1. COURSE OVER VIEW

To develop a skill in dignity of labour, precision, safety at work place, team working and development of right attitude. Ability to design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint.

2. COURSE OBJECTIVES:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at workplace.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

3. COURSE OUTCOMES:

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

CO 1	Study and practice on machine tools and their operations.
CO 2	Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.
CO 3	Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiselling.
CO 4	Apply basic electrical engineering knowledge for house wiring practice.

4. TRADES FOR EXERCISES:

At least two exercises from each trade:

- I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
- III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
- IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
- V. Welding Practice – (Arc Welding & Gas Welding)
- VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
- VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

5. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working and CNC Lathe turning.

6. TEXT BOOKS:

1. Workshop Practice /B.L.Juneja / Cengage.
2. Workshop Manual / K.Venugopal / Anuradha.

7. REFERENCE BOOKS:

1. Workshop Manual-P.Kannaiah / K.L.Narayana / Scitech.
2. Workshop Manual / Venkat Reddy/BSP.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	3	1		1		1	1			1	3	2
CO 2	3	3	3	1		1		1	1			1	3	2
CO 3	3	3	3	1		1		1	1			1	3	2
CO 4	3	3	3	1		1		1	1			1	3	2

COURSE CONTENT

ENVIRONMENTAL SCIENCE								
I Semester: ME / CE / ECE / CSE (AI & ML) / CSE / CSE (DS)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
MC110	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	-	-	-	-	-
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: Nil			
Prerequisite: Basic Principles of earth science.								

1. COURSE OVER VIEW

This course is an interdisciplinary study which examines the interaction between humans and the environment, with specific reference to the effects of modern technological advances. The students will be able to understand the sustainable development, ecological sustainability, environmental pollution, environmental issues in order to protect the environment and followed by the application of this knowledge to current environmental problems in the later years.

2. COURSE OBJECTIVES:

The students will try to Learn:

- i. The interrelationship between living organism and environment.
- ii. The importance of environment by assessing its impact on the human world.
- iii. The knowledge on themes of biodiversity, natural resources, pollution control and waste management.
- iv. The sustainability and unsustainability of various interactions between human society and the earth's natural systems.

3. COURSE OUTCOMES

At the end of the course students should be able to:

CO 1	Infer the basic ecological principles, biogeochemical cycles and its function for the flow of energy in ecosystem.
CO 2	Understand the natural resources and their conservation for sustainable development.
CO 3	Predict the importance of biodiversity for its productive use.
CO 4	Identify the global environmental problems and study the role of international summits for minimizing impact.
CO 5	Outline the features of laws and rules related to environment protection, environmental impact assessment towards sustainable development.

4. SYLLABUS:

MODULE-I: ECOSYSTEMS

Environment: definition, scope and importance of ecosystem, classification, structure and function of an ecosystem, food chains, food webs and ecological pyramids, flow of energy; biogeochemical cycles, hydrological cycle, phosphorous cycle, nitrogen cycle, biomagnifications.

MODULE-II: NATURAL RESOURCES

Natural resources: classification of resources, living and non-living resources; water resources: use and over utilization of surface and ground water, floods and droughts, dams, benefits and problems; mineral resources: use and exploitation, environmental effects of extracting and using mineral resources; land resources; energy resources: renewable and non-renewable energy sources, use of alternate energy source.

MODULE-III: BIODIVERSITY AND BIOTIC RESOURCES

Biodiversity and biotic resources: introduction, definition, genetic, species and ecosystem diversity; value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values; Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, human-wildlife conflicts; Conservation of biodiversity: In situ and ex situ conservation.

MODULE-IV: ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES

Environmental pollution: definition, causes, effects and control measures of air pollution, water pollution, soil pollution, impacts of modern agriculture and noise pollution; solid waste: municipal solid waste management, composition and characteristics of e-waste and its management; Pollution control technologies: waste water treatment methods, primary, secondary and tertiary; global environmental issues and global efforts: climate change and impacts on human environment, ozone depletion, ozone depleting substances; International conventions / protocols: Kyoto protocol and Montreal protocol.

MODULE-V: ENVIRONMENTAL POLICY AND LEGISLATION

Environmental legislations: environmental protection act, air act 1981, water act, forest act. municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules, population and its explosion.

5. TEXT BOOKS:

- i. Erach Bharucha, *Text Book of Environmental Studies for Under Graduate Course*, Orient Black Swan, 3rd Edition, 2021.
- ii. Anubha Kaushik and C P Kaushik, *Perspectives in Environmental Studies*, New Age International private limited, New Delhi, 7th Edition, 2021.
- iii. Benny Joseph, *Environmental Studies*, Tata Mc Graw Hill Publishing Co. Ltd, New Delhi, 3rd Edition, 2017.

6. REFERENCE BOOKS:

- i. Dr. M Anji Reddy, *Text Book of Environmental Science and Technology*, BS Publications, 3rd Edition, 2014.
- ii. Y Anjaneyulu, *Introduction to Environmental Science*, BSP Books Private Limited, 3rd Edition, 2020.

7. ELECTRONICS RESOURCES:

- i. <https://www.meripustak.com/Environmental-Science-Isv-8th-Edition-121505>
- ii. https://www.meripustak.com&gclid=CjwKCAjwtp2bBhAGEiwAOZZTuFwLEkGc6SGNUZjXpz0ffeNwgBOHWQIKge-E-9UvXxTPxQJdjaTgJBoCrQIQAvD_BwE

8. MATERIALS ONLINE

1. Course Template
2. Tutorial Question Bank
3. Model Question Paper – I
4. Model Question Paper - II
5. Lecture Notes
6. Early Lecture Readiness Videos
7. Power Point Presentation