



B. Tech in Electrical Engineering with Honours in Electric Vehicle Technology

Department of Electrical Engineering

Assam Skill University

Sl.	Subject Code	Subject Name
1	BS-01	Engineering Physics-I
2	BS-02	Engineering Mathematics-I
3	ES-01	Basic Electrical and Electronics Engineering
4	ES-02	Engineering Graphics & Design
5	ES-03	Design Thinking
6	HSM-01	English for Technical Writing
7	MNC-AU-01	IDEA lab workshop
Sl.	Subject Code	Subject Name
1	BS-03	Engineering Chemistry
2	BS-04	Engineering Mathematics-II
3	BS-05	Engineering Physics-II
4	ES-04	Programming for Problem Solving
5	ES-05	Electrical and Mechanical Workshop
6	HSM-02	Universal Human Values
7	MNC-AU-02	Sports and Yoga/NSS/NCC

1st Semester Detailed Syllabus

Sl No.	Course Type	Course Code	Course Title
3	ES-01		Basic Electrical and Electronics Engineering

Objective: To provide the students with a strong foundation in electrical and electronic engineering concepts, including electrical circuit analysis, AC and three-phase systems, and basic semiconductor devices, along with practical laboratory skills required for engineering applications.

Course Outcomes:

- CO1:** Apply fundamental electrical laws and network concepts to analyse basic DC circuits and compute current, voltage, and power in simple electrical networks.
- CO2:** Analyse AC circuits involving R, L, and C components using phasor representation, impedance, admittance, and power relationships.
- CO3:** Explain the operation of balanced three-phase systems and determine line-phase relationships and power in star and delta-connected circuits.
- CO4:** Describe the characteristics, operation, and applications of basic semiconductor devices such as diode, Zener diode, BJT, and MOSFET, and construct simple rectifier and wave-shaping circuits.

Module I: Basic Electrical Fundamentals (15 Hours)

Theory (5 Hours)

Definition of active, passive, linear, non-linear properties of electronic components; Networks: unilateral, bilateral, symmetrical, unsymmetrical with example; Sources: current sources and voltage sources, dependent and independent source; Basic electrical components: resistors, capacitors, inductor, and their use in electrical circuits; Ohm's Law; Analysis of series, parallel, and series-parallel circuits excited with dependent and independent voltage sources.

Practical (10 Hours)

1. Identification and rating of components such as resistors, capacitors, and inductors, etc., using basic measuring instruments.
2. Measurements of components such as resistors, capacitors, inductors, etc., using basic measuring instruments
3. Verification of Ohm's law using resistive circuits.
4. Study of series, parallel, and series-parallel combinations of resistors and verification of voltage and current division rules.

Module II: DC Analysis of Electrical Circuits (20 Hours)

Theory (5 Hours)

Kirchhoff's Laws; Nodal and Mesh Analysis; Star-delta conversions; Source Transformations; Theorem: Thevenin's, Norton's, Superposition, Maximum Power Transfer.

Practical (15 Hours)

5. Verification of Kirchhoff's Current Law and Kirchhoff's Voltage Law in electrical circuits.
6. Determination of Thevenin's and Norton's equivalent circuits for a given network.
7. Verification of Superposition Theorem and Maximum Power Transfer Theorem.

Module III: AC Fundamentals and R, L, C Circuit (20 Hours)

Theory (5 Hours)

Equation of AC Voltage and currents, waveform, time period, frequency, amplitude, phase, phase difference; Definition of average value, RMS value, form factor, peak factor; Series and parallel RL, RC, and RLC circuits and their phasor representation; Steady state response; Operator j notation of complex quantity in rectangular and polar form; Concept of impedance and admittance: definition, relation, impedance, and admittance triangle; Complex power: real power, reactive power, apparent power, and power factor.

Practical (15 Hours)

8. Measurement of AC voltage, current, frequency, and phase difference using CRO or DSO.
9. Study of series RL, RC, and RLC circuits and verification of phase relationships.
10. Determination of impedance, power factor, and resonance characteristics in RLC circuits.

Module IV: Three-Phase AC Circuits (15 Hours)

Theory (5 Hours)

Necessity and advantages of three phase systems, generation of three phase power, definition of phase sequence, balanced supply and balanced load; Relationship between line and phase values of balanced star and delta connections; Power in balanced three phase circuits, measurement of power by two wattmeter method.

Practical (15 Hours)

11. Study of three-phase star and delta connected loads and verification of line and phase relationships.
12. Measurement of power in a balanced three-phase circuit by two wattmeter method.
13. Determination of phase sequence of a three-phase supply.

Module V: Introduction to Electronic Devices (20 Hours)

Theory (5 Hours)

Intrinsic and Extrinsic Semiconductors; Active and passive semiconductor devices; PN diode: current-voltage characteristics, applications in half-wave and full-wave rectifier circuits, wave shaping circuits, clippers and Clampers; Zener Diodes; Bipolar Junction Transistor (BJT), Metal Oxide Semiconductor Field-Effect Transistor (MOSFET); Their structures, working principles, and applications.

Practical (15 Hours)

14. Study of V-I characteristics of PN junction diode and Zener diode.
15. Construction and testing of half-wave and full-wave rectifier circuits.
16. Study of clipper and clamper circuits using diodes.
17. Study of BJT as an amplifier.
18. Demonstration of basic switching action using BJT and MOSFET.

Suggested Readings:

1. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering.
2. V. Del Toro, Electrical Engineering Fundamentals.
3. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory.
4. S. Salivahanan, N. Suresh Kumar, and A. Vallavaraj, Electronic Devices and Circuits.
5. A. Sudhakar and Shyammohan S. Palli, Circuits and Networks: Analysis and Synthesis.

Suggested MOOCs Course with Web Link

1. NPTEL: Basic Electrical Circuits - <https://nptel.ac.in/>
2. NPTEL: Electronic Devices and Circuits - <https://nptel.ac.in/>
3. SWAYAM Engineering Courses - <https://swayam.gov.in/>
4. MIT Open Course Ware: Circuits and Electronics - <https://ocw.mit.edu/>

E-Resource Link

1. <https://swayam.gov.in/>
2. <https://ocw.mit.edu/>
3. <https://www.allaboutcircuits.com/>
4. <https://www.electronics-tutorials.ws/>

Mapping of COs to Syllabus

CO	Module I	Module II	Module III	Module IV	Module V
CO 1	H	H	L	L	L
CO 2	L	M	H	L	L
CO 3	L	L	M	H	L
CO 4	L	L	L	L	H

Sl. No.	Course Type	Course Code	Course Title
4	ES-02		Engineering Graphics & Design

Objective:

- Develop the ability to apply engineering drawing conventions for constructing of geometrical figures and engineering scales
- Gain proficiency in using CAD software for precise drafting and industry-standard dimensioning
- Create industry-standard architectural drawings for building projects

Course Outcomes:

- **CO1:** Apply conventions of engineering drawing for the construction of geometrical figures (2 dimensional conic sections and curves) and engineering scales.
- **CO2:** Construct first angle orthographic projections for points, lines and planes
- **CO3:** Apply CAD tools for precise drafting applying industry-standard dimensioning, conventions and symbols as per IS SP-46(2003)
- **CO4:** Apply CAD tools to create 3D parametric models from 2D drawings and generate professional layouts of the various 2D projections, section and sectional views of the 3D models.
- **CO5:** Create industry-standard architectural drawings for a building project.

Module I: Introduction to Engineering Drawing (14 Hours)

Theory (3 Hours)

Principles of Engineering Graphics and their significance, Methodical usage of Drawing instruments, with applications; Lettering: Single stroke, Vertical and inclined capital and small letter, Engineering Scales: Plain, Diagonal and Vernier Scales; Representative Fractions: reduced, enlarged and full-size scales; Conic sections: Ellipse, Parabola, Hyperbola and Rectangular Hyperbola using General method of Construction; Construction of Ellipse using Method Concentric Circles and Arcs of Circle; Normal and Tangent at any point of the conic sections; Curves: Cycloid, Epicycloid, Hypocycloid and Involute; Normal and Tangent at any point of the Curves.

Practical (11 Hours)

1. Methodical Usage of Drawing Instruments.
2. Construction of Lettering plates.
3. Understanding and Creating Engineering Scales based on representative fractions (RF).
4. Geometrical construction of Conic Sections.
5. Geometrical construction of Curves.

Module II: Orthographic Projections of Points, Lines and Planes (16 Hours)

Theory (3 Hours)

Principles of Orthographic Projections, Conventions, Quadrants; Projections of Points: 1st, 2nd, 3rd and 4th angle projection of points; Projection of lines (Line in the 1st quadrant only): Line parallel to one or both planes, line perpendicular to a plane, line inclined to one plane and parallel to other, line inclined to both planes; Projections of planes (Plane in the 1st quadrant only): Plane perpendicular to one plane and parallel to other, plane perpendicular to both plane, plane inclined to one plane and perpendicular to other, plane inclined to both planes

Practical (13 Hours)

1. Construct the orthographic projection of points in space.
2. Develop the orthographic projection of a line in space.
3. Develop the orthographic projection of a plane surface in space.

Module III: Computer-aided drafting interface (14 Hours)

Theory (3 Hours)

Computer Aided Drafting: concept; CAD software: Autodesk AutoCAD; FreeCAD; The user interface; Command window, status bar, drawing area; Setting up new drawing: Units, Limits, Grid, Snap; Snap to objects manually and automatically; Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Polyline; Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates; Producing drawings by Command Line using various coordinate input entry methods to draw straight lines, applying various ways of drawing circles; Modify and edit commands like trim, extend, fillet, chamfer, stretch, delete, copy, offset, array; Special operations in AutoCAD: Layers and Block, Create Block of Repeating objects; Dimensioning and scale; Dimensioning techniques as per SP-46:2003; Dimensioning: Linear, Horizontal, Vertical; Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions, Editing dimensions.

Practical (11 Hours)

1. Creating, saving, and managing drawing files. Configuring units, limits, grid, and snap settings in AutoCAD.
2. Drawing Basic Geometric Entities in AutoCAD: Drawing lines, circles, arcs, polygons, ellipses, rectangles, polylines, and multilines.
3. Modify drawings using commands like trim, extend, fillet, chamfer, stretch, delete, copy, offset, and array.
4. Setting up and managing layers in drawings.
5. Creating reusable blocks for repeated use in layouts.
6. Adding dimensions (linear, angular, radial) as per SP-46:2003 standards. Creating single-line and multiline text annotations.

7. Configuring print parameters, generating print previews, and producing scaled outputs in various projections.

Module IV: Modelling and Projection of Regular Solids using CAD (16 Hours)

Theory (3 Hours)

Parametric Modelling (3D wireframe, shaded solids and meshed topologies) of regular solids: Prism, Cylinder, Pyramid, Cone; Modelling of Complex Solids (Machine Parts) | Two-dimensional documentation (lay-out) of the models; presentation in standard 2D blueprint. Planar projection; plotting of orthographic, isometric, perspective and oblique projections of the 3D models | Print lay-out of the Section of solids: Sectional views, project true shape of the sectioned surface)

Practical (13 Hours)

1. Create 3D CAD Models of Regular Solids: prisms, cylinders, pyramids, and cones
2. Design and parametrize complex 3D solids.
3. Generate 2D Layouts from 3D Models including orthographic, isometric, perspective, and oblique projections.
4. Prepare sectional views and project the true shape of the sectioned surfaces of the 3D solids

Module V: Mini Project (15 Hours)

Theory (3 Hours)

Create a Floor plan showing walls, beams, columns, windows, doors, staircases and fixtures such as WC, bath, sink, shower, etc. Sectional elevation showing foundation to ceiling; front elevation showing some architectural design elements; Demonstrate application of Layer function, Block function, annotations, applying colour coding according to building drawing practice

Practical (12 Hours)

1. Create a Detailed Floor Plan; Draft walls, beams, columns, windows, doors, staircases, and fixtures (WC, bath, sink, shower)
2. Create a Detailed Floor Plan; Draft walls, beams, columns, windows, doors, staircases, and fixtures (WC, bath, sink, shower)

Suggested Readings:

1. N.D. Bhatt, Engineering Drawing, Charotar Publishing House
2. B. Agrawal and C.M. Agrawal, Engineering Drawing, McGraw Hill Education (India) Pvt Ltd.
3. P. Jain, Engineering Graphics & Design, Khanna Book Publishing Co. (P) Ltd.
4. SP 46: 1988; Engineering Drawing Practice for Schools & Colleges, Bureau of Indian Standards, New Delhi
5. Azhar Wahab, A Hand Book on AutoCAD Tools Practice, Notion Press
6. D. Chandra Mouli Darapaneni and B. Swathi, Computer Aided Civil Engineering Drawing, All India Council for Technical Education, New Delhi.

7. Aparna Dwivedi and Pradeep Kumar, Building Planning and Drawing, All India Council for Technical Education, New Delhi
8. Kanak Kalita, Computer Aided Machine Drawing Practice, All India Council for Technical Education, New Delhi

Suggested MOOCs Course with Web Link

1. NPTEL – Engineering Graphics and Design – <https://nptel.ac.in/courses/112107212>
2. Autodesk AutoCAD Essentials – <https://www.autodesk.com/learn>
3. SWAYAM – Engineering Drawing and Computer Graphics – <https://swayam.gov.in>

E-Resource Link

1. <https://www.services.bis.gov.in>
2. <https://wiki.freecad.org>
3. <https://help.autodesk.com/view/ACD/2025/ENU/>
4. <https://nptel.ac.in>

Mapping of COs to Syllabus

CO	Module I	Module II	Module III	Module IV	Module V
CO 1	H	M	L		
CO 2	L	H	M		
CO 3			H	M	L
CO 4			M	H	M
CO 5			L	M	H

Sl. No.	Course Type	Course Code	Course Title
5	ES-03		Design Thinking

Objective:

- To provide the new ways of creative thinking.
- To teach the steps of the Design Thinking process.
- To help students use innovative ideas to develop useful engineering products.

Course Outcomes:

- **CO1:** Compare and classify the various learning styles and memory techniques.
- **CO2:** Apply learning styles and techniques in the engineering education
- **CO3:** Develop new ways of creative thinking.
- **CO4:** Learn the innovation cycle of Design Thinking process for developing innovative products.
- **CO5:** Propose real-time innovative engineering product designs and choose appropriate frameworks, strategies, techniques during prototype development

Module I: An Insight to Learning & Remembering Memory (5 Hours)

Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting, Understanding the Memory process, Problems in retention, Memory enhancement techniques

Module II: Emotions: Experience & Expression & Basics of Design Thinking (5 Hours)

Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers. Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test

Module III: Being Ingenious & Fixing Problem & Process of Product Design (5 Hours)

Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving. Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Assignment – Engineering Product Design

Module IV: Prototyping & Testing & Celebrating the Difference (5 Hours)

What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, Sample Example, Test Group Marketing. Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences

Module V: Design Thinking & Customer Centricity (5 Hours)

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

Module-VI: Feedback, Re-Design & Re-Create (5 Hours)

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

Suggested Readings:

1. E Balaguruswamy (2022), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company.

Suggested MOOCs Course with Web Link

1. Design Thinking – A Primer (NPTEL); https://onlinecourses.nptel.ac.in/noc23_mg127/preview
2. Understanding Design Thinking & People Centred Design (NPTEL), <https://archive.nptel.ac.in/courses/109/104/109104109/>
3. Human Computer Interaction / UI-UX Design (NPTEL); <https://nptel.ac.in/courses/106106224>

E-Resource Link

1. <https://swayam.gov.in>
2. <https://www.coursera.org/learn/learning-how-to-learn>
3. <https://elearn.nptel.ac.in/shop/iit-workshops/ongoing/others/karmic-design-thinking-for-product-service-innovation-solve/>
4. <https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/karmic-design-thinking-a-buddhism-inspired-method-to-help-create-human-centered-products-and-services/>
5. <https://www.coursera.org/learn/creative-problem-solving>

Mapping of COs to Syllabus

CO	Module I	Module II	Module III	Module IV	Module V	Module VI
CO 1	H	L	L			
CO 2	H	M	M	L		
CO 3	L	M	H	M	L	
CO 4		H	H	M	H	M
CO 5		M	H	H	H	H

Sl. No.	Course Type	Course Code	Course Title
7	MNC-AU-01		IDEA lab workshop

Objective:

- To learn all the skills associated with the tools and inventory associated with the IDEA Lab.
- Learn useful mechanical and electronic fabrication processes.
- Learn necessary skills to build useful and standalone system/ project with enclosures.
- Learn necessary skills to create print and electronic documentation for the system/project

Course Outcomes:

- **CO1:** Identify and use basic electronic components, sensors, measurement instruments, and power tools for circuit and system development.
- **CO2:** Design and fabricate electronic circuits and PCBs using EagleCAD, and prototype using 3D printing, CNC machining, and laser cutting tools.
- **CO3:** Interface microcontrollers (Arduino/Raspberry Pi) with sensors and actuators using digital/analog I/O, PWM, serial communication, and interrupts.
- **CO4:** Execute a mini project integrating mechanical and electronic subsystems, demonstrating skills in fabrication, assembly, and testing.
- **CO5:** Document and present project work through structured reports, video demonstrations, and utilize IPR resources for innovation.

Module I: (15 Hours)

Theory (5 Hours)

Electronic component familiarization, Understanding electronic system design flow. Schematic design and PCB layout and Gerber creation using EagleCAD. Documentation using Doxygen, Google Docs, overleaf; Version control tools: GIT and GitHub.

Practical (10 Hours)

1. Basic 2D and 3D designing using CAD tools such as FreeCAD, Sketchup, Prusa Slicer, FlatCAM, Inkspace, OpenBSP and VeriCUT.
2. Introduction to basic hand tools – Tape measure, combination square, Vernier calliper, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading. Adhesives.
3. Introduction to Power tools: Power saws, band saw, jigsaw, angle

Module-II: (15 Hours)

Theory (5 Hours)

Familiarization and use of basic measurement instruments: DSO including various triggering modes, DSO probes, DMM, LCR bridge, Signal and function generator. Logic analyzer and MSO. Bench power supply (with 4-wire output). Automated circuit assembly and soldering using pick and place machines. Basic welding and brazing and other joining techniques for assembly.

Practical (10 Hours)

1. Circuit prototyping using (a) breadboard, (b) Zero PCB (c) 'Manhattan' style and (d) custom PCB. Single, double and multilayer PCBs. Single and double-sided PCB prototype fabrication in the lab.
2. Soldering using soldering iron/station. Soldering using a temperature controlled reflow oven.
3. Mechanical cutting processes: 3-axis CNC routing, basic turning, milling, drilling and grinding operations, Laser cutting, Laser engraving etc.

Module-III: (20 Hours)

Theory (7 Hours)

Electronic circuit building blocks including common sensors. Introduction to Arduino and Raspberry Pi programming. Digital Input and output. Measuring time and events. PWM. Serial communication. Power Supply design (Linear and Switching types), Wireless power supply, USB PD, Solar panels, Battery types and charging. 3D printing and prototyping technology – 3D printing using FDM, SLS and SLA. Basics of 3D scanning, point cloud data generation for reverse engineering. Prototyping using subtractive cutting processes. 2D and 3D Structures for prototype building using Laser cutter and CNC routers.

Practical (13 Hours)

1. Programming using Arduino and Raspberry Pi. Programming examples of digital input and output, time and event measurement, Serial communication, Analog input. Interrupts.
2. Demonstration of 3D printing and prototyping examples.
3. 2D and 3D Structures for prototype building using Laser cutter and CNC routers.

Module IV: (10 Hours)

Theory (3 Hours)

Basics of IPR and patents; Accessing and utilizing patent information in IDEA Lab.

Practical (7 Hours)

1. Demonstration of sample patent document and understanding, accessing, and utilizing the patent information.

Module V: (30 Hours)

Theory (10 Hours)

Implementation of a mini project, followed by documentation and presentation.

Practical (20 Hours)

2. Plan and execute a mini project integrating electronic, mechanical, and prototyping skills.
3. Prepare and present technical documentation of the mini project through reports and videos

Suggested Readings:

1. Workshop / Manufacturing Practices (with Lab Manual), Veerana D.K., Khanna Book Publishing, 2023.
2. All-in-One Electronics Simplified, A.K. Maini; 2021. ISBN-13: 978-9386173393, Khanna Book Publishing Company, New Delhi.
3. Simplified Q&A – Data Science with Artificial Intelligence, Machine Learning and Deep Learning, Rajiv Chopra, ISBN: 978-9355380821, Khanna Book Publishing Company, New Delhi.
4. 3D Printing & Design, Dr. Sabrie Soloman, ISBN: 978-9386173768, Khanna Book Publishing Company, New Delhi.
5. The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018. ISBN-13: 978-1681884325.
6. Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards. Simon Monk and Duncan Amos. McGraw Hill Education. ISBN-13: 978-1260019193.
7. Chapman W.A.J, “Workshop Technology”, Volume I, II, III, CBS Publishers and distributors, 5th Edition,2002.
8. Venuvinod, PK., MA. W., Rapid Prototyping – Laser Based and Other Technologies, Kluwer.

Suggested MOOCs Course with Web Link

1. PCB Design for Everyone – Coursera; <https://www.coursera.org/projects/printed-circuit-board-design>
2. Introduction to Arduino Programming – Coursera; <https://www.coursera.org/learn/arduino-platform>
3. Raspberry Pi Programming – Coursera; <https://www.coursera.org/learn/raspberry-pi-platform>
4. Embedded System Design with ARM – NPTEL; <https://nptel.ac.in/courses/108102045>
5. Product Design and Innovation – SWAYAM, <https://onlinecourses.swayam2.ac.in/>
6. Intellectual Property Rights and Competition Law –NPTEL; <https://nptel.ac.in/courses/109104112>.

E-Resource Link

1. <https://www.arduino.cc/en/Guide>
2. <https://www.raspberrypi.com/documentation/>
3. <https://www.autodesk.com/products/eagle/overview>

4. <https://skills.github.com/>
5. <https://wiki.freecad.org/>
6. <https://help.prusa3d.com/>
7. <https://fab.cba.mit.edu/>
8. <https://www.wipo.int/academy/en/>

Mapping of COs to Syllabus

CO	Module I	Module II	Module III	Module IV	Module V
CO 1	H	H	M		L
CO 2	H	H	M		M
CO 3		M	H		M
CO 4	M	M	H	L	H
CO 5	M		M	H	H

2nd Semester Detailed Syllabus

Sl. No.	Course Type	Course Code	Course Title
4	ES-04		Programming for Problem Solving

Course Objectives:

- Equip students with foundational skills for problem analysis, algorithm design, and program development.
- Introduce computing system terminologies, data representation, and language evolution.
- Establish core programming concepts, control loops, and functions using structural C programming.
- Develop practical skills in incremental compilation, error troubleshooting, and systematic debugging.
- Develop programming skills using Python.

Course Outcomes:

- **CO1:** To classify basic hardware components and software systems, including peripheral device configuration and installation of operating systems.
- **CO2:** To develop flowcharts and algorithms to solve basic computational problems and convert them into executable C programs.
- **CO3:** To model structured programs in C using control structures, arrays, strings, and basic file handling to solve real-life problems.
- **CO4:** To analyse modular programs using user-defined functions and pointers, including recursion, pointer operations, and function-passing techniques to build efficient and reusable code.
- **CO5:** To develop scripts using primitive language constructs of Python and make use of Python standard libraries for programming.

Module I: Introduction to Computer Systems (6 Hours)

Theory (2 Hours)

Definition of Computer System; Block Diagram of Computer System; Components of Computer System-Hardware and Software; Hardware Components and Peripheral Devices; Software Types; Overview of Operating Systems (OS); OS Functions; Types of OS. Number Systems: Binary, Octal, Decimal, Hexadecimal, and Their Interconversion

Practical (4 Hours)

1. Identification of Computer Hardware components (CPU, Input/output devices, memory, etc.).
2. Connect various peripherals (printer, scanner, etc.) to the computer, explore various features of the peripherals and their device driver software.
3. Install and explore Linux/Windows operating systems on the identified lab machines.

Module II: Programming Overview (8 Hours)

Theory (2 Hours)

Overview of Programming Language; Different Types of Programming Languages; Introduction to C Language; Idea of Algorithm: Steps to Solve Logical and Numerical Problems; Representation of Algorithm: Flowchart with Examples; Basic Terminology in C Programming, Input/Output Functions, Identifiers, Data Types, Operators, Headers and Library Files, Expressions, From Algorithms to Programs-Source Code, Variables and Constants; Memory Locations, Syntax and Logical Errors in Compilation; Object and Executable Code.

Practical (6 Hours)

1. Familiarization with programming environment (editors, compilation, debugging, etc.)
2. Develop an algorithm to find the average of three numbers taken as input from the user.
3. Develop an algorithm to divide two numbers and find the quotient.
4. Draw a flowchart to find the sum of only even numbers out of 'n' inputs provided by the user.
5. Draw the flowchart to find the maximum of two numbers.

Module III: Basic C Programming (44 Hours)

Theory (4 Hours)

Simple computational Programme using expressions and operator precedence, Managing Input/Output, Assignment Statements, If, Else-If, Nested If, Switch-case, Goto Statement, While Statement, Do Statement, For Statement, Jumps in Loops, Arrays: One Dimensional arrays (declaration and initialization) and Multi-dimensional Arrays, String: declaration and initialization of string variables, Reading and writing strings, Arithmetic operations on characters, Comparison of Strings.

Practical (40 Hours)

1. Write a program to display "Hello World".
2. Write a program to perform addition, subtraction, multiplication, and division of two numbers.
3. Write a program to find the area of a rectangle and a circle.
4. Write a program to find the root of an equation.

5. Write a program to find simple interest, compound interest, and the amount.
1. Write a program to convert temperature from C to F and F to C.
2. Write a program to compare two numbers using if-else.
3. Write a program to swap two numbers using a third variable.
4. Write a program to arrange the numbers in ascending order using bubble sort.
5. Write a program to find the smallest of four numbers using if-else.
6. Write a program to check whether a year is a leap year or not.
7. Write a program to calculate the sum of all the numbers from 1 to 50 using a for loop.
8. Write a program to display your name up to 10 times using a while loop.
9. Write a program to add the digits of a 5-digit number.
10. Write a program to display an array of elements, check whether the numbers present in the array are odd or even, and print them accordingly.
11. Write a program to find the factorial of a number.
12. Write a program to print all the numbers divisible by 2 and 3 between 1 and 50.
13. Write a program to find the greatest among 10 numbers using a loop.
14. Write a program to reverse a number.
15. Write a program to find the area of a triangle, rectangle, and circle using switch case.
16. Write a program to calculate the grade using nested if and case statements.
17. Write a program to write the first 'n' numbers of digits in a Fibonacci series without using a function.

Module IV: Functions and Pointers in C Programming (28 Hours)

Theory (4 Hours)

User-defined Functions, Definition, Call (Call by Value and Call by Reference), and Declaration; Categories of Functions, Nesting of Functions, Recursion, Passing Arrays to Function, Searching and Sorting, Passing Strings to Function; Idea of Pointers, Defining Pointers, Declaring and Initializing, Accessing Variable through Pointer, Chain of Pointers, Expressions, Increment and Scale Factor, Pointers and Arrays, Pointer to Structure, Pointer to Function, Pointers and Character Strings; Function Returning, Pointer as Function Arguments, Functions Returning Pointers, Pointers to Functions.

Practical (24 Hours)

1. Write a C program using a function to sort an array of integers.
2. Write a C program to use a function to determine whether the given string is a palindrome or not.
3. Write a C program to find the GCD of two numbers using recursive functions.
4. Write a C program using function to search for an integer from an array of 10 numbers.
5. Write a C program using function to perform average of values in a two-dimensional matrix.

6. Write a C program to write the first 'n' numbers of digits in a Fibonacci series using function.
7. Write a C program using function that returns the position of the first minimum value among the first n elements of the given array 'x'.
8. Write a program to illustrate the use of the indirection operator '*' to access the value pointed to by a pointer.
9. Write a C program using pointers to compute the sum of all elements stored in an array.
10. Write a C program using pointers to determine the length of a character string.
11. Write a C program to print the addresses and values of a 2-dimensional array.
12. Write a C program to calculate the sum of two numbers that are passed as arguments using the call-by-reference method.

Module V: Programming using Python (19 Hours)

Theory (3 Hours)

Data Types in Python: Numeric, Strings, Tuples, Lists, Dictionaries; NumPy and Modules.

Practical (16 Hours)

1. Develop a Python program to read numbers and perform the basic arithmetic operations.
2. Develop a program to generate the Fibonacci sequence.
3. Write a Python program to create a list and perform the operations: inserting, removing, appending, displaying the length of the list, popping, and clearing the list.
4. Develop a program to print mean, variance, and standard deviation.
5. Develop a program to print the most frequently appearing words in a text file.
6. Develop a program to read the marks of all subjects from the keyboard for a student.
7. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file.
8. Create a NumPy array with 10 values ranging from 1 to 10. Create a custom module and perform the factorial.

Suggested Readings:

1. Programming in ANSI C, E Balagurusamy, McGraw-Hill Publications.
2. Let Us C: Authentic guide to C programming language, Yashavant Kanetkar, BPB Publications.
3. Automate the Boring Stuff with Python, 2nd Edition: Practical Programming for Total Beginners", 2nd Edition, No Starch Press, 2022.
4. Kyla McMullen, Elizabeth Matthews and June Jamrich Parsons, Programming with Python, Cengage, 2023.

Suggested MOOCs Course with Web Link

1. https://onlinecourses.swayam2.ac.in/cec25_ma09/preview
2. <https://www.udemy.com/course/c-programming-for-beginners-/?couponCode=PMNVD2025>
3. <http://www.digimat.in/nptel/courses/video/106104128/L01.html>
4. https://onlinecourses.swayam2.ac.in/imb25_mg71/preview
5. <https://www.my-mooc.com/en/mooc/c-programming-modular-programming-and-memory-management-3>

E-Resource Link

1. <https://www.tpointtech.com/c-programming-language-tutorial>
2. <https://www.w3schools.com/c/>
3. https://tndalu.ac.in/econtent/8_Computer_Fundamentals_and_Office_Automation.pdf
4. <https://cse02-iiith.vlabs.ac.in/Introduction.html>
5. <https://pythontutor.com/visualize.html#mode=edit>

Mapping of COs to Syllabus

CO	Module 1	Module 2	Module 3	Module 4	Module 5
CO 1	H	M	L	L	L
CO 2	L	H	L	L	L
CO 3	L	L	H	M	M
CO 4	L	L	H	H	M
CO 5	L	L	M	M	H

Sl. No.	Course Type	Course Code	Course Title
5	ES-05		Electrical and Mechanical Workshop

Objective:

- To build manual literacy in tool usage, soldering, carpentry joints, and metal fitting shapes.
- To master technical drawing rules, orthographic views, and isometric projection matrices.
- To introduce modern computer-aided design (CAD) documentation and engineering drawing layouts.

Course Outcomes:

- **CO1:** Apply mechanical workshop safety steps and hand-tool configurations confidently.
- **CO 2:** Analyze engineering component views via formal orthographic and isometric mappings.
- **CO 3:** Evaluate component fit tolerances, soldering connectivity, and structural joints.
- **CO 4:** Design complete technical drawings containing dimension lines and section cuts.

Module 1: Electrical, Electronics & Wire Harnessing Workshop (16 Hours)

Practical

1. Identify electronic passives, relays, fuses, switches, and ICs using multimeters and LCR meters visually.
2. Perform soldering runs on stripboards, mastering point connections and clean desoldering techniques.
3. Cut, strip, crimp lug terminals, and insulate automotive-grade wires using heat-shrink sleeves and heat guns. Assemble a multi-pin connector harness.
4. Assemble and test a functional linear DC power supply circuit on a prototype matrix, validating voltage regulation.
5. Earthing, grounding, electrical wiring and installations.

Module 2: Mechanical Fitting, Sheet Metal & Enclosure Assembly (14 Hours)

Practical

1. Fabricate precise metal profiles (V-shape, square-fit) using hand files, hacksaws, and gauges.
2. Perform layout marking, cutting, and bending of thin sheet metal to construct a basic component electronic/battery enclosure box.
3. Operate drill presses safely; execute manual thread tapping for machine screws and implement blind rivet fastening.
4. Measure completed assemblies with micrometer instruments to verify dimensional tolerances.

Module 3: Geometrical Drawing & Orthographic Mappings (16 Hours)

Practical

1. Initialize engineering sheets to construct foundational geometric profiles, scale dimensions, and standardized title blocks.
2. Project multi-view orthographic layouts (front, top, side views) of solid blocks following First Angle conventions.
3. Construct full section views of hollow assemblies to expose hidden internal structures.
4. Read, interpret, and reverse-engineer industrial multi-view engineering blueprints containing tolerance callouts.

Module 4: Structural Welding & Vehicle Fabrication (14 Hours)

Practical

1. Perform basic lap and butt joints on structural steel plates using shielded metal arc welding, focusing on maintaining correct arc length and safety protocols.
2. Execute continuous weld beads on thin-walled square tubing (the typical material used for custom EV go-kart or student formula chassis frames)
3. Perform lap joints on thin sheet metal pieces using a spot welder to understand how vehicle body panels and battery box structural brackets are assembled in manufacturing plants.
4. Inspect welded joints visually and via dye-penetrant testing for common defects like porosity or undercut, followed by cleaning and grinding operations using angle grinders.

Suggested Readings:

1. ASU Workshop Practice Manual, Latest Edition.
2. S.K.H. Choudhury, A.K.H. Choudhury and N. Roy, *Elements of Workshop Technology, Vol. I: Manufacturing Processes*, Media Promoters, 2008.
3. H. Gerling, *All About Machine Tools, 2nd Edition*, New Age International, 2006.
4. W.A.J. Chapman, *Workshop Technology, 4th Edition*, Viva Books, 1998.
5. HMT, *Mechatronics*, McGraw Hill Education, New Delhi, 2017.

Sl. No.	Course Type	Course Code	Course Title
6	HSM-02		Universal Human Values

Objective:

To develop a holistic understanding of self, society, and nature, fostering ethical values, mutual harmony, and responsible professional conduct for sustainable happiness and prosperity.

Course Outcomes:

- **CO1:** Students will be able to analyse social issues and develop sustainable solutions while demonstrating awareness of human relationships, nature, and societal dynamics.
- **CO2:** Students will be able to apply critical thinking skills to evaluate complex social problems and propose practical solutions based on humane values that align with holistic and sustainable practices.
- **CO3:** Students will demonstrate the ability to implement learned principles in real-life situations, integrating ethical considerations and human values into daily decision-making.
- **CO4:** Students will cultivate self-reflection to evaluate their roles in society, leading to increased responsibility and awareness in life's interactions with family, society, and nature
- **CO5:** Students will showcase an understanding of the interconnectedness of natural systems and human actions, aiming to contribute to mutually enriching relationships with nature.

Module I: Introduction to Value Education (14 Hours)

Theory (3 Hours)

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education); Understanding Value Education; Self-exploration as the Process for Value Education; Continuous Happiness and Prosperity – the Basic Human Aspirations; Happiness and Prosperity – Current Scenario; Method to Fulfil the Basic Human Aspirations.

Practical (11 Hours)

1. Practice session on sharing about Oneself
2. Practice session on exploring human consciousness
3. Practice session on exploring natural acceptance

Module II: Harmony in the Human Being (14 Hours)

Theory (3 Hours)

Understanding Human being as the Co-existence of the Self and the Body; Distinguishing between the Needs of the Self and the Body; The Body as an Instrument of the Self; Human being's desires – Relation with human desires; Understanding Harmony in the Self; Harmony of the Self with the Body; Harmony in Self – Welfare state; Control over one's lives; Programme to ensure self-regulation and Health; Understanding techniques like mindfulness, deep breathing,

and self-reflection that help reduce stress and foster a peaceful, happy mind by aligning thoughts and feelings with right understanding

Practical (11 Hours)

1. Practice session on exploring the difference of needs of self and body
2. Practice session on exploring sources of imagination in the self
3. Practice session on practice mindfulness and reflective journaling to observe thoughts, reduce inner noise, and experience harmony in the self through awareness and self-regulation

Module III: Harmony in the Family and Society (17 Hours)

Theory (3 Hours)

Harmony in the Family – the Basic Unit of Human Interaction; ‘Trust’ – the Foundational Value in Relationship; Harmony in relationships; ‘Respect’ – as the Right Evaluation; Other Feelings, Justice in Human-to-Human Relationship; Understanding Harmony in the Society; Societal systems; Fascism and totalitarianism; World war I and II; Cold war; Capitalism – Free markets, demand-supply, perfect competition, laissez-faire, monopolies, imperialism; Liberal democracy; Communism – Mode of production, theory of labour, surplus value, class struggle, dialectical materialism, historical materialism, Russian and Chinese models; Essential elements of Indian civilization; Gandhian thought; Swaraj, Decentralized economy & polity, Community; Role of education in shaping of society; Empowered human beings; Considerations for humane society; Vision for the Universal Human Order

Practical (14 Hours)

1. Practice session on exploring the feeling of trust
2. Practice session on exploring the feeling of respect
3. Practice session on exploring systems to fulfil human goals

Module IV: Nature (14 Hours)

Theory (3 Hours)

Harmony in Nature /Existence; Relationship with nature; Understanding Harmony in the Nature; Interconnectedness, self-regulation; Satisfaction; Mutual Fulfilment among the Four Orders of Nature; Realizing Existence as Co-existence at All Levels; Holistic thought – The Holistic Perception of Harmony in Existence

Practical (11 Hours)

1. Practice session on exploring the four orders of nature
2. Practice session on exploring co-existence in existence

Module V: Ethics (16 Hours)

Theory (3 Hours)

Implications of the Holistic Understanding – a Look at Professional Ethics; Natural Acceptance of Human Values; Definitiveness of (Ethical) Human Conduct; A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order; Competence in Professional Ethics; Holistic Technologies, Production Systems and Management Models- Typical Case Studies; Technology as driver of society Future directions; Strategies for Transition towards Value-based Life and Profession

Practical (13 Hours)

1. Practice session on exploring ethical human conduct
2. Practice session on exploring humanistic models in education
3. Practice session on exploring steps of transition towards universal human order

Suggested Readings:

1. R. R. Gaur, R. Asthana and G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi
2. Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing Company, New Delhi
3. R.S. Naagarazan, A Textbook on Professional Ethics and Human Values, New Age International (P) Limited, Publishers
4. A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi.
5. Mahatma Gandhi, The Story of My Experiments with Truth, Fingerprint! Publishing
6. J. C. Kumarappa, Economy of Permanence, Sarva Seva Sangh Prakashan
7. Dharampal, Rediscovering India, Stosius Inc/Advent Books Division
8. Mahatma Gandhi, Indian Home Rule, Namaskar Books
9. Maulana Abul Kalam Azad, India Wins Freedom, Orient BlackSwan
10. Romain Rolland, Life of Vivekananda, Advaita Ashrama, India
11. Romain Rolland, Mahatma Gandhi, Maple Press

Suggested MOOCs Course with Web Link

1. <https://nptel.ac.in/courses/109104068>
2. <https://nptel.ac.in/courses/109107121>
3. <https://nptel.ac.in/courses/127105018>

E-Resource Link

1. <https://uhv.org.in/>
2. <https://sdgs.un.org/>

Mapping of COs to Syllabus

CO	Module I	Module II	Module III	Module IV	Module V
CO1	M	M	H	H	M
CO2	M	H	H	M	H
CO3	M	H	M	M	H
CO4	H	H	M	M	M
CO5	L	M	M	H	H

Sl. No.	Course Type	Course Code	Course Title
7	MNC-AU-02		NSS

Course Objective:

Understand the philosophy, history, and organizational structure of the NSS and its relevance in nation-building, foster a spirit of social responsibility, and develop empathy, ethics, and leadership through community service.

Course Outcomes:

- **CO1:** Describe the aims, values, and operational framework of NSS and its role in shaping responsible citizens.
- **CO2:** Demonstrate leadership, teamwork, and empathy by actively participating in community engagement and service activities.
- **CO3:** Apply practical knowledge in health, hygiene, environmental protection, and disaster preparedness to real-life scenarios.
- **CO4:** Engage in civic duties by contributing to national schemes and showcasing awareness of social and cultural diversity.
- **CO5:** Enhance soft skills such as communication, presentation, and time management, supporting holistic personal and professional development

Module I: Introduction to NSS (18 Hours)

Theory (6 Hours)

History, aims, objectives of NSS, NSS emblem, motto, organizational structure, Role of youth in nation-building, Values of voluntary service and social responsibility

Practical (12 Hours)

Orientation session and icebreaking activities; Campus cleanliness drive (Swachh Bharat Abhiyan); Poster or slogan writing on “My Role in Nation Building”.

Module II: Significance of Involvement in Social Issues (18 Hours)

Theory (6 Hours)

Understanding community and social issues, Community participation and mobilization techniques, Leadership qualities and team-building, Importance of empathy, ethics, and active citizenship.

Practical (12 Hours)

Visit to a nearby village, orphanage, or old-age home; Conducting a small survey (e.g., health, education, hygiene); Group presentation on local social issues

Module III: Health & Hygiene (18 Hours)

Theory (6 Hours)

Importance of personal hygiene and public sanitation, Nutritional awareness and disease prevention, Health campaigns and role of NSS volunteers, Safe drinking water and waste management

Practical (12 Hours)

Health or hygiene awareness rally/skit/flash mob; Handwashing or dental hygiene awareness campaign; Participation in a local health camp or blood donation awareness activity

Module IV: Sustainability (18 Hours)

Theory (6 Hours)

Environmental conservation and sustainability, Water conservation, plastic ban, renewable energy, Swachh Bharat, Jal Shakti, and eco-friendly habits, Basics of disaster management, and NSS response.

Practical (12 Hours)

Tree plantation and plastic-free campus campaign; Waste segregation demo (biodegradable/non-biodegradable); Workshop or demo on disaster preparedness or first aid.

Module V: Government Schemes (18 Hours)

Theory (6 Hours)

Government schemes: Digital India, Skill India, Ek Bharat Shreshtha Bharat, National integration and cultural exchange, Communication skills, public speaking, and time management, Career skills through NSS volunteering.

Practical (12 Hours)

Street play, debate, or poster-making on national themes; Organize or participate in cultural exchange/heritage awareness events; Conduct a group discussion or role play to practice communication skills.

Suggested Readings:

1. National Service Scheme Manual – Ministry of Youth Affairs & Sports, Government of India.
2. National Service Scheme (NSS) – A Manual for Students and Volunteers by Dr. S. Rajasekar and R. Jayaprakash.
3. Youth Development and Social Service by S. L. Goel and A. Singh.
4. Community Development and Social Work by Dr. Ramesh K. Sharma
5. Disaster Management: Problems and Perspectives by R.B. Singh

E-Resource Link

1. <https://nss.gov.in/nss-detail-page>
2. https://intuh.ac.in/uploads/about_NSS.pdf
3. <https://nss.gov.in/sites/default/files/manualNss2006.pdf>
4. <https://www.sharing4good.org/article/youth-and-development-role-social-worker>

Mapping of COs to Syllabus

CO	Module I	Module II	Module III	Module IV	Module V
CO 1	H	M	L	L	L
CO 2	M	H	L	L	L
CO 3	L	L	H	H	L
CO 4	L	M	L	H	H
CO 5	L	L	L	M	H