COURSE STRUCTURE

AND

SYLLABUS FOR

UNDERGRADUATE PROGRAMMES

1st year (Semester I)

(APPLICABLE FROM AY 2024-2025 ONWARDS)

CENTRAL INSTITUTE OF TECHNOLOGY KOKRAJHAR

COURSE STRUCTURE
UNDERGRADUATE PROGRAMMES (B. Tech)
1st year
Semester I

Sl. No.	Course Code	Course Name	L	T	P	C
01.	UPH101	Engineering Physics	3	1	0	4
02.	UPH171	Engineering Physics Lab	0	0	2	1
03.	UMA101	Mathematics – I	3	1	0	4
04.	UEE101	Basic Electrical Engineering	2	1	0	3
05.	UEE171	Basic Electrical Engineering Lab	0	0	2	1
06.	UCE101	Engineering Drawing & Graphics	1	0	4	3
07.	UHS101	English for Technical Writing	2	0	2	3
08.	UMD171	Design Thinking Lab	0	0	2	1
09.	UIE101	IDEA Workshop	2	0	2	0
	Contact Hours: 34		**13**	**3**	**14**	**20**

Legends:	
L	Lecture
T	Theory
P	Practical
C	Credits

Paper code : UPH101
Paper name: Engineering Physics (Theory) **Credit : 8**
Total contact hours (per week): 03 **L-T-P=3:1:0**

1. **Mathematical Physics:**

   Vector and Scalar field, grad, divergence, curl,Laplacian, line integral, surface integral, volume integral, physical examples in the context of electricity and magnetism, Stokes theorem, Gauss theorem (No proof). [5 L]

2. **Electrodynamics:**

   Gauss Law of electrostatics, Biot-Savart Law, Ampere's Law, Displacement current, Equation of Continuity, Maxwell's equations in differential and integral form, Maxwell's wave equation in free space, propagation of EM wave in free space, transverse nature of EM wave. [6 L]

3. **Heat and thermodynamics**:

   Thermodynamic system and state variables, Heat &Work, Zeroth Law, 1^{st} and 2^{nd} laws of thermodynamics, Isothermal and adiabatic changes, Carnot theorem, Carnot engine, entropy,
   [4 L]

4. **Wave and Oscillations:**

   - Transverse wave on a string, reflection and transmission of waves at boundary, impedance matching, standing waves and their eigenfrequencies, acoustics waves and speed ofsound.
   - Simple harmonic motion**,** Damped oscillation-its differential equation, energy decay in a damped oscillation, Forced vibration, Resonance, Sharpness of resonance and quality factor. [7 L]

5. **Introduction to Quantum Mechanics:**

   Failure of classical Mechanics: Black body radiation, Photoelectric effect, and Compton effect. Wave-particle duality, Matter waves, Heisenberg's uncertainty principle, wave function and its properties. Schrodinger time dependent and time independent equations. Application of Schrodinger equation for free particle in one dimensional infinite potential box.
   [6 L]

6. **Optics and Optoelectronics:**

   - Huygens' Principle, superposition of waves and interference of light, Young's double slit experiment, Newton's rings, Diffraction, Single slit diffraction, grating. [4 L]

     .
   - LASER: Einstein's theory of matter radiation interaction and A and B coefficients, amplification of light by population inversion, properties of laser: monochromaticity, coherence, directionalityand brightness, different types of laser: gas lasers (He-Ne) and solid state laser (Ruby), applications of laser in science, engineering and medicine. [4 L]

Recommended Text Books:

1. Engineering Physics, Gupta & Gaur, Dhanpat Rai

Reference Books:

1. Engineering Physics, Malik and Singh, Tata McGraw Hill
2. Optics, Ajoy Ghatak, 7th ed. McGraw Hill (2020).
3. Introduction to Electrodynamics, David J Griffiths, 4th ed., Pearson (2015).
4. Engineering Physics, Naidu, Pearson
5. Quantum Mechanics: Concepts and Applications, Nouredine Zettili,2nd ed. Wiley.
6. Thermodynamics and kinetic theory of gases, W. Pauli, Dover Publications, (2010).
7. Electricity, magnetism and light, Saslow Wayne M., Elsevier Science Publishing Co Inc
8. Arthur Beiser, Concepts of Modern Physics (Sixth Edition), Tata McGraw-Hill Publication, New Delhi (1988).

Course title: Engineering Physics Lab

Course code: UPH 171

L T P C: 0 0 2 1

List of Experiments:

1. **Experiment No 1:** To determine the magnetic moment of a bar magnet and the horizontal component of the earth's magnetic field.
2. **Experiment No 2:** To study the Hall Effect in semiconductor (Germanium Crystal) and then to calculate the Hall coefficient.
3. **Experiment No 3:** To Verify Stefan-Boltzmann law of thermal radiation by electrical method.
4. **Experiment No 4:** To study the variation of time period of a bar pendulum about different axes and determine the value of acceleration due to gravity (g) at the place.
5. **Experiment No**- 5: To determine the value of Planck's constant with the help of vacuum phototube.
6. **Experiment No 6:** To determine the wavelength of sodium light by measuring the diameters of Newton's Rings
7. **Experiment No 7:** To study the current flowing through an external circuit by a potentiometer and determine the internal resistance of a standard cell
8. **Experiment No 8:** Determine the ratio of E.M.F. of two cells by using a Potentiometer.

Subject Code	Subject Name	L-T-P	Credit
UMA101	Engineering Mathematics-I	3-1-0	4

Course Objectives: The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

Course Outcomes: The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate differentiation and integration. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

The students will learn

- To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
- The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- The tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To deal with functions of several variables that is essential in most branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

Course Contents:

Module 1: Sequences and series:

Limits of sequence of numbers, Calculation of limits, Infinite series; Tests for convergence, Power series, Radius of convergence.

Module 2: Single-variable Calculus (Differentiation):

Rolle's Theorem, Mean value theorems and applications, Taylor's and Maclaurin's series: Taylor theorem, convergence of Taylor series, error estimate, Extreme values of functions, Linear approximation, Indeterminate forms and L-Hospital's rule.

Module 3: Basic Calculus:

Curvature, evolutes and involutes, Evaluation of definite and improper integrals, Beta and Gamma functions and their properties, Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Module 4: Multivariable Calculus (Differentiation):

Limit, continuity and partial derivatives, directional derivatives, gradient, total derivative, Tangent plane and normal line, Maxima, minima and saddle points, Method of Lagrange multipliers.

Module 5: Multivariable Calculus (Integration):

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities), Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds, Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Gradient, curl and divergence, Theorems of Green, Gauss and Stokes.

TEXTBOOKS:

1. AICTE's Prescribed Textbook: Mathematics-I (Calculus & Linear Algebra), Reena Garg, Khanna Book Publishing Co., 2023.
2. Reena Garg, Engineering Mathematics, Khanna Book Publishing Company, 2022.
3. Introduction to Real Analysis [4th edition] by Robert g. Bartle & Donald R. Sherber, publisher: Wiley India Pvt. ltd. (1 January 2023)
4. V. P. Mishra, Jyoti Singha and Pratibha Mishra, Advanced Engineering Mathematics,(Volume-I), Bhavya Book(BET)TM New Delhi, Reprint, 2019

REFERENCES:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9 th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
7. H.K. Das, Engineering Mathematics, S. Chand & Company Ltd, New Delhi, Reprint,2010

Paper code: UEE101
Paper name: Basic Electrical Engineering
Total contact hours: 40
Credit: 3 L-T-P: 2-1-0

Course Objective: The objective of this Course is to provide basic introduction to the Electrical Engineering.

COURSE OUTCOMES:
The students will learn:
1. To explain the basics of Electrical Engineering
2. To assess the different quantities involving electrical circuits.
3. To identify different applications of commonly used electrical machines.

Module 1: Introduction Contact hours: 4
Sources of energy, power and energy, general structure of electrical power systems, power generation, transmission and distribution, conventional and renewable energy sources.

Module 2: DC Circuits Contact hours: 8
Definitions of active, passive, linear, non-linear circuits elements and networks, voltage and current sources-ideal, non-ideal, Kirchoff's laws, series circuit, parallel circuit, nodal and mesh analysis, network theorems: superposition, Thevenin's, Norton's, maximum power transfer, Millman's, and reciprocity theorems, star-delta transformation, D.C. transient, R-L and R-C circuit transient.

Module 3: Single Phase AC Circuits Contact hours: 16
Generation of single phase sinusoidal EMF, instantaneous, average and effective value, form and peak factor, examples of other alternating waveforms, complex number, concept of phasor and phasor diagrams, phase difference-lagging and leading, phasor addition, subtraction, multiplication, division, pure resistive, inductive and capacitive circuits, power factor, complex power, R-L, R-C and R-L-C series circuits, parallel AC circuits, series and parallel resonance, RL, RC, RLC low pass, high pass and band pass filters.

Module 4: Three phase AC Circuits Contact hours: 4
Generation of three phase EMF, delta and star connections, line and phase value of emf and current, solutions of simple 3-phase balance circuits with resistive and inductive loads, 3-phase power, comparison between 3-phase and 1-phase systems, applications of 3-phase systems.

Module 5: Electromagnetism and Magnetic Circuits Contact hours: 4
Ampere's circuital law, Faraday's Law, Lenz's Law, Fleming's Rules, B-H curve, definition of mmf, flux, flux-density and reluctance, comparison between electric and magnetic circuits, series, parallel magnetic circuits and their solutions, energy stored in magnetic circuit, lifting magnets, electromagnetic induction, self and mutual inductance, hysteresis and eddy current losses.

Module 6: Electrical machines Contact hours: 4
Introduction of electrical machines, classifications (DC and AC machines), transformers, technical specifications, reading of nameplate data, principle of operation and construction of transformers, EMF equation, losses, efficiency and voltage regulation, general applications.

Books / References:
1. W. H. Hayt, J. E. Kemmerly, and S. M. Durbin, Engineering Circuit Analysis, 8th edition. McGraw-Hill, 2013.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2019.
3. S.K. Sahdev, "Basic Electrical Engineering", Khanna Book Publishing Co., 2023.

Paper code: UEE171
Paper name: Basic Electrical Engineering Lab
Total contact hours: 24
Credit: 1 L-T-P: 0-0-2

1. Basic safety precautions, introduction and use of measuring instruments–voltmeter,
1. ammeter, rheostat and wattmeter, oscilloscope, function generator.
2. Making of a finite resistance from a given rheostat and verification of Ohm's Law.
3. Verification of Kirchhoff's laws.
4. Verification of Thevenin's theorem.
5. Verification of Superposition theorem and Maximum Power Transfer theorem.
6. Measurement of voltage, current, power and power factor in single phase AC circuits.
7. RLC series circuit resonance.
8. Measurement of lamp's filament resistance.
9. Wiring
10. Determination of loss and efficiency of single phase transformer.

Course code: UCE101

Course Title: Engineering Drawing & Graphics

Total contact hours: 48

Credit: 3 L-T-P: 1-0-4

Module 1: Lettering and drawing plane curves

Lettering, Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Module 2: Drawing projection of points, lines and plane surfaces Contact hours: 8

Drawing orthographic projection-Principal Planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Module 3: Drawing projection of solids Contact hours: 8

Drawing projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

Module 4: Drawing projection of sectioned solids and development of surfaces Contact hours: 8

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.

Module 5: Drawing isometric and perspective projections Contact hours: 8

Drawing isometric projections – isometric scale –Isometric projections of simple solids and truncated solids – Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions – Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

Module 6: AutoCAD practice Contact hours: 8

Familiarization of AutoCAD application software, Use of DRAW tools, MODIFY tools, TEXT, DIMENSION, PROPERTIES.

Books / References:

1. Bhatt N.D. and Panchal V.M., ―Engineering Drawing‖, Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C.M., ―Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Venugopal K. and Prabhu Raja V., ―Engineering Graphics, New Age International (P) Limited, 2008.
4. Natrajan K.V., ―A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2009.
5. Gopalakrishna K.R., ―Engineering Drawing (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
6. N S ParthasarathyAnd Vela Murali, ―Engineering Graphics, Oxford University, Press, New Delhi, 2015. 7. Shah M.B., and Rana B.C., ―Engineering Drawing, Pearson, 2nd Edition, 2009.

Course Code: UHS101

Course Title: English for Technical Writing

Credits: 3 L-T-P: 2-0-2

Course Objective:

● To provide learning environment to practice listening, speaking, reading and writing skills. ● To assist the students to carry on the tasks and activities through guided instructions and materials.

● To effectively integrate English language learning with employability skills and training.

● To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

Course Content:

Module I: Vocabulary Building

1.1. The concept of word formation

1.2. Root words from foreign languages and their use in English

1.3. Understanding prefixes and suffixes to form derivatives.

1.4. Synonyms, antonyms, functional vocabulary, transitional words, idioms and phrasal verbs, and standard abbreviations.

Module II: Basic Writing Skills

1.1. Sentence structures

1.2. Use of phrases and clauses in sentences

1.3. Importance of proper punctuation

1.4. Creating coherence

1.5. Organizing principles of paragraphs in documents

1.6. Techniques for writing precisely

Module III: Identifying Common Errors in Writing

1.1. Subject-verb agreement

1.2. Noun-pronoun agreement

1.3. Misplaced modifiers

1.4. Articles

1.5. Prepositions

1.6. Redundancies

1.7. Cliches

Module IV: Nature and Style of Sensible Writing

1.1. Describing

1.2. Defining

1.3. Classifying

1.4. Providing examples or evidence

1.5. Writing introduction and conclusion

Module V: Writing Practices

1.1. Letter writing, memo, report
1.2. Email

1.3. CV, resume

1.4. Comprehension, paragraph writing, essay writing

Module VI: Language Lab

(This Module involves interactive practice sessions in Language Lab)

1.1. Listening comprehension: receiving, attending, interpreting, recalling, evaluating, responding

1.2. Speaking Skills: introduction of English Sounds with IPA transcription, tone, intonation, stress, pronunciation, intonation, stress and rhythm

1.3.Grammar: subject-verb agreement, reviewing tense, voice, clause

1.4.Business Writing: successful letters and e-mails, job application letter, cv/resume, report writing, proposal writing

1.5. Common everyday situations: conversations and dialogues

1.6. Communication at workplace

1.7. Interviews

1.8. Formal presentations

Text/Reference Books:

1. AICTE's Prescribed Textbook: English (with Lab Manual), Khanna Book Publishing Co.

2. Effective Communication Skills. Kul Bhushan Kumar, Khanna Book Publishing, 2022.

3. Practical English Usage. Michael Swan. OUP. 1995.

4. Remedial English Grammar. F.T. Wood. Macmillan.2007

5. On Writing Well. William Zinsser. Harper Resource Book. 2001

6. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

7. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

8. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

Course Title: Design Thinking Lab **L-T-P-C: 0-0-2-1**

Course Code: UMD171

Class Hours/week	2
Expected weeks	12
Total hours of classes	24

Course Objectives:

The primary objective of this course is to introduce students to the fundamental concepts and methodologies of design thinking. The course aims to enhance students' critical thinking, creativity, and innovative capacity, enabling them to approach problems in a user-centered manner and develop effective solutions.

Course Outcome:

By the end of this course, students will be able to:

1. Understand and apply the principles and processes of design thinking.
2. Employ empathy to gain insights into user needs and problems.
3. Develop creative and innovative solutions through ideation techniques.
4. Prototype and test solutions effectively.
5. Reflect on the design process to improve and iterate on solutions.

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Unit – 1** **Introduction to Design Thinking**	Definition and history of design thinking, Key principles and phases of design thinking, Comparison with traditional problem-solving methods, Case studies of successful design thinking applications.	5
2	**Unit – 2** **Empathy and User Research**	Importance of empathy in design thinking, Techniques for conducting user research: interviews, surveys, observations, Creating empathy maps and user personas, Identifying pain points and user needs.	5
3	**Unit – 3** **Ideation Techniques**	Brainstorming and mind mapping, SCAMPER (Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, Reverse), Role-playing and storyboarding, Evaluating and selecting ideas.	5
4	**Unit – 4** **Prototyping and Testing**	Types of prototypes: low-fidelity vs high-fidelity, Tools and materials for prototyping, User testing methods: A/B testing, usability testing, feedback collection, Iterating based on feedback.	4
5	**Unit – 5** **Implementation and Reflection**	Planning and managing the implementation of solutions, Communicating design solutions effectively, Reflective practice: learning from success and failure, Case studies of implemented solutions.	5

TEXTBOOKS / REFERENCES:

1. *"Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation"* by Tim Brown, Publisher – HarperCollins, 2009.
2. *"The Design of Everyday Things"* by Don Norman, Publisher – Basic Books, 2014.
3. *"Design Thinking: Integrating Innovation, Customer Experience, and Brand Value"* by Thomas Lockwood, Publisher – Allworth Press, 2009.
4. *"Creative Confidence: Unleashing the Creative Potential Within Us All"* by Tom Kelley and David Kelley, Publisher – William Collins, 2014.
5. *"Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days"* by Jake Knapp, Publisher – Simon & Schuster, 2016.

Paper code: UIE101 **Total contact hours: 40**
Paper name: IDEA Workshop **Credit: 0**
L-T-P: 2-0-2

Course Objectives:

1. To learn all the skills required in using the tools and inventory associated with the IDEA Lab.

2. Learn state-of-the-art technologies used in industries.

3. Acquaint the students with the mechanical and electronic fabrication processes.

4. To provide an environment for creative thinking, undertaking innovative projects to solve real-world problems.

Unit 1: Basic Mechanical Tools

Measuring Tape, combination square, Vernier calliper, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading. Adhesives

Introduction to Power tools: Power saws, band saw, jigsaw, angle grinder, belt sander, bench grinder, rotary tools. Various types of drill bits,

Unit 2: Electronic and Mechanical Design Tools

Familiarization to electrical and electronic components, instruments. Generalized design of electronic systems; notion of inputs, outputs and system. Schematic design, PCB layout and creation of Gerber file using various tools including EagleCAD. Documentation of works using Doxygen, Google Docs, Overleaf. Version control tools - GIT and GitHub.

Basic 2D and 3D designing using CAD tools such as FreeCAD, Sketchup, Prusa Slicer, FlatCAM, Inkspace, OpenBSP and VeriCUT.

Unit 3: Measuring Instruments and PCB Fabrication

Familiarization and use of basic measurement instruments – Digital Storage Oscilloscope (DSO) including various triggering modes, DSO probes, Digital multimeter (DMM), Inductance, Capacitance and Resistance (LCR) bridge, Signal and function generator. Logic analyzer and Mixed Signal Analyzer (MSO). Bench power supply (with 4-wire output) 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. Soldering using soldering iron/station. Soldering using a temperature controlled reflow oven. Automated circuit assembly and soldering using pick and place machines.

Unit 4: Mechanical Cutting and Welding Techniques

Mechanical cutting processes - 3-axis CNC routing, basic turning, milling, drilling and grinding operations, Laser cutting, Laser engraving etc. Basic welding and brazing and other joining techniques for assembly. Concept of Lab aboard a Box.

Unit 5: Embedded Systems and Power Electronics

Electronic circuit building blocks including common sensors. Arduino and Raspberry Pi programming and use. Digital Input and output. Measuring time and events. PWM. Serial communication. Analog input. Interrupts programming. Power Supply design (Linear and Switching types), Wireless power supply, USB PD, Solar panels, Battery types and charging

Unit 5: 3D Printing

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

Unit 6: Intellectual Property Rights and Project Design

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

Implementation of a mini project and its documentation (report and video).

Text Books:

1. Workshop / Manufacturing Practices (with Lab Manual), Prof. Veeranna D K, Khanna Book Publishing, 1st edition, 2022.
1. All-in-One Electronics Simplified, A.K. Maini and N. Maini, Khanna Book Publishing Company, 1st edition, 2021.
2. 3D Printing & Design, Dr. Sabrie Soloman, ISBN: 978-9386173768, Khanna Book Publishing Company, New Delhi.
3. Programming Arduino: Getting Started with Sketches, Simon Monk, McGraw Hill, 2nd edition, 2016.

Reference Books:

1. The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018. ISBN-13: 978-1681884325.
2. Encyclopedia of Electronic Components (Volume 1, 2 and 3). Charles Platt. Shroff Publishers, 1st edition, 2016.
3. Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards. Simon Monk and Duncan Amos. McGraw Hill Education, 2nd edition, 2017.
4. Practical Electronics for Inventors, Paul Sherz and Simon Monk. McGraw Hill, 4th edition. 2016.

List of experiments:

1. Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.

2. Machining of 3D geometry on soft material such as soft wood or modelling wax.

3. 3D scanning of computer mouse geometry surface. 3D printing of scanned geometry using FDM or SLA printer.

4. 2D profile cutting of press fit box/casing in acrylic (3 or 6 mm thickness)/cardboard, MDF (2 mm) board using laser cutter/ engraver.

5. 2D profile cutting on plywood /MDF (6-12 mm) for press fit designs.

6. Familiarity and use of welding equipment.

7. Familiarity and use of normal and wood lathe.

8. Embedded programming using Arduino and/or Raspberry Pi.

9. Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.

Text/Reference Books:

1. Mechanical Workshop Practice, K.C. John, PHI Publisher, 2nd edition, 2010.
2. Workshop / Manufacturing Practices (with Lab Manual), Prof. Veeranna D K, Khanna Book Publishing, 1st edition, 2022.
3. Embedded Systems- Architecture, Programming and Design, R. Kamal, Tata McGraw Hills, 3rd edition, 2017.