UNIVERSITY OF DELHI

FACULTY OF TECHNOLOGY

Bachelor of Technology (B.Tech.)

- **Computer Science and Engineering**
- **Electronics and Communication Engineering**
- **Electrical Engineering**

Semester-I

Sr. No.	Course Domain	Course Title	Hours per week			Total Course Hrs. per week	Credits
			L	T	P		
1.	DSC-1	Mathematics-I	3	1	0	4	4
2.	DSC-2/ DSC-5*	Physics OR Introduction to Electrical and Electronics Engineering	3	0	2	5	4
3.	DSC-3	Fundamentals of Computer Programming	3	0	2	5	4
4.	GE	Select a course from the specified list of GEs					4
5.	AEC	Select a course from the specified list of AECs					2
6.	SEC	Select a course from the specified list of SECs					2
7.	VAC	Select a course from the specified list of VACs					2
Total Credits							**22**

NOTE:

***1. Half of the students enrolled will take up Physics and half of the students will take up Introduction to Electrical & Electronics Engineering in the Semester I and vice versa in the Semester II.**

Bachelor of Technology (B.Tech.)

- **Computer Science and Engineering**
- **Electronics and Communication Engineering**
- **Electrical Engineering**

Semester-II

Sr. No.	Course Domain	Course Title	Hours per week			Total Contact Hrs. per week	Credits
			L	T	P		
1.	DSC-4	Mathematics-II	3	1	0	4	4
2.	DSC-5/ DSC-2*	Introduction to Electrical and Electronics Engineering OR Physics	3	0	2	5	4
3.	DSC-6	Data Structures	3	0	2	5	4
4.	GE	Select a course from the specified list of GEs					4
5.	AEC	Select a course from the specified list of AECs					2
6.	SEC	Select a course from the specified list of SECs					2
7.	VAC	Select a course from the specified list of VACs					2
Total Credits							**22**

NOTE:

***1. Half of the students enrolled will take up Physics and half of the students will take up Introduction to Electronics & Electrical Engineering in the Semester I and vice versa in the Semester II.**

LIST OF SKILL ENHANCEMENT COURSES (SECs)

1. Computer Workshop (Course Credit: 0L-0T-2P, Course Hours: 0L+0T+4P)
2. Electronics Workshop (Course Credit: 0L-0T-2P, Course Hours: 0L+0T+4P)
3. Electrical Workshop (Course Credit: 0L-0T-2P , Course Hours: 0L+0T+4P)

LIST OF GENERIC ELECTIVES (GEs)

The students will be offered a list of Generic Electives as decided by the university from time to time.

LIST OF ABILITY ENHANCEMENT COURSES (AECs)

The students will be required to choose these courses from a pool of courses offered by the University as per UGCF-2022

LIST OF VALUE ADDITION COURSES (VACs)

The students will be required to choose these courses from a pool of courses offered by the University as per UGCF-2022

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Assessment & Scheme of examination:

As per University of Delhi rules as applicable from time to time.

MATHEMATICS-I (DSC-1)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Mathematics-I	4	3L	1T	0P	Class XII with Physics, Chemistry and Mathematics	NIL

Course Hours: L: 03 T: 01 P: 00

Course Objectives:

To teach students concepts of Linear Algebra, Vectors and Calculus and apply them for problem solving.

Course Outcomes:

After completing the course, the students should be able to:

1. Develop a basic understanding of the linear algebra, vectors and calculus use in engineering
2. Solve mathematical problems of vector spaces and matrices
3. Derive calculus theorems and use these to solve some integral problems.
4. Apply calculus to solve suitable engineering applications

Unit-I

Matrices: Matrices, Vectors: addition and scalar multiplication, Matrix multiplication, Linear systems of equations, Linear Independence, Rank of a

matrix, Determinants, Cramer's Rule, Inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Unit-II

Vector spaces I: Vector Space, Linear dependence of vectors, Basis, Dimension,Range and kernal, Rank and nullity, Inverse of a linear transformation, Rank nullity theorem,

Unit-III

Vector spaces II: Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric and Orthogonal Matrices, Eigenbases, Diagonalization, Inner product spaces, Gram-Schmidt orthogonalization.

Unit-IV

Calculus: Indeterminate forms and L'Hospital'srule, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems, Evaluation of definite and improper integrals, Applications of definite integrals to evaluate surface areas and volumes of revolutions, Beta and Gamma functions and their properties.

Suggested Readings*:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.

2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.

3. D. Poole, Linear Algebra: A Modern Introduction, Brooks Cole.

4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.

5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.

6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

7. V. Krishnamurthy, V.P. Mainra and J. L. Arora, An introduction to Linear Algebra, Affiliated East– West Press Private limited

*Latest Edition of the books to be followed.

PHYSICS (DSC-2)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Physics	4	3L	0T	1P	Class XII with Physics, Chemistry and Mathematics	NIL

Course Hours: L: 03 T: 00 P: 02

Course Objectives:

To teach students basic concepts of atomic structures, mechanics, electron theory, semiconductors and investigate their characteristics and applicability.

Course Outcomes:

After completing the course, the students should be able to:

1. Develop a basic understanding of concepts of atomic structures, electron theory and semiconductors.
2. Correlate mechanics and electron theory with engineering applications.
3. Apply concepts of semiconductor junctions and operations for device operations.
4. Plot characteristics of the studied devices, measure their characteristics and use these for some practical applications.

UNIT – I

Review of Atomic Structure and Statistical Mechanics: - Ideas on Atomic Structure, Quantum Mechanics, The Schrodinger Wave Equation, Statistical Mechanics, Bonding of atoms, Crystalline state

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

UNIT - II

Elemental and compound semiconductors, Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, The Hall Effect, Einstein Relations, Excess carriers in semiconductors p-n junction, Excess carriers and Quasi-Fermi Levels, Basic equations for semiconductor device operation, Solution of carrier transport equation.

UNIT - III

P-N Junctions: - The abrupt junction (Electric field, potential, capacitance), V-I characteristic of an ideal diode, a real diode. Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Joint density of states, Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model.

UNIT - IV

Four-point probe and measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, DLTS, band gap by UV-VIS spectroscopy, absorption/transmission.

Density of states in 2D, 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Heterojunctions and associated band- diagram.

Note: Course coordinator will prepare a list of experiments and lab manual for the Practicals covering the whole syllabus.

Suggested Readings*:

1. Pierret, Semiconductor Device Fundamental,
2. P. Bhattacharya, Semiconductor Optoelectronic Devices, Pearson Education
3. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.
4. B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc.
5. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley
6. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York.
7. Online course: “Semiconductor Optoelectronics” by M R Shenoy on NPTEL
8. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar, Deepak Gupta on NPTEL.

*Latest Edition of the books to be followed.

INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING (DSC-5)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Introduction to Electrical and Electronics Engineering	4	3L	0T	1P	Class XII with Physics, Chemistry and Mathematics	NIL

Course Hours: L: 03 T: 00 P: 02

Course Objectives:

To solve electric circuits, to characterize motors, bipolar devices, and multi stage amplifiers

Course Outcomes:

After completing the course, the students should be able to:

1. Solve various DC & AC circuits using applicable theorems.
2. Demonstrate the working of electric motors using different laws and principles
3. Characterize and measure properties of bipolar devices
4. Conceptualize multi stage amplifiers and apply these for engineering applications.

Unit I: D.C. and A.C. Circuits:

Introduction to circuit elements, uncontrolled energy sources, Kirchhoff's laws, Superposition, Thevenin's, Norton's and maximum power transfer Theorems, AC Fundamentals: Sinusoidal a.c. quantities, instantaneous, maximum, average and effective values, Phasor representation, Steady state response of series and parallel R-L, R-C and R-L-C circuits, Concept of impedance and admittance, J-method, Active, Reactive and Apparent Power.

Unit II: Transformers and Electric Motors:

Electromagnetism: Simple magnetic circuits, Electric Circuit analogy. Electromagnetically induced EMF and Induced Force on a conductor. Faraday's Law, Lenz's Law Concept of Self and Mutual Inductance, Transformers: Construction and operation of single phase transformer, EMF equation, Losses, Efficiency and applications of transformers, Electrical Motors: Constructional details of D.C. Motor, Equations, operating characteristics and applications of shunt, series and Compound Motors, Construction, operation and application of different types of single phase induction motors, Measuring Instruments: Moving coil and moving iron Voltmeters and ammeters and extension of range, Dynamometer type wattmeter.

Unit III: Devices and Circuits:

PN Junction diode and its use in Rectifier circuits, Capacitive and Inductive filters, Operation and application of special diodes: Zener diode, photodiode, and light emitting diode (LED), Construction and operation of Bi-polar junction transistors, Characteristics under CB, CE, CC configurations, Voltage and current gains, input and output resistances, Biasing of transistors, load line and operating point, Transistor as a switch, Introduction to FET, UJT SCR, Traic and Diac, their characteristics and applications.

Unit IV: Multi Stage Amplifiers:

R-C coupled amplifier and its frequency response, concept of Bandwidth, Push pull amplifiers, Feedback amplifiers: Classification of feedback amplifiers, Gain, input & output resistance of feedback amplifiers, Advantage of negative feedback, Measuring Instruments: Digital voltmeters, Digital multimeters, CRO and its applications. DSO and oscilloscope probes.

Note: Course coordinator will prepare a list of experiments and lab manual for the Practicals covering the whole syllabus.

Suggested Readings*:

1. Electrical and Electronics Technology by Hughes Revised by John H. Ley, Et al, Pearson
2. Principles of Electrical Engineering by Del-Toro. Pearson.
3. S.N. Singh, Basic Electrical Engineering, S.N. Singh,PHI Learning Private Limited.
4. Boylestad, R.L. and Nashelsky, L. Electronic Devices and Circuit Theory. Pearson Education.
5. Millman, J. and Grabel, A. Microelectronics. McGraw-Hill, Incl.
6. Malvino, A. and Bates, D. Electronic Principles, with Simulation CD,McGraw-Hill, Inc.

*Latest Edition of the books to be followed.

FUNDAMENTALS OF COMPUTER PROGRAMMING (DSC-3)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Fundamentals of Computer Programming	4	3L	0T	1P	Class XII with Physics, Chemistry and Mathematics	NIL

Course Hours: L: 03 T: 00 P: 02

Course Objectives:
To teach students computer fundamentals and do programming using C for problem solving.

Course Outcomes:

After completing the course, the students should be able to:

1. Explain the use of software and programming for problem solving.
2. Develop programming using simple concepts of input, output and control statements.
3. Apply arrays, functions, strings, structures, and pointers for problem solving.
4. Design and implement solutions for data handling with permanent storage using modular programming and files

Unit I

Programming Fundamentals & Control Statements: Block Diagram of Computer, Hardware vs software, concept of operating system and compiler, Introduction to C programming, basic programming using input and output

operators and expressions, programming using if and if-else, Programming using looping-for, while, do-while; use of switch and break.

Unit II

Arrays based Programming: Defining and processing 1-D and 2-D Arrays for Problem solving, string as array of char and its processing

Unit III

Modular programming using Functions: Structured Programming, storage classes defining and calling a function, modular programming using functions, passing arguments and arrays to functions, functions of void and returning values. Recursion, file handling

Unit IV

Programming using pointers, structures and unions: Pointers in C: Pointer declaration, Passing Pointer to functions, pointers vs arrays, dynamic memory allocation. Structures and Unions, Programming Using Array of Structures and Unions, Memory Requirements for Unions.

Note: The programming language to be used for teaching and implementation will be C. The Course coordinator will prepare a list of experiments and lab manual for the Practicals covering the whole syllabus.

Suggested Readings*:

1. Byron S. Gottfried, Programming with C Language, Schaum Series, Tata McGraw Hill.
2. E Balaguruswamy, Programming with C, Tata McGraw Hill.
3. Kernighan & Richie, C Programming, Prentice Hall of India.

*Latest Edition of the books to be followed.

MATHEMATICS-II (DSC-4)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Mathematics-II	4	3L	1T	0P	Class XII with Physics, Chemistry and Mathematics	NIL

Course Hours: L: 03 T: 01 P: 00

Course Objectives:

To teach students process of doing Laplace and Fourier transformation, apply probability distributions over random variables, and statistical techniques for data processing.

Course Outcomes:

After completing the course, the students should be able to:

1. Develop a basic understanding of the Laplace and Fourier transformations
2. Apply random variable and probability distributions for different stochastic processes.
3. Evaluate data characteristics using statistical measures and techniques.
4. Compare and contrast different statistical tests for data evaluation.

Unit-I

Laplace and Fourier Transform: Laplace transformation and its properties, Unit – step, Impulse and Periodic functions; Fourier Transform, Fourier Sine and

Cosine Transform, Finite Sine and Cosine transform, Convolution theorem. Application of Fourier transform.

Unit-II

Random variables and probability distributions: Conditional probability, Probability spaces, Discrete random variables, Independent random variables, Expectation of discrete random variables, Sums of independent random variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality, The multinomial distribution, Poisson approximation to the binomial distribution, Infinite sequences of Bernoulli trials, Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities, Conditional densities, Bayes' rule.

Unit-III

Basic Statistics: Measures of Central tendency: Moments, Skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions; Correlation and regression – Rank correlation; Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

Unit-IV

Applied Statistics: Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations; Small samples: Test for single mean, difference of means and correlation coefficients; Test for ratio of variances - Chisquare test for goodness of fit and independence of attributes; T-test, Anova Test, F-Test.

Suggested Readings*:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
3. S. Ross, A First Course in Probability, Pearson Education.
4. W. Feller, An Introduction to Probability Theory and its Applications, Wiley.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill Publishing Company Limited.

*Latest Edition of the books to be followed.

DATA STRUCTURES (DSC-6)

FUNDAMENTALS OF COMPUTER PROGRAMMING

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Data Structures	4	3L	0T	1P	Class XII with Physics, Chemistry and Mathematics	NIL

Course Hours: L: 03 T: 00 P: 02

Course Objectives:

To understand and efficiently apply various data structures such as stacks, queues, linked lists, trees and graphs for solving various computing problems using C programming language.

Course Outcomes:

After completing the course, the students should be able to:

1. Develop skills to identify and determine the usage of various data structures, operations, associated algorithms and implement their applications.
2. Implement trees and graphs, and explain its applications.
3. Design and implement algorithms for searching and sorting.
4. Analyze efficiency of different algorithms using time and space complexity.

Unit-I

Simple Data Structures: Arrays based Linear Data Structures: Array storage, sparse arrays; Transpose and addition of sparse matrices, Stacks and Queues and their applications, multiple stacks, and queues in an array.

Unit-II

Searching and Sorting: Searching techniques: Linear and Binary, Sorting techniques: Selection, Bubble, Insertion, Merge sort, Quicksort; Complexity analysis; revision of Pointers and Dynamic Memory,

Unit-III

Linked Data Structures: Singly, Doubly & Circular Linked Lists; representation, operations and applications, linked stacks and queues, linked lists based polynomial addition.

Unit-IV

Advanced Data Structures: Trees, Basic concepts and definitions of a tree and binary tree and associated terminology, Binary tree traversal techniques, some more operations on binary trees, Heaps, and heapsort; Graphs: Terminology and Representations, Directed Graphs, Representation of graphs and their Transversal.

Note: The programming language to be used for teaching and implementation will be C. Course coordinator will prepare a list of experiments and lab manual for the Practicals covering the whole syllabus. Course coordinator will also prepare some mini projects to be done by the students utilizing various aspects of the subject & syllabus.

Suggested Readings*:

1. E Horowitz and S. Sahni: Fundamentals of Data Structures in C, Second Edition, Universities Press.
2. R.L. Kruse: Data Structures & Program Design in C, PHI.
3. D.F. Knuth: The Art of Computer Programming Vol-1, Narosa Publications.
4. Byron S. Gottfried: Theory and Problems of Programming with C Language, Schaum's Outlines Series, TMH.

*Latest Edition of the books to be followed.

COMPUTER WORKSHOP (SEC-1)

Semester-I & II [Common to all branches]

Course Name – Computer Workshop

Course Credits: 0L-0T-2P

Course Hours: 0L+0T+4P

Pre-requisite: Nil

Course objectives: Students of Computer Engineering are to work with various hardware and software not only in academia but also in the company. Thus, students should get familiar with various hardware, software, operating systems, and networking. This course will provide students a much-needed knowledge of computer hardware and networking, enabling them to identify and rectify onboard computer hardware, software, and network-related problems. With the help of this course, the student will be able to understand the hardware specifications that are required to run an operating system and various application programs.

Course outcomes: After completing their training in Computer Workshop, students will be able to

CO1. Describe the procedure for installation of software on different systems and identify the various components of hardware systems.

CO2. Identify and demonstrate components of computer and operating system and their troubleshooting.

CO3. Describe the basics of Internet and web design

CO4. Perform the process of software installation

Job 1. Assembly/Disassembly of Computers

Hardware peripherals like RAM, ROM, input devices, output devices, processors, etc. Processors and processor core counts and frequency etc. motherboards, internal and external connectors. Types of data cables. LAN, Audio, and Video. The physical set-up of Printers- Scanner set-up, Webcam,

Bluetooth device, Memory card reader, etc. Working of SMPS. Connection of different types of devices to the ports (CPU), Single board computer: Raspberry Pi.

Job 2. Assembly/Dis-assembly of Laptop

Mounting of processor. Fixing of the motherboard in the tower case. Connection to the power supply. Installation of drivers. Connection of cables. Mount the memory modules. Install the internal cards. Connection of the external devices and power.

Job 3. Computer Network Setup

Networking components, devices, and tools; Preparing the network cables, network setup, configuration and management commands, Installation and configuration of network interface card and identification of MAC address. Sharing of resources

Job 4. Software Installations

Installation of Windows Operating System, Types of software and their installations, some useful software (MS office, Adobe Acrobat, Google Chrome, VLC Media Player, LibreOffice, Win Rar)

Job 5. PC Maintenance

POST (Power on Self-Test), identifying problems by Beep codes errors, checking power supply using Multi-meter, Replacement of components etc.

Job 6. Introduction to MS office

Introduction to MS office - MS Word, MS PPT, MS Excel, Working with MS Word. MS Excel - Introduction to MS Excel, Basic computations, and calculations. Creation of slides including hyperlink, video, audio, and textual content.

Job 7. Tools for Online Teaching and Meetings

Setting & troubleshooting of online meetings and video conferencing like google meet, zoom, Microsoft teams, Webex etc; use of google classroom and google forms for teaching, feedback, and evaluation.

Job 8. Internet and Basic Webpage Design
Searching the Internet, checking the speed of Internet connection, usage of E-Commerce, Creating webpage using HTML, CSS with static text, images, tables, audio, video etc and dynamic contents, animation usage and tools for webpages

Job 9. AI & ML Applications:
Case studies using module (Blackbox based) integration for AI & ML and its applications

Note: Workshop incharge may make additions or deletions in respect of above mentioned jobs as per the situation at any point of time.

Electronics Workshop (SEC-2)

Semester-I & II [Common to all branches]

Course Name-Electronics Workshop

Course Credits: 0L-0T-2P

Course Hours: 0L+0T+4P

Pre-requisite: Nil

Pre-requisite: Nil

Course objectives: To impart practical knowledge to the students about electronic components, circuits, and electronic instruments. This course on Electronic Workshop will enable students to get a good opportunity for beginning their professional career even at the end of first year.

Course outcomes: After completing the course, the students should be able to:

CO1: Identify and troubleshoot various electronic components and instruments.

CO2: Differentiate between various ICs and PCBs

CO3: Disassemble a computer and identify various peripherals and internal circuit component.

CO4. Design and fabricate a product by building an actual power supply.

Job1. Basic components used in the Electronics circuits

- Identification of various components being used in any electronic circuit such as resistor, capacitor, various diodes (p-n junction, Zenner, LED), transistors (BJT, MOSFET, FET), breadboard, potentiometer.
- Learn graphical symbols used to represent the various components.
- Find the value of resistance, capacitance by its color code and value mentioned on the component.

Job2. Instruments for measurement and analysis of Electronics circuits

- Study the various controls on the panel of a typical CRO, Multimeter.
- Testing of components such as resistor, capacitor and transistor as PNP or NPN, Gain value of transistor, ensure the connectivity of their leads using multimeter.

- Perform small jobs as given by your instructor by using some of the above components and instruments.

Job3. Instruments for generating the signals for the electronic circuits

- Study the various controls on the panel of a function generator and DC power supply.
- Using CRO and function generator perform jobs such as waveform analysis, Voltage measurement, frequency measurement, phase difference measurement etc.

Job4. Integrated circuits and (IC) tester

- Study the pin configuration of a given IC number.
- Study the function of IC tester.
- Testing of IC on the IC tester.
- Verify the truth table of various logic gates by assembling them on the breadboard.
- Draw the Pin configuration of various logic gates in your file and record the observations of the truth table of these logic gates.

Job5. Transformer and soldering iron

- Study the transformers used in the electronic circuits.
- Learn the precautions while using a soldering iron.
- Perform small jobs using soldering iron.

Job6. Printed circuit board

- Learn to make a layout of electronic circuit using any PCB design software (OrCAD/TINA/ KiCAD/ DesignSpark PCB/ any other available software).
- Use of electronic components in the layout.
- Perform small jobs such as making a circuit on the PCB and learn soldering of components on PCB.
- Analysis of the designed circuit using CRO, Multimeter and signal generator.

Job7. Identification of various peripheral devices of computer

- Learn to find complete specification of the given computer.
- Identify various peripheral devices including a keyboard, mouse, printer, and flash drive of a computer.

Job8. Assembling and disassembling of computer

- Learn the precautions while disassembling of computer.

- Study of motherboard.
- Identification of various hardware peripherals like RAM, ROM and Processor.
- Study of various ports in a computer for interfacing with external hardware components.

Job9. Product Development (Part 1)

- Study the basic circuit of variable DC power supply.
- Procure all the components required to build a DC supply like transformer, diodes, capacitor, resistance, potentiometer, on/off switch etc. for given specifications of DC power supply.
- Test each component.
- Assemble it on breadboard and test its functionality.

Job10. Product Development (Part 2)

- Design a PCB for variable DC power supply designed in Job 9.
- Fabricate the variable DC power supply by assembling all the components on PCB and perform soldering.
- Test the fabricated variable DC Power supply.

Note: Workshop Incharge may make additions or deletions in respect of above-mentioned jobs as per the situation at any point of time.

ELECTRICAL WORKSHOP (SEC-3)

Semester-I & II [Common to all branches]

Course Name: Electrical Workshop

Course Credits: 0L-0T-2P

Course Hours: 0L+0T+4P

Pre-requisite: **Nil**

Course objectives: In view of the multi exit facility to be provided to the students leaving after first year, this course on Electrical Workshop will enable such to get a good opportunity for beginning their professional career even at the end of first year.

Course Outcomes: After completing their training in Electrical Workshop, students will be able to

CO1. Differentiate the tools, recall their names and develop skill of using each one of these tools. They will also be able to describe the material and components used in House Wiring, get apprised of their names and use in the process of wiring.

CO2. Design various types of wirings and do actual wiring with his/her own hands. Students will also be able to explain the Energy Meter functions and make connections of energy meter and MCBs.

CO 3. Discuss the constructional details of DC and one type of single phase AC motor and maintain such items. Students will also be able to repair few house hold gadgets.

CO4. Design and fabricate the product by building an actual battery charger.

Job 1. Tools in the field of Electrical Engineering:

- Gain awareness about various tools used in the field of Electrical Engineering and to learn the operation of each tool. Like: Vice, drill machine, hand grinder, combination pliers, screw driver set, wire striper, tester, test lamp, multimeter, hammer, lug crimper, Soldering iron, hacksaw, different types of files.
- Perform small jobs as given by your instructor by using some of the above tools.

Job 2. House Wiring Materials:

- Make a study of various components and material used in house wiring. Like: Aluminum and Copper wires of different specifications used in house wiring. Wooden boards and Bakelite sheets, wall mounted switch boxes and wiring plates, 2 pin, 3 pin, 5 pin wall sockets, power sockets, 2 pin, 3 pin & power plugs, iron and PVC conduits, bends, casing capping, junction boxes, Gang boxes, baton holder, pendant holder, bracket holder, angle holder, incandescent bulbs, LEDs, tube light strips, CFL, Indicator lamps. One way, 2 way and power switches. Isolators, MCBs, ELCBs and other materials.
- Practice fixing of switches and sockets in gang box.

Job 3. Performing, House wiring:

- Study various types of house wiring techniques: Baton wiring, casing capping wiring, surface conduit wiring and concealed conduit wiring.
- Perform surface conduit wiring to accomplish stair case lighting.
- Prepare an extension board with following: Two 6A sockets with individual switches and individual indicators on an appropriate gang box.

Job 4. Electronic Energy Meter

- Study the connections of Electronic Energy Meter. Assemble an MCB main board with a double pole MCB/isolator and 2 single pole MCBs and make connection with energy meter on one side and two load circuits on the other. Show operations of MCBs one by one.

Job 5. House hold Gadgets

- Study the construction and operation of a heater, heat convector, Electric iron, kitchen Mixer, soldering iron (depending upon time and availability this list can be modified).
- Assemble a heater from the available components. Operate it and measure its current, Voltage and Power.

Job 6. DC and Single phase AC Motors

- Observe the given D.C. and single phase A.C. motors. Run them by connecting appropriate supply.

- Open the given D.C. Motor, observe its construction, do its servicing, clean its bearings and commutator. Reassemble and rut it.
- Open the given A.C. motor, study its construction. Clean its bearing. Assemble it back and operate it. Measure it's no load current.

Job 7. Ceiling Fans

Study the construction and operation of a ceiling fan, Dis-mental the given ceiling fan. Observe all its parts. Clean its bearings and other parts. Check the continuity of running and starting windings. Test the capacitor for its functionality. Assemble the fan back. Operate it by connecting to supply.

Reverse the direction of rotation by changing connection at the capacitor. Connect an electronic regulator and control its speed.

Job 8. Product Development (Part-1)

- Study the circuit of a battery charger.
- Procure all the components required to build a charges like: Transformer, diodes, capacitor, voltmeter, ammeter, indicator, rotary switch, on/off switch, box connecting load. Test each component separately. (specification of charger will be given)
- Assemble bridge rectifier using 4 diodes.

Job 9. Product Development (Part-2)

- Complete the testing of components procured in job 8.
- Fabricate the battery charger by assembling all the components procured and tested in job no. 8 (product development part-I) and wire it.
- Test the fabricated charger.

Job 10. Experience of Electronic Devices

- Identify resistors, capacitors of various types and specifications
- Identify the given solid state devices like: diodes and transistors, SCR, Triac, Diac, few ICS of various specifications.
- Study the circuit of a solid state low rating voltage regulator.
- Assemble a voltage regulator and test it on fan and incandescent bulb. Or assemble a timer circuit using 555 IC.

Note: Workshop incharge may make additions or deletions in respect of above mentioned jobs as per the situation at any point of time.