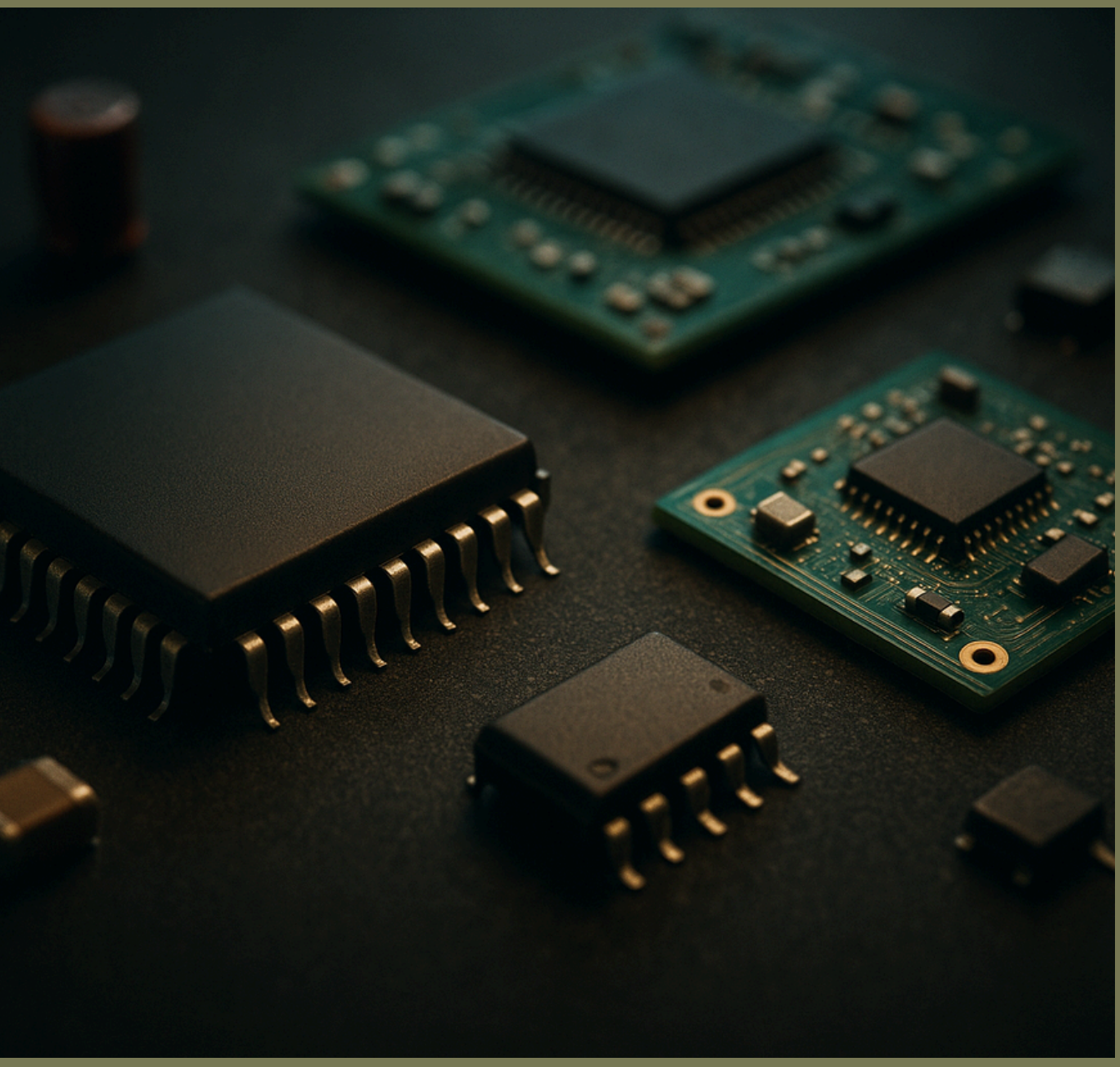
ECE LAB HANDBOOK



2026

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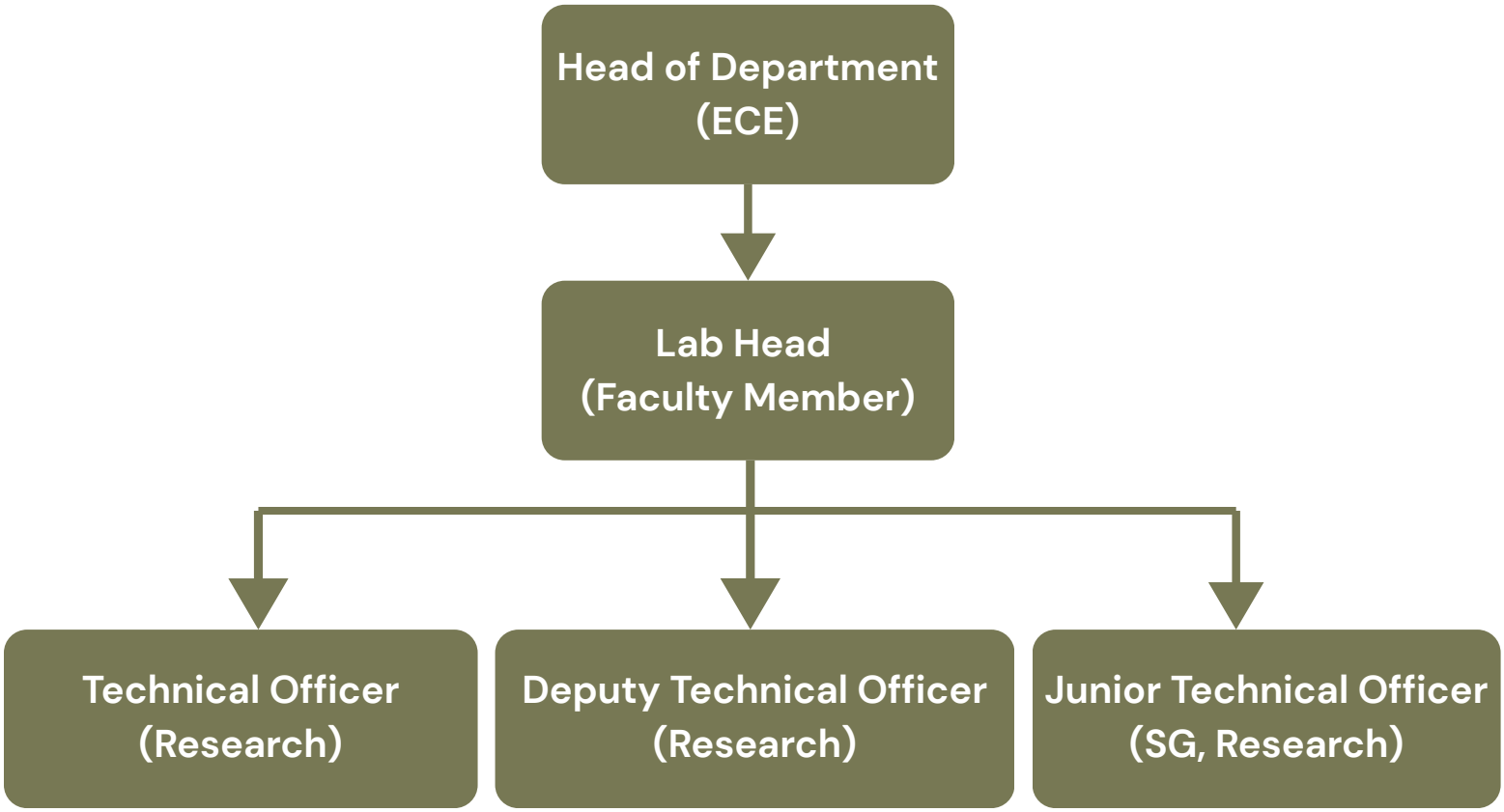
Table of Contents

ARTICLE 1

ECE LAB STRUCTURE

ECE LAB STRUCTURE

The technical team comprises three positions at the operational level: Technical Officer (Research), Deputy Technical Officer (Research), and Junior Technical Officer (Research, SG). These roles report directly to the Lab Head (Faculty Member), who is responsible for overseeing all laboratory operations and technical functions and reports to the Head of the Department (ECE).



ARTICLE 2

WELCOME TO ECE LABS

2.1 ORGANIZATION OF LABS

IIITD, an institute leading in education and research relevant to the current technologies and needs of industry, is running several labs to support its teaching and research work being carried out by its faculty members, research scholars and students, in all its departments. All research labs are being located in the Research & Development block while all the teaching labs are housed in the Lecture Hall Complex in the campus. Teaching labs help students understand theoretical concepts taught in the course of their study. All the laboratories are fully air conditioned and are equipped with the latest instruments. The curriculum of B. Tech. program includes successful completion of latest experiments in these laboratories. Laboratories are well equipped to undertake advanced level teaching and research program in electronics.

2.1.1 Objectives of ECE Labs

- To give the students ample opportunities to apply fundamental concepts related to electronics systems in practical applications
- To familiarize the students with building electronic circuits, both analog and digital, to perform different functions.
- To give the students an experience in computer programming and the use of computer-based simulation software packages for designing systems.
- To provide immense support to institute's research activities.
- To extend its services and facilities as and in favor of the students' requirements and expectations.

2.1.2 Services and Facilities

- 24x7* access to laboratories and its resources.
- Online availability of the list of lab resources.
- Online access to lab exercises, reference guides and technical reports.
- Online documentation of all Issue/Return.
- Assistance in lab courses set up and execution.
- Assistance in lab instruments/equipment.
- Assistance in Course and Research projects.
- Computing Facility: More than 150 Desktops and 14 Laptops.
- Desktops with Windows OS.
- Workshop/Training Programs.
- Technical Events (Quiz, Workshops, Tutorial).
- Management of lab records and documents.
- Instruments calibration and maintenance.
- Technical reports and documentation.
- 24x7 Wi-Fi and LAN connectivity.
- ESD Safe Soldering Bench.
- PCB Fabrication (Single and Double layer).
- 3D Printing facility.
- RFID based lab Access for the students.
- General policies and procedures for all users.

***For details on the labs' resources, please visit https://ecelabs.iiitd.edu.in/.**

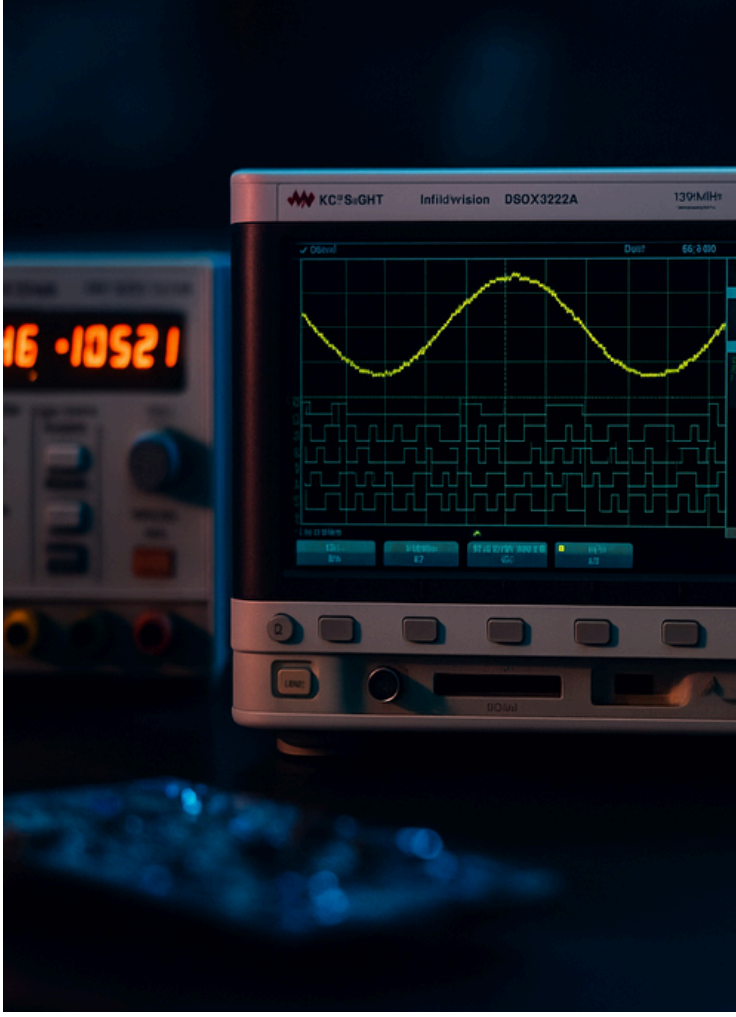
2.2 DIGITAL CIRCUITS LAB (301)

2.2.1 Overview

In Digital Circuits Lab (301) students can create their own electrical circuits and do measurements on it. This lab offers students the opportunity to work on their basics on Digital Circuits and Basic Electronics. Along with this, students are encouraged to work on their own projects using the instruments available in the lab. The aim of the lab, which is under the Electronics and Communication Engineering Department, is to produce trained professionals for the industry and to achieve excellence in research using latest technology and innovative ideas for research as well. The lab caters to the requirement of all the students.

2.2.2 Resources Available

- Digital Trainer Kits
- Multimeter
- DSO, Power Supply
- Digital ICs, Resistors, etc



2.2.3 Facilities

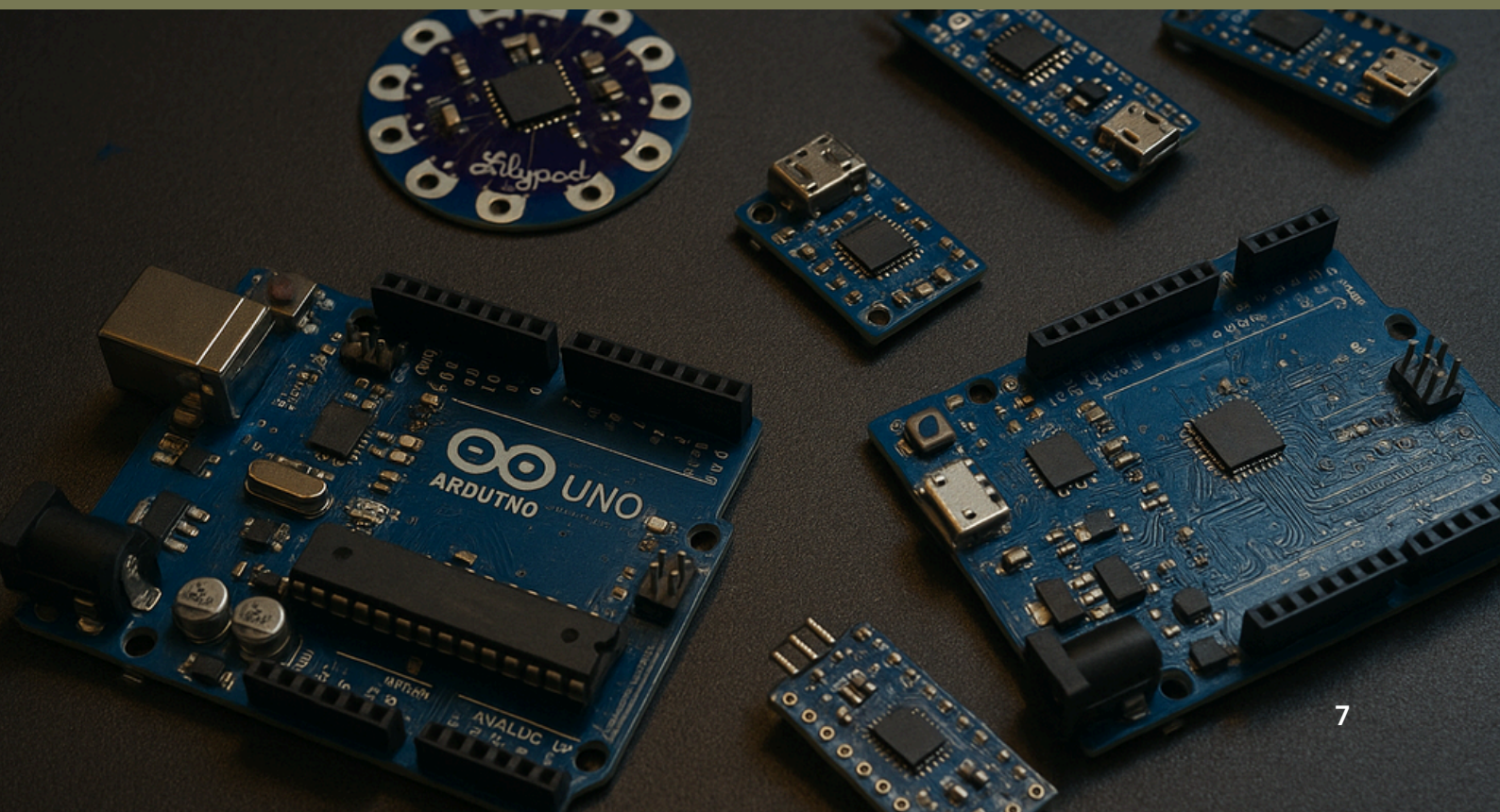
- The laboratory is equipped with modern instruments and tools required for circuit design, simulation, implementation, and testing.
- Assistance in the execution of the lab courses & lab exams.
- The lab supports practical exposure to measurement, debugging, and validation of electronic systems.
- The laboratory infrastructure facilitates individual as well as group-based learning activities.

2.3 CIRCUITS AND INNOVATION LAB (302)

2.3.1 Overview

Circuits and Innovation Lab (302), located at 3rd floor, Lecture Hall Complex is dedicated to circuits designing. It is intended to serve its facilities as one of the teaching labs and also to facilitate teaching and research projects. These projects and teaching work include the experimental and innovative study in the field of analog and digital circuits, microcontrollers and its applications. The aim of the lab, which is under the Electronics and Communication Engineering Department, is to produce trained professionals for the industry and to achieve excellence in research using latest technology and innovative ideas for research as well. The lab caters to the requirement of all the students.

The lab offers access to its resources and facilities which are available online as well. To use these services, some standard guidelines are followed which can be found in this document.



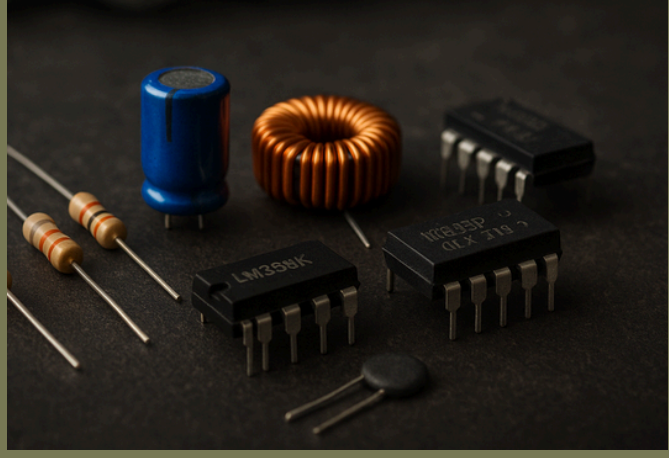
2.3.2 Resources Available

Microcontroller Board	: Intel Galileo, Tiva Launchpad, RPi
Arduino Board	: UNO, MEGA, NANO, MICRO
GPS/GSM	: GSM Module SIM 900/300, GPS Module
Display	: CMOS Camera, LCD, LED, Webcam
Tool	: Drilling kit, Soldering setups, Glue guns
Motor	: DC, Stepper, Servo motors, Motor drivers
Sensor	: IR, Color, Current, Ultrasonic, Temp Sensors
Oscilloscope	: DSO, Function Generator
Power Supply	: Digital Power Supply, Batteries
Converter	: DC-DC step up, step down, HDMI to VGA
Wireless	: Bluetooth, Zigbee, Wi-Fi Modules
Multimeter	: Digital Multimeter, LCR
Softwares	: MATLAB, Arduino IDE, LTSpice, EagleCAD
Miscellaneous	: Desktops, Digital Trainer Kits, etc.

2.3.3 Facilities

- The lab is equipped with resources to assist students in circuit designing and testing.
- Students are provided access to industry-standard software and hardware platforms for hands-on learning and experimentation.
- Issue/Return facility of the lab resources.
- Online access to the manuals, reference guides & technical reports.
- Assistance in the execution of the lab courses & lab exams.
- Facilities are available for prototype development, testing, and performance analysis of course projects.
- The lab environment encourages experiential learning through guided experiments and open lab sessions.
- Desktops are equipped with course related softwares.
- Regular activities like Workshops/Training programmes /Technical events.
- The lab also supports research-oriented activities, including mini-projects, final-year projects, and thesis-related experimental work.

2.4 Basic Electronics Lab (303)



2.4.1 Overview

The Basic Electronics Lab (303) is one of the teaching labs in the ECE department at IIIT-Delhi. This lab is equipped with the necessary resources to conduct course experiments that require hardware and software tools. Currently, this lab supports four core courses every year, which are Basic Electronics (ECE113), Digital Circuits (ECE111), Circuit Theory and Devices (ECE215), and Integrated Electronics (ECE214). Apart from the lab use in these courses, students and faculty from various streams access the lab for their specific projects and course requirements. The labs are equipped with well-maintained test benches and software tools to meet the specific requirements. In addition to these facilities, the lab maintains its own inventory of components, having a range of various active and passive components, analog and digital ICs, IoT-powered controllers, sensors, and actuators. Students and faculty utilize these resources tailored to their specific needs through a well-maintained issue-return facility. This lab also hosts various events and training sessions annually.

2.4.2 Resources Available

- Oscilloscope: Digital Storage Oscilloscope (Bandwidth up to 2GSa/s)
- Wave Generators: Signal generators that can generate a signal up to 20 MHz
- Power Supply: Dual and Triple variable power supplies up to 80W
- Digital Trainer Kit: A Kit for performing digital circuits experiments
- Digital Multimeter: 4 digit multimeter
- High-end desktops with Internet connectivity: Software tools are available in these systems
- Active & Passive Components: Resistors, Capacitors, Inductors, Various Diodes, BJTs, MOSFETs, SCR, IGBT, IoT controllers, Sensors and Actuators, Analog ICs, Digital ICs, etc.
- Software: MATLAB, Arduino IDE, LTSpice, EagleCAD

2.4.3 Facilities

- The lab is equipped with resources to assist students in designing and testing.
- Assistance in the execution of the lab courses & lab exams.
- Soldering bench facility.
- Wi-Fi & LAN connectivity.
- Desktops with dual-boot (Linux + Windows) operating systems.
- Desktops are equipped with course-related software.
- Regular activities like Workshops/Training programs/Technical events.
- In addition, the lab staff can provide technical support in course projects and thesis work.

2.5 RF AND APPLIED ELECTROMAGNETIC LAB (304)

2.5.1 Overview

The RF and Applied Electromagnetic Lab (304) is equipped with high-frequency instruments and tools to explore the RF and applied electromagnetic field. Some licensed software is also available for designing high-frequency antennas & PCBs. This lab acts as a research lab for research scholars, research associates, and interns, and also as a course lab for thesis and course projects. Main Research areas of the lab include understanding high-frequency devices, Antenna theory, and antenna design. Its goal is to become a leading research and development group in the RF and Applied Electromagnetic Engineering.

2.5.2 Resources Available

- CXA Signal Analyzer (N9000A), 9 KHz - 7.5GHz
- MXG Analog Signal Generator (N5181A), 100 KHz-3GHz
- Vector Network Analyzer (N9926A), 14GHz
- Master Spectrum Analyzer (MS2720T), 9 kHz - 9 GHz
- Mixed Domain Oscilloscope (MDO 4104-06), 21Ch, 1GHz, 5GS/s
- USB Power Sensor (U2000A), 10MHz-18GHz
- Mixed Signal Oscilloscope (MSO2012B), 2Ch, 100MHz
- Digital Phosphor Oscilloscope (DPO2002B), 2Ch, 70MHz
- Mixed Signal Oscilloscope (MSO24 2-BW-100), 4Ch, 100MHz
- Single Channel Arbitrary Function Generator (AFG 2021)
- Programmable DC Power Supply (PWS4305), 30V, 5A
- Linear DC Power Supply (PWS2326), 32V, 6A
- Weller Rework Station W3000
- Coaxial Adapters (BNC/SMA/N)

- Flexible coaxial RF Cables
- MATLAB
- CST Microwave Studio
- Advanced Design System (ADS)

2.5.3 Facilities

- Online availability of list of lab resources.
- Online access to lab exercises and manuals.
- Issue/Return facility for Lab Resources.
- RFID based 24x7 lab access for the students.
- Simulation and analysis tools like MATLAB, CST, and ADS.
- Soldering bench facility.
- Laboratory setup for lab courses and exams.
- Separate lockers to aid in 24x7 access of hardware resources.
- High computing desktops.
- Interactive touch screen panel for teaching.
- Wi-Fi and LAN connectivity.
- Air-conditioned lab room. .

2.6 SHANNON LAB (305)

2.6.1 Overview

Shannon Lab (305) supports undergraduate teaching, postgraduate research, and experimental prototyping in modern communication technologies. The lab provides platforms for SDR, FPGA-based prototyping, RF systems, optical wireless communication, and IoT networks. It enables hands-on experimentation in digital and wireless communication, VLC/LiFi systems, phased-array antennas, and next-generation wireless networks. The facility also supports research in RIS, beam steering, SDR-based systems, and optical wireless communication.

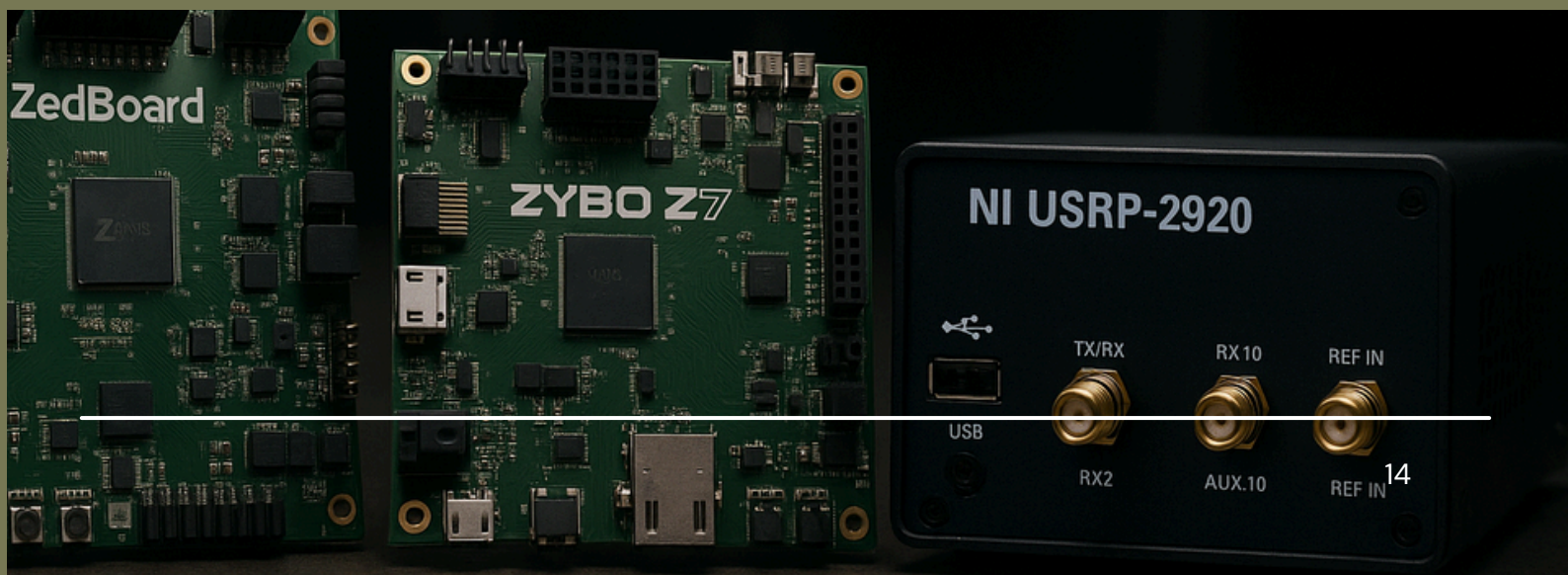
2.6.2 Resources Available

- NI USRP 2921 (2.4 GHz & 4.9-5.9 GHz)
- NI USRP 2922 (400 MHz - 4.4 GHz)
- Dual Band Antenna (2.4-2.48 GHz and 4.9-5.9 GHz)
- Tri Band Antenna (144 MHz, 400 MHz and 1200 MHz)
- USRP MIMO Cable (0.5m)
- SMA-SMA Cable (1m)
- Attenuator (30dB)
- NI-Octoclock CDA-2990
- LabVIEW Software (Academic Suite)
- Communication Trainer kits:-
    - PAM Modulation and demodulation Trainer (Model No-6575).
    - PPM Modulation and demodulation Trainer (Model No-6577).
    - 16 QAM Training Systems (Model No-ST2136).
    - Carrier Demodulation and data Reformatting Receiver Trainer (Model No-ST2157).
    - PWM modulation and demodulation Trainer (Model No-NV6576).
    - Sampling and reconstruction trainer (Model No-ST 2151).
    - Data formatting and carrier Modulation Transmitter trainer (Model No-ST2156).

    - TDM pulse code Modulation Transmitter Trainer (Model No-ST2153).
    - TDM pulse code demodulation Receiver Trainer (Model No-ST2154).
- Power Amplifier 30MHz-6GHz (ADL5544-EVALZ)
- Lenovo Laptops
- OptiSystem version 14 key

2.6.3 Facilities

- Online Lab Resource Issue/Return Facility.
- Offline Issue/Return facility on consumable items.
- Latest licensed versions of the software like MATLAB, LabVIEW, SystemVue 2016.08 and Optisystem are provided to students for their research projects.
- Online availability of list of lab resources.
- Resources available on immediate requirement.
- Wi-Fi connectivity.
- Separate Lockers to keep the issued resources in it.
- ESD safe Soldering Bench.
- RFID lab access to the students.
- 24x7 Lab Access.
- ESD safe tables.
- Laboratory setup for lab courses and lab exams.
- Assistance in Course projects.
- Contact list of the local vendors selling Electronic components for student's convenience.
- General policies and procedure.



2.7 Applied Electronics Engineering Lab (306)

2.7.1 Overview

The Applied Electronics Engineering Lab (306) is one of the prototyping and product development labs in the ECE department at IIIT-Delhi. This lab is equipped with various fabrication facilities, including PCB fabrication and 3D printing, to support prototyping for courses and product development. This lab also supports various core courses conducted by IIITD in manufacturing students' designs each year. Apart from the lab use in these courses, students and faculty from various streams utilize the lab facilities for their specific projects and research requirements. The lab maintains its own inventory of resources to cover a range of PCB and 3D design requirements. This lab also hosts various events and training sessions annually.

2.7.2 Resources Available

- CNC Machine for PCB Designing: LPKF Protomat S104
- LPKF Contact S4 Galvanic Through Hole Plating
- LPKF Multilayer Press S4 Including Automatic Hydraulic Unit
- Ultimaker 3D Printing Machine

2.7.3 Facilities

- The lab is equipped with resources to assist students in designing and testing.
- Assistance in the execution of the lab courses, projects, and product development.
- Regular activities like Workshops/Training programs/Technical events.

2.8 ADVANCED ECE LAB (A-616)

2.8.1 Overview

The Advanced Electronics Lab (A-616) at IIIT-Delhi supports experimental research and hands-on learning in modern wireless and electronic communication systems. It features a 5G standalone testbed with core network, radio unit, IMS, MEC server, and network management system, along with setups for RIS/ORIS and Device-to-Device (D2D) communication. The lab also provides high-performance workstations and embedded platforms for real-time signal processing and prototyping, with all hardware testbeds supported by the Shannon Lab.

2.8.2 Resources Available

- 5G Testbed Infrastructure
  - 5G Core Network Platform – Coral Air
  - 5G Radio Unit – BRIC7401
  - IMS (IP Multimedia Subsystem) Solution – Dell R760xs
  - MEC & Application Server – Dell R760xs
  - Network Management System (NMS) with Dashboard – Coral NMS
  - Router with Integrated Firewall – NRFxG
  - 5G Evaluation Board – Coral Anubhav
  - IoT Gateway – IG4xG
  - IoT Sensor Analytics Platform – Coral Gyan
  - 5G XR (AR/VR/MR) Device – NXGXR2205
  - 5G Mini Drone – SUPARNA
  - 5G Indoor Customer Premises Equipment – KAP510
  - 5G Surveillance Camera – SC-IS 22 BP (Sparsh)
  - 5G Handsets – Galaxy F23 5G
  - Testing & Tracing Tools – Coral Anant

- Supporting Infrastructure
  - L2 Managed Switch – DGS-1250-28XMP
  - UPS Power Backup System – Maxipower UL-D6C24-AB-177
  - Network Rack – 27U D-Link Rack
  - 32-inch FHD Display – Samsung M5 FHD

2.8.3 Facilities

- 5G Standalone Testbed: 5G core, radio unit, IMS, MEC server, and network management system for next-generation wireless experimentation.
- RIS & ORIS Setups: Platforms to study intelligent signal reflection, beam steering, and non-line-of-sight communication.
- D2D Testbeds: Facilities for research on direct wireless communication, cooperative networking, and low-latency systems.
- High-Performance Workstations: Systems for signal processing, simulation, and real-time experimentation.
- Licensed Software: Access to tools such as MATLAB and LabVIEW for system design and analysis.
- ESD-Safe Soldering Stations: Workspaces for circuit assembly, hardware prototyping, and testing.
- ESD-Protected Environment: Antistatic flooring and worktables for handling sensitive electronic components.
- Laboratory Wi-Fi: Connectivity for networked experiments and research activities.
- RFID-Based Secure Access: Controlled entry for authorized users.
- 24×7 Lab Access: Availability for approved academic and research projects.
- Dedicated Lockers: Secure storage for project hardware and experimental setups.
- Technical Support: Assistance for course projects, research prototypes, and experimental development.

2.9 M.TECH LAB (A-617)

2.9.1 Overview

The M. Tech. lab is housed in A617 on the 6th floor, R&D building at IIIT-Delhi. The lab provides industry-standard EDA tools on highly efficient computing devices, enabling seamless use for students. The lab is open to students around the clock so they can work at their convenience.

2.9.2 Resources Available

- High Computing Desktops
- Cadence PG Bundle
- Synopsys Front-end and Back-end
- Siemens

2.9.3 Facilities

- Online availability of list of lab resources.
- Online access to lab manuals.
- RFID-based 24x7 lab access for the students.
- Simulation and analysis tools like Cadence, Synopsys, Siemens, etc.
- Separate lockers to aid in 24x7 access to hardware resources.
- High computing desktops.
- Wi-Fi and LAN connectivity.
- Air-conditioned lab.

2.10 RF Characterization Facility

2.10.1 Overview

The RF Characterization facility has an anechoic chamber that is designed for broadband antenna testing from 0.8 GHz to 40 GHz, supporting measurements of port parameters, radiation patterns (E-plane and H-plane), antenna gain, and radar cross-section (RCS). This facility is available to the institute's faculty members, students, research scholars, and interns for both teaching and research purposes.

2.10.2 Resources Available

- High Computing Desktops
- Anechoic Chamber

2.10.3 Facilities

- Online availability of list of lab resources.
- Online access to lab manuals.
- Simulation and analysis tools like CST, ADS, etc.
- Separate lockers to aid in 24x7 access of hardware resources.
- High computing desktops.
- Wi-Fi connectivity.
- Air-conditioned lab.

2.11 AUTHORITIES AND RESPONSIBILITIES

2.11.1 Faculty Lab Head

The lab head looks after the overall functioning of all the laboratories and its resources. He provides his guidance to the Technical Officers and mentor them for overall functionalities.

- Overall functioning of all ECE Labs.
- Overall co-ordination with all the faculty members, Technical Officers and other departments for ECE Labs.
- Coordinate with Technical Officers regarding lab budget, events etc.
- To take decision/seek approval from the appropriate authority for AMC and Extension of software licenses.
- To take the feedback of ECE labs from Technical Officers and provide guidance to implement the suggestions.
- Point of contact for faculties/dept. for lab related queries, after Technical Officers.
- To take decision/seek approval from appropriate authority for overall infrastructure of ECE Labs.

2.11.2 Technical Officers

The ECE Department currently has four Technical Officers at different levels: one Technical Officer (Research), two Deputy Technical Officers (Research), and one Junior Technical Officer (SG, Research), each handling different laboratories. Every Technical Officer is responsible for the overall management and smooth functioning of their assigned lab(s).

- To prepare the lab experiments of all the lab courses after discussion with the course faculty.
- Coordinate with TAs & TFs regarding lab course and provide them training of lab equiments and experiments.

- Preparing lab budget.
- Taking initiatives for ECE labs & IIITD.
- To coordinate the preparation of appropriate work areas for students, sets up the required tools, equipment, materials, and protocols of experiments and tests and calibrates equipment to ensure proper functioning.
- To instruct and demonstrate the students about proper techniques in lab safety, and use and operation of lab equipment.
- To assist faculty and graduate student in conducting research experiments. Contributes technical knowledge to the design, upgrade, and revision of experiments.
- Take initiatives to design new experiments or find inexpensive solutions for getting robust test results.
- Installation and inspection of all the procured lab resources.
- Testing and troubleshooting of the lab resources.
- To contribute to the formulation and modification of administrative and technical procedures adopted in the laboratories, and ensures such procedures are followed. Includes preparations for laboratory sessions, dispensing tools, equipment, components, materials etc., to students.
- To create and update documents such as lab policies, guidelines for students, TAs, TFs, etc.
- To maintain and update lab inventory
- Issue/Return of lab resources.
- To discuss and develop the individual lab infrastructure.
- Actively participate in professional development activities, which could include workshops, conferences, and on-campus lectures as deemed appropriate by the lab head, in an effort to stay knowledgeable in the current technology.
- Any other responsibility assigned from time to time.

2.11.3 Overall Lab Responsibilities

- Implementation of policies and procedures
- Records and Documentation
    - Inventory Management
    - Resource allocation
    - Working procedures of laboratory resources
    - Documentation of laboratory manuals
    - Documentation of lab courses
- Maintenance
    - Storage of laboratory resources
    - Maintenance and management of laboratory resources
    - General and Infrastructural facilities
    - Testing and Troubleshooting
    - Renewal of licenses and AMC
    - Maintenance and management of lab's desktop
- Procurement
    - Procurement and its tracking as per the yearly budget
    - Research on the required resources
    - Dealing with vendor
    - Assistance to store and purchase
    - Tracking of the purchased resources
    - Installation and Inspection
    - Training/Demonstration of the purchased resource to the students
- Issue and Return of resources
    - Distribution
    - Tracking of resources issued
    - Clearing No-dues of graduating students

- Assistance in Lab courses
  - Design and modification of lab courses as per available resources
  - Laboratory setup for course work
  - Procurement of related resources
  - Assistance in working of lab resources (Hardware and Software)
  - Assistance in course projects
  - Installation and management of software/drivers
- Assistance in Lab exams
  - Laboratory setup for exams
  - Installation and management of software/drivers
  - Procurement of related resources
- Support to research activities of the institute
- Feedback
  - For laboratory courses and its facilities
  - Evaluate and Analyze for necessary actions

2.12 AUTHORITIES AND RESPONSIBILITIES

2.12.1 Initiation process

- Schedule important maintenance and calibration of lab equipments and keep details of all activities for upcoming lab courses.
- Procurement/Purchasing of major equipments and consumable components for lab courses, if needed.
- Information dissemination on Notice boards regarding time table and other necessary material.
- Each lab session is of typically two to three hours of slots, during which students usually complete one experiment.

2.12.2 Preparing for Lab Sessions

- Find out what orientations, handouts or procedures of particular lab Course.
- Meeting with the course faculties, TFs and TAs to establish a regular method for preparing and reviewing labs each week.
- Updating lab handouts according to the change in lab experiments.
- Assisting course TAs & TFs in performing lab experiments.
- Planning the flow of lab, theory explanation, evaluation criteria and creating viva questions to stimulate student thinking.

2.12.3 First Lab Session

- Go over the grading methods, attendance and other requirements of the course.
- Show students how to handle the laboratory equipments that they will be using.
- Introduce students to safety procedures and precautions.
- Divide total strength of students into smaller groups of two partners. The exact number of lab partners per small group will depend on the actual class size, the number of experimental apparatus available for each lab session.

2.12.4 Assistance in running labs smoothly

- Before the lab begins, make sure the lab is properly set up for the experiments. All required apparatus are on the workstation and equipments working properly.
- Make sure that the students construct the designing part of the experiments before coming into the lab.
- The first 15 minutes are set for the theory part explanation, where the TAs explain what they have to perform in that lab. Then 10 minutes are set as a freeze time, where students have to brainstorm and work on the experiments themselves, without the help of TA/TF/TO.
- As students start their experiments, observe all groups and see how they are doing. Do not wait for them to approach you, especially in the first few weeks, since they may be hesitant to ask.
- Because all labs and apparatus are shared, laboratory courtesy is important.

- Assist TAs to be sure that students clean up the lab benches & arrange chairs before leaving.
- If a piece of apparatus breaks set it aside with an appropriate sign. This way the damaged equipment can be put back into service quickly, an important consideration when a limited number of equipment have to be used by a large number of students over a few days' time.

2.12.5 Finishing Up

- Make sure that students complete the assigned task in the given time frame.
- TAs are informed to mark the attendance of the day in the appropriate sheet/online, along with the grading.
- All the working tables should be cleared by the students and other resources should be at their designated places, then the students are allowed to leave.

2.12.6 Evaluation and Feedback

Complete evaluation of all the classes and their efforts are considered to accomplish the students with a grading system. It is considered that the users may give the feedback about the resources used by them and hence a feedback is scheduled at the end of the semester which also help laboratories to facilitate better.

2.12.7 Online Labs

This option is valid only in unavoidable circumstances, where the labs cannot be scheduled in the campus (introduced after COVID-19 pandemic). In such cases, all the above points are considered with modifications:

- The students will work individually and not in groups.
- If number of students are more in a course, then divide them in group of 25 or as required.
- One or more TA/TF/TO will be allotted for each group.
- Depending on the type of experiment, a faculty may select the option of performing the experiments using hardware or only simulation.
- If hardware is also included, procurement of resources has to be done in advance.
- A proper planning on how to handover the resources to the students has to be done well in advance.
- Teaching procedure will remain same; however, instructor has to be sure that the students are not overburdened. So proper explanation and extra office hours to clear all the doubts need to be provided by the TAs/TFs/TOs.

2.13 LAB POLICIES AND PROCEDURES

2.13.1 Issue and return Policy of Laboratory Resources/Components

ECE laboratory issues its resources to the students/faculties of our institute as per the following procedure:

- Users may check online resource list of respective lab (available on the labs' webpage https://ecelabs.iiitd.edu.in/) or visit the concerned lab to know the availability of resources and components.
- Users may request to get components/resources issued as per requirement. For some cases, approval of concerned faculty member may be needed.
- Lab components/resources will be issued for which an online form (Issue Form) of respective lab must be filled by the user.
- An automated mail will be sent to the user on submitting the "Issue form" online. This mail must be taken as confirmation of issued components/resources.
- User will be responsible for the components issued to him/her, till returned and verified by lab.
- While issuing the resource, it is the responsibility of the user to check the working of the resource then and there itself, afterwards no excuse of 'device not working/faulty' will be entertained and it will be considered as the human-error for which some penalty might be imposed.
- Maximum limit of issuance will be 1 month after which user must have to return the resources back to labs or they can get it re-issued by filling the online issue form again.

- Few resources (high-end instruments above 5k) are not allowed to be taken outside the lab. For particular cases, where the resource has to be taken outside the lab, the student has to take approval from the concerned faculty member and Lab Head.
- In case of any issue request from the RA/Intern, the guide (IIITD faculty member) will fill the issue form and the same issue/return procedure needs to be followed by him/her.
- While returning the resources back to labs, user must have to get the reply from lab confirming the return. It will be replied on the same automated mail (received while issuing) stating “returned”.
- Further, you may also verify complete process by looking at updates on online resources list (in the sheet named “Issue Form Response”).
- Issue/return of the lab resources will be done only from Mon- Fri (except Gazetted holidays). Timings are written in front of respective labs/ECE Labs Notice Board.
- In case any issued resource got misplaced/damaged by the user, he/she has to replace it with the same new resource.
- Violating lab rules may lead to restriction on issue/return and no entry to the lab for the same period.

2.13.2 Usage of Labs Resources

This document states the procedure to be followed by students while using lab resources inside the labs.

- **Access in academic hours**
    - User may directly visit the particular lab to request.
    - The required resources will be issued to the user as per the procedure and availability.

- Users will be responsible for the issued resources till they are returned and verified by the respective lab.
- For some of the resources, labs may need approval from concerned faculty member.

- **Access in non-academic hours**
  - This is applicable only for labs without the RFID system, as other labs are available 24x7 (need to take RFID access on the I-Card by requesting the respective Lab's TO).
  - User must request to the TO of the respective lab either through mail or in person, clearly stating the purpose and needed resources to avail the facility.
  - An approval mail will be sent to user(s) after which individual/group can collect the resources and sit in the lab.
  - A list of approved groups will be available with security guard. User must produce their admit card for verification while requesting security guard to open the lab.
  - After completing the work, the user must inform the guard to lock the lab before leaving.
  - User will be responsible till all the equipments verified and returned to lab.
  - For some of instruments/equipments, students have to take approval from concerned faculty member & Lab Head.

2.13.3 Curriculum check list

Checklists organize what needs to be accomplished so nothing is forgotten. It will help you to get ready for the coming Semester.

Check-List for Lab Course Setup

S. No.	Tasks	Status
1	Request to faculty members for resources requirement.	☐
2	Purchase of components and instruments.	☐
3	Testing of all desktops & instruments.	☐
4	Installation of the required softwares in the desktops.	☐
5	Lab handouts preparation.	☐
6	Proper set up of the workstations.	☐
7	Pre-lab experiment practice for course TAs.	☐
8	Attendance sheet of the Students.	☐
9	Grading of students for each lab sessions	☐
10	Feedback from students regarding lab facilities	☐
11	Evaluation of feedback provided by students	☐

Check-List for Lab Exam Setup

S. No.	Tasks	Status
1	Checking availability of all the required components.	☐
2	Purchase of components, if needed.	☐
3	Testing of all desktops.	☐
4	Installation of the required softwares in the desktops.	☐
5	Testing of all required instruments.	☐
6	Proper set up of the workstations.	☐
7	Seating arrangements for the exam.	☐
8	Scheduling exam slots for all the Students.	☐
9	Arrangement of the question papers and answer sheet.	☐
10	Attendance sheet of the Students.	☐
11	Relocation of all arranged stuff after exams	☐

Check-List for Procurement Process

S. No.	Tasks	Status
1	Prior survey, if needed	☐
2	Inquiring quotations from vendors	☐
3	Arrangement of demonstrations for the instrument, if required	☐
4	Tracking the budget allotted for the financial year	☐
5	Order components/instruments online/offline/through S&P dept.	☐
6	Follow-up till delivery	☐
7	Investigation of the purchased resources	☐
8	Installation and demo of the procured resources	☐
9	Arrangement of manuals/user guide	☐
10	Resources allocation and shelving	☐
11	Update in inventory	☐
12	Update online resources list	☐
13	Update documents in online shared network drive	☐
14	Arrangement of Manuals and User guides in hard copy	☐

2.14 LAB ETIQUETTES

Proper etiquette in the labs is important when working with other students and Teaching Assistants (TAs). Engineers work with many different types of people and need to be able to do so proficiently. Another part of proper lab etiquette is cleanliness in the lab.
Engineers work in a variety of spaces; some can work in spaces that are exclusively theirs but many work in shared spaces. When sharing work spaces, respect others that must use that space by keeping it clean and removing messes when finished.

2.14.1 Students

To get the fullest experience out of lab, students are expected to:

- All the students should be present on time. Any entry will not be allowed after 10 minutes of the start of the session.
- Initial 15 minutes of every lab session is specifically dedicated to the teaching part, where TAs will explain the topic covered in that particular lab experiment. Students are expected to come prepared for the same and resolve their doubts after this duration.
- Students (in groups) are expected to sit on their respective numbered table.
- Groups will be responsible individually for all the resources present on their table.
- Students are advised to maintain a disciplined, clean and orderly lab environment. No displacement/sharing of resources is allowed without the consent of TO.
- Tampering the lab resources is not allowed. The incident will be forwarded to the respective authority.

- In case of any theory/experiment related doubt, request the TAs to resolve. If unresolved, it can be escalated to the TF and then the TO.
- File-work/course assignments are strictly not allowed during the lab session. Lab sessions are to perform the experiments only.
- Attendance will be marked once all the components are returned/chairs are arranged/equipment are OFF & covered.
- Consult your TAs in case you are handling any instrument for the first time.
- Students are strictly prohibited to take lab items outside the laboratory without the permission of respective TO.
- Food items/drinks/backpacks are not allowed inside the labs.
- Students who abide by the lab rules & follow discipline will get recognition.
- Students should manage to finish the experiment within the given time-frame. The experiments are designed as per the allotted lab session.

2.14.2 Teaching Assistants (TAs)

Teaching Assistants are expected to:

- Laboratory Teaching Assistants are assigned laboratory sessions that consists of approximately 40-50 students.
- For each session, the TA must attend a pre-lab tutorial, which needs to be supervised by the respective Technical Officer. Pre-lab tutorials include hands-on experience on the experimental set-up.
- TAs may relate the experiments with the real industrial work to provide an analogy to the students.
- TA's are recommended to reach the lab 5 min prior to the start of the lab session and to leave as soon as all students leave the lab or latest by the end of the lab session.

- Initial 15 minutes of every lab session is specifically dedicated to the teaching part, where TAs are expected to deliver the theory explanation of the topic covered in that particular lab experiment.
- It is expected to assist in maintaining a disciplined, clean and orderly lab environment. Students must be seated in their respective seats. Proper placing of the chairs, wires, components, instruments, and other lab resources must be monitored and the attendance should be marked on proper execution.
- Students do make inadvertent mistakes, henceforth, all TAs must keep an eye on the students to avoid any incident which may cause injury to the student and/or damage the instrument.
- Consult your TO in case you are handling any instrument for the first time.
- Please consult with the respective TO immediately in case the instrument seems unresponsive/malfunctions.
- Please do not guide the students about the instrument's usage and its working status, if not sure. Contact the respective TO for the same.
- TA's should manage to handle the lab activities within the given time-frame. The experiments are designed as per the allotted lab session.
- Keep records of student attendance after completion of the experiment in the Lab.
- Regular grading of the students must be done to check their performance in practical. This will highlight the students who need more attention.
- TAs are expected to prioritize the assigned lab sessions over other activities. Steps must be taken from the individual to minimize conflicts with other events. For special cases, the TA may seek permission from the respective TF/TO.

2.14.3 Teaching Fellow (TF)

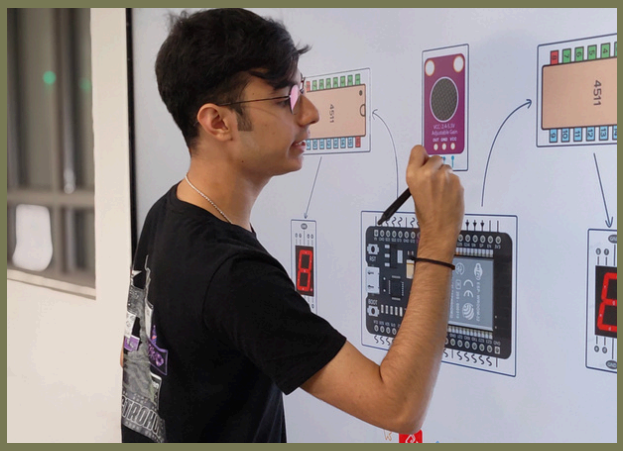
- TF must assure that all the TAs are well aware with the experimental setup and have performed the experiment once before the lab session.
- TF must inform the TO in advance in case of any changes in the existing experiments to confirm the availability of the required resources.
- TF should be present in the beginning of every lab class and must have a regular interaction (or meeting) with the TAs and students.
- TAs presence during the lab session must be confirmed by the TF.
- TF should ensure that the TAs are well prepared for the theory part that they will cover in initial 15 minutes of every lab session.
- TF should take the regular feedback from the students/TAs/TOs regarding the lab sessions for more transparency.
- Please consult with the respective TO immediately in case the instrument seems unresponsive/malfunctions.
- Consult the respective TO in case you are handling any instrument for the first time.
- To contribute in maintaining a disciplined, clean and orderly lab environment.
- TF should schedule meeting with the TAs and TOs whenever required to maintain the proper work flow.

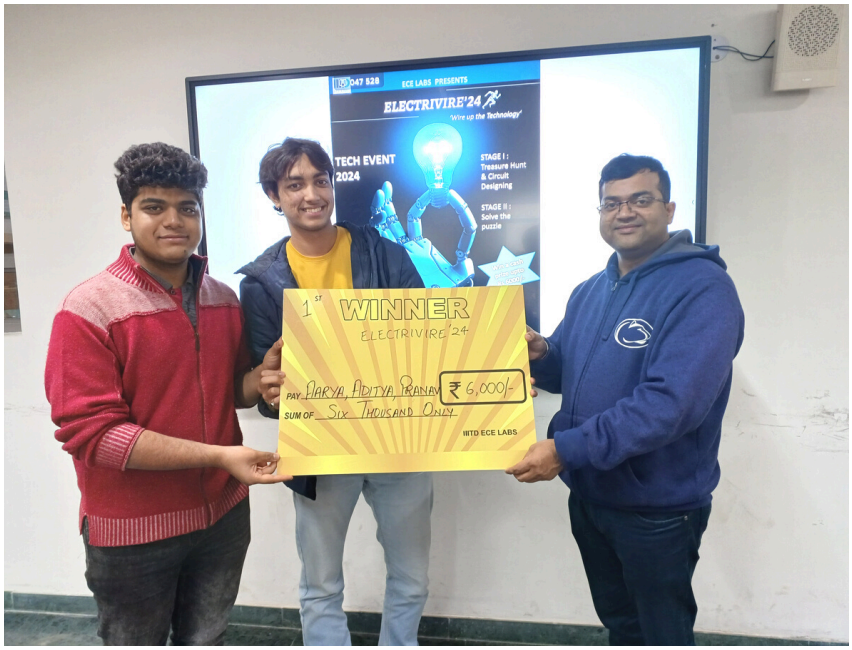
2.15 ECE LAB EVENTS

ECE Labs organize various events/workshops,quizzes etc time to time. Few events are also open for students/Faculty Members/working professionals outside IIIT-D.

Winter Training School, Jan 2026

Electrivire, Aug 2025





Electrivire, Jan 2024

ARTICLE 3

LAB SAFETY

3.1 LAB SAFETY

Safety is always important when working with electricity and electronics. This includes both the safety for you as well as safety for the circuit components you are working with. Concerns such as high voltage or currents can affect the human body, while static safety and proper component use can affect the life of your circuits.

3.1.1 Personal Safety

When working with high voltages and currents, it is important you remember that you can be hurt if your body becomes the 'circuit', since the human body is a conductor of electricity. This issue has long been combated by using the 'one hand rule.' Whenever you are working with a potentially dangerous circuit, turn it off, but if it cannot be turned off, use only one hand when working on it. This will prevent a circuit from going through your heart, which could be potentially fatal.

3.1.2 Component Safety

Many electrical components are likely to be damaged by static electricity. Static charge can build up to many thousands of volts, but with little energy. This cannot harm humans, but it can easily damage electronic components. To ensure static-safe handling, the best practice is to wear an anti-static strap and connect it to an earth ground such as a computer case or a water pipe. If you do not have an anti-static wristband, you can instead touch a ground every few minutes to discharge your static build up.

3.1.3 Safety guidelines for the students

Following proper safety practices are a must when working with electronic equipment. Not only is there the danger of electrical shock, but the components can explode if not connected properly. Many of today's electronic components are easily damaged by improper handling. The test equipment used in the electronic service industry is expensive and easily damaged if proper operating procedures are not followed.

- DOUBLE CHECK circuits for proper connections and polarity prior to applying the power. Observe POLARITY when connecting polarized components or test equipment into a circuit.
- Always OBSERVE POLARITY when connecting components into a circuit, especially with electrolytic capacitors. Always CUT wire LEADS so the clipped wire falls on the table top and not toward others.
- ONLY work with powered units WHEN NECESSARY for troubleshooting. REPLACE ALL screws, not just some.
- Use the CORRECT CLEANING SOLVENTS for the job.
- Avoid PINCHING wires when putting equipment back together.
- ALWAYS REPLACE shields that were removed during service to avoid signal RADIATION.
- Make sure TEST instruments are set for proper FUNCTION AND RANGE prior to taking a measurement.
- Keep the INTENSITY on oscilloscopes as LOW as possible when in use and all the way down when not in use to avoid burning out the screen.
- When measuring UNCERTAIN qualities, start with the range switch on the HIGHEST setting.

- Apply HEAT from a soldering pencil for no more than a couple of seconds to AVOID HEAT DAMAGE.
- When soldering a multi-pin component, avoid excessive heating to one area of the component; DO NOT go from pin to pin in a straight line.
- KEEP soldering irons in their protective STAND when not in use. DO NOT TOUCH the tip end of a soldering iron to check for heat.

ARTICLE 4

USER COMMENTS

4.1 USER COMMENTS

The comments are non-edited and are from the feedback reports of the lab courses.

- The availability of all apparatus required and everyone working without any hassles on experiments that make real sense.
- Experiments designed for IED lab were really exiting.
- The experiments are quite interesting and include a lot of external thinking and focus for its performance. TAs are approachable and can answer questions at times with full satisfaction.
- There is enough apparatus for students to get a hand on experience in every experiment.
- Stuff was exciting. The experiments and all were interesting
- Experiments are really good. They give us knowledge more than the theory in the class.
- Lab staff is friendly & courteous.
- All the lab equipment & material were properly set up at the beginning of each lab.
- I am satisfied with the issue-return policy.
- **More than 80% students agree** that the lab staff is very prominent in providing help.
- **More than 75% students agree** that the lab has adequate facilities to perform the experiments.
- **More than 70% students agree** that all the lab instruments are fully operational.

ARTICLE 5

FREQUENTLY ASKED QUESTIONS

5.1 FAQs

1. Where are ECE labs located?

There are total 9 ECE Labs. Six are housed in Lecture Hall Complex, 3rd Floor:

- 301: Digital Circuits Lab
- 302: Circuits and Innovation Lab
- 303: Basic Electronics Lab
- 304: RF and Applied Electromagnetic Lab
- 305: Shannon lab
- 306: Applied Electronics Engineering Lab

Two are located in R&D Building, 6th Floor:

- A616: Advanced ECE Lab
- A617: M.Tech Lab

One is located in Ground Floor, Old Academic Building

- Anechoic chamber

2. What about the availability of labs?

Though the labs are fully engaged in the lab courses during academic hours, there are few slots which can be allotted to students for their makeup session or any project work. In addition, few labs can be accessed beyond academic as per the procedure mentioned in 2.13.2.

3. What all resources are available in the Labs?

Please visit the webpage of these labs at https://ecelabs.iiitd.edu.in/. In the facilities section of these labs, the resources are mentioned.

4. Is it Possible to borrow a components or other piece of equipment for a project I am working on?

Yes, you can borrow or other piece of equipment for a project in which you are working by filling up the issuing form which an online form. An automated mail will be sent to you on submitting the “issue form” online. This mail must be taken as confirmation of issued components/resources. User will be responsible for the components once issued till returned and verified by lab.

5. Is that possible to track if something is available in the labs to get issued?

Yes, it is. The lab inventory is available online at https://ecelabs.iiitd.edu.in/.

6. What should I do if something is damaged/burnt/not working?

Every mistake can be made good by apologizing and becoming careful the next time. Please write the apology mail to respective lab In-charge (TO/DTO/JTO) and return back the damaged/burnt components. The final decision will be taken by the authorities.

7. What is the procedure if issued item is missing?

Apologizing is often considered an ethical obligation; however, it comes with a responsibility. Write the Apology mail to the respective lab In-charge (TO/DTO/JTO) keeping the lab-head faculty in CC.

You must be sure that you will be more careful in the future. The misplaced items should be replaced with the same new resource. The final decision will be taken by the authorities.

8. Where I can get the handouts of lab courses?

You can remotely access all the available handouts of respective lab @\\192.168.1.68\ece. This drive is locally available to all the IIITD students.

ARTICLE 6

APPENDICES

6.1 APPENDICES

6.1.1 Resources available in ECE Labs

Analyzers and Oscilloscopes

- CXA Signal Analyzer (N9000A), 9 KHz - 7.5GHz
- Vector Network Analyzer (N9926A), 14GHz
- Master Spectrum Analyzer (MS2720T), 9 kHz - 9 GHz
- Mixed Domain Oscilloscope (MDO 4104-06), 21Ch, 1GHz, 5GS/s
- USB Power Sensor (U2000A), 10MHz-18GHz
- Mixed Signal Oscilloscope (MSO2012B), 2Ch, 100MHz
- Digital Phosphor Oscilloscope (DPO2002B), 2Ch, 70MHz
- Mixed Signal Oscilloscope (MSO24 2-BW-100), 4Ch, 100MHz
- Digital Storage Oscilloscope(DXO2002A, 2 CH, 70MHz)

Signal Generators, Multimeters and Power Supplies

- Single Channel Arbitrary Function Generator (AFG 2021)
- Programmable DC Power Supply (PWS4305), 30V, 5A
- Linear DC Power Supply (PWS2326), 32V, 6A
- Precision Multimeter (DMM 4040), 6.5 Digit
- Triple Output DC Power Supply (E3631A)
- Handheld Multimeter (Keysight U1232A)

Workshop Machines and Tools

- Weller Rework Station W3000
- Anechoic Chamber
- CNC Machine for PCB Designing: LPKF Protomat S104
- LPKF Contact S4 Galvanic Through Hole Plating
- LPKF Multilayer Press S4 Including Automatic Hydraulic Unit
- Ultimaker 3D Printing Machine

Cables and Connectors

- Coaxial Adapter Straight F-BNC M-N
- Coaxial adapter Straight M-BNC F-N
- Coaxial adapter Straight F-BNC F-N
- Coaxial adapter Straight F-BNC M-SMA
- Coaxial adapter straight M-SMA M-SMA
- Coaxial adapter Straight F-SMA F-SMA
- Coaxial adapter Straight F-SMA F-N
- Coaxial adapter M-SMA F-N
- Coaxial adapter Straight F-N F-N
- Coaxial adapter Straight M-N M-N
- Coaxial adapter Straight F-N F-N
- Coaxial adapter Tee F-SMA M-SMA F-SMA
- BNC To Crocodile cables
- Banana Cables and Snap Connectors
- Flexible coaxial RF Cables
- SMA-SMA Cable (1m)
- Attenuator (30dB)

Available Software

- MATLAB
- LabVIEW
- Advanced Design System (ADS)
- CST Microwave Studio
- Vector Signal Analysis Software with Modulation Analysis
- Power Analysis Manager (N1918A)
- SystemVue
- ArbExpress Software
- Open Choice Desktop
- Master Software Tools
- Cadence PG Bundle
- Mentor Graphics HEP-1
- Xilinx for synthesis and analysis of HDL Designs
- TINA
- Circuit Pro
- Synopsys Front-end and Back-end
- Siemens

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