

EE Dept, IIT Bombay

Academic Year: 2025-2026, Semester I (Autumn)

Course: MS101 Makerspace

EE Lecture 0

MS101 – Introduction (EE Part)

Topics

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|-------------------------------------|-------------------------|
| 1. Course Objective | 7. EE Lectures |
| 2. MS101 Project (past and present) | 8. EE Lab Experiments |
| 3. Course Weightages | 9. EE Lab Rules |
| 4. EE Instructors | 10. List of EE Tool-set |
| 5. EE Lecture and Lab Schedules | 11. Reference Books |
| 6. EE Lab Slots & Venues | |

1. Course Objective

- The primary objective of this course is to inculcate a spirit of “making it by hand” among the students.
- It replaces the earlier Engineering Drawing and Workshop courses (which were Institute UG Core Courses).
- At present ME and EE departments are jointly offering MS101.
- From the EE side you will learn basic circuit theory, passive and active devices, operational amplifier circuits, digital circuit basics, microcontroller basics and Arduino/ESP32 board based interfacing techniques and controlling of motors.
- After the mid-semester examination you will be doing a project, in groups of four. The project will involve both ME and EE related tasks.

2. MS 101 Project

- **Project problems (previous six semesters):**
 - 2022-23/I - Aut – Line Follower with an extra mechanical task
 - 2022-23/II - Spr – BOT for Mountain Cargo Delivery (a track with 10 deg, 20 deg and 30 deg slopes)
 - 2023-24/I – Aut – Automatic Tensile Testing Apparatus to break paper board strips
 - 2023-24/II – Spr – Remote-Controlled Drone (Mobile remote control)
 - 2024-25/I – Aut – Remote-Controlled Drone (using Joystick)
 - 2024-25/II – Spr – Remote-Controlled Drone Using Joystick (Drone frame design, Joystick PCB design and Joystick case design).
- **Project problem statement (for the current semester):**
 - A Joystick controlled BOT for Mountain Cargo Delivery (a track with 10 deg, 20 deg and 30 deg slopes), using ESP32 microcontroller boards.

3. Course Weightages

- **EE Total: 30 %**
 - Labs: 15 % (Pre-lab quizzes + Lab Expts)
 - Midsemester Exam: 10 %
 - Lecture Attendance: 5 % (1 absence condoned)
- **ME Total: 30%**
- **Project: 40 %**
 - Project Lab Work (up to Final Demo) : ME:15 % ; EE: 15 %
 - Final Demo & Viva: 10 %

4. EE Instructors

- Prof Anil Kottantharayil (P1&P2) - anilkg@ee.iitb.ac.in, anilkg@iitb.ac.in
- Prof Srikanth Raj Chetupalli (P1&P2 and P9&P10) - srikanthrajch@ee.iitb.ac.in, srikanthrajch@iitb.ac.in
- Prof Kushal Tuckley (P3&P4) – kushal@ee.iitb.ac.in, i16107@iitb.ac.in
- Prof Saravanan Vijayakumaran (P3&P4) - sarva@ee.iitb.ac.in, saravanan@iitb.ac.in
- Prof Joseph John (P7&P8) – jjohn@ee.iitb.ac.in, j.john@iitb.ac.in
- Prof Shalabh Gupta (P7&P8) - shalabh@ee.iitb.ac.in, shalabhg@iitb.ac.in
- Prof Prof PC Pandey (P9 & P10) – pcpandey@ee.iitb.ac.in, pcpandey@iitb.ac.in

5. EE Lecture and Lab Schedules

- **Lectures:**

- EE lectures are held in special slots as given in the EE Lecture Schedule, uploaded on Moodle MS 101 2025-1-ALL. (ME lectures are held as per the Institute time table).
- There are 11 EE lectures.
- Lect 1 will be held during the MS101 Lab slots in the Drawing Hall (Transit Building 1st floor) on July 28 Mon and July 29 Tue.
- Lect 2-7 will be held in the Lecture Hall Complex during the Institute Quiz slots - Wed and Fri (8:30-9:25am). See the EE Lecture Schedule (on Moodle) for details.
- Lect 8 and 9 will be held during the MS101 EE lab slots and venues.
- Lect 10 and 11 – no physical lectures; videos will be uploaded.
- Please see the detailed EE lecture schedule uploaded on Moodle MS 101 2025-1-ALL.

- **Labs:**

- There are 5 EE lab experiments.
- Detailed EE lab schedule is uploaded on Moodle MS 101 2025-1-ALL.

6. EE Lab Slots & Venues

- *DH – Drawing hall; DESE – Dept of Energy Science & Engg*
- P1 & P2 - Prof Anil Kottantharayil and Prof Srikanth Raj Chetupalli
EE Lab slots : **P1 & P2** () – Mon, 2-5pm (in DH) ; **P2**() – Thu, 2-5pm (in DESE-101&108)
- P3 & P4 - Prof Kushal Tuckley and Prof Saravanan Vijayakumaran
EE Lab slots: **P3 & P4** () –Tue, 2-5pm (in DH) ; **P4** () – Fri, 2-5pm (in DESE-101&108)
- P7 & P8 - Prof Joseph John and Prof Shalabh Gupta
EE Lab slots: **P8** () – Mon, 8:30-11:30 (in DESE-101&108) ; **P7& P8** () - Thu, 9:30-12:30 (in DH)
- P9 & P10 - Prof PC Pandey and Prof Srikanth Raj Chetupalli
EE Lab slots: **P10** () – Tue, 8:30-11:30 (in DESE-101&108) ; **P9 & P10** () – Fri, 9:30-1230 (in DH)

7. EE Lectures

- Objective: to give students sufficient background in Electronic Circuits so as to design and implement their final project.
- EE Lectures
 - Lect 1 – Devices and Circuits I.
 - Lect 2 – Devices and Circuits II.
 - Lect 3,4 – Operational Amplifier Circuits I & II.
 - Lect 5 – Diode Circuits.
 - Lect 6 – Digital Logic.
 - Lect 7 – Digital Logic: Implementation.
 - Lect 8 – Introduction to Microprocessors.
 - Lect 9 – Application Development with Microcontrollers.
 - Lect 10 – Transistors.
 - Lect 11 - Electromechanical Components.

8. EE Lab Experiments

- 1) Familiarization with basic measuring instruments and other lab equipment (DMM, DSO, AFG); measurement of frequency response of an RC high-pass filter.
- 2) Op amp based inverting amplifier; op amp I-to-V converter for displaying the I-V characteristics of rectifier diodes, LEDs, Zener diodes and photodiodes.
- 3) a) Unregulated DC power supply using transformer and bridge rectifier; measurement of ripple voltage.
b) Regulated DC power supply using a 3-pin regulator IC; measurement of line and load regulations.
- 4) a) Familiarization with the ESP32-WROOM-32 board and interfacing.
b) Controlling BO motors using an ESP32-WROOM-32 board.
- 5) Remote Control of BO Motors using ESP32-WROOM-32 boards.

9. EE Lab Rules

- 100% Attendance in labs is compulsory.
- Arrive at least 5 min before the lab starting time at the lab venues.
- Come fully prepared by going through the EE Lab expt handout.
- **There will be a Pre-lab Quiz during the first 10 minutes of the lab (based on the Lab handout).**
- Wear proper dress as per MS101 Lab instructions.
- Wear formal shoes or canvas shoes. Slippers will not be allowed.
- EE Lab expts will be done in groups of two (groups will be allotted strictly as per the roll list).
- **Each one should have his/her Lab Record (a dedicated note book to record observations and results of each experiment). There will be mark penalty for not bringing your Lab record.**
- TAs will evaluate your Lab preparation and Lab performance, and award you marks out of 10. We shall communicate these marks to you through Moodle within a week.

10. List of EE Tool-Set

- Digital multimeter
- Bread board (see the figure on next slide)
- Wire stripper
- Flat screw driver (3 mm)
- Nose plier (small one for general use – soldering, straightening wires etc)
 - Note: Even though students will be performing experiments in groups of 2, we encourage all students to buy their tool-set.
 - There will be mark penalty for not bringing Tool-set (one set per group).
- ESP-32 WROOM-32 board and micro USB cable – One.
- Male-Female jumper wires – 10 nos.



Digital Multimeter (DMM)

Tool set for Electronics Lab



Wire Stripper



Solderless Breadboard

* Images are give for your reference



Flat Tip
Screwdriver



Nose Plier



ESP32-WROOM-32 board

11. Reference Books

- W H Hayt, J E Kemmerly, and S M Durbin, Engineering Circuit Analysis, 8th ed., Mc Graw-Hill, (Indian Edition), 2013.
- A.S. Sedra and K.C. Smith, Microelectronic Circuits, Oxford University Press, 7th ed. (Indian edition), 2017.
- MA Mazidi, S Naimi, S Naimi, AVR Microcontroller and Embedded Systems: Using Assembly and C, Pearson India, 1st edition 2013.
- *Note: No need to buy these books. E-copies of the relevant portions will be uploaded on Moodle.*