MS 101 Makerspace: Introduction

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MS 101 Makerspace

- The primary objective of this course is to inculcate a spirit of “making it by hand” among the students.
- It is meant to replace 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, and Arduino board based interfacing techniques and controlling of motors.

Summary of EE Laboratory Activities

- During the first half of the semester, EE Experiments will involve
  - Use of Bread boards for assembling and testing of electronic circuits.
  - Use of Digital Multimeters (DMM) for measuring voltages and resistances and learning to use the major Lab equipment.
    - Waveform Generator (Tektronix AFG 1022) for generating test signals (sine and triangle waveforms).
    - Digital Storage Oscilloscope (Tektronix TBS 1072C) for for displaying and measuring time varying voltage signals.
    - DC Power Supply (Keithley 2231A Triple Channel DC Power Supply) to give the required DC Power Supply voltages to amplifier ICs.
  - Operational amplifier based amplifier circuits.
  - Unregulated and regulated DC power supplies.
  - Familiarization with the Arduino microcontroller board for doing basic interfacing and control of DC motors.

1. Breadboard familiarization

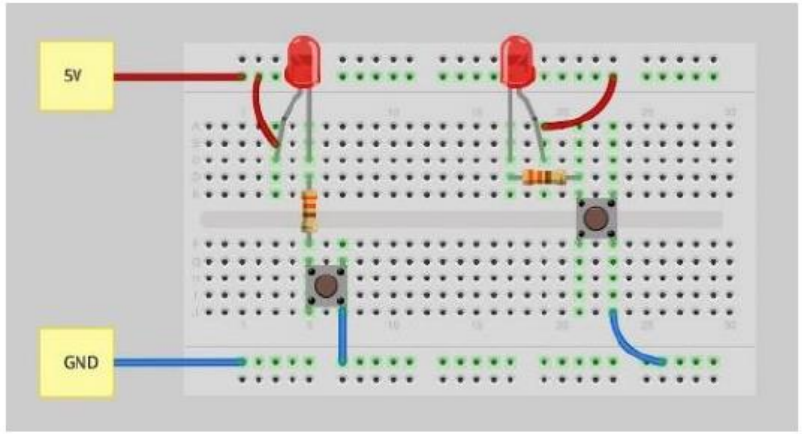


Fig 1.1 A Breadboard with a wired circuit

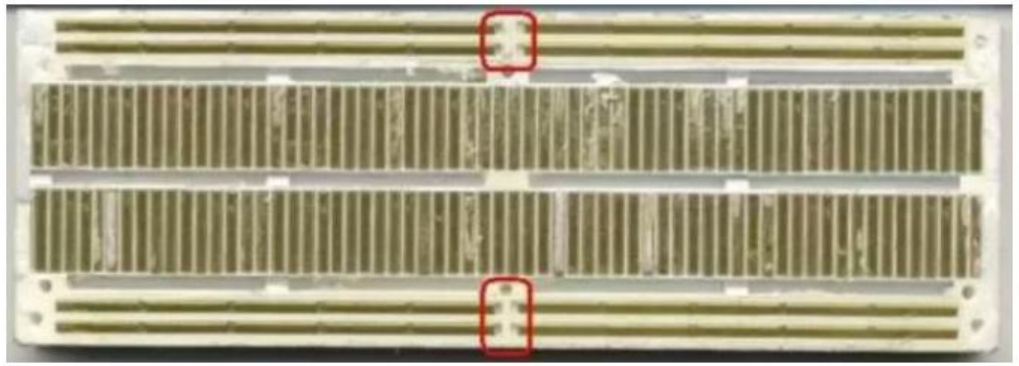
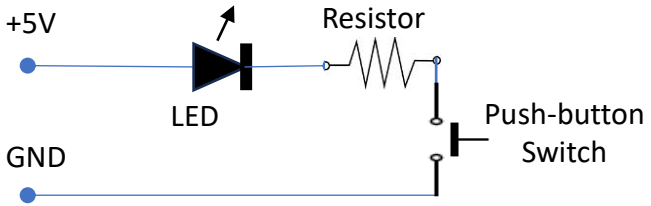
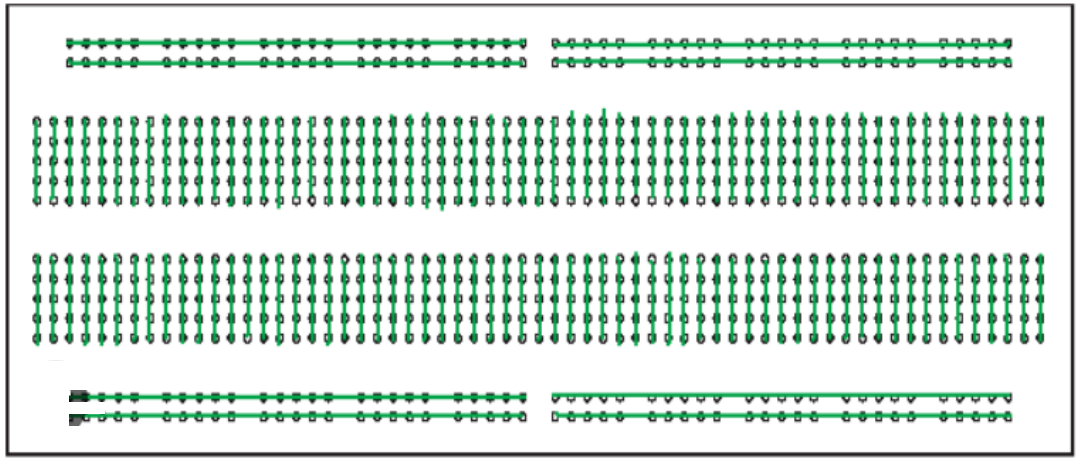


Fig 1.1B Typical Breadboard internal connections





2. Digital Multimeter

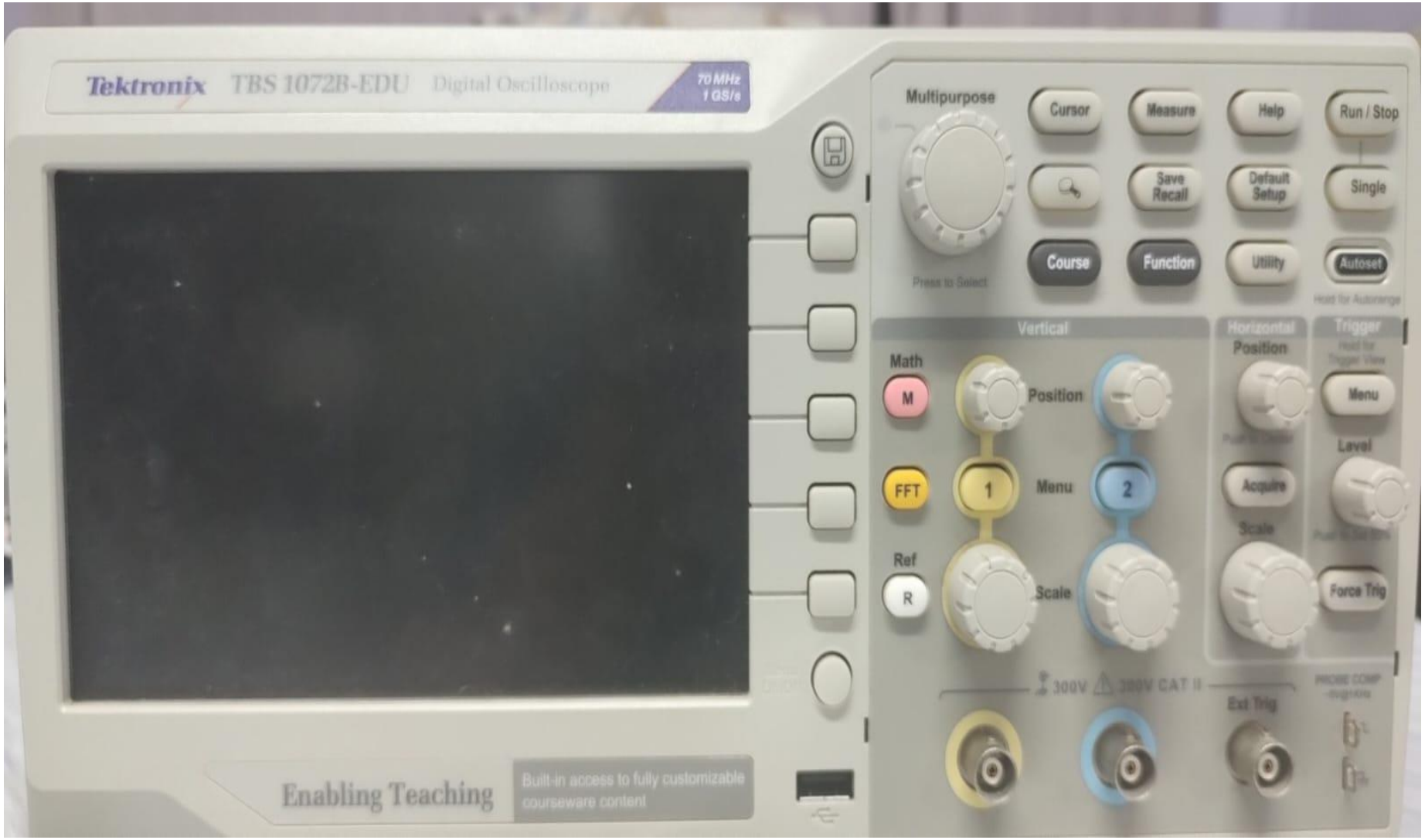
Fig 1 Front panel of Mastech 830L Digital Multimeter

- Used for measuring
  - Resistances
  - Voltages,
  - Currents
- Additional Features (commonly available)
  - Continuity check
  - Diode check

3. Arbitrary Waveform Generator (AFG-1022)

- Ensure that the Output setup has Hi-Z and NOT 50 ohms.
- To change:
  - Utility > output setup > Hi-Z

4. Digital Storage Oscilloscope (TBS-1072C)



…Summary of EE Laboratory Activities

- Second half of the semester
  - Design and implementation of the MS101 Project (involves application of all the learning of ME and EE)
  - Projects done in groups of six (assigned by us)
  - Projects done during the last 9 lab sessions of MS101
  - Progress of the project evaluated and marks awarded every week
  - Project demonstration and a viva voce during the last lab session of the semester.

- Project problem statement (for the current semester)
  - Will be announced in about two weeks

Course Weightages (for the EE Part)

- EE Total: 30 %
  - Quizzes : 10 % (Two quizzes)
  - Labs : 10 % (Five EE Lab Expts)
  - Midsemester Exam : 10 %
- ME Total: 30%
- Project : 40 %

- Project problems:
  - 2022-23/I - Autumn semester – Line Follower with extra mechanical task
  - 2022-23/II - Spring semester – BOT for Mountain Cargo delivery (a track with 10 deg, 20 deg and 30 deg slopes)
  - 2023-24/I – Autumn semester - Automatic tensile testing apparatus to break paper board strips

Batches - Faculty wise

- Division D3: Batches B1, B2, B3 - Prof Dinesh K Sharma and Prof Narendra Shiradkar
  - Labs : Mon and Thu 2-5pm
- Division D3: Batches B4, B5, B6 - Prof Kushal Tuckley and Prof Kishore Chatterjee
  - Labs: Tue and Fri 2-5pm
- Division D4: Batches B7, B8, B9 - Prof Joseph John and Prof BG Fernandes
  - Labs: Mon and Thu, 9:30-12:30
- Division D4: Batches B10, B11, B12- Prof PC Pandey and Prof Debraj Chakraborty
  - Labs: Tue 8:30-11:30, Fri 9:30-1230

EE Lab Rules

- 100% Attendance in Labs compulsory
- Arrive at least 5 min before at the Lab venues. Late comers will have mark penalty
- Wear proper dress as per MS101 Lab instructions

- EE Lab expts done in groups of two (as per the given list)
  - Half the expt will be carried out by one member and the other half by the second member.
  - Come fully prepared by going through the EE Lab expt handout.

- Each one should have his/her Lab Record (a dedicated note book to record observations and results of each experiment)
  - Mark penalty for not bringing your Lab record

- Your TAs will evaluate your Lab preparation and performance and award you marks out of 10.

List of EE Tool Set

- Digital Multimeter
- Bread board (see the figure on next slide)
- Wire Stripper
- Flat Screw driver (5 mm or 4 mm)
- Nose Plier (small one for general use – soldering, straightening wires etc)
- Forceps (for holding ICs and other components)

Tool set for Electronics Lab

Digital Multimeter (DMM)

Wire Stripper

ESD angled tweezer

Solderless Breadboard

Flat Tip Screwdriver

Nose Plier

* Images are give for your reference