Laboratories and Equipment's

Criterion 6 Facilities and Technical Support 80

6.1 Adequate and well-equipped laboratories, and technical manpower (40)

S. No.	Name of the Laboratory	No. of students per setup (Batch size)	List of important equipment	Weekly utiliz-ation status	Technical manpower support		
					Name of technical staff	Designation	Qualif-icatio n
1	Mechanical Workshop (including benchwork and fitting, carpentry, sheet metal work, welding, turning, milling, drilling, and tapping for workshop practice)	4 students per setup	Lathe, Manek make, 250 mm swing Turret mill, Falcon make, model FM-2S, Metal working lathes, Osaki make, model MML300 Metal working mill cum drills, Osaki make, model MMD250 Double column band saw, Krishna make, model KE Vertical band saw, Metabo make, model BAS 260 Swift Pillar type drilling machines, Sohit make - model MEW20, Kobe make - model DPB350, Osaki make - model PDB132 Grinders, Kobe Industrial Power Tools make, SKIL	16 hours	Mr. G. M. Reddy Mr. K. N. Rao Mr. R. N. Rao	Laboratory Assistant Laboratory Assistant Laboratory Assistant	DME ITI DEE & ITI

			make & Bosch make, model GBG8 Professional Arc welders:AdorFontech make, model Tornado 401& Tayor make model Arc200G Oxy-acetylene welding kit Industrial shears, Atlas make, model BS120 Power tools: Planer, Jigsaw, Cutting machine, and Drill Anvils and Swage Blocks Bench vices, Universal vices, Carpenter vices, Drill press vices, Milling vice				
2	Manufacturing and Metrology Laboratory	4 students per setup	CNC Lathe - Lokesh make - model TL200 CNC milling machine - BFW make - model Chandra	6 hours	Mr. G. M. Reddy Mr. K. N. Rao Mr. R. N. Rao	Laboratory Assistant Laboratory Assistant Laboratory Assistant	DME ITI

			CNC milling machine - Intelitek make - model Benchmill 6000 CNC milling machine, Intelitek make, model Promill 8000 Injection molding machine, All Plast make, model ABST-60 Shared conventional machines listed under workshop equipment Granite surface plates, Height gage & Spirit levels Vernier calipers, Steel rules, micrometers & bore gages Sine bar & Bevel protractor Gear caliper Cutting tools for turning, milling, drilling, threading & knurling Slip gage set, thread gages, three wire sets, dial indicator, magnetic stand, parallel blocks, fixturing and work holding sets, V-block, edge finder,Tri-squares & scriber				DEE & ITI

			Hand tool sets including wrenches, pliers, calipers, hammers, bolt cutter, etc. Portable surface roughness tester & comparator type surface roughness gage Soldering irons				
3	Mechanical Laboratory (Thermal engineering, Theory of Machines, Fluid mechanics and Fluid machinery)	4 Students per setup	**Thermal engineering**: Stephen Boltzmann apparatus Forced convection apparatus Natural convection apparatus Thermal conductivity (metal rod) apparatus Heat transfer from a pin fin Window Air-conditioning trainer **Theory of Machines**: Universal vibration apparatus Universal governor apparatus Motorized gyroscope Static and Dynamic balancing equipment **Fluid mechanics & fluid machinery**: Venturimeter, orificemeter& rotameter apparatus	6 hours	Mr. G. M. Reddy Mr. K. N. Rao Mr. R. N. Rao	Laboratory Assistant Laboratory Assistant Laboratory Assistant	DME ITI DEE & ITI

			Bernoulli's theorem apparatus Pitot static tube apparatus Orifice & mouthpiece apparatus Pelton wheel turbine test rig Centrifugal pump test rig Working models of machine elements are located in the manual drawing laboratory and listed under the Design and Drawing Laboratory section of this document				
4	Materials Testing and Characteri-zation Laboratory	4 students per setup	**Hardness testing**: Rockwell hardness tester Brinell hardness tester Vickers hardness tester **Tensile and impact testing**: Universal testing machine Instron make, model 5969 Charpy impact testing machine **Metallographic testing**: Precision high speed saw with diamond wafering blade for metallographic sample cutting, Metco make, model Baincut-HSS Sample mounting press Metco make, model Bainmount Double disc variable speed sample	12 hours	Mr. N. Mannepalli	Laboratory Assistant	DME

			grinder/polisher, Metco make, model Bainpol Metallurgical microscope, model Metascope T1600, magnification 50X to 1000X				
5	Finite Element Analysis Laboratory and CAD Laboratory	1 student	Desktop computers (LH 12): 65 Nos. ANSYS software: 100 Academic licences AutoCAD Inventor 3D software: No limit Academic licences MATLAB software: No limit Academic licences HP Laser jet M700 A3 size printer and Epson make overhead projector	4 hours	Mr. B.N.S. Chouhan Sub. P. K. Paruchuri	Laboratory Assistant Laboratory Assistant	B.Tech DP
6	Design Laboratory and Engineering Drawing Laboratory	4 students per setup for design 1 student per setup for drawing	<u>Design Laboratory</u>: 3D printer Makerbot make <u>Engg drawing laboratory</u>: Drawing boards: 69 seats The following models of machine elements are also housed in this location: Spur Gear Trains, OSW make, model SMM201 Crank Drive, OSW make, model SMM202 Cam Drive, OSW make, model SMM203 Friction Wheel and Clutch, OSW make, model SMM204	16 hours	Mr. B.N.S. Chouhan Sub. P. K. Paruchuri Mr. S. Baisetty	Laboratory Assistant Laboratory Assistant Laboratory Assistant	B.Tech DP DME

			Clutch Drive, OSW make, model SMM205 Belt Drive, OSW make, model SMM206 Belt Type, OSW make, model SMM207 Linkage Gears, OSW make, model SMM208 Linkage Gears, OSW make, model SMM209 Special Gears, OSW make, model SMM210 Internal Gear, OSW make, model SMM211 Internal Gear, OSW make, model SMM211 Differential Gear, OSW make, model SMM213 & 318				
7	Robotics Research Laboratory	n/a	Six Axis Manipulator, ABB make, model IRB1200 Selective Compliance Assembly Robot Arm (SCARA), ABB make, model IRB 910SC 4-Axis educational Robot, DOBOT make, model Magician 3-D Single extrusion printer for Rapid Prototyping, Ultimaker make, model 2+ Mobile Robots Platform, manufactured by MU	n/a	n/a	n/a	n/a
8	Fluidics and Heat Transfer Research Laboratory	n/a	Fluid flow supply system - micro syringe pump Digital differential pressure measurement instrument	n/a	n/a	n/a	n/a

			IR Thermal camera Labjack - DAQ system Testo 405i - thermal anemometer with smartphone operation Pitot tube Digital flow measuring sensor K- type Thermocouple Humidity sensor				
9	Electric Vehicle Research Laboratory	n/a	Ebike kit Egolf cart SkyRC battery tester IR Thermal camera Labjack data acquisition system Motor load test rig 5 hp Battery cycle tester 1 kW	n/a	Mr. S. Baisetty	Laboratory Assistant	DME
10	High Performance Computing Laboratory	n/a	Dell PowerEdge R430 Servers: 2 Nos DELL PowerEdge R440 Servers: 2 Nos.	n/a	n/a	n/a	n/a
11	Tribology and Materials Research Laboratory	n/a	Rotary Tribometer: Pin on Disc type tester, Ducom Instruments make, model TR-20LE-PHM-CHM40C Mixer cum extruder, Phoenix Advanced Materials make, model Sigma Oven, Phoenix Advanced Materials make	n/a	n/a	n/a	n/a

12	Automotive Systems Laboratory	n/a	Motorized Cut Section of a Heavy (31 tonne) Truck Drivetrain (chassis mounted) Light Truck Chassis and Drivetrain Stand Mounted Truck Cabin (for interior study) 50 tonne Mahindra Navistar Truck (driveable)	n/a	n/a	n/a	n/a

6.2 Laboratories maintenance and overall ambiance (10)

Maintenance of laboratory equipment:

1. Technical support staff monitors the condition of laboratory equipment in coordination with the faculty member in-charge of each laboratory.

2. Preventive maintenance is done before the beginning of a new semester when the equipment is to be used. The institution provides adequate budget for this activity. Breakdown maintenance is done on an ongoing basis and is need based for which the institution provides sufficient funds.

3. Minor repairs are done by technical staff, and service representatives of equipment suppliers are contacted for any major repairs. The institution has provided funding whenever such support has been found to be necessary.

4. Housekeeping staff is assigned to keep the laboratories clean on a regular basis.

5. The result of these activities is that equipment is in working order.

Overall ambiance:

1. Laboratories are housed in clean facilities with adequate ventilation and sufficient lighting to provide for a safe and comfortable working atmosphere for students, technical staff, and faculty.

2. The university has made arrangement for power back-up using diesel generators in case of power supply breakdown. Computers and electronic equipment are powered using uninterrupted power supply outlets for which a centralized battery back-up facility is installed at the university.

3. All the laboratories have adequate and comfortable furnishings.

4. Sufficient number of equipment is available so that no equipment is ever overcrowded. The maximum number of students sharing any piece of equipment for any experiment is four.

5. Laboratory manuals are available wherever these are relevant.

6. Safety precautions are documented and displayed prominently, and students are made aware of safety precautions on the first day of the laboratory sessions every semester.

7. Fire extinguishers are located strategically within easy visibility. These are regularly maintained and certified by qualified fire safety regulators.

8. First aid kits are available at strategic locations in the university premises. A doctor is available on-campus, and an ambulance is also available to take care of any health or injury emergencies. During their orientation, students are made aware of these facilities. All faculty and staff are aware of these facilities, and they are available to help students when in need arises.

6.3. Safety measures in laboratories (10)

S. No.	Name of the Laboratory	Safety precautions
1	Mechanical Workshop (including benchwork and fitting, carpentry, sheet metal work, welding, turning, milling, drilling, and tapping for workshop practice)	1. Closed toed shoes to be worn at all times. 2. Safety glasses to be worn when working with tools or machines. 3. Sleeves to be rolled up. 4. Loose clothes to be avoided or tucked in securely. 5. Long hair to be tied back securely in a bun. 6. For powered machinery, be aware of the emergency stop button location. 7. Familiarize yourself well with the controls of powered machinery before operating it. 8. No calling anyone from behind and no horseplay in the laboratory. 9. No cellphone use while working with machines or tools, or while walking. 10. Workplace to be cleaned and tools/instruments returned before leaving the laboratory.
2	Manufacturing and Metrology Laboratory	1. Closed toed shoes to be worn at all times. 2. Safety glasses to be worn when working with tools or machines. 3. Sleeves to be rolled up. 4. Loose clothes to be avoided or tucked in securely. 5. Long hair to be tied back securely in a bun. 6. For powered machinery, be aware of the emergency stop button location.

		7. Familiarize yourself well with the controls of powered machinery before operating it. 8. No calling anyone from behind and no horseplay in the laboratory. 9. No cellphone use while working with machines or tools, or while walking. 10. Workplace to be cleaned and tools/instruments returned before leaving the laboratory.
3	Mechanical Laboratory (Thermal engineering, Theory of Machines, Fluid mechanics and Fluid machinery)	1. Closed toed shoes to be worn at all times. 2. Safety glasses to be worn when working with tools or machines. 3. Sleeves to be rolled up. 4. Loose clothes to be avoided or tucked in securely. 5. Long hair to be tied back securely in a bun. 6. For powered machinery, be aware of the emergency stop button location. 7. Familiarize yourself well with the controls of powered machinery before operating it. 8. No calling anyone from behind and no horseplay in the laboratory. 9. No cellphone use while working with machines or tools, or while walking. 10. Workplace to be cleaned and tools/instruments returned before leaving the laboratory.
4	Materials Testing and Characterization Laboratory	1. Wear closed toed shoes. 2. Minimize exposed skin, and confine long hair and loose clothing. 3. Use safety eye shield when grinding specimens. 4. Do not remove specimens from abrasive cut-off machine until the wheel has stopped. 5. Tensile Testing: During the tensile test observe from a distance and wear protective eyewear. 6. Read MSDS carefully before using chemicals for etching/cleaning specimen 7. Charpy machine: Never leave the hammer in the up position until ready to break a specimen. 8. No calling anyone from behind and no horseplay in the laboratory. 9. No cellphone use while working with machines or tools, or while walking. 10. Workplace to be cleaned and tools/instruments returned before leaving the laboratory.
5	Finite Element Analysis Laboratory and CAD Laboratory	1. Wear closed toed shoes 2. Loose clothing to be tucked in 3. Long hair to be tied back in a bun 4. No shouting out to call anyone from behind 5. No horseplay and no idle chats. 6. Cellphones to be turned off fully and kept away. Absolutely no cellphone use inside the laboratory.

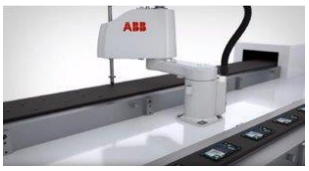
6	Design Laboratory and Engineering Drawing Laboratory	1. Wear closed toed shoes 2. Loose clothing to be tucked in 3. Long hair to be tied back in a bun 4. No shouting out to call anyone from behind 5. No horseplay and no idle chats. 6. Cellphones to be turned off fully and kept away. Absolutely no cellphone use inside the Lab.
7	Robotics Research Laboratory	1. Wear closed toed shoes. 2. No food or drinks are allowed in the Lab. 3. Keep work areas neat and organized, and clean up all work areas after the lab. 4. No playing or running, and no throwing of objects of any kind. 5. Do not wear loose or baggy clothing or jewelry when using tools. 6. Weareye protection, and gloves when necessary. 7. Do notconverse with other students while operating machines or using tools. 8. Readthe lab instructions carefully and make sure you know what you're about to do before starting to do it. 9. Stop using the equipment if it is not working properly. 10. Know the location of the nearest fire extinguisher and first aid kit, and in the event of a fire or on hearing the fire bell, leave calmly by the stairs and assemble outside the building.
8.	Fluidics and Heat Transfer Research Laboratory	1. Closed toed shoes to be worn at all times. 2. Safety glasses to be worn when working with tools or machines. 3. Sleeves to be rolled up. 4. Loose clothes to be avoided or tucked in securely. 5. Long hair to be tied back securely in a bun. 6. Familiarize yourself well with the controls of powered machinery before operating it. 7. No calling anyone from behind and no horseplay in the laboratory. 8. No cellphone use while working with machines or tools, or while walking. 9. Workplace to be cleaned and tools/instruments returned before leaving the laboratory.
9.	Electric Vehicle Research Laboratory	1. Closed toed shoes to be worn at all times. 2. Safety glasses to be worn when working with tools or machines. 3. Sleeves to be rolled up. 4. Loose clothes to be avoided or tucked in securely. 5. Long hair to be tied back securely in a bun. 6. Familiarize yourself well with the controls of powered machinery before operating it.

		7. No calling anyone from behind and no horseplay in the laboratory. 8. No cellphone use while working with machines or tools, or while walking. 9. Workplace to be cleaned and tools/instruments returned before leaving the laboratory.
10.	High Performance Computing Laboratory	1. Ensure that computers and electronic equipment are properly earthed. 2. No idle chats and no horseplay in the laboratory.
11.	Tribology and Materials Research Laboratory	1. Wear closed toed shoes. 2. Minimize exposed skin, and confine long hair and loose clothing. 3. Use safety eye shield when grinding specimens. 4. No calling anyone from behind and no horseplay in the laboratory. 5. No cellphone use while working with machines or tools, or while walking. 6. Workplace to be cleaned and tools/instruments returned before leaving the laboratory.
12.	Automotive Systems Laboratory	1. Closed toed shoes to be worn at all times. 2. Safety glasses to be worn when working with tools or machines. 3. Sleeves to be rolled up. 4. Loose clothes to be avoided or tucked in securely. 5. Long hair to be tied back securely in a bun. 6. Familiarize yourself well with the controls of powered machinery before operating it. 7. No calling anyone from behind and no horseplay in the laboratory. 8. No cellphone use while working with machines or tools, or while walking. 9. Workplace to be cleaned and tools/instruments returned before leaving the laboratory.

6.4. Project laboratory (20)

There are a number of computational and experimental facilities in the Department of Mechanical Engineering to facilitate the students to carry out their final year projects. In addition, these facilities play a supporting/central role for some research projects. These facilities assume significance since a final year project is mandatory as a part of the coursework. Additionally, a third-year project is also mandatory as a part of the coursework.

Laboratory Photo	Description
   	**Design and Prototyping Laboratory** 3-D printing facility is available for use in projects: Two MakerBot Replicator 2X 3-D printers are installed for this purpose.
  	**Materials Testing Laboratory** To measure the mechanical properties of materials, an advanced Universal Testing Machine of Instron make model 5969 and indentation machines to measure hardness are available. In addition, metallographic sample preparation facilities and a Metallurgical microscope, model Metascope T1600, magnification 50X to 1000X are available. The lab also house the pin on disk wear machine for projects addressing the tribological properties of materials.
 	**Fluidics and Heat Transfer Laboratory** Projects addressing mixing characteristics of fluids in a low Reynolds number flow, developing cooling methods for high heat flux generating surfaces, and thermal management of batteries in e-vehicles are carried out in the fluidics and heat transfer lab facility. The lab is equipped with micro syringe pump, Digital differential pressure measurement instrument, IR Thermal camera, Labjack - DAQ system, Testo 405i - thermal anemometer with

	smartphone operation, Pitot tube, Digital flow measuring sensor, K- type Thermocouple, and Humidity sensor.
   	**Robotics Laboratory** Robotics is an indispensable part of the curriculum in MU is becoming an increasingly productive area for projects and product development. The center for robotics enables students and researchers to implement new ideas and innovations in the area of robotics. This center is equipped with a Dobot Magician robot, an ABB make SCARA Robot, an ABB Make 6-axis robot arm, a 3-D printer Ultimaker_2+, a Lab developed Stewart platform, a Lab developed Robomouse.
 	**Computing Facilities** The computation lab in the department of mechanical engineering houses over 60 computers equipped with drafting and solid modeling software such as Autodesk Inventor. Multiple softwares such as Altair Hyperworks, COMSOL Multiphysics, ANSYS Multiphysics and Fluent and Abaqus provide resources for projects based on computational approaches. In addition to the lab, computationally intensive simulations can be executed on the 4 node 80 core high performance compute cluster.

Project Facilities:

1. Working space available in the workshop as well as the research laboratories for projects. (Some of the interesting projects executed by students include manufactureof the Baja four wheeled vehicle for a student competition, aircraft for a student competition, and an Automated Underwater Vehicle for a student competition.)
2. 24 x 7 power supply on the campus
3. 24 x 7 wi-fi connection is available on the campus.
4. Access to computer the lab on the campus.
5. A foldable swimming pool available for underwater vehicle testing.
6. Workshop facilities are available for project fabrication.
7. 3D-printing facility is available for project fabrication.
8. Institutional support for attending competitions and displaying projects to the public.

Annexure 6.1 Laboratory details (AY 2019-20)

S. No	Name of the laboratory	No. of students per setup (batch size)	Name of the important equipment	Weekly utilization status	Technical man power support		
					Name of the technical staff	Designation	Qualification
1	Surveying	4	• Prismatic compass • Plane table • Theodolite • Total station • Dumpy level • GPS	6 hours per week	Mr. K. Sathyam Naidu	Lab Assistant	B. Tech
2	Concrete Technology	4	• CTM • Vibrating machine • Accelerating curing tank • Concrete mixer drum type 1 m^3 capacity • UTM • Vee-Bee consistometer • Vibrating table • Vicat apparatus • Slump cone apparatus • Flow table	6 hours per week	Mrs. T. Bindhu Madhavi	Lab assistant	B. Tech

3	Fluid mechanics and Hydraulics and Hydraulic Machinery	4	1. Pelton wheel 2. Centrifugal pump 3. Reynold's number 4. Notches 5. Pipe friction apparatus 6. Bernoulis Equipment 7. Orifice and Venturi meter 8. Pipe fittings 9. Pitot tube	6 hours per week	Mr. K. Satyam Naidu	Lab assistant	B. Tech
4	Soil mechanics	4	• Unconfined compression test • Permeability Test • Consolidation Test • California Bearing test • Direct shear test • Relative density	6 hours per week	Mr. K. Satyam Naidu	Lab assistant	B. Tech
5	Computer aided drafting/drawing	1	• Auto CAD 2019 Software • Systems with 1TB HDD and 8GB RAM	6 hours per week	Mrs. T. Bindhu Madhavi	Lab Assistant	B. Tech
6	Transportation Engineering	4	(a) Loss Angeles abrasion testing machine (b) Bitumen penetrometer (c) Ductility testing machine (d) Universal water bath (e) Marshall stability apparatus	6 hours per week	Mr. K. Satyam Naidu	Lab assistant	B. Tech

7	Environmental Engineering	4	• Spectophotometer • COD heater block • Portable DO meter TDS/Temperature meter • Jar test apparatus • Hot air oven • Muffle furnace • Digital BOD incubator	6 hours per week	Mrs. T. Bindhu Madhavi	Lab assistant	B. Tech
8	Computing Lab	1	● MATLAB ● Autodesk Inventor ● Systems with 1TB HDD and 8GB RAM	6 hours per week	Mrs. T. Bindhu Madhavi	Lab Assistant	B. Tech

Annexure 6.2 Laboratory details (AY 2018-19)

S. No	Name of the laboratory	No. of students per setup (batch size)	Name of the important equipment	Weekly utilization status	Technical man power support		
					Name of the technical staff	Designation	Qualification
1	Surveying	4	1. Prismatic compass 2. Plane table 3. Theodolite 4. Total station 5. Dumpy level 6. GPS	6 hours per week	Mr. Vamshi	Lab Assistant	B. Tech
2	Concrete Technology	4	1. CTM 2. Vibrating machine 3. Accelerating curing tank 4. Concrete mixer drum type 1 m^3 capacity 5. UTM 6. Vee-Bee consistometer 7. Vibrating table 8. Vicat apparatus 9. Slump cone apparatus 10. Flow table	6 hours per week	Mr. K. Sathyam Naidu	Lab assistant	B. Tech
3	Hydraulics and Hydraulic Machinery	4	9 Pelton wheel 10 Centrifugal pump 11 Reynold's number 12 Notches 13 Pipe friction apparatus 14 Bernoulis Equipment 15 Orifice and Venturi meter 16 Pipe fittings	6 hours per week	Mr. K. Satyam Naidu	Lab assistant	B. Tech

			- Pitot tube				
4	Soil mechanics	4	- Unconfined compression test - Permeability Test - Consolidation Test - California Bearing test - Direct shear test - Relative density	6 hours per week	Mr. Vamshi	Lab assistant	B. Tech
5	Computer aided drafting/ drawing	1	- Auto CAD Software - Systems with 1TB HDD and 8GB RAM	6 hours per week	Mrs. T. Bindhu Madhavi	Lab Assistant	B. Tech
6	Transportation Engineering	4	- Loss Angeles abrasion testing machine - Bitumen penetrometer - Ductility testing machine - Universal water bath - Marshall stability apparatus	6 hours per week	Mr. K. Satyam Naidu	Lab assistant	B. Tech

7	Environmental Engineering	4	1. Spectophotometer 2. COD heater block 3. Portable DO meter TDS/Temperature meter 4. Jar test apparatus 5. Hot air oven 6. Muffle furnace 7. Digital BOD incubator	6 hours per week	Mrs. T. Bindhu Madhavi	Lab assistant	B. Tech
8	Computing Lab	1	1. MATLAB 2. Autodesk Inventor 3. Systems with 1TB HDD and 8GB RAM	6 hours per week	Mr. Vamshi	Lab Assistant	B. Tech

CRITERION 6	Facilities and Technical Support	80

Adequate and well-equipped laboratories, and technical manpower (40)

S.No.	Name of Lab	No of Students per set up (Batch Size)	No of Systems	Name of the important Equipment	Weekly Utilization Status (all the courses for which course is utilized)	Technical Manpower Support		
						Name of technical Staff	Designation	Qualification
1	LH 11	30/60	70	Intel® Core™ i5-7500 CPU @ 3.40GHz × 4 / 1 TB/(16 GB/8GB)	ES106, CS 307, CS 415, CS 417	MUNIGANTI SRINIVAS	SR. LAB ASSISTANT	M.TECH (CSE)
2	LH 12	30/60	66	Intel® Core™ i5-6500 CPU @ 3.20GHz 3.19GHz/1 TB/8 GB	ES 211, ME 312, ME 201, CS 308, CE 307	SAMA SUDHEER REDDY	LAB ASSISTANT	M.TECH (CSE)

3	Language Lab	30/60	59	Intel ® Core™ i5-4590 CPU@ 3.30GHz, 3301MHz,4 Cores(S),4 Logical Pro/ 1 TB/8 GB	HS 101, ES 210, CS 204, CS 310, CS 311, CS 312	MUNIGANTISRINIVAS	SR. LAB ASSISTANT	M.TECH (CSE)
						SAMA SUDHEER REDDY	LAB ASSISTANT	M.TECH (CSE)
						CHANDRAKALA SHARMA	LAB ASSISTANT	B.TECH (IT)
4	Computer Center	30	41	Intel®Core™ i5-4570CPU@3.20 GHz/500 GB/4 GB -	ME 309	ASHISH KUMAR ROY	LAB ASSISTANT	B. Tech (Electronics Engineering)

Table B.6.1

- **Laboratories maintenance and overall ambiance (10)**

  - All the laboratories are well equipped and maintained to conduct laboratory courses.
  - Minimum 15% to 20% of unutilized lab slots are allotted for regular maintenance of laboratories. Technical Staffs are well trained for maintenance.
  - Stock Register, Service Register, Log Register, Obsolete Register, Movement Register are available in the laboratories.
  - Curriculum relevant materials like list of experiments, laboratory manuals and previous
  - sample laboratory records are made available in all laboratories.
  - Laboratories are equipped with Computer / Laptop with internet facility, LCD projector
  - and other teaching aids wherever required.

- Adequate working and instructional space with good ambiance is available in all
- laboratories. Computer Laboratories are air-conditioned and provided with internet through LAN /
- Wi-Fi.
- Adequate furniture like chairs, work benches and stools are made available in all
- laboratories.
- Regular checkup of equipment is carried out at the end of every semester.
- Breakdown register is maintained in the laboratories.
- As per the requirement minor repairs are carried out by the lab technical staff.
- List of experiments, laboratory equipment details, charts / models and Time-Tables are
- displayed in the laboratory.
- Major repairs are outsourced by following the procedure of the institute.
- Lighting system is very effective, along with the natural light in every corner of the rooms.
- Labs are equipped with sufficient hardware and licensed software to run program specific curriculum

Table 6.2 Maintenance schedule of the laboratory

Task	Frequency	Performed by	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Lab cleaning	Every day	House keeping												
Software Installations	Half yearly	Lab staff												
CRO calibration and Probe testing	Every Month	Lab staff												
Regulated Power Supply calibration	Monthly	Lab staff												
Equipment Purchasing	As per need	Lab staff												
Equipment servicing	As per need	Lab staff												

Stock verification	Half yearly	Lab staff												
Faulty equipment repairing	As per need	Lab staff												
Safety equipment checking	Monthly	Lab staff												

- Safety measures in laboratories (10)

S. No.	Name of the Laboratory	Safety Measures
1	**LH 11** 	7. General rules of conduct in laboratories are displayed. 8. Specific Safety Rules for students displayed. 9. First aid box, Fire extinguisher are kept in the laboratory. 10. Well trained technical supporting staff. 11. Avoiding the use of damaged equipment and providing needful equipment and components. 12. Periodical servicing of the lab equipment. 13. Maintain a clean and organized laboratory, 14. Avoiding the use of cellphones. 15. Appropriate storage areas.
2	**LH 12** 	General Rules of Conduct in Laboratories are displayed. 10. Specific Safety Rules for students displayed. 11. First aid box, Fire extinguisher are kept in the laboratory. 12. Well trained technical supporting staff. 13. Avoiding the use of damaged equipment and providing needful equipment and components. 14. Periodical servicing of the lab equipment. 15. Maintain a clean and organized laboratory. 16. Avoiding the use of cellphones. 17. Appropriate storage areas.
3	**Language Lab**	7 General Rules of Conduct in Laboratories are displayed. 8 Specific Safety Rules for students displayed. 9 First aid box, Fire extinguisher are kept in the laboratory. 10 Well trained technical supporting staff.

		• Avoiding the use of damaged equipment and providing needful equipment and components. • Periodical servicing of the lab equipment. • Maintain a clean and organized laboratory. • Avoiding the use of cellphones. • Appropriate storage areas.
4	**Computer Center-GF** 	• General Rules of Conduct in Laboratories are displayed. • Specific Safety Rules for students displayed. • First aid box, Fire extinguisher are kept in the laboratory. • Well trained technical supporting staff. • Avoiding the use of damaged equipment and providing needful equipment and components. • Periodical servicing of the lab equipment. • Maintain a clean and organized laboratory. • Avoiding the use of cellphones. • Appropriate storage areas.

Table B.6.3

- Project laboratory (20)

NVIDIA DGX-1 Supercomputer Lab

The NVIDIA® DGX-1™ Deep Learning System is the world's first purpose-built system for deep learning with fully integrated hardware and software that can be deployed quickly and easily.

The NVIDIA DGX-1 comes with a base operating system consisting of an Ubuntu OS, Docker, Docker Engine Utility for NVIDIA GPUs, and NVIDIA drivers. This system is designed to run a number of NVIDIA-optimized deep learning framework applications packaged in Docker containers. You can use your own scheduling and management software to run jobs, and also build and run your own applications on the DGX-1.

Hardware Specifications Component

Component	Qty	Description
Base Server	**1**	**Dual Intel® Xeon® CPU motherboard with x2 9.6 GT/s QPI, 8 Channel with 2 DPC DDR4, Intel®C610 Chipset, AST2400 BMC**
	1	**GPU Baseboard supporting 8 SXM2 modules (Cube Mesh) and 4 PCIE x16 slots for InfiniBand/Ethernet NICs**
	1	**Chassis with 3+1 1600W Power supply and support for up to five 2.5 inch drives**
	1	**10/100BASE-T IPMI Port**
	1	**RS232 Serial Port**
	2	**USB 3.0 Ports (set as USB 2.0 by default. To enable USB 3.0, see Enabling USB 3.0 for instructions.)**
Power Supply	**4**	**1600 W each.**
CPU	**2**	**Intel® Xeon® E5-2698 v4, 20-core, 2.2GHz, 135W**
GPU	**8**	**(Pascal) Tesla P100, featuring** **170 teraflops, FP16** **16 GB memory per GPU** **28,672 NVIDIA CUDA® Cores** **(Volta) Tesla V100, featuring** **1 petaflop, Mixed Precision** **16 GB memory per GPU** **40,960 NVIDIA CUDA® Cores** **5120 NVIDIA Tensor Cores** **(Volta 32 GB) Tesla V100, featuring** **1 petaflop, Mixed Precision** **32 GB memory per GPU** **40,960 NVIDIA CUDA® Cores** **5120 NVIDIA Tensor Cores**
System Memory	**16**	**32 GB DDR4 LRDIMM (512 GB total)**
SAS Raid Controller	**1**	**8 port LSI SAS 3108 RAID Mezzanine**
Storage (RAID 0)	**4**	**1.92 TB, 6 Gb/s, SATA 3.0 SSD**

(Data)		
Storage (OS)	**1**	**480 GB, 6 Gb/s, SATA 3.0 SSD**
10 GbE NIC	**1**	**Dual port, 10GBASE-T, network adapter Mezzanine**
InfiniBand EDR/100GbE NIC	**4**	**Single port, x16 PCIe, Mellanox ConnectX-4 VPI MCX455A-ECAT or Single port, x16 PCIe, Mellanox ConnectX-5 VPI MCX555A-ECAT**

Mechanical

Feature	Description
Form Factor	**3U Rackmount**
Height	**5.16” (13.1 cm)**
Width	**17.5" (44.4 cm)**
Depth	**34.1" (86.6 cm)**
Gross Weight	**134 lbs (61 kg)**

Environmental

Feature	Description
Operating Temperature	**5º C to 35º C (41º F to 95º F)**
Relative Humidity	**20% to 85% noncondensing**
Airflow	**340 CFM @ 35º C**
Heat Output	**12000 BTU/hr**

Power Requirements

Input		Specification for Each Power Supply	Comments
200-240 V (ac)	**3500 W max.**	**1600 W @ 200-240 V, 8 A, 50-60 Hz**	**The DGX-1 contains four load-balancing power supplies, with 3+1 redundancy.**

Connections and Controls

ID	Type	Qty	Description
1	**Power button**	**1**	**Press to turn the DGX-1 on or off. Blue: System power on**

			Off: System power off **Amber (blinking): DC power Off, fault reported in BMC SEL** **Amber and blue (blinking): DC power On and fault reported in BMC SEL**
2	**ID button**	**1**	**Press to cause an LED on the back of the unit to flash as an identifier during servicing.**
3	**InfiniBand/Ethernet (QSFP28)**	**4**	**EDR IB/100GbE**
4	**USB**	**2**	**USB 3.0 ports are available to connect a keyboard.**
5	**VGA**	**1**	**The VGA port connects to a VGA capable monitor for local viewing of the DGX-1 setup console or base OS.**
6	**DB9**	**1**	**RS232 serial port for internal debugging**
7	**AC input**	**4**	**Power supply inputs**
8	**Ethernet (RJ45)**	**2**	**10GBASE-T dual port network adapter Mezzanine**
9	**IPMI (RJ45)**	**1**	**10/100BASE-T Intelligent Platform Management Interface (IPMI) port**

Rear Panel Power Controls

	Status	**Description**
1 (Port 1 Link/Activity)	**Amber (steady)**	**LAN link**
	Amber (blinking)	**LAN access (off when there is traffic)**
	Off	**Disconnected**
2 (Port 1 Speed)	**Green**	**10 Gb/s**
	Amber	**1 Gb/s**
	Off	**100 Mb/s**
3 (Port 0 Link/Activity)	**Amber (steady)**	**LAN link**
	Amber (blinking)	**LAN access (off when there is traffic)**
	Off	**Disconnected**
4(Port 0 Speed)	**Green**	**10 Gb/s**
	Amber	**1 Gb/s**
	Off	**100 Mb/s**

Table B.6.3

Lab Photo	Description
 Fig 1: Super Computer Lab Facility	**Project** : Lab for Execution of High-Performance Computing projects

Fig 2: DGX

Venue : Supercomputing Laboratory

Many external and internal research projects have requirements for intensive computing. This is typical of projects requiring simulations of governing equations of different physical processes as well as Artificial Intelligence projects that need extensive computations for training. Our Supercomputer laboratory has one NVIDIA DGX-1 computer with 8 V-100 GPU cards each having 5120 threads. It also a latest Intel 48-core CPU-based server. Independently, there are 32 Workstations that support Dassault-Systemes 3D-Experience Software along with underlying packages like CATIA and DELPHI.

CRITERION 6	Facilities and Technical Support	80

- **Adequate and well-equipped Laboratories, and technical manpower (40)**

Table B.6.1 Laboratory detail

S.No	Name of the Laboratory	No of students per setup (Batch size)	Name of the Important Equipment	Weekly utilization status (all the courses for which lab is utilized)	Technical Manpower Support		
					Name of the Technical Staff	Designation	Qualification
1	Basic Electrical Engineering Lab (2 Nos)	3-4	7. Oscilliscope 8. Bench multimeter i dm 201 n 9. Tg 120 function gen 10. Adjustable power supply 11. Single phase transformer	2017-2018: Odd Sem: 8 Hrs + 6 Hrs project	Mr. Akhilesh Pandey	Lab Assistant	B.Tech

			7. Hand held air blower(wolf make) 8. LED TV samsung 45" 9. Digital Storage Oscillosoce 50 mhz: 1GS/s:2 ch 2.5K record Length- Model TBS1052B-EDU 10. Digital Storage Oscillosoce 70 mhz: 1GS/s:2 ch 2.5K record Length- Model TBS1072B-EDU 11. Digital Storage Oscillosoce 200 mhz: 1GS/s:2 ch 2.5K record Length- Model TBS1202B-EDU 12. Arbitrary/Function Generator : 2Chl:125MS/s: 25mhz Sine Waveform:14-bits:3.9 color LCD 2U half rack: USB Host/Device-Model: AFG1022	Even Sem: 8 Hrs + 6 Hrs Project 2018-2019 Odd Sem: 8 Hrs + 6 Hrs project Even Sem: 8 Hrs + 6 Hrs Project 2019-20: Odd sem: 8 Hrs+6 Hrs project	Mr. Rakesh	Lab Assistant	B.Tech

			11. Arbitrary/Function Generator : 2Chl:125MS/s: 25mhz Sine Waveform:14-bits:3.9 color LCD 2U half rack: USB Host/Device-Model: AFG1022 12. Computer				
2	Electrical Machines Lab	3-4	10. 5HP3PHASESLIPPERING MOTOR 11. 3 phase squirrel cage induction motor 12. Rheostat 1000 ohm/2A 13. Rheostat 220 ohm/2A 14. Rheostat 350 ohm/2A 15. Rotor resistance stater 16. Star Delta Stater 17. Synchronising panel 18. Voltmeter 0-30V AC 19. Voltmeter 0-300V AC 20. Voltmeter 0-600V AC 21. Wattmeter3ph 2E600V/10A	2017-2018 Odd Sem: 8 Hrs + 6 Hrs project 2018-2019 Odd Sem: 8 Hrs + 6 Hrs project 2019-2020 Odd Sem: 8 Hrs + 6 Hrs project	Mr. Bharatlal Rai	Lab Assistant	B.Tech

			7. Wattmeter 300V/10A 8. Wattmeter300V/10A UPF 9. 2 point stater 10. 3 Point Stater 11. 5HP DC Motor with 3PH Alternater 12. 5HP DC Shunt Motor with Generator 13. AMMETER0-15A 14. AMMETER0-2.5/5A 15. Auto Transfomer 10A 16. Auto Transfomer 20A with Bridge Rectifier 17. Dc Series Motor 5HP 18. DPST Switch 19. Hylem Sheet with Accy 20. Rheostat 1PH 3KW 21. Rheostat 3PH 2kw 22. Rheostat 3PH 3kw 23. Ammeter 0-10 A AC 24. Ammeter 0-2A DC				

			10. Ammeter 0-30A DC 11. TRANSFORMER 3PH 2KVA 12. DIGITAL WATTMETER(Schneider) 13. DIFFERENTIAL PROBE 14. AC/DC CURRENT CLAMP 15. ANALOG MULTIMETER 16. INDUCTOR COIL 0.15H - 1.4 H 3. Rheostat 50 ohms 5A 4. Veriable Transformer 0-250V AC 5. DC MOTER 1HP,4A 6. 3 PH Inductions Motor,0.75 KW-1.8 A 7. DIGITAL MULTIMETER 4&1/2 8. TRANSFORMER 1HP0.75 kw,200-240V AC				

3	Power Electronics Lab	3-4	16. Dual Power Supply 17. Oscilloscopes 18. Differential Probes 19. Function generator 20. DC DC converters 21. DC AC Inverters 22. Computers 23. MATLAB software 24. LABVIEW software 25. PLEXIM	2017-2018 Even Sem: 8 Hrs + 3 Hrs project 2018-2019 Odd Sem: 8 Hrs + 3 Hrs project 2019-2020 Odd Sem: 8 Hrs + 3 Hrs project	Mr. Babu ram dash And Mr. B M Hazari	Lab Assistant Lab Assistant	B.Tech B.Tech
4	Advanced Electronics Lab	3-4	18. Dual regulated power supply 19. Single channel power supply 20. Digital storage oscilloscope (DSO) 21. Dual channel function generator	2017-2018 Odd Sem: 8 Hrs Even Sem: 8 Hrs + 4 Hrs project	Mr. Muragaiah	Lab Assistant	Diploma

			11 Digital multimeter 12 (dmm) 13 Digital multimeter 14 Black 15 Analog multimeter 16 Analog system lab kits 17 (asl kits) 18 Project bread board kits 19 Bread boards	2018-2019 Odd Sem: 8 Hrs Even Sem: 8 Hrs + 4 Hrs project 2019-2020 Odd Sem: 8 Hrs Even Sem: 8 Hrs + 4 Hrs project			
5	Digital Electronics & Microprocessor Lab	2-3	• Computers • 8085 Based Advance Microprocessor Trainers Kits • 8086/8088 based Advance Microprocessor- • 8255 study Card Interface • 8259 Study Card Interface	2015-16 : Odd sem : 8 hrs Even sem :8 hrs	Mr. A. Rajesh Yadav	Lab Assistant	B.Tech

			• 8channel 12 bit ADC Interface without Mux • Stepper Motor Interface with Stepper motor-3No's • Dual DAC interface-3No's • Raspberry pi 3bmodel • Altrea DE2-115 Educational and development kit Board • 8051 Microcontroller Trainers kit • STM-32F303 Nucleo • Arduino uno • Sim900A • Xbee S2c • Xbee USB Host – • 20*4 LCD • 16*2 LCD - • Ultrasonic HRSO4 - • MG996 SERVO MOTOR • Stepper Motor - 18 No's	2016-17 : Odd sem : 8 hrs Even sem: 8 hrs 2017-18 : Odd sem : 8 hrs Even sem: 8 hrs 2018-19 : Odd sem : 8 hrs Even sem: 8 hrs 2019-20 : Odd sem : 8 hrs Even sem: 8 hrs			

6	Wireless Innovation & 5G Lab	1-2	• WSN-iOT Testbed for 5G • Lime SDR with Firmware & Gateware Updates • LTE Band 7 Duplexer • Lime SDR Case • UFL to SMA Cable • SMA Cable male to female • SMA Connector male to female • Female USB 3.0 tp male 3.0 with Y spliter • 50Hz-6GHz Telescopic Antenna • ACS 4G- LTE sim card Reader/ Writer • 4G LTE blank sim card • Huawel E938U 4G Dongel • Sim card Writer software • 10A Lenovo power bank • Logitech C270 Web Cam • Mobile phone power bank	2015-16 : Odd sem : 8 hrs 2016-17 : Odd sem : 8 hrs 2017-18 : Odd sem : 8 hrs 2018-19 : Odd sem : 8 hrs	Dalbir Singh	Lab Assistant	B.Tech

			• Bread Board • 5NR-iOT Bridge • Samsung S6 Edge Smart – Phone Compatible with 5 nines radio • RSA –DKIT 306 • CPU& Monitors -06 • NI USRP-2901, 2 channel 70 MHz to 6 GHz • USRP24W power supply • Tri band 7 inch vertical Antenna • 2.4 & 5 GHz Dual band vertical antenna • 824-960MHz Antenna • CPU & Monitor s-02	2019-20 : Odd sem : 8 hrs			

- **Maintenance Schedule and Overall ambience**

Cleanliness of a laboratory is a prime concern for good teaching/learning ambience. The electrical appliances (fan, light and proper ventilation) are the next significant component of the laboratory. Any laboratory has several equipment's specific to its own domain. Each of such equipment's have to be in good working condition during the conduct of any laboratory class. Proper maintenance and servicing on a periodic basis are done in all the laboratories. Any deficit of equipment/ test kit is noted at the beginning of the semester and efforts are taken to procure the same. The consumable components of laboratory get worn out (or) get damaged. These items need to be purchased periodically as when need arises. Annually each laboratory is monitored for their assets and a status report is prepared. Some components which are obsolete are disposed from time to time. The maintenance schedule carried out in Electrical and Electronics Engineering Department is attached below table 6.

Table B.6.2 Maintenance schedule of the laboratory

Task	Frequency	Performed by	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Lab cleaning	Every day	House keeping												
Multimeter Checking	Weekly	Lab staff												

Project kits making	Half yearly	Lab staff												
Experimental Kit Testing	Weekly	Lab staff												
CRO calibration and Probe testing	Every Month	Lab staff												
Connectors soldering, Wire Clamping	Weekly	Lab staff												
Regulated Power Supply calibration	Monthly	Lab staff												
Function Generators calibration	Monthly	Lab staff												
Equipment Purchasing	As per need	Lab staff												
Equipment	As per	Lab staff												

servicing	need													
Stock verification	Half yearly	Lab staff												
Faulty equipment reparing	As per need	Lab staff												
Safety equipment checking	Monthly	Lab staff												

- **Safety measures in Laboratories (10)**

Table B.6.3 Safety measures in laboratories

Sl.No	**Name of the laboratory**	**Safety Measures**
1	Basic Electrical Engineering Lab (2 Nos)	Fire extinguisher, First aid kit, Emergency Exit
2	Electrical Machines Lab	First Aid, Fire Extinguisher, Rubber Mat, Safety Instruction Board,

		MCB, Safety precautions chart, Treatment against shock chart, Emergency Exit
3	Power Electronics Lab	First Aid, Fire Extinguisher, Rubber Mat, Safety Instruction Board, MCB, Safety precautions chart, Treatment against shock chart, Emergency Exit
4	Advanced Electronics Lab	MCB, Fire extinguisher, First aid kit,

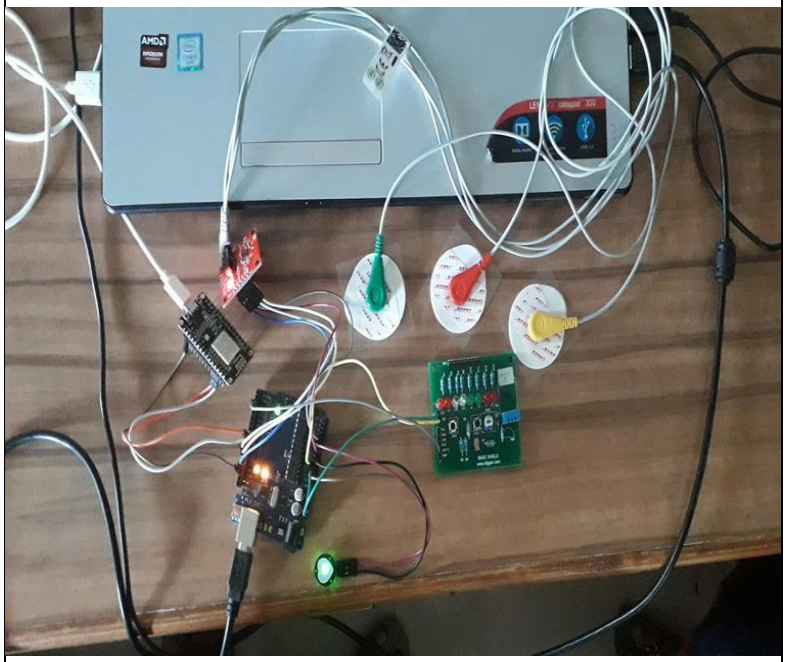
		Rules and Safety Precaution Board. Emergency Exit
5	Digital Electronics & Microprocessor Lab	MCB, Fire extinguisher, First aid kit, Rules and Safety Precaution Board. Emergency Exit
6	Wireless Innovation & 5G Lab	Fire extinguisher, First aid kit, Emergency Exit

- **Project laboratory (20)**

All the academics labs are equipped with a designated location where students can do their projects. The project lab is equipped with state of art facilities and latest emerging equipment's. All the research equipment which are used for PhD research is also accessible to the UG students to perform their project work. Also, in the department it is highly encourage towards the multi-disciplinary projects, where students from different programs can also come and work.

Table B. 6.4 Project Laboratory

Lab Photo	Description
	**Project**: Load Test on Three Phase Transformer
	Venue: Electrical Machines Laboratory
	Description: To determine the performance of transformer under open circuit and short circuit conditions and it is equipped with a three phase transformer 2kVA-01 Nos, Three phase Auto-Transformer 440V,10A -01, Ammeter 0 to 15A -02 Nos, Voltmeter 0 to 300V -01 Nos, Digital Wattmeter 440V,20A -02 Nos, Loading rheostat, Panel mounted Three phase 2 KW-01 Nos

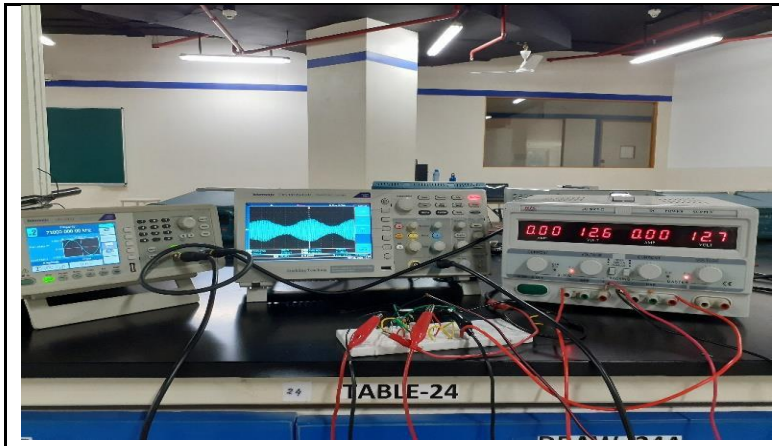


Project Lab: Smart health check

Venue: Digital Lab and Microprocessor Lab

Description: Keeping track of the health status of the patient at home is a difficult. Especially old age patients should be periodically monitored and their loved ones need to be informed about their health status from time to time while at work. So we propose an innovative system that automated this task with ease. Our system puts forward a smart patient health tracking system that uses Sensors to track patient health and alerts the care takers in case of emergencies.

This laboratory is equipped with various digital and micro controller equipment in which students can able to test the electronic equipment.

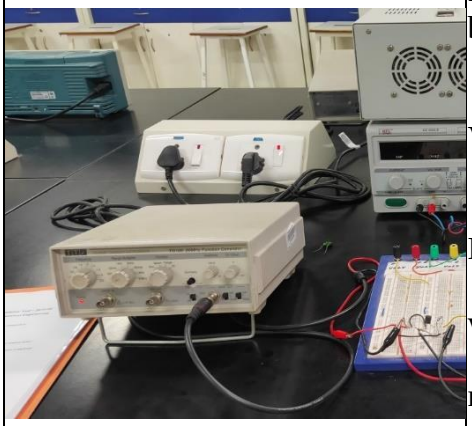


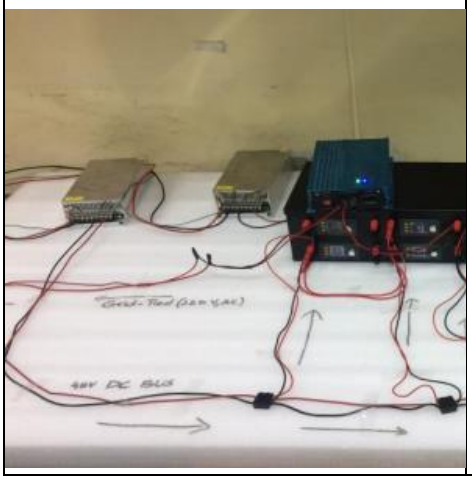
Project Lab:- Amplitude Modulation

Venue: Advanced Electronics Lab

Description:- This project lab has facilities 2 channels digital storage oscilloscope with range 70Mhz- 1GS/S here this instrument is very usefulfor analysis wave shaping, frequency, due to cycle,

And time periods of radio frequency, and carrier signal. Advanced level function generator instrument also available in this laboratory it can generate the different functions wave forms with 25Mhz and 125 MS/S and duel regulated power supply available in this laboratory.in this laboratory can be analysis & practice communication engineering many projects work.





Project Lab: Smart Microgrid and Renewable Energy Research test bed

Venue: Power Electronics and Machines Lab

Description: This is equipped with the state of art research equipment withcutting edge technology. It has latest NI Labview SBRIO, DC microgrid research testbed, required communication infrastructure, DC-ACinverters, Dataloggers, My RIO's, Variable frequency drives, FPGA boards, Solar PV array emulator etc