

## ANNEXURE G

### LABORATORY FACILITIES

#### HEAT TRANSFER LABORATORY

##### List of major equipments

1	Specific heat apparatus
2	Lagged pipe apparatus
3	Parallel flow and Counter flow Heat exchangers.
4	Emissivity apparatus
5	Stefan-Boltzmann's apparatus
6	Coiled type heat exchanger
7	Condenser
8	Forced convection apparatus
9	Natural convection apparatus
10	Radiation heat transfer apparatus

##### List of Experiments

1	Determination of specific heat by method of mixtures.
2	Determination of thermal conductivity by lagged pipe method
3	Determination of thermal conductivity in a composite wall
4	Solving problems on conduction and convection heat transfer
5	Determination of heat transfer coefficient in a parallel flow heat exchangers.
6	Determination of heat transfer coefficient in a counter flow heat exchangers
7	Determination of heat transfer coefficient in forced convection
8	Determination of heat transfer coefficient in free convection.
9	Solving problems on radiation heat transfer.
10	Determination of emissivity of the given test surface.
11	Determination of Stefan-Boltzmann's constant in radiation heat transfer.
12	Determination of effectiveness of heat transfer in a radiator.
13	Determination of effectiveness of heat transfer in a coiled type heat exchanger.
14	Determination of effectiveness of a condenser.
15	Solving problems on mass transfer.
16	Solving problems on mass transfer.

## **UNIT OPERATIONS LABORATORY**

### **List of major equipments**

1	Rotary flash evaporator
2	Centrifugal separator
3	Cyclone separator
4	Filtration apparatus
5	Sieve Shaker
6	Burr mill
7	Ball mill
8	Hammer mill
9	Pin mill
10	Cleaner cum grader
11	Soxhlet apparatus

### **List of Experiments**

1	Determination of economy and thermal efficiency of rotary flash evaporator
2	Solving problems on single effect evaporator
3	Solving problems on multiple effect evaporators
4	Determination of separation efficiency of centrifugal separator.
5	Determination of collection efficiency in cyclone separator.
6	Determination of efficiency of liquid solid separation by filtration.
7	Determination of absorption efficiency in a packing tower
8	Determination of particle size of granular foods by sieve analysis.
9	Performance evaluation of a sieve.
10	Determination of performance characteristics in size reduction using the burr mill.
11	Determination of energy requirement in size reduction using the ball mill and hammer mill.
12	Performance evaluation of pin mill.
13	Performance evaluation of a hammer mill.
14	Performance evaluation of a steam distillation process.
15	Visit to a solvent extraction industry.
16	Visit to a sugar industry.

## **CROP PROCESS ENGINEERING LABORATORY**

### **List of major equipments**

1	Moisture meters
2	Porosity apparatus
3	Hardness tester
4	Coefficient of static friction apparatus
5	Angle of repose apparatus
6	Air-screen machine apparatus
7	Specific gravity separator
8	Groundnut decorticator
9	Indented Cylinder separator
10	Parboiling unit
11	Engleburg huller
12	Centrifugal dehusker
13	Rubber roll sheller.
14	Bucket elevator
15	Screw conveyor
16	Belt conveyor.
17	Thin layer dryer
18	Fluidized bed dryer

### List of Experiments

1	Experiments with moisture meters and determination of moisture content by different methods.
2	Determination of bulk density, porosity and particle density of food grains.
3	Determination of hardness of grains, coefficient of static friction and angle of repose for various food grains.
4	Performance evaluation of air-screen machine for cleaning and grading of various grains/ seeds.
5	Performance evaluation of specific gravity separator
6	Experiment on groundnut decorticator to determine the efficiency of shelling.
7	Performance evaluation of cylinder separator.
8	Experiment on parboiling of paddy.
9	Testing of Engleburg huller for dehusking and polishing of rice
10	Testing of centrifugal dehusker and polisher

11	Experiment on rubber roll sheller and polisher.
12	Evaluation of bucket elevator and screw conveyor.
13	Evaluation of belt conveyor.
14	Experiment on thin layer dryer to determine drying characteristics.
15	Experiment on fluidized bed dryer to determine drying characteristics.
16	Visit to modern rice mill/ storage godowns.

## **FOOD ENGINEERING LABORATORY**

### **List of major equipments**

1	Foam mat dryer
2	Tray drier
3	Twin screw Extruder
4	Freeze dryer
5	Fruit pulper
6	Water activity meter
7	Viscometer
8	Textural analyzer
9	Canning apparatus

### **List of Experiments**

1	Determination of mixing index of solids.
2	Determination of mixing index of liquids.
3	Experiments on sterilization of foods in retorts.
4	Experiments on tray dryers.
5	Determination of osmotic characteristics of food materials
6	Experiments on foam mat drying of foods
7	Experiments on extrusion cooking.
8	Determination of freezing point of food materials.
9	Experiments on freeze dryer.
10	Evaluation of fruit pulper
11	Determination of water activity of food materials.
12	Determination of viscosity of food materials.
13	Determination of textural characteristics of foods.

14	Experiments on canning
15	Solving problems on determination of thermal death time, F, D and Z.
16	Visit to food processing pilot plant

## **DAIRY ENGINEERING LABORATORY**

### **List of major equipments**

1	Plate heat exchanger
2	Cream separator
3	Homogenizer
4	Butter churner
5	Spray dryer
6	Drum dryer
7	Ultra filtration equipment
8	Reverse osmosis equipment

### **List of Experiments**

1	Determination of properties of butter and ghee
2	Determination of properties of milk
3	Experiments on pipe fitting, gaskets, storage tanks to study the material of construction and performance.
4	Experiments on milking machine
5	Experiments on HTST pasteurizer to evaluate the performance of the system for holding time.
6	Experiments on cream separator to determine the separation efficiency.
7	Experiments on homogenizer to determine homogenization efficiency.
8	Experiments on construction and operation of butter churn and butter working accessories
9	Determination of extraction efficiency of butter churn
10	Experiments on ice cream freezer and production of ice creams.
11	Experiments on spray dryer.
12	Experiments on drum dryer.
13	Experiments on ultra filtration equipment.
14	Experiments on reverse osmosis equipment.
15	Solving problems on pasteurization of milk.
16	Estimation of energy requirement for the production of milk powder

## **FOOD PACKAGING LABORATORY**

### **List of major equipments**

1	Bursting strength apparatus
2	Tensile strength. Apparatus
3	Tearing strength
4	Permeability apparatus
5	Impact strength apparatus
6	Paste filling machine
7	Sealing machine
8	Bottle filling machine
9	Volumetric filling machine

### **List of Experiments**

1	Testing of paper thickness and percent moisture present.
2	Testing of paper - opacity.
3	Testing of papers - bursting strength.
4	Testing of papers - tensile strength.
5	Testing of papers - tearing strength and permeability.
6	Testing of bottle - measurement, resistance to thermal shock.
7	Can measurement and canning.
8	Testing of plastics - thickness.
9	Testing of plastics – impact strength.
10	Experiments with paste filling machine.
11	Experiments with pilfer proof thread sealing machine.
12	Experiments with constant volume form-fill – seal machine.
13	Experiments with bottle filling machine – vacuum principle.
14	Retort pouching.
15	Visit to a packaging industry.
16	Visit to a food industry and study the packaging practice.

## BIO CHEMISTRY LABORATORY

### List of Experiments

Sl.No	
1	Qualitative tests for carbohydrates
2	Estimation of reducing sugars
3	Estimation of total carbohydrates
4	Determination of fructose
5	Estimation amylase
6	Estimation of starch
7	Estimation of oil in seeds
8	Estimation of free fatty acids
9	Determination of iodine value
10	Qualitative tests for amino acids and proteins
11	Estimation of free amino acids
12	Estimation of protein
13	Paper chromatography
14	Assay of amylase
15	Assay of catalase
16	Estimation of ascorbic acid
17	

### List of equipments

Sl.No	
1	Spectrophotometer
2	Colorimeter
3	PH metter
4	KEL PLUS
5	Autoclave
6	Hot air oven
7	Electronic balances
8	Mixer/blender
9	Chromatograph
10	TCC complete set

## WIND ENERGY CONVERSION

Sl.No.	List of major equipments
1.	Horizontal axis wind mill, and vertical axis wind mill
1.	Wind generators
1.	Horizontal axis wind mill with AC generator test rig
1.	Vertical axis wind mill apparatus with DC generator test rig
1.	Wind mill apparatus with gear pump test rig
1.	Anemometer
1.	Digital Ammeter
1.	Digital voltmeter
1.	Digital Frequency meter
1.	Low power aerogenerator
1.	Wind mill gear pump experimental set-up with wind
1.	Generator
1.	Digital RPM counter
1.	Storage batteries
List of experiments	
S.No.	Title of the exercise
1.	Study on wind energy potential in India.
2.	Wind energy conversion calculations for power.
3.	Study of wind measuring instruments.
4.	Energy estimation from wind data.
5.	Power available at different heights.
6.	Design of rotor blade.
7.	Aerofoil design.
8.	Problems on forces on the blades and thrust on turbines.
9.	Study of water pumping windmills.
10.	Problems on Betz coefficient.
11.	Velocity duration curves.
12.	Power duration curves.
13.	Problems on tip speed ratio.
14.	Visit to wind farms.
15.	Wind farm economics.
16.	Study on wind energy storage system

**ERG 182 FUELS AND COMBUSTION (1+1)**

<b>Sl.No.</b>	<b>List of major equipments</b>
1.	Pilot Biodiesel Plant
2.	Bomb calorimeter
3.	Dual fuel engine test setup
4.	Tar viscometer
5.	Distillation apparatus
6.	Flash point apparatus (Ables Flash Point apparatus)
7.	Say bolt Viscometer
8.	Corrosion test apparatus
9.	Bomb colorimeter
10.	Kinematic viscometer
11	Ried's vapour pressure test apparatus
12	Cloud and power point apparatus
13	Engler Viscometer
14	Flash point apparatus(Pensky martens Flash point Apparatus
15	Redwood viscometer
16	Carbon residue apparatus
17	Filtration unit
18	Orsat apparatus
19.	Biodiesel production and testing instruments
<b>List of experiments</b>	
<b>S.No.</b>	<b>Title of the exercise</b>
1.	Proximate analysis of solid fuels.
1.	Calculation of HHV of solid and liquid fuels.
1.	Calculation of LHV of gaseous fuels.
1.	Determination of stoichiometric air requirement and excess air.
1.	Gravimetric analysis, volumetric analysis and conversion.
1.	Study and use of Bomb calorimeter.
1.	Study of Boy's gas calorimeter.
1.	Study of Junker's gas calorimeter.
1.	Study of Orsat apparatus.
1.	Study of infra-red gas analyzers.
1.	Study of Gas Chromatography.
1.	Study of stack gas monitor.

1.	Study of different types of furnaces.
2.	
1.	Study of different types of refractories.
1.	Testing of briquetting machines and wood burning stoves.
1.	Heat balance analysis of combustion systems.

<b>Sl.No.</b>	<b>List of major equipments</b>
1.	Hot air oven
2.	BOD incubator
3.	Laboratory centrifuge
4.	Filtration Assembly
5.	Fermenter models
6.	Digital electronic balance
7.	Heavy duty lab stirrers
8.	COD apparatus
9.	Agitators assembly
10.	Aeration Assembly – Lab Model
11.	Muffle furnace
<b>S.No.</b>	<b>Title of the exercise</b>
1.	Determination of growth rate of microorganism.
1.	Determination of doubling time.
1.	Mass balance calculation in bioreactors.
1.	Determination of reaction rate and order of reaction.
1.	Problems on MM equation.
1.	Problems on Lineweaver – Burk Method.
1.	Problems on Eadie – Hofstee plot.
1.	Determination of dissolved oxygen content.
1.	Determination of biological oxygen demand.
1.	Determination of chemical oxygen demand.
1.	Design of fermenter.
1.	Scale up procedures in fermenters.
1.	Experiments on filtration and centrifugation.
2.	
1.	Membrane separation in biochemical process.
1.	Downstream processing methods.
1.	Experiments on agitation.

## ERG 281 BIOCHEMICAL ENGINEERING AND APPLICATIONS (1+1)

### SOLAR ENERGY CONVERSION

Sl.No.	List of major equipments
1.	Multi point temperature recorder
2.	Solar generator
3.	Multi stem thermometer
4.	Global solar radiation model WE 300
5.	Digital temp. indicator – 2 Nos.
6.	Hand-held Humidity/Temperature meter
7.	Biometallic pyranometer
8.	Hygrometer – 0 – 100 °C
9.	Fibre glass moulded solar cooker
10.	Solar water heater
11.	TNAU model solar drier
12.	ULV sprayer
13.	TNAU step type solar dryer W/Al tray
14.	Pyranometer with Albedo system and electric Integrated printer
15.	Pyreheliometer
16.	Digital Anemometer
17.	Micro pressure based temperature process monitor and transmitter with
18.	accessories
19.	Solar PV modules
20.	Solar lantern
	Solar home lighting and street lighting systems
List of experiments	
S.No.	Title of the exercise
1.	Study of radiation measuring instruments pyrheliometer, pyranometer, sunshine recorder, Eppley pyrheliometer.
1.	Visit to meteorology section.
1.	Estimation of relationship between basic earth – sun angles.
1.	Estimation of solar energy availability.
1.	Determination of local civil time, solar time and time of day.
1.	Estimation of thermal losses, overall heat loss co-efficient of FPC.
1.	Estimation of efficiency of solar flat plate collectors.
1.	Testing of solar cookers.

1.	Testing of solar air heaters.
1.	Testing of solar water heater.
1.	Testing of solar dryers.
1.	Testing of solar still.
1.	Testing of PV cells.
1.	Estimation of PV characteristics
1.	Study on PV sprayer.
1.	Problems on PV applications.

### **BIO AND THERMO CHEMICAL CONVERSION**

<b>Sl.No.</b>	<b>List of major equipments</b>
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1.	Hot air oven
2.	Muffle furnace
3.	Hot plate
4.	BOD Incubator
5.	COD assembly
6.	Micro Kjeldahl assembly
7.	Flame photo meter
8.	High rate reactor – experimental set up
9.	Solid state biogas plant – experimental set up
10.	Biphasic system –experimental set up
11.	KVIC type biogas plant – experimental set up
12.	Biogas burners
13.	Biogas storage devices
14.	Biogas plant lab models
15.	Biogas run engine
16.	Biogas cum solar light type
17.	Biogas brooder
18.	Biogas lamp
19.	Sacharometrer
20.	Online temperature and pressure monitoring System
22.	Smoke analyzer
23.	Test rig for gasification (downdraft)
24.	Test rig for pyrolysis
25.	Rice husk gasifier
26.	Wood based gasifier
27.	High temperature pyrolytic apparatus
28.	Temperature scanner
29.	Load cell
30.	Engine test rig
31.	Gas calorimeter
32.	Open core gasifier
33.	Wood burning stoves
34.	Tar & TSP measurement set up
35.	Fluidized bed gasifier
36.	Different types of gas cleaning systems.

**List of experiments**

<b>S.No.</b>	<b>Title of the exercise</b>
1.	Biomass characteristics – proximate analysis and ultimate analysis
1.	Determination of total solids and volatile solids.
1.	Design of fixed dome type and movable drum type biogas plants.
1.	Design of gas conveyance system.

1.	Slurry analysis for N, P, K content.
1.	Study of biodigested slurry handling machines.
1.	Visit to biogas plant and analysis and rectification of defects.
1.	Study of biogas purification.
1.	Cost estimation of biogas plants – drum type, dome type.
1.	Study and use of biogas stove and dual fuel engine.
1.	Study of different types of kilns for charcoal production.
1.	Testing of rice husk gasifier.
1.	Testing of down draft gasifier.
1.	Testing of open core gasifier.
1.	Study of producer gas cleaning systems.
1.	Testing of fuel efficient wood burning stoves – gas analysis.

### GENERAL MICROBIOLOGY (2+1)

Sl.No.	List of major equipments
1.	Laminar flow chamber
2.	BOD incubator
3.	Laminator flow chamber
4.	Hot air oven
5.	Autoclave
6.	Refrigerator
7.	Environmental shaker
8.	Calorimeter
9.	Hot plate
10.	Gas chromatograph
11.	Digital pH meter
12.	Spectrophotometer
13.	BOD incubator
14.	Flame photometer
15.	Distillation assembly
16.	Muffle furnace
17.	Glass water still
18.	Laboratory centrifuge
19.	Laboratory shakers
20.	COD apparatus
<b>List of experiments</b>	
S.No.	Title of the exercise
1.	Study and experiments with light microscope

1.	Study and experiments with different microscopes.
1.	Measurement of microorganisms.
1.	Simple staining.
1.	Gram staining.
1.	Sterilization techniques and equipments.
1.	Preparation of culture media.
1.	Isolation of microorganisms and enumeration.
1.	Growth of bacteria - colorimetric method - plating method.
1.	Purification of bacteria.
1.	Purification of fungi.
1.	Study of physiological characteristics of bacteria.
1.	Study of bacteria - morphology.
1.	Study on the bacterial mutation.
1.	Viruses - bacteriophages - plaque formation.
1.	Industrial uses of microorganisms.

### **HYDROGEN PRODUCTION AND FUEL CELL**

<b>Sl.No.</b>	<b>List of major equipments</b>
1.	B.E.T. Analyzer
2.	LDU AFC Plant
3.	Furnace (high temp.)
4.	Gas mixer
5.	Deionisation unit
6.	Pyrolytic furnace
7.	Hydrogen generator
8.	LDU of AFC
9.	Tape cast roller
10.	Half cell assembly
11.	Flow and pressure test bench
12.	Ultrasonic blender
13.	Water bath
14.	Magnetic stirrer
15.	Ultrasonic cleaner
16.	Fuel cell assembly
17.	SOFC fabrication die
<b>List of experiments</b>	
<b>S.No.</b>	<b>Title of the exercise</b>
1.	Study of simple electrolysis, tank electrolyzer and filter press electrolyzer.

1.	Study of Westinghouse electrochemical thermal sulphur cycle and Ispra Mark cycle.
1.	Study of gas generators and comparison.
1.	Study of solar energy methods for hydrogen production.
1.	Study of hydrogen production through shift reactions.
1.	Study of transportation and utilization of gas.
1.	Comparison of various alternative fuels with hydrogen as engine fuel.
1.	Study of metal hydride and its applications.
1.	Study of alkaline fuel power plants.
1.	Study of molten carbonate fuel cell.
1.	Study of phosphoric acid and solid oxide fuel cells.
1.	Study of polymer electrode membrane fuel cell.
1.	Study of conversion efficiency and polarization of fuel cell.
1.	Work output and EMF of the fuel cell.
1.	Problems on various types of fuel cells.
1.	Study of fuel cell power plants.

## HUMAN ENGINEERING LAB

### List of major equipment

S.No.	List of major equipments
1.	Computerized ambulatory metabolic measurement systems
1.	Computerized heart rate monitor
1.	Blood lactate analyser
1.	<b>Computerized heart rate monitor</b>
1.	<b>Nova tech load cells</b>
1.	Anthropometer
1.	Bicycle ergometer
1.	Air Velocity Meter Model Prova Avm- 03
1.	Digital hand held Lux meter Model LX 102
1.	Digital contact/Non contact Tachometer Model D7 2236
1.	Digital precision pocket barometer Model GPB-1300
1.	Hand held gun type infrared thermometer
1.	Digital thermo hygrometer
14	Torque transducer
15	Tread mill

<b>List of experiments</b>	
<b>S.No</b>	<b>Title of the exercise</b>
1	Identification of anatomical reference planes and directional terms of human body
2	Identification of anthropometric dimensions for agricultural machinery design
3	Measurement of anthropometric data
4	Selection of subjects for ergonomic investigations
5	Estimation of Basel Metabolic Rate (BMR) using Benedict- Roth spirometer
6	Estimation of power and capacity of human subject using tread mill
7	Estimation of power and capacity of human subject using Ergometer
8	Measurement of heart rate using Polar heart rate monitor
9	Calibration of subjects and computation of Maximum Aerobic Capacity (VO <sub>2</sub> max) of human subject
10	Energy cost of operation by closed circuit method using indirect calorimetry
11	Assessment of oxygen consumption rate of human subject in terms of Acceptable Work Load (AWL)
12	Assessment of work pulse of human subject in terms of Limit of Continuous Performance (LCP)
13	Grading of energy cost of work
14	Assessment of subjective rating scale in terms of Overall Discomfort Rating (ODR)
15	Assessment of subjective rating scale in terms of Body Part Discomfort Score (BPDS)
16	Measurement of force required for manually operated implements

### **MACHINE SHOP**

<b>S. No.</b>	<b>List of major equipments</b>
1	Lathe
2	Drilling machine
3	Shaper
4	Milling machine
5	Welding machine
6	Drilling machine
7	Grinding machine
8	Power hammer
9	Sheet bending machine
10	Spot welding machine

<b>List of experiments</b>	
<b>S. No</b>	<b>Title of the exercise</b>
1	Identification of carpentry tools & Exercise in planing a wooden block
2	Practice in making a half lap joint
3	Practice in making a tee halving joint
4	Identification of fitting tools & Exercise in filing a metal piece
5	Practice in making a "L" joint
6	Exercise in fitting a square joint
7	Identification of smithy tools and exercise in making a "S" hook
8	Visit to foundry and identification of foundry and pattern making tools
9	Identification of arc welding equipments and tools & Exercise in welding a butt joint
10	Identification of gas welding equipment and tools & Exercise in welding a Tee joint
11	Identification of lathe and its functional components and Exercise in facing operation
12	Plain turning exercise in lathe
13	Step turning exercise in lathe
14	Drilling and boring exercise on lathe
15	Thread cutting exercise on lathe
16	Practice in shaping and milling operations

#### **Electronics and Instrumentation Lab.**

<b>S. No.</b>	<b>List of major equipments</b>
1	Cathode ray oscilloscope and micro processor 8085
2	Variable power supply
3	Dual power supply
4	LVDT instrumentation trainer kit
5	LDR instrumentation trainer kit
6	Capacitance instrumentation trainer kit
7	Photo electric instrumentation trainer kit
8	Variable reluctance instrumentation trainer kit
9	Stain measurement instrumentation trainer kit
10	Load measurement instrumentation trainer kit
11	Temperature measurement using Thermister, RTD and thermocouple

12	Operation amplifier trainer kit
13	Multi meter and other digital measuring devices for humidity, pressure etc.
<b>List of experiments</b>	
<b>S. No</b>	<b>Title of the exercise</b>
1	Studies on Electronic components, Measuring and Testing instruments
2	Circuit practice on 741 operational amplifier applications – I
3	Circuit practice on 741 operational amplifier applications – II
4	Building timer based circuits using 555 IC
5	Bridge rectifier circuit – with and without filter
6	Study of Johnson counter and ring counter
7	Digital to analog converter and analog to digital converter
8	LDR Transducers for displacement sensing
9	Strain gauge transducers
10	Capacitive transducer and Piezo electric crystal transducer
11	Linear variable differential transformer
12	Speed measurement using variable reluctance and photoelectric transducers
13	Temperature detector using thermistor
14	Temperature detector using RTD
15	Digital measuring devices
16	Study of 8085 microprocessor

## ELECTRICAL ENGINEERING LABORATORY

<b>S. No.</b>	<b>List of major equipments</b>
1	A.C. motor – load test
2	Circuit connections (Hostel, godown, signal , staircase and dim & bright circuits)
3	D.C. converter
4	D.C. series motor
5	D.C. compound motor
6	D.C. motor (Shunt)
7	D.C. shunt generator
8	Single phase transformer
9	Starter connections – Star Delta
10	Starter connection – DOL starter
11	Electrical accessories like Watt meter, volt meter and ammeter for power factor determination
<b>List of experiments</b>	
<b>S. No</b>	<b>Title of the exercise</b>
1	Computation of electrical energy for an appliance by using energy meter
2	Determination of power factor of a load
3	Characteristics and application of DC shunt motor
4	Characteristics and uses of DC series motor
5	Determination of performance characteristics of DC compound motor
6	Testing of DC series generators for industrial use
7	Testing of a DC shunt generator
8	No load and load characteristics of a single phase transformer
9	Practice of staircase and hostel wiring
10	Practices on industrial wiring
11	Determination of characteristics of 3-phase induction motor
12	Alternator – mode of connection and testing
13	DOL starter connection
14	Star delta starters – connections
15	Installation practice for 3 phase motors and single phase motors
16	Determination of electrical load for a plant/installation



**CADCAM LAB**

<b>S. No.</b>	<b>List of major equipments</b>
1	PC with Intel P 4, 2 GHZ, Computer and accessories (Init)
2	AMD Athlon0 x P 200 processor -Computer and accessories (HCL)
3	PC with Intel P 4 3GHZ –Intel D915 MB Computer and accessories (Init)
4	PC with Intel P4, 3 GHZ 530 Model (Init)
5	Computer Stand (3'x1½'x2 ½')
6	Computer Stand (3'x1½'x2 ½')
7	Computer Stand (2 ½'x1½'x2 ½')
8	Computer Operator seat
9	Revolving Computer Operator seat
10	5 KVA online UPS (BPC)
11	White Board (900x200mm)
12	Wall mounting screen (5' x 5')
<b>List of experiments</b>	
<b>S. No</b>	<b>LCD Projector (Sanyo)</b>
1	Computer Stand cum Podium (4'x2'x2')
2	Pro Engineer / CADCAM Software
3	Lock (Godrej) (8 lever)
4	Networking Cabling
5	APC 500 VA UPS
6	AutoCAD blocks and x refs- composing and plotting drawings.
7	Dressing the drawings cross hatching, free hand sketching – using inquiring commands.
8	Dimensioning the drawings – adding attributes to drawing.
9	Advanced dimensioning – ordinate, chain and datum dimensioning.
10	Importing and exporting data and images.
11	Creating 3 D models using user co-ordinate system.
12	3D Poly lines, 3D faces,3 D surface meshes.
13	3D surface commands, boxes, wedges, cones and sphere.
14	Adjusting 3D viewpoint.
15	Creating presentations using dynamic views, slides and scripts.
16	Shading and rendering for presentation.
17	3D solid modeling.

18	Extrusion features.
19	Revolving features.
20	Introduction to machine components and convention of representation.
21	Drawing of shafts and bearing.
22	Drawing of rivets, bolt and nut other threaded fasteners.
23	Drawing of keys, hubs.
24	Drawing of shaft couplings, splines.
25	Drawing assembly of simple machines screw jack.
26	Drawing assembly of tailstock.
27	Computer aided solution to engineering problems.
28,29	Database management systems- using access for energy machinery selection
30,31, 32	Using dedicated FEM programmes for stress analysis and fluid flow.

### **SOIL DYNAMICS LAB**

<b>S. No.</b>	<b>List of major equipments</b>
1	Hot air oven
2	Insitu direct shear apparatus
3	Torsion shear apparatus
4	vane shear apparatus
5	Digital Triaxial apparatus
6	Rototap sieve shaker
7	Delta T data logger
8	Teta moisture probe
9	Digital tensiometer
10	Electronic Cone penetrometer
11	Hydraulic cone penetrometer
12	Electronic tillage dynamometer
13	Hydraulic dynamometers
14	Furrow profile meter
15	Toplink compression apparatus
<b>List of experiments</b>	
<b>S. No</b>	<b>Title of the exercise</b>

1	Determination of cone penetrometer resistance
2	Determination of shear strength of soil – Direct shear apparatus
3	Determination of shear strength of soil- vane shear apparatus
4	Determination of sinkage properties of soil
5	Determination of shear strength of soil under triaxial test
6	Determination of pulverization of soil
7	Measurement of soil moisture using Theta probe
8	Measurement of furrow profile created by tillage tools
9	Determination of draft of tillage tool by top link compression

### **TRACTION AND TILLAGE LABORATORY**

<b>S. No.</b>	<b>List of major equipments</b>
1	Rectangular soil bin
2	Dynamometers
3	Single wheel tester
4	Torque transducer
<b>List of experiments</b>	
<b>S. No</b>	<b>Title of the exercise</b>
1	Estimation of pull developed by a tyre
2	Estimation of area of contact between tyre and rigid surface
3	Tyre deflection measurements
4	Determination of slip for wheels
5	Draft force estimation of a plough body as influenced by speed and moisture content
6	Evaluation of single tyre in traction test rig at constant normal load
7	Evaluation of single tyre in traction test rig at various ballast
8	Evaluation of single tyre in traction test rig in different soil conditions
9	Forces acting on the rotary tiller tyres
10	Calculation, power requirement of rotary tillers
11	Determination of main parameters of oscillatory tools
12	Testing procedures and evaluating primary cultivation implement
13	Testing procedures and evaluating secondary cultivation implement

### **FLUID MECHANICS LAB**

#### **List of Equipments**

<b>Sl.No.</b>	<b>Name of the Equipments</b>
1	Apparatus for determining losses in pipe lines due to sudden enlargement, contraction, bends & elbows.
2	Measuring discharge through venturimeters
3	Measuring discharge through orifices
4	Centrifugal pump set
5	Venturimeters 25mm to 100mm
6	Orifice meters – 25mm to 100mm
7	Plunger pump
8	Point gauges
9	Pitot tubes
10	Air Compressor Pump

### **List of Experiments**

<b>Sl.No.</b>	<b>Name of the Experiments</b>
1	Head loss in pipe lines
2	Head loss in pipe fittings
3	Flow measurement in pipes – Venturimeter
4	Flow measurement in pipes – Orifice meter
5	Flow measurement in channels – V-notch
6	Flow measurement in channels – Rectangular notch
7	Flow measurement in channels – Orifice
8	Flow measurement from tanks - mouthpiece.
9	Performance of Centrifugal pumps
10	Performance of Monoblock pumps.