

Minimum Standards of Higher Agricultural Education (MSHAE)

Agricultural Engineering



Education Division

**Indian Council of Agricultural Research
PUSA, New Delhi 110 012**

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1	Office Order constituting the Committee	F. No. Edn. 5/4/2013-EQR dated 1 st October, 2013
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Proceedings of ICAR Committee Meeting on Minimum Standards of Higher Agricultural Education held at College of Agricultural Engineering & Technology, PAU, Ludhiana on November 25 – 26, 2013

Following were present at the meeting;

- | | |
|---|----------------|
| 1. Prof Gajendra Singh
Former Vice Chancellor & DDG (Engg.), ICAR | - Chairman |
| 2. Dr DVK. Samuel
Head, Division of Agricultural Engineering
IARI, New Delhi | - Member |
| 3. Dr HC Sharma
Dean, College of Technology, GBPUA&T, Pantnagar | - Member |
| 4. Dr JK Singh
Former Dean PGS, GBPUA&T, Pantnagar | - Member |
| 5. Dr Pritpal Singh Lubana
Dean, College of Agril Engg. & Tech., PAU, Ludhiana | - Member |
| 6. Prof Suresh S Honnappagol
Assistant Director General (EQR)
Education Division, ICAR
Pusa, New Delhi | - Member Secy. |

The committee was welcomed by Dr. B S Dhillon, Vice Chancellor of PAU and he acknowledged the ICAR for providing this opportunity to host the two important meetings of developing minimum standards of Home Science and Agricultural Engineering at PAU.

Dr P P S Lubana introduced the various HODs and Directors of constituent departments and schools of College of Agricultural Engineering & Technology, PAU, Ludhiana. He also mentioned the initiatives taken by the college towards industry collaborations and international exchange programmes for professional development and job placements of the graduating students of the college.

Dr. Gajendra Singh in his opening remarks welcomed the initiative taken by ICAR for taking up this task to establish minimum standards and requirements for opening new institution offering B.Tech degree in agricultural engineering. He

mentioned the need of strengthening the foundation of basic sciences in engineering colleges and also emphasized on producing the agricultural engineers beyond the scope of crop science. He shared his views on building the inter disciplinary cross functional teams in the institutions to complement each other rather than competing. He also mentioned that the course curriculum in the colleges should not be tight jacketed and students should have some liberty in opting their elective subjects to make themselves more employable and industry oriented.

Prof. S. S. Honnappagol acknowledged PAU for providing the requisite assistance in hosting this committee meeting at its campus. He elaborated the initiatives taken by ICAR in constituting discipline wise expert committees to workout minimum standards of higher agricultural education and also briefed regarding the new initiatives being undertaken by the education division of ICAR. He also shared the project objectives of NAEP to be carried out during 12th Five year plan.

Consequent to the above, detailed deliberations were made by the committee with due interaction among the HODs and Directors of constituent departments and schools of College of Agricultural Engineering & Technology, PAU. The minimum standards of agricultural engineering education were drafted as enclosed in the Appendix.

(Gajendra Singh)
Chairman

(D V K. Samuel)
Member

(H C Sharma)
Member

(J K Singh)
Member

(P P S Lubana)
Member

(S S Honnappagol)
Member Secretary

APPENDIX

Minimum Standards for Higher Agricultural Education

Agricultural Engineering

These are the minimum standards required for establishing a College of Agricultural Engineering with an intake of 60 students per year. However, the Agricultural University will be at liberty to enhance admission intake with appropriate addition of human resources, equipments, facilities, etc.

(1) Degree Nomenclature

B.Tech (Agricultural and Biosystems Engineering) is proposed in view of the wide opportunities available at global level.

To be debated and decided by the V Deans' Committee

(2) Eligibility Criteria

As prescribed by AICTE

(3) Medium of Instruction : English

(4) Minimum Intake : 60 students per year

(5) Departments

- i) Department of Soil and Water Engineering (SWE)
- ii) Department of Farm Machinery and Power Engineering (FMPE)
- iii) Department of Processing and Food Engineering (PFE)
- iv) Department of Applied Sciences and Engineering (AS&E)

(6) Cafeteria Courses

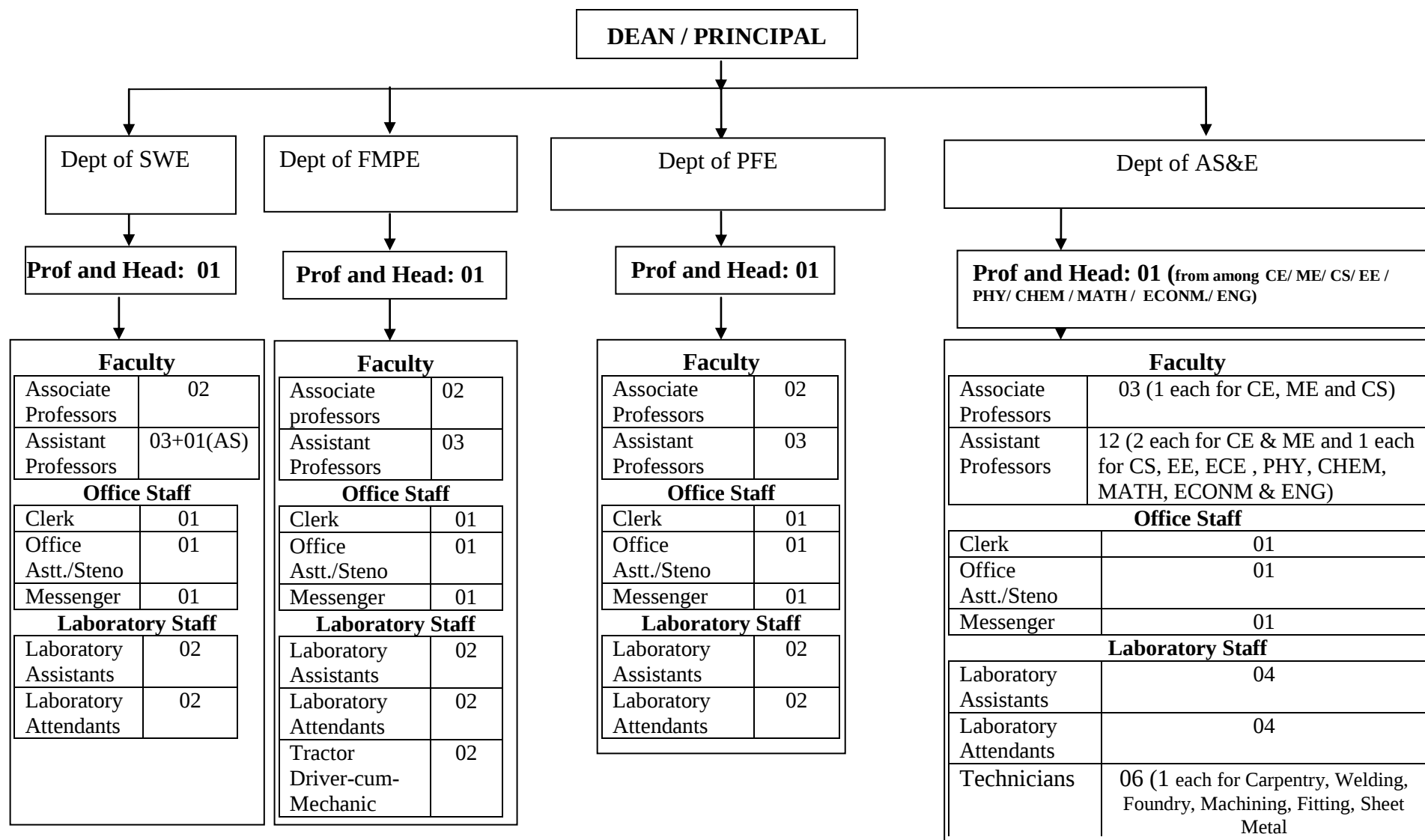
In addition to the existing 21 cafeteria courses, the following three more courses are proposed for the course of study.

- Rural Transport, Water Supply and Sanitation
- Horticultural Engineering
- Aquaculture Engineering

(7) Land Requirement: 10 hectares

(8)

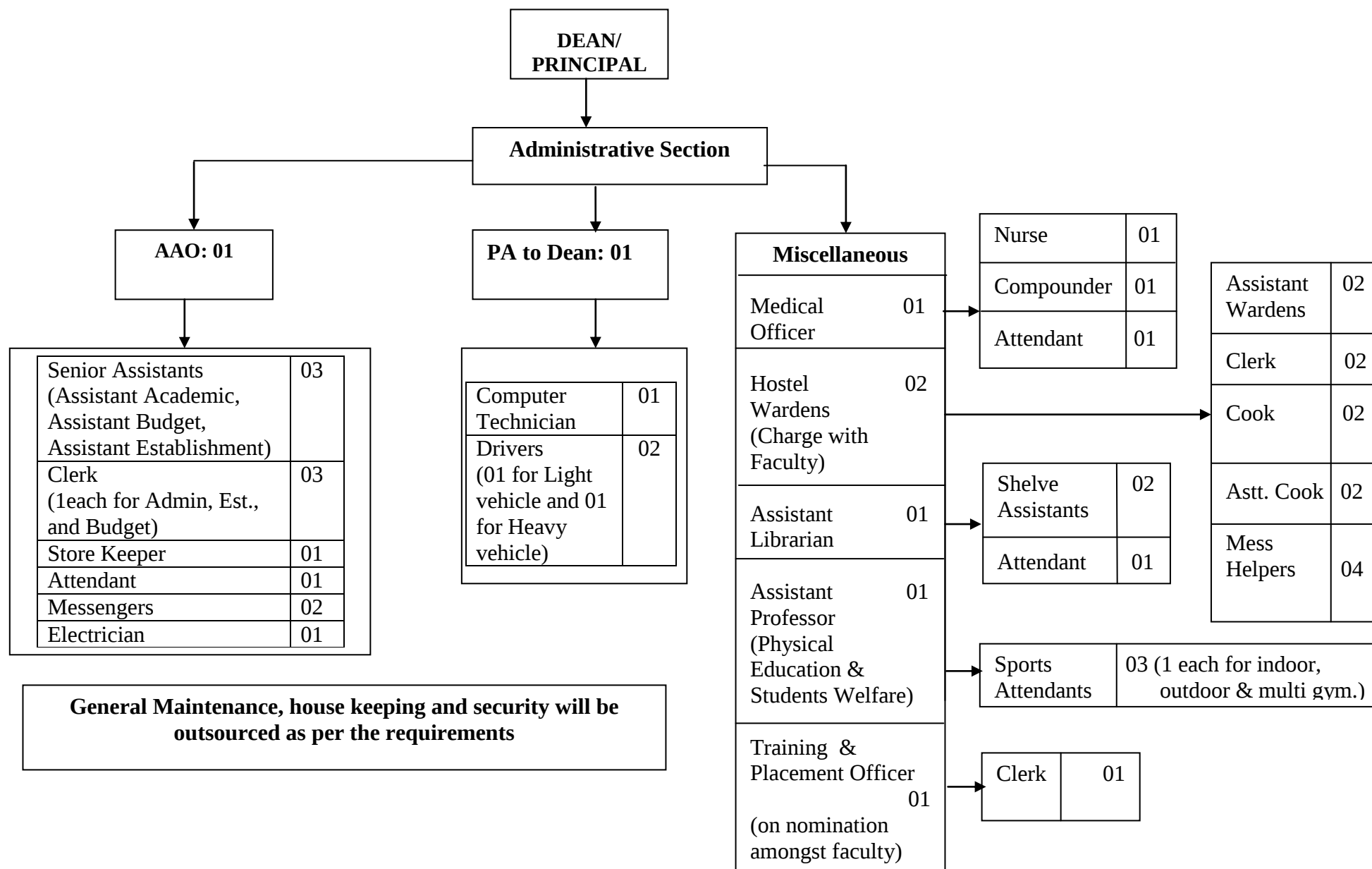
Manpower Requirement of College of Agricultural Engineering



AS: Agricultural Science; CE: Civil Engineering; ME: Mechanical Engineering; CS: Computer Science; EE: Electrical Engineering; ECE: Electronics & Communication Engineering; PHY: Physics; CHEM: Chemistry; MATH: Mathematics; ECONM: Economics; ENG: English

(8a)

Man-Power Requirement of Dean/Principal Office



(9) Department wise Laboratories

Sr. No.	Department	Name of the laboratory
1	Soil & Water Engineering	Irrigation and Drainage Lab
		Soil and Water Conservation Lab
		Field Lab
2	Farm Machinery and Power Engineering	Tractor and Power Lab
		Farm Equipment Lab
		Field Lab
3	Processing and Food Engineering	Process Engineering Lab
		Food Engineering
		Agricultural Structures and Environmental Control Lab
4	Applied Sciences and Engineering	Physics Lab
		Chemistry Lab
		Civil Engineering Lab (Surveying, Strength of Material, Soil Mechanics)
		Mechanical Engineering Lab (Engineering Drawing, CAD/CAM, Refrigeration & Air conditioning, Heat Engines, Fluid Mechanics)
		Workshop (Carpentry, welding, Foundry, Machining, Fitting, Sheet metal)
		Computer Lab
		Electrical Engineering Lab
		Electronics Lab

(10) Floor Space Requirement

Offices

Sr. No.	Office	Number	Dimension
1	Dean/Principal	1	20' x 25'
2	Head of department	4 (one for each department)	15' x 20' each
3	Admin. Staff	6 (2 for Dean office and one for each department)	10' x 15' each
4	Faculty rooms	36	10' x 12' each

Laboratories

Sr. No.	Department	Number	Dimension
1	SWE	2	20' x 30' each
2	FMPE	3	20' x 30' each
3	PFE	3	20' x 30' each
4	AS&E	08 (1 Physics, 1 Chemistry, 2 Civil, 2 Mechanical, 1 Computer, 1 Electrical & Electronics) 01 Drawing hall 01 Workshop	20' x 30' each 40' x 30' 60' x 30'

(11) College Building Requirements

Sr. No.	Description	Number	Remarks
1	Class rooms	8	Sitting capacity of 60
2	Multipurpose room	1	Sitting capacity of 100
3	Auditorium	1	Sitting capacity of 500
4	Hostels	2	1 for Boys (200 residents) 1 for Girls (200 residents)
5	Sports complex	1	Outdoor
		1	Indoor
		1	Gymnasium
6	Guest house	1	10 rooms
7	Dispensary	1	
8	Library	1	
9	Canteen	1	
10	Toilets	1 set (1 for Ladies and 1 for Gents)	Every wing of each floor should have 1 set
11	Parking space	As per requirement	For college and hostels

(12) Department wise List of Laboratory Equipment

(12.1) Department of Soil and Water Engineering

Sr. No.	Name of Equipment	Quantity
Soil & Water Conservation Lab		
1	Rain Gauge	2
2	50 kg capacity Weighing Balance	1
	1 kg capacity electronic balance	1
3	Models of Soil Water Conservation Structures (Drop Spillway, Chute Spillway and Drop Inlet Spillway)	1 each
4	Stage Recorder	1
5	Coshocton Wheel runoff sampler	1
6	Multi slot runoff sampler	1
7	H flume, Hydraulic Flume and Parshall Flume	1 each
Irrigation and Drainage Lab		
1	Oven	1
2	Tensiometer	5
3	Electrical Conductivity Meter	2
4	Distillation apparatus	1
5	Sprinkler Irrigation System (for one acre area)	1
6	Drip Irrigation System (for One acre area)	1
7	Double Ring Infiltrometer	2
8	pH Meter	2
9	Water Quality Testing Kit	2
10	Moisture Boxes	50
11	Augers	4
12	Current meter	1
13	Darcy Apparatus	1
14	Porous cup & Measuring Flask	5
15	Sieve shaker	1
16	Filters & Strainers	5
17	Cut section of centrifugal pump, submersible pump and Turbine pump	1 each
18	Positive displacement pump (Hand Pump)	1
19	Water level Indicator	2
20	Tachometer	1
21	Pump Testing Rig	1
Field Lab		
1	Diesel Engine with Centrifugal Pump	1
2	Submersible Pump	1
3	Weather Station	1
4	Irrigation Water Measuring Devices (V-Notch, Parshall Flume, H-Flume, Orifice Plate)	1 each
5	Hydraulic Ram	1
6	Underground Pipeline system	1

(12.2) Department of Farm Machinery and Power Engineering

Sr. No.	Name of Equipment	Quantity
Tractor and Power lab		
1	Tractor – 45 + hp	1
2	Power Tiller	1
3	Work bench	1
4	Grinder	1
5	Air compressor	1
6	Mechanical jacks	2
7	Tool kits with box (having tools : Ellen key set, Open end spanner set , Pliers, Nose pliers, Circlip pliers)	3 sets
8	Welding machine	1
9	Feeler gauges	2
10	Piston ring expander	1
11	Piston ring compressor	1
12	Plastic mallet	1
13	Weighing balances (mechanical and digital)	1 each
14	Oil pans	2
15	Grease gun	1
16	Bearing puller	1
17	Nozzle compression tester	1
18	Cylinder pressure gauge	1
19	Battery charger	1
20	Anvil	1
21	Cut sections of: • Tractor • Single cylinder engine • Multi cylinder engine • Air cleaner • Gear box • Differential • Battery • Fuel injection pump	1 each
22	Models of: • Electrical system • Lubrication system • Cooling system • Tractor hydraulic system	1 each
23	Engine for dismantling	1
24	Display boards: • Fuel feed pumps • Oil pumps • Types of pistons • • Fuel injection pumps	1 each
25	Models of • Mould board	1 each

	• Standard disc plough • Oneway plough • Different types of disc harrows • Different types of agricultural discs • Furrow openers • Seed metering mechanism • Seed drill calibration set-up • Cutter bar cut section • Tangential flow thresher • Axial flow thresher • Knap sack sprayer • Sprayer nozzles • Set of manually operated sprayer and dusters	
26	Hot air oven	1
27	Mechanical sieve shaker	1
28	Cone penetrometer	1
29	Load cells- various capacities	4 of different load capacity each
Farm Machinery Lab and Field Lab		
1	Mould board plough	1
2	Sub soiler	1
3	Rotary tiller	1
4	Cultivator	1
5	Seed-cum fertilizer drill	1
6	Inclined plate planter	1
7	Potato planter	1
8	Sugarcane cutter planter	1
9	Vertical conveying reaper	1
10	Wheat thresher	1
11	Paddy thresher	1
12	Multicrop thresher	1
13	Potato digger	1
14	Laser leveler	1
15	Hand tools including Khurpas, Sickles, spades, Scythe	As per need
16	Set of animal drawn implements : disc harrow and cultivator	1 each

(12.3) Department of Processing and Food Engineering

Sr. No.	Name of Equipment	Quantity
Food Engineering Laboratory		
1	Weighing Balance	3
2	Texture analyzer	1
3	Apparatus for angle of repose, coefficient of friction measurement, anemometer, nitrogen analyzer	1
4	Apparatus for measurement of properties of milk and milk products	1
5	Bod incubator, ,	1
6	Seed germinator,	1
7	Autoclave	1
8	Mini Oil Expeller	1
9	Refrigeration and freezing tutor	1
10	Fruit penetrometer	1
11	Plate heat exchanger	1
12	Soxlet apparatus,	1
13	Boiler	1
Process Engineering Laboratory		
1	Moisture meter	3
2	Hammer Mill	1
3	Bur Mill (Vertical & Horizontal Plate Type)	1
4	Aspirator Column	1
5	Vibratory Screen Cleaner With Aspirator	1
6	V – Mixer	1
7	Tyler Sieve Set	3
8	Manual sieve set	2
9	Ro – Tap Shaking Machine	2
10	Indented cylinder grader	1
11	Pneumatic Grader	1
12	Illuminated Purity Table	1
Agricultural Structures & Environmental Control Laboratory		
1	Weighing Balance	2
2	Digital Thermo-hygrometer with data logger	1
3	Wet & Dry bulb Thermometer	1
4	Anemometer	1
5	Lux meter	1
6	Solar power meter	1
7	Muffle Furnace	1
8	Hot air Oven	1
9	Thermal conductivity apparatus	1
10	Thermal diffusivity apparatus	1

(12.4) Department of Applied Sciences and Engineering

Civil Engineering

Sr. No.	Name of Equipment	Quantity
Material Testing Lab		
1	Universal Testing Machine	1
2	Deflection of Beam Apparatus	1
3	Torsion Testing Machine	1
4	Drop Hammer testing apparatus	1
5	Charpy's Test Apparatus	1
6	Curing Tank (Temperature controlled)	1
7	Cement Testing Moulds (70.5mmX70.5mmX70.5mm)	1
8	Cube Moulds (150 mmX150mmX150mm)	1
9	Concrete Mixer	1
10	Vibrating Table	1
11	Cement storing drums	2
12	Weighing Balance (5 kg.)	1
13	Weighing Balance (200 kg.)	1
Soil Mechanics Lab		
1	Pycnometer	5
2	Core Cutter Apparatus	5
3	Sand Replacement Apparatus	5
4	Sieve Set	2
5	Liquid Limit Apparatus (Cassagrande)	5
6	Compaction Test Apparatus	5
7	Direct Shear Test Apparatus (2'x 2')	1
8	Unconfined Compression Test	1
9	Constant Head Permeability Apparatus	1
10	Variable Head Permeability Apparatus	1
11	Mercury	200 ml
12	Weighing Balance (100 g)	1
13	Sieve shaker	1
14.	Oven	1
15	Sample Containers for moisture content	25
16	Auger	2
17	Hammer	2
18	Split spoon sampler	2
19	Desiccators	1
20	Straight edge	4
21	Trowel	2
22	Sieve Brush	2
23	Hydrometer	2
24	Measuring Cylinders (1000 ml)	4
25	Thermometer	2
26	Shrinkage limit Test Kit	4
27.	Sample Box	25

Survey Lab		
1	Chain (30 m)	5
2	Metallic Tape (30 m)	7
3	Arrow	100
4	Cross-staff	5
5	Wooden Pegs	100
6	Wooden Mallet	5
7	Ranging Rods	50
8	Offset Rod	10
9	Surveyor's Compass with stand	5
10	Prismatic Compass with stand	5
11	Plain table with accessories	5
12	Theodolite with stand	5
13	Planimeter	5
14	Dumpy Level with stand	5
15	Levelling Staff	10
16	Abney Level	2
17	Hand Level	2
18	Ceylon Ghat Tracer	2
19	Plumb Bob	5

Mechanical Engineering

Sr. No.	Name of Equipment	Quantity
Fluid Mechanics Lab		
1	Venturimeter and an orifice meter setup	1
2	Bernoulli's Theorem Apparatus	1
3	Different vanes for measuring impact of water jet	1
4	Mouthpiece to determine the coefficient of discharge	1
5	Triangular and rectangular notches arrangement	1
6	Meta-centric height Apparatus	1
7	Pipes friction apparatus	1
8	Current meter	1
Workshops		
1	Wood Working Machine	1
2	Bend Saw (Small)	1
3	Wood Working Lathe	2
4	Wood Working Bench	5
5	Black Smith Hearth	3
6	Power Hammer	1
7	Work bench	4
8	Fitter's Table	4
9	Surface Plate	2
10	Power Hacksaw	1
11	Bench Grinder	1
12	Arc Welding Machines	3
13	Gas Welding Equipment	1
14	Resistance Welding Machine	1

15	Work Table	5
16	Shear (Manually Operated)	1
17	Bench Grinder	1
18	Cupola (Small Size)	1
19	Crucibles	2
20	Lathe	2
21	Shaper	1
22	Universal Milling Machine	1
23	Bench Drilling Machine	1
24	Radial Drilling Machine	1
25	Bench Grinder	1
26	Work Bench	1
27	Surface Plate	1
28	Power Hacksaw	1
CAD Lab		
1	Computers	16
2	Server	1
3	2-D software(AutoCAD)	1
4	3-D software (Catia/Solid works/Unigraphics/Delcam/ etc)	1
5	CAM software (Master CAM/Delcam/etc.)	1
Refrigeration and Air Conditioning Lab		
1	Set up for determination of the coefficient of performance of vapour compression refrigeration system	1
2	Set up for determination of the coefficient of performance of vapour absorption (electrolux) refrigeration system	1
3	Set up for determination of humidifying efficiency	1
4	Set up for determination of dehumidifying efficiency	1
5	Set up for determination of the coefficient of performance of a domestic refrigerator	1
6	Set up for determination of the coefficient of performance of air conditioning system	1
Theory of Machine & Machine Design Lab		
1	Epicyclic Gear Train	1
2	Clutch Models 1) Single Plate Clutch 2) Multi Plate Clutch 3)Cone Clutch	1 each
3	Models of Knuckle Joint Assembly, Cotter Joint Assembly, Muff Coupling, Flange Coupling, Leaf Spring, Oldham coupling	1 each
4	Centrifugal and inertia governors working models	1
5	Model of different types of mechanisms	1 each
6	Model of different types of key sets	1 each
7	Different type of gears, pulleys, sprockets, chains, ropes , springs etc	1 each

Computer Science and Electrical Engineering

Sr. No.	Name of Equipment	Quantity
Computer Lab		
1	Computers	15
2	MFP-Printer	One
3	Networking equipment – (Like router, LAN card)	One router, LAN card for each computer
4	Uninterrupted power supplies	15
5	Integrated projection system	One
Electrical and Electronics Engineering Lab		
1	Bread Board	10
2	D.C. Power supply	6
3	Multi-meters	10
4	Cathode ray oscilloscopes (Dual Channel)	5
5	Passive components (Resistors, Inductors, Capacitors)	20 each
6	Small signal active components	10 each
7	Various transducers	10 each
8	Single Phase transformers	Four
9	DC series motor	One
10	Energy meter	2
11	Resistive load box	2
12	Micro processor kits – 8085	10
13	Micro controller kits 8051, 89c52	4
14	DAC AND ADC	4 each
15	DC series Generator (with DC drive)	1
16	DC shunt motor	1
17	Three phase Induction motor (complete set)	1
18	Single Phase induction motor	1
19	Slip Ring Induction motor (Three phase)	1
20	Techometer	5
21	Digital multimeters	5
22	Digital Power factor meter	2
23	Wattmeters of various ratings (5A, 10A, 20A, 40A)	2 each
24	Ammeter (Analog type) (0-10A)	5
25	Voltmeter (Analog type) (0-300V)	5
26	Rheostats of various ratings (2.5A, 5A,10A)	2 each
27	Variac single phase or Dimmer Set (0-250V)	2
28	Three phase Dimmer Set	2

Physics & Chemistry

Sr. No.	Name of Equipment	Quantity
Physics Lab		
1	Photocell kit	1
2	Energy Band Gap kit using PN Junction diode	1
3	Hysteresis curve (BH curve) set-up including CRO	1
4	Induced emf study (with simple harmonic motion of magnet fitted on semi-circular arc) as a function of velocity	1
5	Specific charge (e/m) set-up by Helical method	1
6	Desauty Bridge set-up including oscillator, diode etc	1
7	Carey Foster Bridge set-up including resistance boxes, resistance coils, galvanometer, jockey, connecting wires etc.	1
8	Electrical vibrator apparatus including weight box, pulley etc	1
9	Magnetometer (Stewart & Gee Tangent galvanometer) set-up with battery, reversing key, rheostat etc.	1
10	Probe kit	4
Chemistry Lab		
1	Viscometer	1
2	Stalagomometer	1
3	Refractrometer	1
4	Spectrophotometer	1
5	Plarimeter	1
6	FT-IR Spectroscopy	1
7	Fuel properties measuring apparatus : bomb calorimeter, gas calorimeter, flash and fire point apparatus, cloud point apparatus, etc	1 each

(13) List of Additional Cafeteria Courses

- Rural Transport, Water Supply and Sanitation
- Horticultural Engineering
- Aquaculture Engineering

(13.1) Rural Transport, Water Supply and Sanitation

Theory: Introduction and scope of the subject, types of roads, planning of rural road, geometric design of roads, pavement design, material for construction of roads, source and characteristics of water supply, estimation of quantity for rural water supply, layout of distribution system intake works, capacity requirements of storage of water, water treatment methods, pipe network analysis, estimation and design of sewage systems, septic tanks.

Practicals: Design problems on geometric design of roads, Road pavement design problems, Estimation of quality of drinking water for a town, Water quality test, Design of overhead tanks, Design of sedimentation tanks for water treatment, Problems on Hardy Cross methods, Study of purification of rural water supply, Design of septic tanks, Design of sewage disposal for Rural areas.

(13.2) Horticultural Engineering

Introduction and scope of mechanization of Horticultural Crops; Engineering properties of common fruits and vegetables; Fruit pickers/Harvesters, Shakers, Cleaners, Graders; Vegetable planters, Vegetable root crop diggers, Vegetable Combines; Vegetable Cleaners and Graders; Storage requirements for fruit and Vegetable; Design of Cold Storage for fruits and Vegetables, Evaporative Cooled Structures; Cool Chamber, Refrigerated Vans for safe transportation of fruits and Vegetables; Cool-Chain Management.

(13.3) Aquaculture Engineering

Technical components of farm designing, future trends in aquaculture engineering; Aquaculture facilities; Planning process, site selection and evaluation, design, components and construction of tanks, ponds, cages and hatcheries; Water intake and outlet; Pipe line, water flow and head loss, pumps; Water treatment; Equipment used for Water treatment filters, ultraviolet light, ozone, heating and cooling and

other processes of disinfection; Aeration and oxygenation; Design and fabrication of aerators, oxygen injection system; Recirculation and water use system: Definition, components and design; feeding system: Different types of feeding equipment, feed control system, dynamic feeding systems; Instrumentation and monitoring: Instruments for measuring Water quality.

