

5.1 FARM TRACTOR

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RATIONALE

The tractor is the most important machinery in a farm and the students should be fully familiar with the construction, working, and operation of various tractors, maintenance of tractor and repair and overhauling of the same. The course will equip them to handle the tractors effectively and efficiently and they will be able to run tractor. This course will also help them to run tractor and machinery custom hiring centre.

DETAILED CONTENTS

1. Introduction (3 hrs)
Sources of farm power and scope of mechanization. Tractor - classification and different type of tractors and systems. Main assemblies of the tractors (Names only)
2. Power Transmission System of Tractors (9 hrs)
Functions and various components of power train. Clutch; functions of clutch, type of clutch(single plate, dual plate and multi plate clutch) . Gear box; function and working of gear box, types of gear boxes (sliding, constant mesh and synchromesh gears). Differential and differential lock; function and constructional details. Final drive; reduction gear and rear axle. Power take off shaft and drive to the PTO shaft.
3. Braking System (4 hrs)
Importance and function of brakes, various types of brakes viz. mechanical and hydraulic and their working.
4. Wheels and Tyres of Tractors (5 hrs)
Types of wheels rim and tyres used in tractors. Function of tyres. Causes of tyre wear. Need for changing the rear wheel, spacing of wheels and arrangement for the change. Wheel ballasting and methods of ballasting.
5. Hydraulic System (6 hrs)
Principles and working of hydraulic system. Various components and working of hydraulic system of tractor. Position control, draft control and mix control. Various components of hitching system of tractors viz. 3-point linkage, drawbar

6. Controls and Gauges on Tractors (2 hrs)
Familiarization with various control and gauges on the tractor and their functions.
7. Steering System of Tractors (6hrs)
Functions and components of steering systems. Types of steering gear boxes in different type of steering systems, power steering. Working of different types of steering systems. Familiarity with the concepts of toe-in, toe-out, camber angle, caster angle and king pin inclination.
8. Electrical System of Tractors (5 hrs)
Components of electrical systems viz. battery, starter switch, self starter, motor, dynamo: their construction, functions, operation; maintenance and care of the battery.
9. Economics, Selection and Safety of Tractors (6 hrs)
Various factors affecting the right selection of a tractor. Safety measures in the operation of tractor, cost analysis of use of tractors.
10. Periodical Maintenance, Repair and Overhauling of Tractor (10 hrs)
Daily, weekly and monthly maintenance, repair and overhauling of tractor.
11. Tractor Testing (8hrs)
Traction, Terms related to traction- Traction efficiency, coefficient of traction, rolling resistance, slip, rim pull. Tractor testing stations, test conditions, general requirements for testing a tractor. Type of tests. BIS and ISO standards.

LIST OF PRACTICALS

1. Familiarization with different makes, models and availability of tractor, main units and control gauges.
2. Familiarization with various tools used for dismantling and assembling of tractors and implements
3. Pre-starting checks, correct operating techniques & energy saving tips.

4. Clutch - dismantling and study of clutch and its components and assembly.
5. Transmission- study of gear box, differential and final drive.
6. Brake and steering –dismantling and study of their components.
7. Wheel equipment-care and maintenance, fitting of wheels and adjustment of track width.
8. Operation of hydraulics system, draft position and mix control systems.
9. Periodical maintenance and service of tractors
10. Repair and overhaul of tractors.
11. To prepare the cost estimate for repair work.

LIST OF BOOKS

1. Elements of Agricultural Engineering by Dr. Jagdishwar Sahay; Standard Publisher Distributors, Nai Sarak, Delhi-110006.
2. Farm Power Machinery & Surveying by Irshad Ali; Kitab Mahal, Allahabad, Surjit Book Depot P.B.No. 1425,4074-75, Nai Sarak, Delhi.
3. Principle of Agricultural Engineering Volume-I by A.M. Michael &T.P.Ojha; Jain brothers.
4. Farm Machines & Equipments by C.P.Nakra; Dhanpat Rai & Sons ,Nai Sarak New Delhi.
5. Farm Tractors Maintenance & repairs by S.C. Jain & C.R. Rai; Tata McGraw-hill Publishing Co. Ltd., New Delhi.
6. Elements Of Agricultural Engineering Part 1 & 2 by Dr. O.P. Singhal and Naresh Chandra Aggarwal; Mumfordganj, Allahabad.
 7. Basic Farm Machinery by Shiphen & Ellen; Jain brothers.

5.2 AGRO PROCESS ENGINEERING

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RATIONALE

The agricultural material has to undergo different operations and processes before reaching the consumer as a final product. In this subject, processing techniques of different agricultural products e.g. paddy, wheat, oilseeds, pulses have been covered. These will enable the students to understand the basic principles, operation and maintenance of different processing machinery and also to set up their own processing unit.

DETAILED CONTENTS

1. Seed Processing (16 hrs)

Introduction, principles of seed processing. Steps in processing and flow diagram showing various steps/operations in processing. Machine used in processing of seeds of cereals, pulses and cotton e.g. conveyors and elevators, different types of cleaners and graders viz. air screen cleaner-cum-grader, disc separators, indented cylinders, spiral separators, specific gravity separators, pneumatic separators, magnetic separator, inclined draper and belt type electrostatic separators. Process of Mechanical and acid delinting of cotton seeds. Layout and plan of seed processing plant. Seed treaters, calibration of seed treater.

2. Rice Milling (16 hrs)

- 2.1. Paddy grain structure, paddy cleaning, pre milling treatment. Parboiling ; basic concept and principles. Method of parboiling ; traditional method , single boiling , double boiling method
- 2.2. Modern methods :- CFTRI , Kisan continuous, pressure parboiling REPC and sodium chromate method.
- 2.3. Rice milling process: deshelling operations of paddy. Under runner disc sheller, rubber roller sheller and hullers, whitening, polishing operations of deshelled rice.
- 2.4. a). Vertical cone rice whitener. b). Horizontal abrasive rice whitener, glazing , minimizing breakage of rice. Utilization of the by-products of rice mill.

3. Pulse Milling (8 hrs)

Important unit operations of pulse milling: cleaning/grading, polishing and grading. Pulse milling process: domestic level process, commercial level process.

Pulse milling method : Wet milling and dry milling. Factors affecting pulse milling out turn a). grain parameter b) machine parameter.

4. Wheat Milling (8 hrs)

Introduction to flour milling , steps in wheat milling, receiving ,drying and storage, cleaning, conditioning, milling into flour and by product, packaging and blending. Component, operation and performance of wheat mill.

5. Oil Mills (8 hrs)

Processes of oil milling, unit operations in oil mills. Oil expression and extraction. Mechanical expression devices such as Ghani, hydraulic press and screw press; Their principle of operations. Principle and concepts of solvent extraction.

6. Animal Feed Processing (8 hrs)

Introduction to various animal feeds. Machines used for grinding, blending, mixing, pelleting of feed ingredients. Densification of wheat straw. Lay out of animal feed plant.

LIST OF PRACTICALS

1. Study of operation and adjustments of air screen cleaner-cum-grader.
2. Study of operation and adjustment of specific gravity separator.
3. Study of operation and adjustment of indented cylinder.
4. Visit to a seed processing plant.
5. Study of different materials handling equipments.
6. Visit to rice milling industry for the study of parboiling and rice milling equipment.
7. Visit to a Dall mill and study the operations.
8. Visit to flour mill and study of machinery and processes used in flour milling.
9. Visit to oil-mill and solvent extraction plant.
10. Visit to animal feed plant and study of machines used in feed mill

RECOMMENDED BOOKS

1. Rice Processing Technology by Bandhyopadhyaya; Oxford & IBH Publication Co.
2. Post harvest Technology of cereal, Pulses, oil seeds by Chakraverty; Oxford & IBH Publication Co.
3. Food Processing, by Potty & Mulky; Oxford & IBH Publication Co.
4. Seed Industry in India, by Gurdev Singh; Oxford & IBH Publication Co.
5. Unit operation of Agro Processing Engineering by Dr. K.M. Sahay; Vikas Publications.
6. Principle of Agro Process Engineering, by Dr.K.M. Sahay; Vikas Publications.
7. Seed Technology by R.L.Aggarwal; Oxford & IBH Publication Co.
8. Rice Processing Technology by S. Bandyopadhyaya & N.C. Roy; Oxford & IBH Publication Co.
9. Food Processing Industry in India by Desai; Oxford & IBH Publication Co.
10. Fruits & Vegetable Processing by Bhatti Suman; Oxford & IBH Publication Co.
11. Drying & Storage of Grains & oil Seeds by Brooker D.B.; Oxford & IBH Publication Co.
12. Food Process Engineering by Holdman; Oxford & IBH Publication Co.

5.3 CAD

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RATIONALE

Engineering systems have been undergoing rapid transformation due to advances in Information Technology. The quality, speed and flexibility are the key factors in modern design and drafting system. Auto CAD is a general-purpose computer aided design programme to prepare wide variety of two-dimensional drawing and three-dimensional models. After studying this subject, students will be acquainted with Auto CAD.

DETAILED CONTENT

1. Fundamental Concepts (6 hrs)

- Introduction to Auto CAD
- Starting & finishing Auto CAD
- Screen layout
- Different menus, icons, toolbars, cursor
- Command prompt area
- Concept of units and scales
- Drawing units
- Create new drawing
- Open an existing drawing
- Saving a drawing
- Exercise on viewing pull down menus and tool bars in new drawing

2. Basic Drawings (9 hrs)

- Setting drawing limits
- Using zoom all option
- Using grid and snap
- Drawing a line using absolute, relative and polar co-ordinates, using ortho command
- Drawing a circle
- Exercise on drawing a triangle
- Using various co-ordinate systems
- Exercise on drawing a ball bearing

3. Advance drawing commands (15 hrs)

Drawing ray, double line, polyline, construction line, rectangles, polygons, arcs, point, do nut, splines, ellipse, sketch. Use of object snap in drawing.

- Exercise on a drawing a hexagonal bolt head.
- Exercise on drawing front view of a plumber block.

4. **Modify Commands** (15 hrs)
- Erase, move, copy, rotate, array, offset, mirror, zoom, pan, break, trim, scale, lengthen, stretch extend, fillet, chamfer, divide, measure, undo, redo, oops.
- Practice of these commands on an existing drawing
5. **Text and Dimensioning** (12 hrs)
- Text creation – single line and multiline
 - Modifying text
 - Types of dimensions - linear, aligned, ordinate, radius, diameter, angular, leader, base line, continue, oblique, align text
 - Formatting dimension style, modifying line and arrows, extension line, arrowheads, center mark, text, and units
 - Inserting tolerances
 - Exercise on dimensioning an existing drawing
6. **Advance drawing techniques** (12 hrs)
- Creating a new layer, on/off, freeze/thaw, lock/unlock a layer
 - Loading line type and line weight
 - Changing color of layer and line
 - Match properties
 - Hatching – pick points, select objects; using various patterns
 - Drawing various views of sectional flange coupling using layers.
7. **Blocks and External References** (12 hrs)
- Making a block, inserting a block, writing a block
 - Exploding blocks, polyline & hatch objects
 - Using external references, inserting one file into another file
 - Exercise on making a block and using it in same file and another file
8. **Introduction to 3 – Dimensional Drawing** (12 hrs)
- UCS Icon – world, face, view, named. creating 3D objects by giving thickness
 - Hiding and shading
 - 3D solids and surfaces
 - Union, subtract, extrude
 - Converting a 2D object into 3D object and vice versa, view ports
 - Exercise on converting 2D plumper block drawing into 3D.
9. **Plotting** (3 hrs)
- Plotting a drawing, plot preview, page set up
 - Exercise on plotting various existing drawings.

RECOMMENDED BOOKS

1. Engineering Graphics with Auto CAD 2000 by S.C. Sharma; Galgotia Publications Pvt. Ltd., New Delhi.
2. Illustrated Auto CAD 2002 for you – by Umesh Shettigar, Abdul Khader A.A.; Janata Publishers, Udupi.

5.4 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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RATIONALE

Entrepreneurship Development and Management is one of the core competencies of technical human resource. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/vocational stream students to start their own small scale business/enterprise. Based on the broad competencies listed above, following detailed contents are arrived to develop the stated competencies.

DETAILED CONTENTS

- | | | |
|-----|--|---------|
| (1) | Entrepreneurship | (4 hrs) |
| | 1.1 Concept/Meaning | |
| | 1.2 Need | |
| | 1.3 Competencies/qualities of an entrepreneur | |
| (2) | Entrepreneurial Support System | (6 hrs) |
| | 2.1 District Industry Centres (DICs) | |
| | 2.2 Commercial Banks | |
| | 2.3 State Financial Corporations | |
| | 2.4 Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State level | |
| (3) | Market Survey and Opportunity Identification (Business Planning) | (6 hrs) |
| | 3.1 How to start a small scale industry | |
| | 3.2 Procedures for registration of small scale industry | |
| | 3.3 List of items reserved for exclusive manufacture in small scale industry | |
| | 3.4 Assessment of demand and supply in potential areas of growth | |
| | 3.5 Understanding business opportunity | |
| | 3.6 Considerations in product selection | |
| | 3.7 Data collection for setting up small ventures | |
| (4) | Project Report Preparation | (6 hrs) |
| | 4.1 Preliminary Project Report | |
| | 4.2 Techno-Economic feasibility report | |
| | 4.3 Project Viability | |

- (5) Managerial Aspects of Small Business (8 hrs)
- 5.1 Principles of Management (Definition, functions of management viz planning, organisation, coordination and control
 - 5.2 Operational Aspects of Production
 - 5.3 Inventory Management
 - 5.4 Basic principles of financial management
 - 5.5 Marketing Techniques
 - 5.6 Personnel Management
 - 5.7 Importance of Communication in business
- (6) Legal Aspects of Small Business (6 hrs)
- 6.1 Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules
 - 6.2 Factory Act and Payment of Wages Act
- (7) Environmental considerations (6 hrs)
- 7.1 Concept of ecology and environment
 - 7.2 Factors contributing to Air, Water, Noise pollution
 - 7.3 Air, water and noise pollution standards and control
 - 7.4 Personal Protection Equipment (PPEs) for safety at work places
- (8) Miscellaneous (6 hrs)
- 8.1 Human relations and performance in organization
 - 8.2 Industrial Relations and Disputes
 - 8.3 Relations with subordinates, peers and superiors
 - 8.4 Motivation – Incentives, Rewards, Job Satisfaction
 - 8.5 Leadership
 - 8.6 Labour Welfare
 - 8.7 Workers participation in management

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi

4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan , New Delhi
5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and Deep Publications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.
9. Principles of Management by Philip Kotler TEE Publication

5.5 IRRIGATION TECHNOLOGY

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RATIONALE

A diploma holder in agricultural technology needs to learn the principles pertaining to the optimum use of water for maximum agricultural yield besides understanding engineering principles for solving problems of irrigation and drainage. After studying this subject, the students shall acquire adequate knowledge and skills about water requirement of crops and water lifting devices.

DETAILED CONTENTS

1. Introduction (6 hrs)

Irrigation, necessity of irrigation and advantages and disadvantages of irrigation. Types of irrigation viz. artificial(flow, lift etc.) and natural. Sources of irrigation water. Quality of irrigation water.

2. Water Requirement of Crops (16 hrs)

Evaporation, measurement of evaporation by pan evaporimeter. Transpiration and transpiration ratio. Evapotranspiration or consumptive use, seasonal consumptive use, peak period consumptive use.

Measurement of evapotranspiration by direct methods viz. Lysimeter experiment, Field experimental plots.

Estimation of evapotranspiration from evaporation data and climatological data(introduction only).

Water infiltration and determination of infiltration rate.

Water requirement, net and gross irrigation requirement of crops.

Irrigation frequency and irrigation period. Estimation of irrigation depth and irrigation scheduling, irrigation intensity

Duty and Delta; factors affecting duty and methods of improving duty.

Irrigation efficiencies- water conveyance, application, storage, distribution, water use, project, operational and economic efficiency. Uniformity coefficient.

3. Water Application Methods (20 hrs)

Introduction to surface, subsurface, sprinkler and drip irrigation systems. Surface methods of irrigation viz. border, check basin and furrow irrigation, their basic details, characteristics, types and their adaptability.

Concept of subsurface irrigation method, its importance and adaptability.

Sprinkler irrigation-its adaptability and limitations, types ,components, operation and maintenance of sprinkler systems. Layout and various design parameters of sprinkler irrigation system.

Drip irrigation- its adaptability and limitations, types ,components, operation and maintenance of sprinkler systems. Layout and various design parameters of drip irrigation system.

4. Water Lifting Devices (22 hrs)

Introduction to various water lifting devices viz. manual, animal and power operated. Classification of pumps-positive displacement (reciprocating and rotary), variable displacement.

Terms related to pumps.

Principle of operation of centrifugal pumps (volute and diffuser type, single stage and multistage type),

Types of impellers of centrifugal pump

Installation, operation and maintenance of centrifugal pumps, submersible pump and vertical turbine pumps; their common troubles and remedies.

Principles of operation of propeller and jet pumps, their adaptability and limitations. Criteria and procedures for selection of irrigation pumps, power requirements, efficiency and economics of irrigation pumping plants.

LIST OF PRACTICALS

1. Installation, operation and maintenance of sprinkler irrigation system.
2. Installation and operation of centrifugal pump.
3. Dismantling of centrifugal pump, study of constructional feature of its component and its assembly.

4. Installation, operation & maintenance of submersible pump. Identifying/locating the faults/troubles and remedies.
5. Determination of infiltration rate of soil.
6. To survey market and field for the availability, adaptability and selection of various types of pumps and irrigation systems in the region.
7. Measurement of irrigation water in the field channels with the use of Parshall flumes and weir.
8. Study tours to watershed management, irrigation and drainage projects.

LIST OF BOOKS

1. Ground Water and Well Drilling by Parveen Kumar; CBS Publishers and Distributors, Delhi
2. Sprinkler Irrigation by Sivanappan; Oxford & IBH Publication Co.
3. Irrigation Engineering by M. Lal & Etal; New India Publishing House.
4. Water use Efficiency in Agriculture by Giriappa; Oxford & IBH Publication Co.
5. Irrigation Practice & Water Management by FAO; Oxford & IBH Publication Co.
6. Irrigation Engineering by Sharma & Bari; Satya Parkashan Publishers.
7. Irrigation Engineering by B.L. Gupta; Satya Parkashan Publishers.
8. Irrigation Engineering (Vol. 1,2,3) by Sharma & Sharma; Oxford & IBH Publication Co.
9. Irrigation Water Power & Water Resource Engineering by K. R. Arora; Standard Publication.
10. Water well & Pump Engineering by A.M. Michael & S.P.Khepar; Tata McGraw Hill Publishing Co. Ltd., New Delhi.
11. Text Book of Irrigation Engineering (Vol. 2,3) by Sharma & Sharma; Oxford & IBH Publication Co.

5.6 INDUSTRIAL MANAGEMENT

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RATIONALE

The knowledge of this subject is required of all diploma holders who wish to choose industry/field as this career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about safety and labour, industrial laws and management in different areas.

DETAILED CONTENTS

1. Principles of Management (2 hrs)
 - Management, different functions of management: Planning, organizing, coordination and control.
 - Structure of an industrial organization.
 - Functions of different departments. Relationship between individual departments.

2. Human and Industrial Relations (4 hrs)
 - Human relations and performance in organization.
 - Understand self and others for effective behaviour.
 - Behaviour modification techniques.
 - Industrial relations and disputes.
 - Relations with subordinates, peers and superiors.
 - Characteristics of group behaviour and trade unionism.
 - Mob psychology
 - Grievance, handling of grievances.
 - Agitations, strikes, lockouts, picketing and gherao
 - Labour welfare.
 - Workers' participation in management.

3. Professional Ethics (4 hrs)
 - Concept of ethics.
 - Concept of professionalism.
 - Need for professional ethics.
 - Code of professional ethics.
 - Typical problems of professional engineers.
 - Professional bodies and their role.

4. Motivation (4 hrs)
 - Factors determining motivation
 - Characteristics of motivation.
 - Methods for improving motivation.
 - Incentives, pay, promotion, rewards.
 - Job satisfaction and job enrichment.
5. Leadership (4 hrs)
 - Need for leadership.
 - Functions of a leader.
 - Factors for accomplishing effective leadership.
 - Manager as a leader.
6. Human Resource Development (4 hrs)
 - Introduction.
 - Staff development and career development.
 - Training strategies and methods
7. Wage Payment (4 hrs)
 - Introduction
 - Classification of wage payment scheme.
8. Labour, Industrial and Tax Laws (4 hrs)
 - Importance and necessity of industrial legislation.
 - Types of labour laws and disputes.
 - Brief description of the following Acts: The Factory Act 1948; Payment of Wages Act 1936; Workmen Compensation Act 1923; Industrial Dispute Act 1947; Employee' State Insurance Act, 1948; Provident Fund Act.
 - Various types of Taxes-Production Tax, Local Tax, Sales Tax, Excise Duty, Income Tax.
 - Labour Welfare schemes.
9. Accidents and Safety (4 hrs)
 - Classification of accidents; according to nature of injuries i.e. fatal, temporary; according to event and according to place.
 - Causes of accidents-psychological, physiological and other industrial hazards.
 - Effects of accidents.
 - Accidents-prone workers.
 - Action to be taken in case of accident with machines, electric shock, road accident, fires and erection and construction accidents.

- Safety consciousness & publicity.
- Safety procedures.
- Safety measures-Do's and don'ts & good housekeeping (5S).
- Safety measures during executions of Electrical Engineering works.

10. Environmental Management (4 hrs)

Basics of environmental pollution, various management techniques for control of environmental pollution, various control acts for air, water, solid waste and noise.

11. Materials Management (4 hrs)

Material in industry, inventory control model, ABC Analysis, Safety stock, Re-order, level, Economic ordering quantity, Stores equipment, Stores records, purchasing procedures, purchase records, Bin card, Cardex, Material handling, Manual lifting, Hoist, Cranes, conveyors, trucks, fork trucks.

12. Financial Management (3 hrs)

Important, ledger, Journal, Profit and Loss Account, Balance Sheet, Interpretation of Statements, Ratio Analysis, Project financing, Project appraisal, return on investments.

13. Marketing and Sales (3 hrs)

Sellers and Buyers markets, Marketing, Sales, Market conditions, monopoly, oligraphy, perfect competition, Cost Elements of Cost, Contribution, Break even analysis, Budgets, Pricing Policies.

RECOMMENDED BOOKS

1. Industrial Engineering and Management by TR Banga.
2. Industrial Engineering and Management by OP Khanna, Dhanpat Rai Publications, Delhi.
3. Industrial Management by VK Sharma, OP Harkut.
4. Sharma BR, Environmental and Pollution Awareness: Satya Prakashan, New Delhi.
5. Thakur Kailash, Environment Protection Law & Policy in India: Deep & Deep publication, New Delhi.
6. Handbook of Small Scale Industry by P.M. Bhandari.
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Principles of Management by Philip Kotler, TEE Publication.
9. Industrial Organisation and Management by Tara Chand, Nem Chand and Brothers, Roorkee

6.1 INDUSTRIAL TRAINING CUM PROJECT WORK

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Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given for a group. The students should identify or given project assignment at least two to three months in advance. The project work identified in collaboration with industry may be preferred.

Each teacher is expected to guide the project work of 5-6 students.

A suggestive criteria for assessing student performance by the external (personnel from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance criteria	Max. marks	Rating Scale				
			Excellent	Very good	Good	Fair	Poor
1.	Selection of project assignment	10	10	8	6	4	2
2.	Planning and execution of considerations	10	10	8	6	4	2
3.	Quality of performance	20	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20	20	16	12	8	4
5.	Sense of responsibility	10	10	8	6	4	2
6.	Self expression/ communication skills	5	5	4	3	2	1
7.	Interpersonal skills/human relations	5	5	4	3	2	1
8.	Report writing skills	10	10	8	6	4	2
9.	Viva voce	10	10	8	6	4	2
Total marks		100	100	80	60	40	20

The overall grading of the practical training shall be made as per following table

	Range of maximum marks	Overall grade
i)	More than 80	Excellent
ii)	79 > 65	Very good
iii)	64 > 50	Good
iv)	49 > 40	Fair
v)	Less than 40	Poor

In order to qualify for the diploma, students must get “Overall Good grade” failing which the students may be given one more chance of undergoing 8 -10 weeks of project oriented professional training in the same industry and re-evaluated before being disqualified and declared “not eligible to receive diploma ”. It is also important to note that the students must get more than six “goods” or above “good” grade in different performance criteria items in order to get “Overall Good” grade.

Important Notes

- 1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.**
- 2. The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.**
- 3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.**
- 4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.**

The teachers are free to evolve another criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.

9. RESOURCE REQUIREMENTS:

Various equipments and tools required for different laboratories are given as follows:

CROP PRODUCTION LAB

Sr.	Description of Tools	Cost (Rs.)
1.	Hand tools (wheel hoe, kasi, kasola, khurpi, sprayer)	5,000
2.	Cultivator – a) bullock drawn b) tractor drawn	10,000
3.	Tractors (35 hp)	3,00,000
4.	MB Plough	15,000
5.	Disc Plough	15,000
6.	Harrow	15,000
7.	Planker	2,500
8.	Fertilizer spreader	1,000
9.	Seed-cum-fertilizer drill	10,000
10.	No till drill	16,000
11.	Strip till drill	50,000
12.	Bed planter	22,000
13.	Sugar cane planter	60,000
14.	Potato planter	25,000
15.	Rice transplanter – manual	4,000
16.	Farm land – 2 Acre	-
17.	Vehicle for field visits	7,00,000

NON-CONVENTIONAL ENERGY SOURCES LAB

Sr.	Description of Tools	Cost (Rs.)
1.	Solar Cooker – domestic	1,800
2.	Solar Cooker – parabolic type	6,000
3.	Solar water heater (100 litre/day)	25,000
4.	Solar Lantern	2,500
5.	Solar lighting system with gadgets	25,000
6.	Solar photovoltaic water pump	1,60,000
7.	Wind mill model	10,000

FARM MACHINERY AND IMPLEMENTS LAB

Sr.	Description of Tools	Cost (Rs.)
1.	Rotavator	50,000
2.	Vertical coveyer reaper	35,000
3.	Potato digger	22,000
4.	Groundnut digger	12,000
5.	Multi crop threshing machine	50,000
6.	Duster	2,500
7.	Vertical conveyor reaper	32,000
8.	Straw combine	80,000
9.	Power tiller	70,000

CAD LAB

Sr.	Description	Cost (Rs.)
1.	Computer with (AutoCAD software) 8 Nos	5,00,000
2.	Printer – Laser jet	25,000
3.	UPS ordinary – 2 Nos.	15,000
4.	CVT – 2 Nos.	10,000

IRRIGATION TECHNOLOGY LAB

Sr.	Description	Cost (Rs.)
1.	Centrifugal Pump	5,000
2.	Submersible Pump	20,000
3.	Inflirtometer – 10 Nos	20,000
4.	Parshall bloom	15,000
5.	Weirs and notches	5,000
6.	Drip Set	25,000
7.	Sprinkler irrigation system set	1,00,000

IC ENGINES LAB

Sr.	Description		Cost (Rs.)
1.	Diesel engine of different make	4	1,00,000
2.	Tool set for engine dissembly	5	25,000
3.	Measuring tools	1	10,000
4.	Nozzle testing machine	1	5,000
5.	Working models of diesel engine	2	20,000
6.	Brake dynamometer	1	3,00,000
7.	Exhaust smoke meter	1	50,000

FARM TRACTORS LAB

Sr.	Description	Cost (Rs.)
1.	Tractor (20 hp)	2,00,000
2.	Tractor (50 hp)	4,00,000
3.	Air compressor	25,000
4.	Tractor washer	25,000
5.	Clutch model	10,000
6.	Gear box model	20,000
7.	Hydraulic trainer	1,00,000

POST HARVEST TECHNOLOGY AND AGRO PROCESSING LAB.

Sr.	Description	Cost (Rs.)
1.	Measuring instruments (verniers caliper, micrometer, height gauge) – 1 set	10,000
2.	Moisture meters (hand held, infrared, universal) – 3 Nos.	30,000
3.	Digital balance – 2 Nos.	80,000
4.	Hot air oven – 2 Nos.	80,000
5.	Models of materials handling devices – 1 each	20,000
6.	Grain storage structure	30,000
7.	Air screen cleaner-cum-grader – lab model	1,50,000
8.	Specific gravity separator - lab model	1,50,000
9.	Indented cylinder - lab model	1,50,000
10.	Mini rice sheller	60,000
11.	Rice polisher	60,000
12.	Flour Mill	15,000
13.	Pulse Mill (Mini dal mill)	60,000
14.	Oil expeller (Model)	60,000
15.	Paletting Machine Model	25,000

10. RECOMMENDATIONS FOR EFFECTIVE IMPLEMENTATION OF CURRICULUM

The following recommendations are made for effective implementation of this curriculum.

- a) While imparting instructions, stress should be laid on the development of practical skills in the students. For this purpose, as far as possible, classes should be conducted in the laboratories itself.
- b) Industrial visits should be organized as and when required to clarify the concepts, principles and practices involved. For this purpose, time has already been provided in student centered activities
- c) Extension lectures from professionals should be organized to impart instructions in specialized areas
- d) There is no need of purchasing very costly equipment. Efforts may be made to establish linkages with local industrial organizations
- e) Considerable stress should be laid on repair and maintenance of equipment
- f) Teachers should generate competitiveness among the students for the development of professional skills.
- g) Teachers should take working drawings from the industries and provide practices in reading these drawings
- h) Hobby clubs and other co-curricular activities be promoted to develop creativity in the students
- i) Teachers should be sent for training in the new areas incorporated in their curriculum
- j) Students should be given well thought out project assignments. This can help students in developing creativity and confidence in them for gainful employment (wage and self)

A **project bank** should be developed by the Agricultural Technology Department in consultation with local industry.