5.1 MANUFACTURING TECHNOLOGY

L	T	P
4	--	4

RATIONALE

The knowledge of manufacturing techniques in the area of foundry, machine shop (fitting shop, lathe machines and shaping), inspection and gauging and in coating both on metallic and non- metallic is essential at the first stage for understanding technology. Hence the following topics are included.

DETAILED CONTENTS

1. Foundry (8 Periods)

   Introduction, types of patterns, pattern materials, cores and core boxes, core materials, preservation and storage of patterns,. Introduction to moulding, types of moulding sounds, types of moulds, preparation of cores, defects in moulds and their remedies, types of melting furnaces (pit furnace, tilting furnace, cupola, oil fired and induction furnaces), casting defects and their remedies.

2. Lathes (12 Periods)

   Introduction, types of lathes, specifications, description and functions of lathe parts, feed mechanism, drives and transmission, work holding devices, turning tools

   Lathe operations – plain turning, facing, centring, parting off, undercutting, taper turning, eccentric turning, drilling, reaming, thread cutting and knurling, speeds and feeds of cut.

   Introduction to capstan and turret lathes, copying lathe and their attachments, difference between capstan and turret lathes and heads, tool holders and tool layout, tool geometry and use of throwaway tips, brazed tools and HSS tools.

3. Shaper and Planers (10 Periods)

   Classification of shapers, quick return mechanism, difference between shaper and planer, planer and shaper sizes, classification of planers. Tool and work holding devices

4. Drilling and Milling Machines (10 Periods)

   Classification of drilling and milling machines, drilling machine size, kinds of drills, cutting speed, drill holding devices, specification and operation on drilling and milling machines

5. Finishing Operations (6 Periods)

   Types of machines, methods of grinding, polishing, lapping, buffing, honing super finishing operations and their applications

6. Fabrication Practices (6 Periods)

   Various sections of steels such as L, T, I, and C, specification and their welded joints, their methods of production, welding techniques in different positions, gas

and electric arc welding

7. Inspection Instruments and Gauges (12 Periods)
Height gauge, depth gauge, bore gauge, slip gauge, sine bar, measurement of taper by use of slip gauges, limits, fits and tolerances, interchangeability, Go and Not-Go gauges, screw thread micrometer, thread gauge, radius gauge, dial gauge, and gear tooth vernier, hardness checking instruments, coating thickness checking instruments, surface finish checking instruments.

LIST OF PRACTICALS

1. Machine Shop
   Lathe Machines
   - Step turning, taper turning and knurling
   - Drilling, boring, counter boring and internal turning
   - V-thread cutting
2. Simple exercises on shaper and planer
3. Group work on milling machine involving down and climb milling, slab milling and gear cutting
4. Fitting Shop
   - To make different keys
   - To make limit gauge
   - To grind a drill

RECOMMENDED BOOKS

1. Workshop Technology by BS Raghuwanshi, Dhanpat Rai & Sons, Delhi
2. Manufacturing Technology by M Adithan and Gupta, New Age International (P) Ltd., Delhi
3. Elements of Workshop Technology by SK Choudhary & Hazara, Asia Publishing House
4. Workshop Practice by RK Singhal, SK Kataria & Sons, New Delhi.
5. Production Technology by HMT, Tata McGraw Hill, New Delhi.
6. Workshop Technology Vol. – I, II & III by Chapman, Standard Publishers Distributors, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	8	10
2	12	20
3	10	15
4	10	15
5	6	10
6	6	10
7	12	20
Total	**64**	**100**

5.2 WATER HARVESTING AND PROTECTED CULTIVATION TECHNOLOGY

L T P
4 -0- 4

RATIONALE

A diploma holder in Agricultural Engineering needs to learn about the soil erosion, the factors affecting the erosion besides the soil erosion control practices. A course on water harvesting and protected cultivation shall equip the students with the knowledge of the various techniques related to water harvesting and poly house and other protected cultivation. Hence this subject.

DETAILED CONTENTS

1. Hydrology (10 Periods)
   Hydrologic cycle, importance, its components, occurrence and forms of precipitation; characteristics of rainfall in India, rain fall intensity, measurement of rain fall by non-recording and recording type of rain gauges, method of computing average rainfall, reoccurrence interval.

2. Run Off (10 Periods)
   Definition, phenomenon and forms of run off, characteristics of run off, factors affecting run off, measurement of run off by float, current meter and weirs, time of concentration and its impact on run off, estimation of peak run off rate by rational equation.

3. Flood Control (6 Periods)
   Types of flood, damages caused by floods, elementary idea of head water flood control methods

4. Water Conservation Reservoirs (12 Periods)
   Types and uses of water conservation reservoirs, site selection and storage capacity of farm ponds, design principles of water harvesting bunds and structures, digging of ponds, construction and maintenance of water conservation structures. Roof water harvesting system and their design.

5. Protected cultivation – What and Why in Agriculture (8 Periods)
   Protected cultivation Technologies –Raised bed cultivation, mulching, low tunnel, greenhouses and micro irrigation

6. Green house (18 Periods)
   History and types of greenhouse; importance, function and features of green house; scope and development of green house technology. Location, Planning and various component of greenhouse; design criteria and calculation; constructional material and methods of construction; covering materials and its characteristics, solar heat transfer, solar fraction for green house, steady state analysis of green house, Greenhouse heating, cooling, shedding and ventilation systems; Carbon Dioxide generation and monitoring and lighting systems, instrumentation & computerized environmental Control Systems.

LIST OF PRACTICALS

1. Study of rain gauges, their operation and installation
2. Computation of average rainfall depth over an area by Symons's rain gauge
3. Study and use of float and current meter to measure runoff
4. Design of farm ponds
5. Cost estimation of digging of farm ponds of dimensions
6. Visit to various area of water harvesting management
7. Study/visit to a functional protected cultivation technologies
8. Planning and layout of green house & associated utilities;
9. Material selection for the construction of green house;
10. Measurement of temp. using thermomseter, thermistor & thermocouples inside the green house; Measurement of humidity & air velocity using various methods;
11. Measurement of solar radiations inside the green house;
12. Visit to a commercial green house.
13. Visit of micro irrigation farms

RECOMMENDED BOOKS

1. Principles of Agricultural Engineering-II by AM Michael and TP Ojha
2. Land and Water Management Engineering by VVN Murthy
3. Soil Conservation by Norman Hudson
4. Introduction to Soil and Water Conservation Engineering by BC Mal
5. Green House by Das. Kalyani Publishers. New Delhi / Ludhiana

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	15
2	10	15
3	6	10
4	12	20
5	8	15
6	18	25
Total	**64**	**100**

5.3 PRINCIPLES OF WATERSHED MANAGEMENT

L	T	P
3	-	4

RATIONALE

A diploma holder in Agricultural Engineering needs to learn about the soil erosion, the factors affecting the erosion besides the soil erosion control practices. A course on soil conservation shall equip the students with the knowledge of the physical and chemical properties of soil, various agents of erosion and various methods of erosion control. Hence this subject.

DETAILED CONTENTS

1	Introduction, watershed concept, watershed management, PRA	2 Periods
2	Factors affecting watershed management, watershed characteristics	4 Periods
3	Watershed delineation, water yield assessment and measurement	4 Periods
4	Sediment yield estimation and soil loss measurement from a watershed	6 Periods
5	Effect of land management and cultural practices on watershed hydrology	6 Periods
6	Formulation, Evaluation and Monitoring of watershed management programms	8 Periods
7	Cost benefit analysis of watershed management programme	6 Periods
8.	Bascis of Remote Sensing- Classification, Electromagnetic spectrum (EMR), Visual image interpretation	6 Periods
9.	Principles of Geographic Information System, Digital Elevation Model and its application in watershed management	4 Periods
10.	Case studies	2 Periods

LIST OF PRACTICALS

1 Study of watershed characteristics

2 Delineation of watershed

3 Study of various watershed management technologies

4 Study of toposheets

5 Study of DEMs of different resolutions

6 Delineation of watershed with the DEM

7 Cost benefit analysis of formulated problem on watershed planning

8. Preparation of economical and environmentally viable projects

RECOMMENDED BOOKS

1. watershed Planning and management – Rajvir Singh, Yash Publishing House
2. Hydrology and Soil Conservation Engineering – Ghanshyam Das, Prentice Hall
3. Remote Sensing and Image Interpretation, Lille Sand and Kaiffer R., John Willey and Sons
4. Principles of geographical information systems for land resources assessment- P. A. Burrough

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted(**Periods**)**	**Marks Allotted (%)**
1	2	5
2	4	10
3	4	10
4	6	10
5	6	10
6	8	15
7	6	15
8	6	10
9	4	10
10	2	5
Total	**48**	**100**

5.4 PROCESSING OPERATIONS OF PERISHABLES

L	T	P
3	-	4

RATIONALE

A diploma holder in agriculture engineering should learn basic knowledge of perishable items Such as milk, milk products and various post harvest operations related to them. After studying this subject, the student shall acquire the adequate knowledge and skills the use of perishable items , the products related to them and various methods of handling, storage and packaging of these items.

DETAILED CONTENT

1. Introduction (12 Periods)

1.1 Introduction to post harvest technology of agricultural perishable products, it's need , scope and importance.

1.2 Introduction to various post harvest unit operations.

1.3 Brief discussion to primary/secondary/tertiary processing.

2. Handling, processing and preservation of milk and it's products. (14 Periods)

2.1 Milk receiving , pasteurization, standardization and cream separation.

2.2 Brief introduction to technology of milk and milk products, equipments.

3. Post harvest technology of fruits and vegetables. (16 Periods)

3.1 Introduction to the storage of fruits and vegetables. Need and importance of storage, principles of storage of fruits and vegetables.

3.2 Introduction to packaging of fruits and vegetables, types of packaging.

3.3 Concept of modified atmospheric/controlled atmospheric packaging . Factors and treatment effecting shelf life of fruits and vegetables.

4. Brief introduction to latest processing technologies. (6 Periods)

BOOKS

- Post Harvest Technology of cereals, pluses and oil seeds by A. Chakravarty
- Unit of Agricultural processing by K.M Sahay and K.K Singh
- Principles and practice of Post Harvest Technology by P.H. Pandey

LIST OF PRACTICALS

1. Study of different packaging materials.
2. Study of material conveying equipments.
3. Preparation of seasonal pickles, jams, jellies and ketchup
4. Study and sketch of cream separator.
5. Study of pasteurization process
6. Visit to processing plants.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (**Periods**)**	**Marks Allotted (%)**
1	12	25
2	14	30
3	16	30
4	6	15
Total	**48**	**100**

5.5 IRRIGATION AND DRAINAGE ENGINEERING

L	T	P
5	-	4

RATIONALE

A diploma holder in agricultural engineering needs to learn the principles pertaining to the optimum use of water to achieve 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, irrigation methods and drainage as reclamation techniques of salt affected water logged soils.

DETAILED CONTENTS

(A) IRRIGATION ENGINEERING

1. Introduction (5 Periods)

Purpose of irrigation, sources of irrigation water, present status of development and utilization of different water resources of the state and country; advantages and disadvantages of irrigation.

Types of irrigation viz. artificial (flow, lift etc.) and natural. Sources of irrigation water. Quality of irrigation water, surface water sources, ground water sources

2. Measurement of irrigation water, weir, notches, flumes and orifices and other methods; water conveyance, design of irrigation field channels, underground pipe conveyance system, irrigation structures, channel lining; (7 Periods)

3. Water Requirement of Crops (13 Periods)

Types of soils, soil properties in relation of irrigation and drainage, classes and availability of soil water, preparation of land for irrigation and drainage, quality of irrigation water, evaporation, transportation, evapotranspiration, consumptic use, estimating crop water methods of improving duty, principle crops of India. Assessment irrigation water requirement of different crops, estimation of depth and time of irrigation, different criteria for irrigation scheduling depending upon soil-plant-atmospheric factors

4. Irrigation Methods (15 Periods)

Surface and subsurface methods, sprinkler and drip system of irrigation and conjunctive use

5. Evaluation of Farm Irrigation Systems (5 Periods)

Measurement of irrigation efficiencies, water conveyance, storage, application, distribution and water use efficiency

6. Soil Moisture Movement (5 Periods)

Soil moisture measurement, soil moisture tension, soil moisture characteristics curve, saturation and field capacity, wilting point, moisture equivalent, percolation seepage, infiltration, hydraulic conductivity, permeability

7.. Design of Irrigation Channels (5 Periods)

Non-erodible channels, design of open channels, maximum permissible velocity, channel slops, free board, hydraulic sections, most economical section. Flow through pipes, losses

(B) DRAINAGE ENGINEERING

8. Introduction (4 Periods)

Definition, necessity, water logging, salinity, its control inter-relationship of irrigation drainage, drainage co-efficient, water table fluctuations

9. Drainage Investigation and Requirement (6 Periods)

Estimation of drainage requirements, required water table depths, lowering of water table, ground water contours, drainage depths for different crops

10. Drainage Systems (8 Periods)

Different types of surface and subsurface drainage systems, design of surface drainage systems, different types of subsurface drainage systems and their design, pipe drainage depth and spacing of pipe drains, field survey, installation and layout of drains, installation of pipe outlets

11. Special Methods of Drainage (7 Periods)

Vertical (single and multiple well point system) mole drains, drainage of irrigated lands in semi arid and arid areas. Bio drainage

LIST OF PRACTICALS

1. Installation, operation and maintenance of sprinkler irrigation system
2. Installation and operation of drip irrigation system
3. Determination of infiltration rate of soil
4. To survey market and field for the availability, adaptability and selection of various types of pumps and irrigation systems in the region
5. Measurement of irrigation water in the field channels with the use of Parshall flumes and weir.
6. Measurement of advance and recession in border irrigation
7. Estimation of irrigation efficiency; measurement of advance and recession in furrow irrigation and estimation of irrigation efficiency;
8. Measurement of uniformity coefficient of sprinkler irrigation method;
9. Study tours to watershed management,

10. Visit of irrigation and drainage projects.

LIST OF BOOKS

1. Ground Water and Well Drilling b y 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 b y 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.
12. Irrigation Theory and Practice by AM Michael; Vikas Publishing House (P) Ltd, Delhi
13. Land Drainage by Luthin
14. Micro irrigation by R Suresh, Standard Publishers and distributors, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (**Periods**)**	**Marks Allotted (%)**
1	5	05
2	7	10
3	13	15
4	15	15
5	5	10
6	5	05
7	5	05
8	4	05
9	6	05
10	8	15
11	7	10
Total	**80**	**100**

5.6 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

	L	T	P
Periods per week	5	-	-

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

DETAILED CONTENTS

SECTION – A ENTREPRENEURSHIP

1. Introduction (23 periods)
   - Concept /Meaning and its need
   - Qualities and functions of entrepreneur and barriers in entrepreneurship
   - Sole proprietorship and partnership forms of business organisations
   - Schemes of assistance by entrepreneurial support agencies at National, State, District level: NSIC, NRDC, DC:MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP)

2. Market Survey and Opportunity Identification (17 periods)
   - Scanning of business environment
   - Salient features of National and State industrial policies and resultant business opportunities
   - Types and conduct of market survey
   - Assessment of demand and supply in potential areas of growth
   - Identifying business opportunity
   - Considerations in product selection

3. Project report Preparation (14 periods)
   - Preliminary project report
   - Detailed project report including technical, economic and market feasibility
   - Common errors in project report preparations
   - Exercises on preparation of project report

SECTION –B MANAGEMENT

4. Introduction to Management (06 periods)
   - Definitions and importance of management
   - Functions of management: Importance and Process of planning, organising, staffing, directing and controlling
   - Principles of management (Henri Fayol, F.W. Taylor)
   - Concept and structure of an organisation
   - Types of industrial organisations

a) Line organisation
b) Line and staff organisation
c) Functional Organisation

5. Leadership and Motivation (05 periods)

a) Leadership
- Definition and Need
- Qualities and functions of a leader
- Manager Vs leader
- Types of leadership

b) Motivation
- Definitions and characteristics
- Factors affecting motivation
- Theories of motivation (Maslow, Herzberg, McGregor)

6. Management Scope in Different Areas (10 periods)

a) Human Resource Management
- Introduction and objective
- Introduction to Man power planning, recruitment and selection
- Introduction to performance appraisal methods

b) Material and Store Management
- Introduction functions, and objectives
- ABC Analysis and EOQ

c) Marketing and sales
- Introduction, importance, and its functions
- Physical distribution
- Introduction to promotion mix
- Sales promotion

d) Financial Management
- Introductions, importance and its functions
- Elementary knowledge of income tax, sales tax, excise duty, custom duty and VAT

7. Miscellaneous Topics (05 periods)

a) Customer Relation Management (CRM)
- Definition and need
- Types of CRM

b) Total Quality Management (TQM)
- Statistical process control
- Total employees Involvement
- Just in time (JIT)

c) Intellectual Property Right (IPR)
- Introductions, definition and its importance

- Infringement related to patents, copy right, trade mark

Note: In addition, different activities like conduct of entrepreneurship awareness camp extension lecturers by outside experts, interactions sessions with entrepreneurs and industrial visits may also be organised.

INSTRUCTIONAL STRATEGY

` Some of the topics may be taught using question/answer, assignment or seminar method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi
4. Entrepreneurship Development - Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi
5. Entrepreneurship : New Venture Creation by David H Holt; Prentice Hall of India Pvt. Ltd., New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Principles and Practice of Management by L M Prasad; Sultan Chand & Sons, New Delhi.
8. Entrepreneurship Development & management By V.K. Joshi, Jagdamba Publication, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Pds)	Marks Allotted (%)
1	23	30
2	17	20
3	14	15
4	6	10
5	5	05
6	10	15
7	5	05
Total	**80**	**100**