MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : DIPLOMA IN AGRICULTURE ENGINEERING

COURSE CODE : AU

DURATION OF COURSE : 6 SEMESTERS **WITH EFFECT FROM 2012-13**

SEMESTER : FIFTH **DURATION : 16 WEEKS**

PATTERN : FULL TIME - SEMESTER **SCHEME : G**

SR. NO	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME								SW (17500)
							PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)	
				TH	TU	PR		Max	Min	Max	Min	Max	Min	Max	Min
1	Soil and Water Conservation	SWC	17578	03	--	02	03	100	40	--	--	25#	10	50@	20	
2	Dairy Technology and Air Conditioning	DTA	17579	03	--	02	03	100	40	--	--	--	--	25@	10	
3	Farm Machinery and Equipment	FME	17580	03	--	02	03	100	40	50#	20	--	--	25@	10	
4	Irrigation Engineering	IEG	17581	03	--	02	03	100	40	50#	20	--	--	25@	10	**50**
5	Post Harvest Technology	PHT	17582	02	--	02	02	50	20	--	--	25#	10	25@	10	
6	Watershed Management	WSM	17583	02	--	02	02	50	20	--	--	--	--	25@	10	
7	Behavioral Science	BSC	17075	01	--	02	--	--	--	--	--	25#	10	25@	10	
8	Entrepreneurship Development and Project	EDP	17086	01	--	02	--	--	--	--	--	--	--	25@	10	
	TOTAL			**18**	**--**	**16**	**--**	**500**	**--**	**100**	**--**	**75**	**--**	**225**	**--**	**50**

Student Contact Hours Per Week: **34 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks**: 950**

@ - Internal Assessment, # - External Assessment, No Theory Examination, $ - Common to all branches, β – Common to Mechanical & Chemical Engineering Groups, *# - On Line Theory Examination.

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR, TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

Course Name : Diploma in Agriculture Engineering

Course code : AU

Semester : Fifth

Subject Title : Soil and Water Conservation

Subject Code : 17578

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	25#	50@	175

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

This course is aimed to equip the learner with knowledge and skill required for taking effective measures against soil erosion, construction and maintenance of water conservation structures and development of land for irrigation and agricultural purposes.

The contents of the subject have been developed to inculcate capabilities for performing the above mentioned task economically and effectively.

Objectives:

The students will be able to:

1. Identify the types of soil erosion.
2. Know the causes of soil erosion and loss of soil and water from the land surfaces.
3. Understand the design procedures of temporary and permanent gully erosion control structures.
4. Apply the proper erosion control structures on the farms for conservation of soil and water and safe removal of the excess water from the soil surfaces.

Theory:

Topic No.	Name of the topic and contents	Hours	Marks
01	**Basics of Soil and Water Conservation** • An introduction to the soil as a natural body. • Definitions and functions of soil. • Various constituents of soil and their importance for soil as a medium of plant growth. • Major soils of India.	02	08
02	**Soil and its Properties** • Properties of soil in relation to plant growth - physical properties. • Soil separates, their physical nature and classification • Soil texture- definition and textural classification of soil • Soil structure - definition, types and factors affecting soil structures. • Bulk density, particle density of soil, consistency, porosity and voids ratio, degree of saturation. • Soil moisture content (Dry basis and Wet basis). Methods of soil moisture determination. • Retention of soil moisture - maximum retentive capacity, field capacity, permanent wilting percentage, hygroscopic coefficient. • Soil moisture classification - physical, biological and available water holding capacity of the soil. • Soil permeability - definition and importance, Darcy's law, coefficient of permeability, infiltration and infiltration rate, soil air and aeration. Soil temperature, soil tilth and its importance. • Chemical properties– soil reaction (pH), electrical conductivity (Ec), cation exchange ratio, sodium absorption ratio (SAR), exchangeable sodium percentage (ESP), salt concentration in the soils.	20	36
03	**Erosion** • Definition, classification of erosion and agents causing erosion. • Mechanics of water erosion - raindrop erosion, sheet erosion, rill erosion, gulley erosion and principle of gulley erosion and classification of gullies. Stream channel erosion. • Effect of water erosion, factors affecting erosion by water. • Mechanics of wind erosion - process of saltation, suspension, surface creep. Factors affecting erosion by wind.	08	16
04	**Erosion Control** • Principles of erosion control. • Agronomic and field practices to control erosion by wind and water i.e. contour farming, strip cropping, tillage etc. • Terracing to control erosion by water, types of terraces, terrace design parameters and planning a terrace system. Bench terrace-types and design parameters. • Use of bunds to control erosion and design parameters of bunds. Contour bunding. • Vegetated water ways for the control of erosion.	14	32

	• Temporary structures for the control of gully erosion, their types and adaptability. • Permanent soil conservation structures viz. drop spill way, chute spill way, drop inlet spill way for the control of erosion, their principles, adaptability, constructional features and material of construction. • Introduction to the farm ponds, earthen embankments and water harvesting structures in relation to soil and water conservation, soil conservation through tree and grass cultivation. • Concept of ground water recharge.		
05	**Storage Structures** • Introduction of different types of dam's e.g. earthen dams, rock filled, hydraulic filled etc. • Different types of spillways and outlets. • Cross sections of earthen dams. • Causes of failures of earthen dams.	04	08
	Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Understand the principles of design of Bunds, terraces, farm ponds.
2. Select control method for soil erosion.
3. Select structures suitable for soil erosion.

Motor Skills:

1. Ability to draw accurately the various structures.
2. Use appropriate instruments for drawing.

List of practicals:

1. To study the various types of soil erosion and their control.
2. To study the terracing and bunds for soil erosion control.
3. To study the soil erosion control structures.
4. To study the vegetative water ways for the control of erosion and safe disposal of water.
5. To study the design of bunds.
6. To study the design of terraces.
7. To study the design of farm ponds.
8. To study the design of gully plugging.
9. To study the design of cement nala plugs.
10. To study the design of earthen dams.
11. To study the design of check dams.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
1	G. O. Schwab, R. K. Frevert, T. W. Edminster, K. K. Barmes	Soil and Water Conservation Engineering	John Willy and Sons, New York
2	Gurmail Singh	Manual of Soil and Water Conservation Practice	Oxford and IBH Publication Co.
3	R. Suresh	Soil and Water Conservation Engineering	Standard Publication
4	A. M. Michael and T. P. Ojha	Principles of Agricultural Engineering Vol. II	Jain Brothers

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Fifth

Subject Title : Dairy Technology and Air Conditioning

Subject Code : 17579

Teaching and Examination Scheme

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

This subject is classified as an Applied Technology. The 21st century predicts revolutionary developments in Air Conditioning. Air conditioning is one of the most meaningful job areas for diploma holders in Agricultural Engineering. Considering the wide and increasing use of Air conditioning for commercial and industrial applications and the challenges put by the use of air conditioning equipments in existing stage, it is absolutely necessary that Diploma Engineers should learn this subject. They should know the processes, equipments, systems of Air Conditioning with their functioning, maintenance, repairs and measures to meet the challenges of the near future in this area. The Knowledge of Thermal Engineering and Power Engineering is a prerequisite for this subject.

Objectives:

The student should be able to: -

1. Describe types, working principles and construction of Air Conditioning systems.
2. Calculate performance of air conditioning system.
3. Use various charts and tables used in air conditioning.
4. Enlist properties of refrigerants, their applications and effects on environment.
5. Identify various components and controls used in air conditioning.

Theory:

Topic and Contents	Hours	Marks
Topic 1. Dairy Industry Sanitary Features and Equipments 1.1Sanitary pipes and fittings: Stainless Steel Pipes, Glass Pipes, Plastic Tubing, Sanitary Pipe and Fitting. 1.2 Sanitary pumps: Centrifugal Pump. Positive displacement pumps: Specification, Stuffing Box and Rotary Seal. 1.3 Pipe and Fitting Standards 1.4 **Milk Receiving Equipment:** Weigh can and receiving tank, chilling equipment, Weighing and measuring milk standards. Can washers: principles of operation, Rotary and straight through can washer. 1.5 **Storage Equipment**: Insulated storage tank, refrigerated storage tanks: specification for the storage tanks. Milk transport tank. 1.6 **Milk processing equipments**: Separators: warm milk separators, cold milk separators, Centrifugal cream separators.	10	20
Topic 2. Heat Exchanging Equipments and Homogenizers 2.1 Heat exchangers**:** Types of heat exchangers 2.2 Pasteurization: Batch type and continuous type pasteurizing plants, purpose and special requirement. 2.3 High temperature short time pasteurizer, utilities, regeneration, holding time. Metering pump and drive, F.D.V. UHT (Ultra High Temperature) Pasteurizers. 2.4 Evaporators and Drying Equipments: Concept, necessity and principle of operation of Evaporators, Single and multiple operation, 2.5 Introduction of drum dryer and spray dryer. 2.6 **Homogenizers**: Theory of homogenization, Single stage and two stage homogenizers, Efficiency of homogenization 2.7 **Installation of IN floor And On floor Conveyor**: Different types of conveyors used in dairy industry, their drives, take up units and conveyor components (Case stackers and unstackers, platising milk cases, handling of dispenser milk containers, handling of ice cream).	14	28
Topic 3. Milk Product Equipments and Psychometric process 3.1 **Ice Cream Equipments:** Ice cream freezers: Batch Freezer, Continuous Freezers. Air incorporation, over run, control systems, freezing cylinder, dasher, scrapping blades, Controls of refrigeration. 3.2 **Cream, Butter and Ghee Handling Equipment:** Cream ripening tanks, materials used, automatic control, operation, cleaning, Maintenance of Continuous Butter making equipment. Wooden churn, metal churn. Ghee pan and Ghee making equipments. 3.3 **Psychometric process: -** Definition and necessity of air conditioning. Properties of Air, Dalton's law of partial pressure. Psychometric chart. Psychometric processes, Bypass Factor, ADP, concept of SHF, RSHF, ERSHF and GSHF. Simple numerical using Psychometric chart. 3.4 Adiabatic mixing of Air streams. 3.5 Equipments used for Air- conditioning like humidifier, dehumidifier	12	24

and filter, heating and cooling coils.		
Topic 4. Air- conditioning systems 4.1 Classification of A.C. systems:- Industrial and commercial A.C. systems, Summer, winter and year round A.C. systems, Central and unitary A.C. systems. 4.2 Application areas of A.C. systems. 4.3 **Comfort conditions and cooling load calculations:** Thermal exchange of body with environment. Factors affecting human comfort. Effective temperature and comfort chart. Components of cooling load-sensible heat gain and latent heat gain sources, calculation of cooling load (No numericals). 4.4 **Air distribution systems: Duct systems**: a) Closed perimeter system, extended plenum system, radial duct system, duct materials, requirement of duct materials and losses in ducts. b) Air distribution outlets: Supply outlets, return outlets, grills, diffusers. c) Fans and Blowers: Types, working of fans and blowers. 4.5 **Insulation:** Purpose, properties of insulating material, types of insulating materials, methods of applying insulation.	12	28
Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Interpret psychometric chart to find various properties of air.
2. Observe working of test rigs and calculate coefficient of performance.

Motor Skills:

1. Handle various tools used for air conditioning plant maintenance.
2. Use of temperature, pressure, energy measuring devices.
3. Draw the layout of central Air conditioning plant.
4. Perform cooling load calculations for different air conditioning applications.

List of Practicals:

1. Demonstration of various controls like L.P./H.P. cut outs, thermostat, overload protector, solenoid valve used in RAC.
2. Identification of components of 'hermetically sealed compressor'.
3. Visit to repair and maintenance workshop in view of use of various tools and charging procedure.
4. Cooling load calculations for cabin, classrooms, laboratory, canteen and dairy plant, milk storage, small freezers (minimum one).

5. Trial on A.C. test rig.
6. Visit to central A.C. plant in view of ducting system, insulation system and Air distribution system (e.g. frozen food industry/ice- cream industry/mushroom plants/textile industries).
7. Trouble shooting of window air - Conditioner.
8. Visit to a Dairy and Milk product manufacturing Unit.

Report of visit covering aspects of both air-conditioning and Dairy operation be prepared under the guidance of the teacher concerned

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
1	R.S.Khurmi	Refrigeration and Air Conditioning	S. Chand and Co.
2	Arrora and Domkundwar	Refrigeration and Air Conditioning	Dhanpat Rai and Sons
3	Manohar Prasad	Refrigeration and Air Conditioning	New Age Publications

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Fifth

Subject Title : Farm Machinery and Equipment

Subject Code : 17580

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	50#	--	25@	175

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Supervisor of agriculture machinery at farms has to organise and supervise field operation. For doing this he needs to have understanding of the proper use of various machinery and have skill in their operation. Similarly in the workshop of Agro- industry and service centre farms he should have knowledge of repair and maintenance of equipment and machinery for supervisory work.

Objectives:

The student will be able to:

1. Know operation of various farm equipment and Machinery such as Ploughs, Tillers, Sowing and Planting, Threshing, Harvesting.
2. Able to identify appropriate equipment and machinery as per the requirements.
3. Able to calculate the cost of use of equipment and machinery for specific use for specific period.
4. Select appropriate plant protection equipment.

Theory:

Name of the Topic and Contents	Hours	Marks
Topic 1: Farm Mechanizations Definition, Objectives of farm mechanizations, status of farm mechanization in India, scope for development, limitations, advantages.	04	08
Topic 2: Tillage and Tillage Equipments Tillage: Definition, Benefits of tillage, classification of tillage, types of tillage Equipments, **Primary Tillage equipments:** • **Mould Board Plough:** Types of mould board plough, construction. Types of share, and Mould board and their material of construction, Concept of suction, plough size, hitching of plough, point of bearing, Draft, side draft, unit draft, factors affecting draft, forces acting on plough. (Introduction only) Horse power requirements, and related numerical problems. • **Disc Plough:** Purpose, principles, types, construction and adjustment. • **Other Plough:** Chisel, sub surf • **Secondary Tillage Equipments:** Ace, Rotary plough. • **Ploughing**: Concept of terms related with ploughing, Methods of Ploughing. **Secondary Tillage equipments:** • **Harrow**: Types, construction and Adjustment, repair and maintenance of Animal and tractor driven harrow. • **Land Rollers Hackers and Pulveriser:** Types construction & operatic • Rotavator and Puddlers. • Intercultural and Weed Control Equipment.	08	16
Topic 3: Field Capacity & Efficiency: Introduction, Concept about Field capacity & Efficiency. Selection of farm machines and matching equipments of farm needs, Calculation of cost of operation of farm-machines, Field capacity & field efficiency.	04	08
Forces acting on tillage tools, Hitching systems and controls. Draft measurement of tillage equipments.	04	08
Topic 4: Sowing and Planting Equipment: **Seed Drill/Seed cum Fertilizer Drill:** Functions, Types, Construction, detail, size Metering devices, Furrow openers, seed covering devices Calibration of seed drill, and related numerical problems. Field adjustment, repair and maintenance & constructional details. Zero fill ferti drill, Fill plant machine, Strip fill drill Raised bed Planting Machine **Planters:** Function, Types, Metering devices, Method of planting. Field adjustment, repair and maintenance. Potato Planter, Sugar Cane Planter, Cotton, Misc. etc. **Trans-Planter**: Paddy transplanter (Mannual and self propelled), Vegetable trans-planter. **Fertilizing Equipments:** Manure Spreaders: Construction and working. Fertilizer Distributor: Construction and working.	06	12
Earth moving equipment, their construction & working principles viz. Bulldozer, Trencher, Elevators	04	08

Topic 5: Plant Protection Equipment: Types, principles of working, parts and material of construction, function and adjustment of sprayer and duster, Selection of plant protection equipment, field adjustment, repair and maintenance , safety precaution.	06	12
Topic 6: Harvesting Equipments: Principles & types of cutting mechanisms. Construction & adjustments of shear &impact-type cutting mechanisms. **Mower, Windrower and Reaper**: Principle of cutting, types, construction working, adjustments, trouble shooting. **Combined Harvester** : Types, Construction, Working, Material **Field Forage Harvesters**: Types, working adjustment and flow path adjustment, maintenance. Root crop harvesting equipment: Potato & Groundnut Digger: Construction and working. **Sugarcane Harvester**: Construction and working. Forage chopping & handling equipment. Principles of fruit harvesting tools and machines. Horticultural tools and gadgets.	06	14
Topic 7: Threshing Equipments: Threshing mechanics , Types of threshers: Olpad thresher, Power wheat and paddy thresher, working principle, material, flow path, adjustment, repair and maintenance, trouble shooting and precaution. straw combines & grain combines, maize harvesting & shelling equipment,	06	14
Total	**48**	**100**

Practicals;
Skills to be developed:

Intellectual Skills:

1. Identify machines and equipment required for various farm operations.
2. Identify parts of various farm equipment and know their functions.
3. Know how to operate them as per the requirement on the farming jobs.
4. Able to diagnose the faults.

Motor Skills:

1. Ability to draw sketches of the parts of various farming equipments.
2. Operate farming machinery and equipment under different conditions for its appropriate use on farm.
3. Ability to identify faults in farm equipments.

List of Practicals:

1.	Introduction to various farm machines, visit to implements shed.
2.	Measurement of Field capacity and field efficiency for at least two machines/implements for field machine and crop machine.
3.	Measurement of draft and fuel consumption for different implements under different soil conditions.
4	Study of constructional details, adjustments and working of M.B. plow and disc plow.

5	Study of constructional details, adjustments and working of disc harrow and secondary tillage tools.
6	Study of construction and working of rotavators and other rotary tillers. Field measurement of their performance.
7	Study of working of seed-cum-fertilizer drills, planters and their calibration in field.
8	Study of weeding Equipments: Manual Wheel Hoe, Bullock drawn and power operated inter-row cultivator and their use.
9	Study of sprayers, dusters, measurement of nozzle discharge, field capacity etc.
10	Study of various types of forage harvesters: constructional details, working and field operation with anyone.
11	Study of various types of threshers: constructional details, working and fields operation with any one type.
12	Study of various types of fruit harvesters, constructional details, working and fields operation with any one type.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
1	Kepner, Bainer and Barger	Principles of farm machinery	CBS Publisher and distributor, Delhi (1987) Indian edition.
2	S. C. Jain, Grace and Philip.	Farm Machinery and Approach, First Edition, 2003	Standard publishers Distributors,
3	SC. Jain and C.R.Rai	Farm Tractor Maintenance And Repair Second Edition, 1999	Standard publishers Distributors, New Delhi
4	CP Nakra	Farm machines & Equipment Edition 1990.	Dhanpat Rai & Sons, 1962, Nai Sarak Delhi.
5	A. C. Srivastava	Elements of Farm Machinery	Oxford & IBH Publishing Co.
6	Donel Hunt	Farm Power Machinery Management	Iowa state Univ. Press,
7	Ames Low	The Operation Care And Repairs Of Farm Machinery	Deere and Company
8	Dr. T.K. Bhattacharya	A Work book of Practical Farm Machinery, Vol. I and 2	Saroj Prakashan, 646 Katra, Allahabad – 211 002.

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Fifth

Subject Title : Irrigation Engineering

Subject Code : 17581

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	50#	--	25 @	175

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

This course is aimed to equip the learner with knowledge and skills required for designing of an modern irrigation systems for irrigating the crops and optimizing the crop production in the most efficient and economical ways.

The contents of the subject have been developed to inculcate capabilities for performing the above mentioned task economically and effectively.

Objectives:

The student will be able to,

1. To know the soil water plant relation ship.
2. Determine the crop water requirements.
3. Determine the time of irrigation.
4. Design the efficient irrigation method.
5. Compare and analyze the various methods of irrigation.

Theory:

Name of the topic and Content	Hours	Marks
Topic 1. Water Resources and their Utilization 1.1 Irrigation: Definition, Need, advantages and disadvantages of irrigation. 1.2 Impact of irrigation on environment. 1.3 Some major and medium irrigation schemes of India 1.4 Sources of irrigation water: Surface water sources and Ground water resources 1.5 Soil irrigability classes 1.6 Present status of development and utilization of different water resources of the country.	04	08
Topic 2. Soil Water Plant Relationship 2.1 Soil physical properties influencing irrigation such as soil texture, soil structure and bulk density, capillary and non-capillary pores and soil consistency. 2.2 Volume and mass relationships of soil constituents, kinds of soil water. 2.3 Movement of water into soils: Infiltration, factors affecting infiltration rate, Measurement of infiltration, infiltration equation $Y= at^a + b$ 2.4 Soil moisture constants: Saturation capacity, field capacity, moisture equivalent, permanent wilting percentage, available water, soil moisture characteristics curves.	12	28
Topic 3. Crop Water Requirement **3.1 Evapotranspiration:** Evaporation, transpiration and consumptive use **3.2 Measurement of Evapotranspiration:** Lysimeter experiment, field experimental plots, soil moisture depletion studies and water balance method. **3.3 Estimation of evapotranspiration from climatological data:** Blaney-Criddle method, Thornthwaite formula, Modified Panman formula, Panman-Monteith, Jensen-Haise and Hargraves-Samani 3.4 Selection crop coefficient for estimating ET (crop)	06	12
Topic 4. Irrigation Requirement 4.1 **Depth of irrigation:** Net irrigation requirement and Gross irrigation requirement 4.2 Duty, delta, crop period and base periods. Relationship between duty and delta. 4.3 Factors affecting duty and delta 4.4 Quality of irrigation water 4.5 Irrigation frequency, Irrigation period and Irrigation efficiencies. 4.6 Determination of design discharge based on cropping pattern and power calculation for pumping unit.	08	16
Topic 5. Conventional Irrigation Methods 5.1 Classification of irrigation methods 5.2 **Border irrigation:** Introduction, types, specifications, hydraulic of border irrigation, Design of border irrigation **5.3 Check basin irrigation:** Introduction, types, specifications, hydraulic of check basin irrigation, Design of check basin irrigation **5.4 Furrow irrigation:** Introduction, types, specifications, hydraulic of furrow irrigation, Design of furrow irrigation, contour irrigation	12	24

Topic 6. Advanced Irrigation Methods 6.1 Past, present and future need of micro-irrigation systems, role of Govt. for the promotion of micro-irrigation in India (Statistics to be continuously updated) 6.2 Merits and demerits of micro-irrigation system 6.3 Types and components of micro-irrigation system, 6.4 Basic variables involved in design of irrigation methods. 6.5 **Sprinkler Irrigation:** Introduction, adaptability, limitations, types of systems and Components of the sprinkler system. **Uniformity and efficiency:** Moisture distribution patterns and uniformity of coverage, uniformity coefficient. **Design of Sprinkler irrigation system:** Inventory of resources, layout of sprinkler system, sprinkler selection and spacing, capacity of the sprinkler system. **Hydraulic design of sprinkler systems:** Design of sprinkler laterals, main line pipe size. Pressure requirement and power units. Economical pipe selection and system economics and Rain-gun irrigation system. 6.6 **Drip (Trickle) irrigation:** Introduction, benefits of drip irrigation, components of drip irrigation system. Selection and design criteria for emitters**.** Design of lateral, sub main, main and pump. **Clogging and filtration: -** Types of filters and Degree of filtration. Application of fertilizers and chemicals through drip irrigation system. Maintenance and upkeep of drip irrigation. Cost economics of the system. Evaluation of drip irrigation system.	06	12
Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Select method for soil moisture measurement
2. Estimation of evapotranspiration, irrigation efficiency
3. Design sprinkler/drip irrigation system

Motor Skills:

1. Ability to measure various quantities accurately.
2. Calculate irrigation efficiency.
3. Make design calculation as per data given.

List of Practicals:

1. Measurement of soil moisture by gravimetric method, tensiometer, gypsum block, pressure plate apparatus.
2. Measurement of infiltration using double ring infiltrometer.
3. Determination of field capacity, wilting point.

4. Estimation of evapotranspiration based on climatological data.
5. Estimation of irrigation efficiencies.
6. Study of advance, recession and computation of infiltration opportunity time
7. Evaluation of border, furrow and check basin methods of irrigation.
8. Study of different components of sprinkler and drip irrigation systems.
9. Design of the sprinkler irrigation system a case study.
10. Determination of precipitation pattern, discharge and uniformity coefficient in sprinkler irrigation method.
11. Design of drip irrigation system a case study.
12. Determination of pressure discharge relationship and emission uniformity of drip irrigation system.
13. Study of different types of filters and determination of filtration efficiency.
14. Determination of rate of injection and calibration for Chemigation / Fertigation.

Learning Resources:
Books:

Sr. No.	Author	Title	Publication
1	A. M. Michael	Irrigation Theory and Practice Second Edition, 2008	Vikas Pub. House Pvt. Ltd. New Delhi.
2	Dilip Kumar Majumdar	Irrigation Water Management Principles and Practice	Prentice-Hall of India Pvt. Limited.
3	V.V.N. Murthy	Land and Water Management Engineering	Kalyani publishers, New Delhi
4	R.G. Allen, L.S. Pereira, D. Raes, M. Smith	Crop evapotranspiration (Guidelines for computing crop water requirements) FAO-56	FAO, Rome
5	M. L. Choudhary, U. S. Kadam	Micro-irrigation for cash crops	Westvile Publishing house, New Delhi
6	M. S. Mane, B. L. Ayare and S. S. Magar	Principles of Drip Irrigation System	Jain Brothers, New Delhi
7	Anonymous	Centrally Sponsored Scheme on Micro Irrigation (Drip & Sprinkler Irrigation) Guidelines	Ministry of Agriculture, Dept. of Agril. & Co-operation, New Delhi. 2006.

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Fifth

Subject Title : Post Harvest Technology

Subject Code : 17582

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
02	--	02	02	50	--	25#	25@	100

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Seasonal Work (SW).**

Rationale:

Post harvest technology, an integral part of the agricultural system, needs to be developed at par with developments in agriculture. In agriculture, harvesting and threshing are very important operation in the field. Now a day's machines are used in the farms for threshing and harvesting purpose by agro-industries, corporations, agricultural engineering departments. For operation and maintenance of post harvest equipments supervisory personnel are required. There is urgent need to develop the machinery and methods to reduce the losses and to promote value addition for export and domestic consumption.

In view of the emphasis given by the government for conservation, storage and adding value to the agricultural produces, the post harvest technology has assumed special significance. Primary operations like drying, cleaning, grading, sorting, storage, milling, preservation, packaging, processing, product development aspects, layout of marketing yards and transportation system are worth mentioning. All the above operations are done by the farmers at farm level through corporation or with the help of government level.

The contents of this subject have been developed to cater the above needs and equipment with the knowledge of post harvest techniques and equipments, so as to economise the processes and optimize the use of equipments and available infra structure.

Objectives: The student will be able to

1) Make the different products such Jam, Jelly, Marmalade, squash, ketchup and syrup.
2) Develop skill of cleaning and grading.
3) Execute seed treatment.
4) Study cleaning/processing equipments.

Theory:

Name of the Topic & Content	Hours	Marks
Topic 1. Introduction • Introduction to post harvest technology of Agricultural Produce • Importance and Scope of PHT • Need of PHT • Series of post harvest operations/unit operations	02	02
Topic 2. Drying • Introduction • Purpose of drying • Moisture content, Different methods used for determination of moisture content ➢ Direct method ➢ Indirect method • Relationship between dry and wet basis moisture content • Equilibrium moisture content • Process of drying such as Constant rate period and Falling rate period • Thin layer drying, Deep bed drying • Effect of different factors on drying process • Methods of grain drying ➢ Sun drying and ➢ Artificial drying • Grain dryer ➢ PHTC dryer ➢ Flat bed dryer ➢ Deep bed dryer ➢ LSU dryer ➢ Baffle dryer ➢ Rotary dryer ➢ Tray dryer ➢ Tunnel dryer ➢ Solar dryer ➢ Spray dryer	06	10
Topic 3. Cleaning and Grading • Importance • Machines / Equipments & working principles ➢ Scalper ➢ Air screen cleaner ➢ Rotary cleaner ➢ Spiral separator ➢ Specific gravity separator ➢ Indented cylinder separator ➢ Debearder and ➢ Magnetic separator ➢ Screen grader ➢ Divergent belt grader ➢ Roller grader ➢ Weight grader	06	08

Topic 4. Seed Treatment, Bagging, Packaging and Storage • Importance of seed treatment • Methods of seed treatment • Seed Treater: Slurry Treater and Direct Treater • Importance of bagging • Methods of bagging: Manuel Bagging, Semi-automatic bagging and Automatic bagging • Importance of Packaging • Requirements and function of packaging materials. • Packaging Materials: Shipping containers, Retail containers • Need & Importance of storage • Purpose of storage • General principal of storage • Changes in stored product during storage • Factor affecting storage	06	08
Topic 5. Milling / Size Reduction • Introduction • Grain shape • Average size of particle in a ground product • Screen analysis • Fineness modulus • Principles of size reduction • Crushing efficiency, energy requirement, Rittingers law, Kicks law • Size reduction machinery for cereals, pulses and oilseeds: ➢ Crushers: Jaw Crusher, Gyratory Crusher and Crushing roll ➢ Grinders: Hammer mill, Roller mill, Attrition mill ➢ Fine grinders ➢ Cutting machine: Knife, Cutter and Dicers • Oil expression and extraction • Mechanical expression device: Hydraulic press, Screw press	04	08
Topic 6. Material Handling and Transportation • Introduction • Mechanical devices for handling and transportation, their operation and maintenance ➢ Belt conveyor, ➢ Screw conveyor, ➢ Pneumatic conveyor, ➢ Bucket elevator	04	04
Topic 7. Canning • Need and Importance of canning • Principle and process of canning: ➢ Selection of fruits and vegetables, ➢ Washing, sorting/grading, peeling, cutting/slicing, blanching, cooling, can filling, lidding, exhausting, sealing, processing or retorting, cooling & storage • Containers for canning • Advantages of canning	02	04
Topic 8. Processing of Fruits and Vegetables	02	06

• Preparation of Jam, Jelly, Marmalade, squash, ketchup and syrup • Methods and machinery used for Preparation of Jam, Jelly, Marmalade, squash, ketchup and syrup		
Total	**32**	**50**

Practical:
Skills to be developed:

Intellectual Skills:

1) Knowledge of seed treatment method
2) Knowledge of drying equipments/methods
3) Storage methods & Packaging
4) Value addition

Motor Skills:

1) Determine moisture content for grains
2) Seed treatment /grading
3) Preparation of food/fruit/vegetable products.

List of Practicals:

1) Determination of moisture content.
2) Study of air screen cleaner and other cleaning equipments.
3) Study of grain dryers.
4) Study of seed treater.
5) Study of seed bagging and packaging.
6) Study of seed storage.
7) Determination of milling quality of cereals, pulses and oilseeds.
8) Study of material handling and transportation equipments.
9) Study of canning of fruits and vegetables.
10) Preparation of jam, jelly, marmalade, squash, ketchup and syrup.
11) Visit to fruits and vegetable processing units/industries and seed processing plant.

Learning Resources:
Books:

Sr. No	Author	Title	Publisher
1	K. M. Sahay & K. K. Singh	Unit operation of Agril. Processing	Vikas publication house Pvt. Ltd. 576, mashid road Jhangpur, New Delhi 110014
2	A. Chakraverty	Post harvest technology of cereals, pulses and oilseeds	Oxford & IBH publishing company Pvt. Ltd.
3	T. P. Ojha & A. M. Michael	Principles of Agril. Engineering Vol. 1	Jain brothers, New Delhi
4	R. P. Srivastava & Sanjeev Kumar	Fruits & vegetable preservation	International book distribution company, Lucknow

		3rd revised & Enlarrged Edition	
5	G. A. Henderson & R. C. Perry	Agricultural Process Engineering	The AVL Pub. Company Inc.
6	K. P. Sudheer & V. Indira	Post harvest technology of horticultural crops	New India publishing agency, New Delhi 110 088
7	P. S. Phirke	Post harvest engineering of fruits & vegetables	CBS publishers & Distributors, New Delhi

List of Instruments, Equipment and Machines:

1) Hot Air Oven
2) Aluminium Box
3) Attrition mill
4) Sugar
5) Citric acid
6) Muslin cloth
7) Paraffin wax
8) Glass bottles
9) Jel meter
10) Knife
11) Churner
12) Wire basket
13) Vinegar
14) Spices

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Fifth

Subject Title : Watershed Management

Subject Code : 17583

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
02	--	02	02	50	--	--	25@	75

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Seasonal Work (SW).**

Rationale:

This course is aimed to equip the learner with knowledge and skill required for taking effective measures against soil erosion, construction and maintenance of water conservation structures and development of land for irrigation and agricultural purposes.

The contents of the subject have been developed to inculcate capabilities for performing the above mentioned task economically and effectively.

Objectives:

The students will be able to:

1. Identify the types of soil erosion.
2. Know the causes of soil erosion and loss of soil and water from the land surfaces.
3. Understand the design procedures of temporary and permanent gully erosion control structures.
4. Apply the proper erosion control structures on the farms for conservation of soil and water and safe removal of the excess water from the soil surfaces.

Contents: Theory

Topic No.	Name of the topics	Hours	Marks
01	**Watershed Management** 1.1 Problems and Prospects 1.2 Definition, Multi use concept, size of watershed 1.3 Concept of watershed management. 1.4 Principles, objectives and components of watershed Management. 1.5 Causes of watershed detonation and identification of problems. 1.6 Problems and prospects of watershed management. 1.7 Use of remote sensing in watershed management. 1.8 Planning of watershed developments.	04	08
02	**Soil and Water Conservation** 2.1 Definition. 2.2 Aim of soil and water conservation in agriculture. 2.3 Land capability and Land use of capability classification. 2.4 Soil survey and Mapping unit 2.5 Conservation farming. 2.6 Hydrologic data for watershed planning.	04	06
03	**Watershed Based Land Use Planning** 3.1 Watershed Characteristics- Physical: size, shape, Slope, hydrologic cover, topography, geology 3.2 Geomorphological Watershed characteristics. 3.3Factors affecting watershed management, Hydrologic data for watershed planning 3.4 Delineation of watershed on priority basis. 3.3 Drainage network in watersheds. 3.4 Water yield assessment and measurement from a watershed. 3.5 Hydrologic and hydraulic design of earthen embankment. 3.6 Diversion structures.	06	12
04	**Agronomic Measures for Soil and Water Conservation** 4.1 Crop classification on the basis of soil conservation value. 4.2 Contour farming, mulching, strip cropping, cover cropping, mixed cropping and crop rotation, ley farming, monoculture. 4.3 Role of grasses in soil conservation. 4.4 Sediment yield estimation and measurement from a watershed and models.	08	12
05	**Evaluation and Monitoring of Watershed** 5.1 Peoples participation in watershed management. 5.2 planning and formulation of project proposals. 5.3 Cost benefits analysis of watershed. 5.4 Water budgeting in watershed. 5.5 Effect of cropping system on land management and cultural practices. 5.6 Ground water recharging and Water harvesting techniques.	10	12
	Total	**32**	**50**

Practical:
Skills to be developed:

Intellectual Skill:

1. Decide cropping pattern based on soil and water availability
2. Calculate availability of water from water resources.
3. Decide methods to use for augmentation of water resources.
4. Review of literature to understand the various suitable watershed works proposed for a specific watershed.
5. Collect data, presentation and interpretation of data.
6. Identify suitable watershed works.
7. Understand the field practices in construction and maintenance of watershed works.

Motor Skills:

1. Use of suitable survey instruments for collection of data.
2. Prepare drawings for watershed development.

List of Practicals:

1. Study of watershed characteristics and analysis of hydrologic data for watershed management.
2. Delineation of watershed and measurement of area under different vegetable and topographic conditions.
3. Measurement of water and sediment yield from watershed.
4. Study of different watershed management structures.
5. Study of various water budget parameters.
6. Study of watershed management technology.
7. Preparation of techno economically effective project proposal.
8. Grid survey of area, Preparation of contour map and delineation of watershed.
9. Determination of geomorphologic characteristic of the watershed.
10. Estimation of hydrologic parameters for watershed management.
11. Estimation of runoff from the watershed.
12. Preparation of techno-economically feasible project proposal for selected watershed.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
1.	G. O. Schwab, R. K. Frevert, T. W. Edminster, K. K. Barmes	Soil and Water Conservation Engineering	John Willy and Sons, Newyork
2.	Rajvir Singh	Watershed Planning and	--

		Management	
3.	Gurmail Singh	Manual of Soil and Water Conservation Practice	Oxford and IBH Publication Co.
4.	V. V. N. Murthy	Land and Water Management Engineering	Kalyani Publications
5.	R. Suresh	Soil and Water Conservation Engineering	Standard Publication
6.	A. M. Michael and T. P. Ojha	Principles of Agricultural Engineering Vol. II	Jain Brothers
7.	S. K. Datta	Soil Conservation and Land Management	--

Course Name : All Branches of Diploma in Engineering & Technology

Course Code : EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/ CO/CM/IF/ EE/EP/CH/PS/CD/ED/EI/CV/FE/FG/IU/MH/MI/TX/TC/DC/AU

Semester : Fifth for EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/ CO/CM/IF/EE/EP/CH/PS/AU and Sixth for CD/MH/IU/CV/FE/FG/MI/ ED/EI/DC/TC/TX

Subject Title : Behavioural Science

Subject Code : 17075

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	--	--	--	25 #	25 @	50

Rationale:

With increased globalization and rapid changing business expectations, employers are looking for wide cluster of skills to cater to the changing demand. Personality traits and soft skills are playing a key role in a student's career in this changing scenario. Corporate houses look for soft skills that supplement hard skills.

Addition of behavioural science in curriculum is intended to enhance the efficiency of a person so that he can contribute to overall growth of organisation. It aims at developing insight into leadership, team building, motivation, interpersonal relationship, problem solving, decision making and aspects of personality in a technician's profile. Addition of the topic of organizational culture will further mould him/ her in the organisational role.

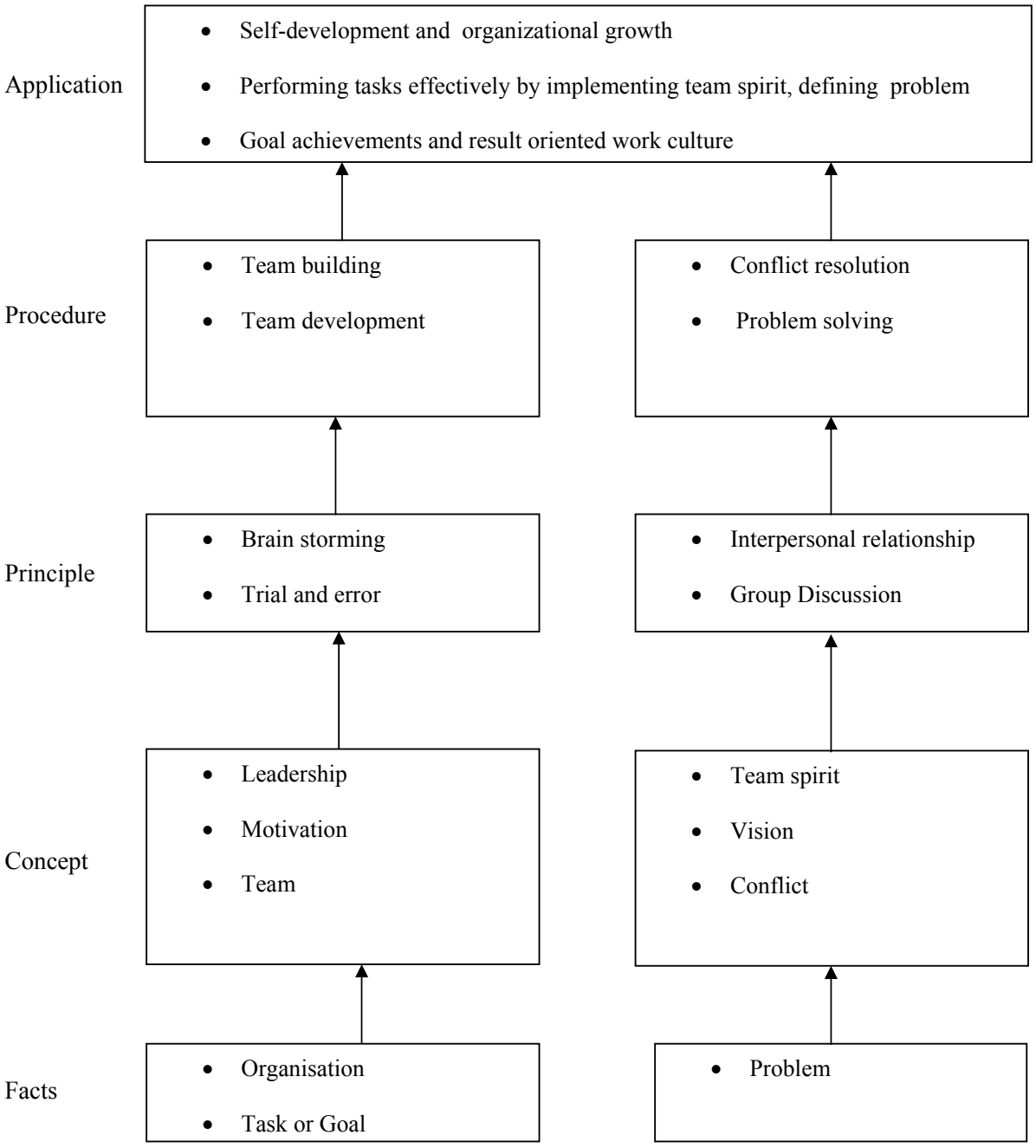
This subject of 'Behavioural Science' provides a broad base in which a technician can develop a successful career in the world of work.

General Objectives:

After studying this subject, the students will be able to:

1. Develop him/her as Team leader.
2. Use self-motivation and motivate others.
3. Build a team and develop team spirit among the team members.
4. Improve the interpersonal relationship skills.
5. Learn Problem solving and decision making skills.
6. Discuss a particular topic in a group and face the interview.

Learning Structure:



Theory:

Topic and Contents	Hours
Topic 1: LEADERSHIP Contents: 1.1 Introduction – Importance, examples of different types of leaders. 1.2 Meaning and Definition of Leadership. 1.3 Leadership qualities – Confidence, Vision, Communication Skills, influencing people etc. 1.4 Types of Leadership styles, their advantages and disadvantages – Autocratic, Democratic, Delegative, Bureaucratic and Laizze Fairie.	02
Topic 2: MOTIVATION Contents: 2.1 Meaning and Definition of motivation. 2.2 Types of motivation. 2.3 Maslow's Motivation theory. 2.4 Job characteristic model to enhance motivation.	03
Topic 3: TEAM BUILDING Contents: 3.1 Definition of Team. 3.2 Difference between Group and Team. 3.3 Need for formation of good team (vision, trust, cooperation, initiative, etc.) 3.4 Approach to Team building (Personality based, activity based, skill based, problem solving based, etc.)	02
Topic 4: CONFLICT RESOLUTION Contents: 4.1 Definition of Conflict. 4.2 Types of Conflict – Functional and Dysfunctional 4.3 Sources of Conflict – Ego, Authority, Frustration etc. 4.4 Positive and Negative effects of conflicts. 4.5 Methods of Conflict resolution – Compromising, withdrawal, forcing.	04
Topic 5: PROBLEM SOLVING AND DECISION MAKING Contents: 5.1 Steps in Problem Solving. 5.2 Methods used for solving problems – trial and error method, brain storming, lateral thinking method. 5.3 Techniques used for Decision making- Decision tree, Decision Matrix, Mind Mapping etc.	03
Topic 6: GROUP DISCUSSION AND INTERVIEW TECHNIQUES Contents: 6.1 GROUP DISCUSSION • Objectives of Group Discussion (ability to work in team, speaking and listening skills, leadership, creativity) • Does and Don'ts of Group Discussion. • How to conclude Group Discussion.	02

6.2 INTERVIEW TECHNIQUES • Types of Interviews. (patterned, stress, behavioural) • Dress Code, Body Language and Communication Skill. • Probable questions for Interview. • Telephonic or Video Interview.	
Total	**16**

Practical:
Skills to be developed:

Intellectual Skills:
1. Develop ability to find his strengths.
2. Select proper source of information.
3. Follow the technique of time and stress management.
4. Set the goal.

Motor Skills:
1. Follow the presentation of body language.
2. Work on internet and search for information.
3. Prepare slides / transparencies for presentation.

List of Practicals / activities:
1. Form a group of 4 or 5 students and discuss the topic 'Qualities of an effective leader'. Each group will prepare its list with justification to the entire class and write an assignment under the guidance of subject teacher.
2. Form a pair of student and each one from pair will ask each other questionnaire on motivation, self-motivation, experiences that motivated him or other which him for success in the past and write an assignment under the guidance of subject teacher based on discussion.
3. Form a group of 4 or 5 students and assign them a group activity such as 'making a shape from match stick (50 to 100 match sticks) without guidance and without group discussion.
4. The group as in activity 3 will now perform the same activity. After group discussion and under guidance of subject teacher, each student from a group will write an assignment for both the activities and write their inferences with reference to group discussion, team development, team building, etc.
5. Form a group of 8 to 10 student and arrange a group activity such as;
   - Industrial visit.
   - Visit to any historical place/fort/museum etc.
   - Housekeeping and cleaning of any laboratory/seminar hall for any function.

   After the execution of activity student will write an assignment under guidance of teacher keeping in mind individual role, purpose of activity, inter dependency of work or task, coordination of person and task involved and final performance.
6. Write an assignment on interpersonal relationship and conflict management with student's personal experience of solving conflicts.
7. Form a group of 20 students and ask them to prepare a list of 8 to 10 problems affecting the institute. Subject teacher should analyze one such problem on black board using 'Fish bone technique' with the participation of students. Students will write an assignment consisting;
   - Apparent problem statement.
   - Analysis of the causes.
   - Definition of real problem.

8. The subject teacher starts the session with 'Statement of the problem' written on the black board. After ensuring that all the participants are at the same level of understanding the statement of problem, he initiates NGT (Normal Group Technique) to arrive at maximum possible number of creative solutions.
   Based on ranking matrix the group will arrive at feasible solutions and students will write an assignment consisting of;
   - Problem Statement.
   - Model of problem solving.
   - List of creative solution suggested by participants.
   - Write the most feasible solution based on given criteria.

9. Form a group of 4 to 5 students and give them a topic for GD for 10 to 15 minutes. Teacher should analyse GD on certain parameters and students will write an assignment on aspects of GD and prepare a format (suggested or designed by teacher) which gives details of GD carried out.
10. Arrange a guest lecture of H.R. Person from industry/expert in interview technique and conduct mock interview of each student. Student should write a report on this activity.
11. Arrange a visit to industry and gather information about organisation, product, turnover, work culture, vision/mission statement, quality policy, Corporate social responsibility etc. and write a report on it.

Note - Subject teacher shall guide the students in completing the assignments based on above practicals.

Learning Resources:
Books:

Sr. No.	Author	Name of Book	Publication
1	Subject Experts-MSBTE	Handbook and Assignment Book on Development of Life Skills-II	MSBTE
2	Dr. Kumkum Mukherjee	Principles of Management and Organizational Behaviour	Tata McGraw Hill Education Pvt Ltd.
3	Dr.T.Kalyana Chakravarti Dr.T.Latha Chakravarti	Soft Skills for Managers	Biztantra
4	Barun K. Mitra	Personality Development and Soft Skills	Oxford University Press
5	Priyadarshini Patnaik	Group Discussion and Interview Skills	Foundation Books

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Fifth

Subject Title : Entrepreneurship Development and Project

Subject Code : 17085

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	--	--	--	--	25@	25

Rationale:

The curriculum of diploma course in Agricultural Engineering is being developed keeping in view the job opportunities in the field. It has been experienced that all students who pass out diploma do not go for jobs. Persons who possess entrepreneurial traits and attributes prefer setting up their own small scale industries/ business venture instead of seeking jobs.

The percentage of students who like to set up their own industrial/ business venture could be increased by way of introducing entrepreneurship development in agricultural engineering curriculum. The contents of this subject have been developed to cater the above needs.

Objectives:

The student will be able to**,**

1) Identify entrepreneurship opportunity.
2) Acquire entrepreneurial values and attitude.
3) Use the information to prepare project report for business venture.
4) Develop awareness about enterprise management.

Theory:

Topic and Contents	Hours
Topic 1. Entrepreneurship Development • Introduction: Entrepreneur, entrepreneurship, its meaning and importance. • Qualities of an entrepreneur. Entrepreneur Motivation Training (E M T). Ring toss, Achievement Planning, Business Idea Methods and techniques to generate business idea.. • SWOT Analysis	02
Topic 2. Industries: • Role and importance of small scale and other Industries. • Classification of industries-village industry, tiny industry, small, medium and large scale industry. Ancillary industry and skill based industry. • Identification of industry resources, demand • Financing Agencies for Land, Infra Structure, Machinery, Raw Material, Import of Raw Material and Machinery. • Role and function of Govt. department connected with the development of industries in the State. • Information related to project, Information related to support system, Information related to procedures and formalities	05
Topic 3. Market Survey: • Project selection based on market survey, demand and supply estimation, fast moving brands etc. • Market Assessment	02
Topic 4. Industrial Management: • Marketing Management and Liaison, Basic concept of marketing and salesmanship, Marketing mix, Working capital management, Cash flow. Personnel management. Limiting cost, budget and its control, book keeping, balance sheet, Break even analysis. • E-Commerce - Concept and process • Global Entrepreneur	03
Topic 5. Industrial Legislation and Taxes: • Industrial and Labour Laws, Production Tax. Local tax, Sales tax, Excise duty, Income tax.	02
Topic 6. Project Report: • Project report preparation and provisional registration. Components of project report/profile **(Give list)** • Preparation of detailed project report (D. P. R.) for financial assistance. • Component of project report: Land, Building, Electricity, water, Equipment and other utilities. Materials, its availability, cost, labor availability and wage rates. Price of finished product. • Project Appraisal : Meaning and definition, Technical, Economic feasibility, Cost benefit Analysis	02
Total	**16**

List of Assignments:

1. Assess yourself as an entrepreneur?
2. Prepare a project report and study its feasibility.

Components of Report (on following basis the report should be written):

1. Project Summary (One page summary of entire project)

2. Introduction (Promoters, Market Scope/ requirement)
3. Project Concept & Product (Details of product)
4. Promoters (Details of all Promoters- Qualifications, Experience, Financial strength)
5. Manufacturing Process & Technology
6. Plant & Machinery Required
7. Location & Infrastructure required
8. Manpower (Skilled, unskilled)
9. Raw materials, Consumables & Utilities
10. Working Capital Requirement (Assumptions, requirements)
11. Market (Survey, Demand & Supply)
12. Cost of Project, Source of Finance
13. Projected Profitability & Break Even Analysis
14. Conclusion.

Learning Resources:
1. Books:

Sr. No	Author	Title	Publisher
1	E. Gorden K. Natrajan	Entrepreneurship Development	Himalaya Publishing, Mumbai
2	Prepared by Colombo Plan staff college for Technical Education.	Entrepreneurship Development	Tata Mc Graw Hill
3	J. B. Patel D. G. Allampally	A Manual on How to Prepare a Project Report	EDI Study Material Ahmadabad
4	Poornima M. Charantimath	Entrepreneurship Development of Small Business Enterprises	Pearson Education, New Delhi
5	Special Edition for MSBTE	Entrepreneurship Development	McGraw Hill Publication
6	J.S. Saini B. S. Rathore	Entrepreneurship Theory and Practice	Wheeler Publisher, New Delhi
7	--	Entrepreneurship Development	TTTI, Bhopal / Chandigadh

2. Websites: http://www.ediindia.org