

**PROPOSED CURRICULUM STRUCTURE FOR THE SEMESTER 5 of DIPLOMA IN AGRICULTURAL ENGINEERING**

								Examination Pattern						Full Marks For			FULL MARKS	Credits	Page No.
					contact period per week		Internal assessment(for theoretical sub			External assessment (for theoretical sub)			Sessional subjects						
SL no	SUBJECT	Subject code	Question code	Packet code	lecture	sessional	Mid Semester Exam(CT)	TA	Total internal	obj	Subj	Marks allotted For ESE	Theoretical subject	TW	PR	Total			
<b>THEORITICAL</b>																			
1	Irrigation & Drainage Engineering				4	--	20	10	30	20	50	70	100	--	--	--	100	3	
2	Agricultural Waste Utilization				2	--	10	5	15	10	25	35	50	--	--	--	50	2	
3	Farm Power				4	--	20	10	30	20	50	70	100	--	--	--	100	3	
4	Seed Processing Technology				3	--	20	10	30	20	50	70	100	--	--	--	100	3	
5	Refrigeration And Air Conditioning				3	--	20	10	30	20	50	70	100	--	--	--	100	3	
6	Soil And Water Conservation				2	--	10	5	15	10	25	35	50	--	--	--	50	2	
7	Elective - I				4	--	20	10	30	20	10	70	100	--	--	--	100	3	
<b>SESSIONAL</b>																			
8	Agricultural Waste Utilization Lab.				--	4	--	--	--	--	--	--	--	25	25	50	50	2	
9	Seed Processing Technology Lab.				--	4	--	--	--	--	--	--	--	25	25	50	50	2	
10	Farm Power And Agricultural Tractors And Machineries Lab.				--	6	--	--	--	--	--	--	--	50	50	100	100	2	
<b>TOTAL</b>					22	14	120	60	180	120	260	420	600	100	100	200	800	25	

Student contact hour per week is 31 hour.

Theory and Practical classes will be of 1(one) hour duration.

List of abbreviation used: CT – class test; TA - Teacher's Assessment ( Attendance & surprise quizzes = 6 marks ; Assignment & group discussion = 4 marks.)

Obj: objective Subj - Subjective Minimum passing marks for Theoretical and Sessional subjects will be 40%

All other rules and regulations for assessment of practical and term work will be carried out as per prevailing norms

NO QUESTION SHOULD START WITH “WHY” OR ASKS FOR “ GIVING OR CITING REASONS”

TW – Term work ( to be evaluated by a board of departmental teachers) PR- Practical (to be evaluated by external teachers)

## 1 IRRIGATION & DRAINAGE ENGINEERING

Name of course: Diploma in Agricultural Engineering  
Course Code: Agr. E Course Duration: 6 semester  
Subject Code: Question Code:

Subject: Irrigation & Drainage Engineering  
Subject offered in semester: Fifth  
Marks: 100

Teaching Scheme	Examination Scheme
Theory : 4 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz -10
Practical: Nil	End Semester Exam - 70
Credit:- 3	Total Marks - 100

### Aim:-

To have knowledge of crop water requirements, skill on irrigation and drainage methods and water saving technique. To design efficient channels and water conveyance system.

### Objective :-

Irrigation water is supplied to supplement the water available from rainfall and the contribution from ground water. Amount and timing of rainfall is not adequate in many areas. Irrigation becomes essential to raise crops. On the other hands excess water causes a lot of problem not only to crops but to human as well. This makes the necessarily of drainage equally important.

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	INTRODUCTION	2	5
Unit 2	SOIL-WATER PLANT RELATIONSHIP	10	11
Unit 3	LAND GRADING AND LAND PREPARATION FOR IRRIGATION AND DRAINAGE	4	12
Unit 4	DESIGN OF IRRIGATION CHANNELS	1	10
Unit 5	WATER CONVEYANCE AND CONTROL STRUCTURES	3	8
Unit 6	APPLICATION OF IRRIGATION WATER	3	9
Unit 7	DRAINAGE	3	8
Unit 8	IRRIGATION AND DRAINAGE WATER QUALITY	4	7
Unit 9	RECYCLING OF DRAINAGE WATER FOR IRRIGATION		
	TOTAL	45	70

**Content:** Theory (Irrigation & Drainage Engineering) 3 hrs/wk

### 1.0 Introduction:

1.1 Water Resource Development And Utilization In India  
Importance Of Irrigation

### 2.0 Soil-Water Plant Relationship:

2.1 Measurement Of Soil Moisture, And;

2.2 Infiltration

2.3 Measurement Of Irrigation Water- Weirs And Notches, Area-Velocity Method, Parshal And Cut Throat Flumes

- 2.4 Consumptive Use And Evapotranspiration
- 2.5 Water Requirement Of Crops
- 2.6 Irrigation Efficiencies
- 3.0 Land Grading And Land Preparation For Irrigation And Drainage:
- 4.0 Design Of Irrigation Channels:
- 5.0 Water Conveyance And Control Structures:
- 6.0 Application Of Irrigation Water:
  - 6.1 Irrigation Scheduling
  - 6.2 Methods Of Irrigation Water Application-Flood, Border, Furrow, Check Basin, Sprinkler And Drip
  - 6.3 Evaluation Of Irrigation Methods.
- 7.0 Drainage:
  - 7.1 Causes And Effect Of Water Logging- Prevention And Control
  - 7.2 Drainage Investigations
  - 7.3 Drainage Requirements Of Various Crops
  - 7.4 Types Of Drainage Systems
  - 7.5 Planning, Design And Layout Of Surface And Sub Surface Drainage Systems
- 8.0 Irrigation And Drainage Water Quality:
- 9.0 Recycling Of Drainage Water For Irrigation:

**Text Book:**

SI NO	Name of Book	Writer's Name	Publisher's Name
1	Irrigation & Water Power Engineering	Dr. B. C. Punmia	Laxmi Publication Pvt. Ltd.
2	Irrigation Engineering	G. L. A. Sawa	Wiley Eastern Ltd.
3	Irrigation of Field Crops: Principles & Practices	S. S. Prihar , B. S. Sandhu	ICAR
4	Soil & Water Engineering	Prof. B.C.Mal	John Wiley & Sons
5	Land and Water Management Engineering	V.V.N. Murthy	-----
6	Solved Problems in Agricultural Engineering	Radhey Lal & A.C.Dutta	----

**2 AGRICULTURAL WASTE UTILIZATION**

Name of course: Diploma in Agricultural Engineering  
 Course Code: Agr. E Course Duration: 6 semester  
 Subject Code: Question Code:

Subject: Agricultural Waste Utilization  
 Subject offered in semester: Fifth  
 Marks: 50

Teaching Scheme	Examination Scheme
Theory : 2 lecture per week	CT- 10
Tutorial: Nil	Attendance, Assignment & Quiz -5
Practical: Nil	End Semester Exam - 35
Credit:- 2	Total Marks - 50

**Aim:-**

The basic aim is to trend the students for various recycling of the agricultural waste to maintain the natural balance while trapping the energy from them.

**Objective :-**

The utilization of Agricultural waste is equally important with a view.to make effective recycling. The efficient design of agricultural waste fired furnaces, briquetting process, equipment, power alcohol, utilization of wastes for paper production, particle board, by-products of rice husk, rice bran are some of the example which need to known to the students.

**Content:** Theory (Agricultural Waste Utilization)                      3 hrs/wk

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	Source and availability of agricultural wastes and byproducts - types - solids & liquids - utilization pattern	2	1
Unit 2	Suitability of wastes as fuel - waste fired furnace - mechanism, construction and efficiency	2	2
Unit 3	Fuel briquettes - wastes suitable for briquetting - advantages of briquetting - process - types - machinery	2	2
Unit 4	Fuel briquetting - machinery - construction - working - factors affecting briquetting	3	2
Unit 5	Power alcohol - suitability of waste materials as raw materials - processes - acid hydrolysis, enzymatic hydrolysis and alkali hydrolysis	4	2
Unit 6	Production of power alcohol - fermentation, distillation, extractive distillation - effluent treatment in alcohol production	3	3
Unit 7	Paper board production - suitability of agricultural waste materials - unit operations - importance of proportion of waste and other chemicals for quality of paper boards	3	3
Unit 8	Testing of paper boards - quality aspects - tensile, tearing, bursting and water absorption characteristics	4	2
Unit 9	Production of particle boards - raw materials - processes - resins - types - unit operations - chipping, cleaning, mixing, hot pressing - equipments	3	2
Unit 10	Quality aspects - mechanical strength - water absorption and utility characters	3	2
Unit 11	Products of coconut processing - byproducts - utilization of husk and shell - fiber extraction - methods - utilization of fiber and shell - various uses - production of activated carbon - utilization of coir pith - manure and particle board	5	3
Unit 12	Byproducts of rice milling - rice husk and rice bran - utilization of rice husk - fuel in furnace - construction of furnace and particle board	3	2
Unit 13	Production of furfural, white ash cement and activated carbon from rice husk	2	2
Unit 14	Utilization of rice bran - oil extraction - process - edible oil - refining process - utilization of by products of refining	2	2

Unit 15	Byproducts of wheat milling - germs and bran - use as cattle feed	4	3
Unit 16	Byproducts of pulse milling - husk, germs and broken - utilization as cattle feed and manufacture of baby food	3	2
	TOTAL	48	35

**Text Book:**

SI NO	Name of Book	Writer's Name	Publisher's Name
1	Rice: Production and Utilization	Luh(ed) S. Bor,	Oxford & IBH Publishing Co. Pvt LTD. New Delhi
2	Food, Feed and Fuel from Biomass	Chahal.D.S	Oxford & IBH Publishing Co. Pvt LTD. New Delhi
3	Biotechnology and other Alternative Technologies for Utilization of Biomass/ Agricultural Wastes	Chakraverty,A	Oxford and IBH Publishing Co. New Delhi
4	Post-harvest Technology of cereals and pulses	Chakraverty,A. and D.S.De.	Clarendon Press Oxford
5	Waste Management - Planning, Evaluation, Technologies	David C.Wilson	Ann Arbor Science Publishers,Inc. Michigan
6	Fuels from Biomass and wastes	Donald. L.Klass and Emert H. George	AACC, USA
7	Rice; Chemistry and Technology	Houston,D.F	Elsevier Applied Science Publishers. London
8	Energy Applications of Biomass	Michael.Z. Lowenstein	ICAR
9	Agro-Industrial Byproducts and nonconventional feeds for livestock feeding. Indian Council of Agricultural Research	Ranjhan,S.K	The Solvent Extractors Association of India ,Bombay
10	Hand Book on Rice Bran Processing and utilization of Products	Sheth B.M & B.V Metha	Jain Brothers. New Delhi
11	Biomass briquetting and Utilization	Srivastava P.K.,Maheswari R.C and Ohja T.P.	
12	Biomass Utilization	Wilfred. A. Cote	Plenum Press. New York

### 3 FARM POWER

Name of course: Diploma in Agricultural Engineering  
Course Code: Agr. E Course Duration: 6 semester  
Subject Code: Question Code:

Subject: Farm Power  
Subject offered in semester: Fifth  
Marks: 100

Teaching Scheme	Examination Scheme
Theory :4 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical: Nil	End Semester Exam - 70
Credit:- 3	Total Marks - 100

#### Aim:-

The aim of the subject is to develop the basic concept of different power source used on agricultural farms, their principles of operation and application in agricultural production system.

#### Objective :-

This subject deals with studies related to different sources of power available for agricultural use and their details for agricultural production. It includes both animate and inanimate sources of power like bullock tractors, power tiller and small engines. The study also include the working principles of an IC engine, constructional details, and their working efficiency.

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	INTRODUCTION- Power Sources	2	4
Unit 2	Engine Components	6	10
Unit 3	Engine Working Principles	7	9
Unit 4	Valve Mechanism	6	10
Unit 5	Engine Supporting Systems	8	8
Unit 6	Transmission Systems	8	9
Unit 7	Power Tillers	7	10
Unit 8	Economics	4	10
	TOTAL	48	70

**Content:** Theory (Farm Power) 3 hrs/wk

#### 1.0 Introduction- Power Sources

1.1 Power Availability On The Farms From Animate And Inanimate Sources Of Energy, Their Capacities And Efficiencies;

#### 2.0 Engine Components

2.1 Tractor Engine Components And Their Working;

#### 3.0 Engine Working Principles

3.1 Operating Principles And Function Of Engine Systems;

3.2 Differences Of Ci And Si; 2s And 4s Engines

#### 4.0 Valve Mechanism

4.1 Engine Valve And Valve Mechanism,

4.2 Valve Timing Diagram

- 4.3 Class Tests And Assignments.
- 5.0 Engine Supporting Systems
  - 5.1 Fuel And Air Supply
  - 5.2 Cooling And Lubrication
  - 5.3 Ignition And Starting & Electrical Systems
  - 5.4 Engine Governing;
- 6.0 Transmission Systems
  - 6.1 Transmission Systems Of Wheel And Track Type Tractors,
  - 6.2 Clutch And Brake, Gearbox, Differential, Pto,
  - 6.3 Belt Pulley And Draw-Bars And Final Drive Mechanisms;
- 7.0 Power Tillers
  - 7.1 Power Tillers Components And Uses
  - 7.2 Small Engines For Farm Operations;
- 8.0 Economics
  - 8.1 Performance And Cost Analysis Of Farm Tractors And Power Tillers.

**Text Book:**

SI NO	Name of Book	Writer's Name	Publisher's Name
1	Tractor & Their Power Units	J.B.Liljedahl, Turnquist, Smith, Hoki	C. B. S. Pub. & Distributers,11 Daryagan, N.D.-2
2	Fundamentals Of Internal Combustion Engine	Paul.W.Gill, James H Smith, Eugene. J. Ziurys	Oxford Publishing Pvt. Ltd
3	Principles of Agricultural Engineering	A. M. Michael & T. P. Ojha	---
4	Elements of Agricultural Engineering	J. Sahay	Agro Book Agency, New Chitragupta Nagar, Patna – 20

**4 SEED PROCESSING TECHNOLOGY**

Name of course: Diploma in Agricultural Engineering  
 Course Code: Agr. E Course Duration: 6 semester  
 Subject Code: Question Code:

Subject: Seed Processing Technology  
 Subject offered in semester: Fifth  
 Marks: 100

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical: Nil	End Semester Exam - 70
Credit:- 3	Total Marks - 100

**Aim:-**

The aim of the subject is to develop the basic concept on seeds, its management, pricing and marketing.

**Objective :-**

This subject deals with studies related to different topic of seed processing in which the study will make the students a basic concept on seed processing such as seed drying, seed storage, marketing and its management in industrial level.

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	Introduction And Principles Of Seed Processing	1	2
Unit 2	Seed Drying	6	8
Unit 3	Seed Storage	4	5
Unit 4	Physiology And Deterioration Of Stored Seed	6	5
Unit 5	Temperature And Relative Humidity In Seed Storage	5	8
Unit 6	Disease And Insect Management In Seed Storage	5	6
Unit 7	Seed Viability, Vigour And Dormancy	6	4
Unit 8	Seed Priming	2	3
Unit 9	Seed Pelleting	2	2
Unit 10	Seed Testing	2	5
Unit 11	Packaging And Labeling Of Vegetable Seeds	3	10
Unit 12	Seed Marketing, Management Of Seed Distribution, Seed Market Promotion And Seed Orice Management	6	12
	TOTAL	48	70

**Content:** Theory (Seed Processing Technology)      3 hrs/wk

1. Introduction and principles of seed processing
  - i) Dry and wet seed processing cleaning.
  - ii) Seed grading.
  - iii) Adjustment of moisture content for storage.
2. Seed drying
  - i) Drying seeds for long term storage
  - ii) Oven drying method
  - iii) Microwave drying method
  - iv) Artificial drying using seed dryers.
3. Seed storage
  - i) Importance
  - ii) Classification
  - iii) Factors affecting storage life of seeds
  - iv) Seed storage methods
4. Physiology and deterioration of stored seed
  - i) Physiological changes during ageing
  - ii) Theories of seed deterioration
  - iii) Prevention of deterioration
5. Temperature and relative humidity in seed storage
  - i) Effect of temperature



- ii) Seed moisture and humidity on storage use of seed
- 6. Disease and insect management in seed storage
  - i) Seed borne diseases and its management
  - ii) Insect management during seed storage
- 7. Seed viability, vigour and dormancy
- 8. Seed priming
  - i) Types of seed priming
  - ii) Factors affecting the seed priming
- 9. Seed pelleting
  - i) Evolution of seed coating (pelleting),
  - ii) Selection of materials used for coatings
  - iii) Types of pelleting
  - iv) Process of pelleting
- 10. Seed testing
  - i) ISTA background
  - ii) Seed testing analysis
  - iii) Seed vigour test
- 11. Packaging and labeling of vegetable seeds
  - i) Materials for short-term long-term storage
  - ii) Containers for shippings
  - iii) Labeling
  - iv) Record keeping
- 12. Seed marketing, management of seed distribution, seed market promotion and seed orice management
  - i) Marketing activities
 Government seed policies

## 5 REFRIGERATION AND AIR CONDITIONING

Name of course: Diploma in Agricultural Engineering  
 Course Code: Agr. E Course Duration: 6 semester  
 Subject Code: Question Code:

Subject: Refrigeration And Air Conditioning  
 Subject offered in semester: Fifth  
 Marks: 100

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical: Nil	End Semester Exam - 70
Credit:- 3	Total Marks - 100

### Aim:-

The course provides knowledge and expertise on various refrigeration and air conditioning systems. It also includes design of systems with cooling load calculation and air distribution.

**Objective :-**

Refrigeration is helpful for safe storage of agricultural commodities and air conditioning provides suitable atmosphere for farm live stock. Hence it is essential for the students to learn the theory and operation of refrigeration and air conditioning system.

**Content:** Theory (Refrigeration And Air Conditioning) 3 hrs/wk

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	Principles- refrigeration effect - Carnot cycle, Bell coleman cycle- vapor compression cycle	7	4
Unit 2	Temperature-entropy diagram, pressure-enthalpy charts, effect of dry compression-wet compression- under cooling- superheating-actual vapor compression cycle-	16	10
Unit 3	Vapor absorption cycle, Electrolux refrigerator, Centrifugal and steam jet refrigeration systems, Thermoelectric refrigeration systems, Vortex tube and other refrigeration systems.	12	9
Unit 4	Ultra low temperature refrigeration.	4	10
Unit 5	Types and functions of air conditioning Physiological principles in air-conditioning, humidification and dehumidification- room dehumidifiers.	11	10
Unit 6	Calculation of cooling and heating loads.	3	7
Unit 7	Air distribution and duct design methods,	5	10
Unit 8	Fundamentals of design of Cold storage & complete air-conditioning systems.	5	10
	TOTAL	63	70

**Text Book:**

SI NO	Name of Book	Writer's Name	Publisher's Name
1	Refrigeration & Air Conditioning	C. P. Arora	Mc Graw Hill
2	Applied Air conditioning and refrigeration	Gosling	C.T. Applied Science Publishers Ltd. London

**6 SOIL AND WATER CONSERVATION**

Name of course: Diploma in Agricultural Engineering  
 Course Code: Agr. E Course Duration: 6 semester  
 Subject Code: Question Code:

Subject: Soil And Water Conservation  
 Subject offered in semester: Fifth  
 Marks: 50

Teaching Scheme	Examination Scheme
Theory : 2 lecture per week	CT- 10
Tutorial: Nil	Attendance, Assignment & Quiz - 5

Practical: Nil	End Semester Exam – 35
Credit:- 2	Total Marks - 50

**Aim:-**

To have knowledge on the process of the soil erosion and types of land which are vulnerable. To develop skill on different control measures, proper design and protection of land.

**Objective :-**

Degradation of land due to erosion is a serious problem. Water, wind along with human activities accelerates the process of erosion and substantial amount of top soil is lost which needs utmost attention and control.

SL. NO.	TOPIC	Contact period	Maximum Marks
Unit 1	INTRODUCTION	1	2
Unit 2	SOIL EROSION	6	3
Unit 3	WATER EROSION CONTROL MEASURE	7	4
Unit 4	GULLY CONTROL STRUCTURES	4	3
Unit 5	FARM PONDS	6	4
Unit 6	FLOOD CONTROL	4	3
Unit 7	WATERSHED MANAGEMENT	5	3
Unit 8	CONTOURING	4	3
Unit 9	LAND DEVELOPMENT	5	4
Unit 10	WIND EROSION	3	3
Unit 11	FOREST (CONSERVATION) ACT	3	3
	TOTAL	48	35

**Content:** Theory (Soil And Water Conservation)      3 hrs/wk

- 1.0 INTRODUCTION:
  - 1.1 Scope of soil and water conservation
- 2.0 SOIL EROSION:
  - 2.1 Mechanics and types of erosion and their causes
  - 2.2 Rainfall, runoff and sedimentation relationships and their measurement
- 3.0 WATER EROSION CONTROL MEASURE:
  - 3.1 Biological control measures
  - 3.2 Contour bunds, contour trenches, contour stone walls, contour ditches
  - 3.3 Terraces
  - 3.4 Stream bank protection-vegetative barriers
  - 3.5 Outlets and grassed waterways
- 4.0 GULLY CONTROL STRUCTURES:
  - 4.1 Temporary structures
  - 4.2 Design of permanent soil conservation structures such as chute, drop and drop inlet spillways
- 5.0 FARM PONDS:
  - 5.1 Design of farm ponds and percolation ponds
- 6.0 FLOOD CONTROL:
  - 6.1 Principles of flood control and flood routing
- 7.0 WATERSHED MANAGEMENT:

- 7.1 investigation, planning and implementation
- 7.2 Selection of priority areas and water shed work plan
- 7.3 Water harvesting and moisture conservation
- 8.0 CONTOURING:
  - 8.1 Definition
  - 8.2 Object of preparing contour map
  - 8.3 Uses of contour map
  - 8.4 Characteristics of contours
  - 8.5 Methods of contouring
  - 8.6 Method of interpolation of contours
  - 8.7 Contour gradient
  - 8.8 Field location of grade contour
- 9.0 LAND DEVELOPMENT:
  - 9.1 Leveling, estimation of earth volumes and costing
- 10.0 WIND EROSION:
  - 10.1 design of shelter belts and wind brakes and their management
- 11.0 FOREST (CONSERVATION) ACT:

**Text Book:**

SI NO	Name of Book	Writer's Name	Publisher's Name
1	Principles of Agricultural Engineering	A. M. Michael & T. P. Ojha	----
2	Soil and Water Conservation Engineering	R Suresh	----
3	Land and Water Management Engineering	V. V. N. Murthy	---
4	Ground Water	H. M. Raghunath	Wiley Eastern Ltd., 40/8, Ballygunge circular Road ,Kol-19
5	Soil Engineering	Alam Singh	Asia Publishing House
6	Soil Erosion & Conservation	R.P. Tripathi	Wiley Eastern Ltd., 40/8, Ballygunge circular Road ,Kol-19
7	Soil & Water Engineering	Prof. B.C. Mal	Kalyani Publishers, Ludhiana

## 7 ELECTIVE – I

Name of course: Diploma in Agricultural Engineering  
Course Code: Agr. E Course Duration: 6 semester  
Subject Code: Question Code:

Subject: Elective – I  
Subject offered in semester: Fifth  
Marks: 100

Teaching Scheme	Examination Scheme
Theory : 4 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical: Nil	End Semester Exam – 70
Credit:- 3	Total Marks - 100

Elective: I - A

## ENTREPRENEURS DEVELOPMENT

Name of course: Diploma in Agricultural Engineering  
Course Code: Agr. E Course Duration: 6 semester  
Subject Code: Question Code:

Subject: Entrepreneurs Development  
Subject offered in semester: Fifth  
Marks: 100

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical: Nil	End Semester Exam – 70
Credit:- 3	Total Marks - 100

### Aim:-

To The course content aims to provide knowledge and understanding of Entrepreneurship Development to the student. This will impart the students a thorough idea on systematic procedure for developing own small enterprise.

### Objective :-

Entrepreneurship plays a prime role in industrial development of the country in general and of the state in particular. In any course of study particularly in engineering field it has been felt that a student should have some idea regarding Entrepreneurial Development, unlike other common subject. A diploma student in Agricultural Engineering the knowledge of Entrepreneurship Development is essential.

**Content:** Theory (Entrepreneurs Development) 3 hrs/wk

Sl. No.	TOPIC/SUB-TOPIC	Contact period	Maximum Marks
Unit 1	Entrepreneur and Entrepreneurship: Concept and introduction	7	5
Unit 2	Factors affecting Entrepreneurial Growth	5	7
Unit 3	Entrepreneurial Competencies and Motivation	12	15
Unit 4	Small Enterprises: an introductory framework	6	7
Unit 5	Project formulation and Appraisal	6	7
Unit 6	Financing of Enterprise and Institutional support to Enterprises	8	10
Unit 7	Govt. policy and Small Scale Enterprises	4	5
Unit 8	Marketing, HRM and TQM concepts and implications in Entrepreneurship Development	12	14
	TOTAL	60	70

**Text Book:**

1. Entrepreneurial Development- S. S. Khanka: S.Chand & Company
2. Industrial Entrepreneur in India- N.L.Dass: Orient Longman
3. Entrepreneurship in Small Scale Industries- S.S. Khanka: Himalaya Publishing House
4. Advances to Small Industries and Small Borrowers- Gopal Swarup: Sultan Chand and Sons

Elective: I - B

**REMOTE SENSING & GIS**

Name of course: Diploma in Agricultural Engineering      Subject: Remote Sensing & GIS  
 Course Code: Agr. E      Course Duration: 6 semester      Subject offered in semester: Fifth  
 Subject Code:      Question Code:      Marks: 100

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical: Nil	End Semester Exam – 70
Credit:- 3	Total Marks - 100

**Aim:-**

The course aims to make understand (a) The fundamental concepts and foundation of remote sensing (b) Elements of photographic systems (c) Data acquisition and interpretation in remote sensing (d) Basic concepts of geographic

information system (GIS) (e) Use of some leading software in remote sensing as well as GIS (f) Concepts of various types of data used in GIS software and their management.

**Objective :-**

The knowledge and skills of remote sensing and GIS is very important for agricultural engineering study now a day. The theory together with practices of this subject will definitely help agricultural engineers in efficient and sustainable management of scarce water resources as well as in soil conservation practices and irrigation water management practices.

**Content:** Theory (Remote Sensing & GIS)      3 hrs/wk

- 1.0 INTRODUCTION:
  - 1.1 Definition: History Of Remote Sensing: Abroad \ India
- 2.0 MULTICONCEPTS:
  - 2.1 Concepts Of Scale, Resolution
  - 2.2 Merits & Demerits Between Conventional And Remote Sensing Approaches
  - 2.3 Electromagnetic Spectrum: Optical \ Microwave
  - 2.4 Visible Region: Blue, Green And Red Wavelength Portion
  - 2.5 Non-Visible Region: B. UV, TIR, MW Wavelength Portion
  - 2.6 Radiation Sources: Active And Passive
  - 2.7 Natural \ Stimulated Luminescence; Photon
- 3.0 ENERGY TRANSMISSION:
  - 3.1 Maxwell's Formulation; Wavelength And Frequency: Their Relation And Units Of Measurement
  - 3.2 Polarization; Coherent & Incoherent Radiation; Doppler Effect
  - 3.3 Radiation Quantities - Radiant Energy, Radiant Energy Density, Radiation Flux, Irradiation, Radiance, Emissivity.
- 4.0 ATMOSPHERIC CHARACTERISTICS:
  - 4.1 Atmospheric Gas Composition, Pressure, Temperature, Number And Mass Densities; Scale Height; Clouds; Solar Radiant Energy.  
Flight Planning - Crab And Drift - Computation Of Flight Plan  
Specification For Aerial Photography, Basic Horizontal And Vertical Control  
Pre-Pointing And Post-Pointing -Planning For Ground Control  
Cost Estimates
- 5.0 PHOTOGRAPHIC IMAGES:
  - 5.1 Basic Characteristics And Interpretation Keys - - -
  - 5.2 Visual And Digital Interpretation
  - 5.3 Basic Elements In Photographic Interpretation For Terrain Analysis
  - 5.4 Equipments For Interpretation. Imagery Interpretation For Land Use -Geology - Soil -Forestry
- 6.0 MAPS:
  - 6.1 Introduction
  - 6.2 Map - Definitions - Representations - Point Line Polygon Common Coordinate Systems
  - 6.3 Map Projects Transformation, - Map Analysis.
  - 6.4 History Of Development Of GIS
  - 6.5 Definition - Basic Components - Standard GIS Packages.
- 7.0 DATA:

- 7.1 Data - Entry, Storage And Maintenance
- 7.2 Data Types - Spatial - Non-Spatial (Attribute Data) Data Structure
- 7.3 Data Format - Point Line Vector - Raster - Polygon - Object Structural Model -Files And Files Organization
- 7.4 Data Base Management System (DBMS), Entering Data In Computer - Digitizer - Scanner - Data Compression.

**Text book:**

- 1. Introduction to Remote Sensing by J.B. Campbell. Taylor & Francis, London, 622 pp.
- 2. Introductory Remote Sensing: Principles and Concepts by P.J. Gibson. Taylor & Francis, London, 184 pp.
- 3. Remote Sensing and Image Interpretation by T.M Lillesand, R.W. Kiefer, and J.W. Chipman. 5th Edition, John Wiley & Sons, New York, 763 pp.
- 4. Principles of Remote Sensing by P.J. Curran. Longman, London, 282 pp.

Elective: I - C

**CLIMATOLOGY**

Name of course: Diploma in Agricultural Engineering      Subject: Climatology  
 Course Code: Agr. E      Course Duration: 6 semester      Subject offered in semester: Fifth  
 Subject Code:      Question Code:      Marks: 100

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz -10
Practical: Nil	End Semester Exam – 70
Credit:- 3	Total Marks - 100

**Content:** Theory (Low Temperature Preservation Of Food Products)      3 hrs/wk

- 1. Climatology: basic concepts
- 2. A part of physical geography, an atmospheric science, types and subdivisions, aims and scope of climatology, a historical perspective, elements of weather and climate, controls of weather and climate.
- 3. Origin, composition and structure of atmosphere
- 4. Meaning and significance, atmosphere as a part of biospheric ecosystem, origin and evolution of atmosphere, structure of atmosphere.
- 5. Temperature
- 6. Introduction, transfer of heat energy, heating and cooling of the atmosphere, mean temperature, range of temperature, distribution of temperature, vertical distribution of temperature



7. Atmospheric pressure and motion
  8. Atmospheric pressure, pressure gradient, pressure types, variations in atmospheric pressure, horizontal distribution of air pressure and pressure belts, meridional distribution of pressure, shifting of pressure belts, atmospheric motion, wind direction and speed, classification of winds.
  9. General atmospheric circulation
  10. Atmospheric circulation, general circulation, mechanism of general circulation, zonal circulation of atmosphere, tricellular meridional circulation, seasonal shifting of pressure and wind belts and their climatic significance, el-nino la-nina phenomenon, walker circulation and el-nino southern oscillation.
  11. Local and seasonal winds
  12. Local winds: meaning and concept, periodic local winds, non-periodic local winds, monsoons, concept of the origins of monsoons, origin of Indian monsoon.
  13. Atmospheric humidity and condensation
  14. Humidity, water, latent heat, hydrological cycle, humidity capacity, types of humidity measurement, evaporation, evapo-transpiration, condensation, cooling of air and adiabatic change of temperature, condensation nuclei, forms of condensation, stability and instability of the atmosphere, atmospheric stability and weather.
  15. Fogs, clouds and precipitation
  16. Forms of condensation, fogs, clouds, precipitation, man-induced precipitation
  17. Frontogenesis, cyclones and anti-cyclones
  18. Fronts and frontogenesis, conditions of frontogenesis, creations of fronts, classification of fronts, frontal zones, weather associated with fronts, cyclones, temperature cyclones, anti-cyclones.
  19. Atmospheric extreme events and hazards
  20. Extreme events and hazards, types of extreme events and hazards, atmospheric extreme events and hazards, tropical cyclones, thunder storms, tornadoes, cumulative atmospheric hazards, floods, droughts.
  21. Climatic change
  22. Meaning and concept, scale dimension, indicators of climatic changes, reconstruction of climochronology, causes and theories of climatic changes.
  23. Global warming and change in atmospheric chemistry
  24. Major global problems, evidences of global warming, ozone depletion, green house effect and global warming, impact of climate change in India, global warming and international cooperations, global change in atmospheric chemistry.
- Weather forecasting.

## 8 AGRICULTURAL WASTE UTILIZATION LAB.

Name of course: Diploma in Agricultural Engineering  
 Course Code: Agr. E      Course Duration: 6 semester  
 Subject Code:              Question Code:

Subject: Agricultural Waste Utilization Lab.  
 Subject offered in semester: Fifth  
 Marks: 50

Teaching Scheme	Examination Scheme
Theory : Nil	Term work (TW) – 25
Tutorial: 4 period/wk	Practical (PR) – 25
Practical: 32	Total marks – 50
Credit:- 2	

**Aim:-**

To have knowledge on the process of the soil erosion and types of land which are vulnerable. To develop skill on different control measures, proper design and protection of land.

**Objective :-**

Degradation of land due to erosion is a serious problem. Water, wind along with human activities accelerates the process of erosion and substantial amount of top soil is lost which needs utmost attention and control.

**Content:** Practical (Agricultural Waste Utilization Lab.)      3 hrs/wk

Experiments on stepped crate and fluidized bed rice husk furnaces, waste fuel furnace, croqueting machine - production of alcohol from waste materials - production and testing of paper boards and particle boards from agricultural wastes.

1. Determination of thermal efficiency of the stepped crate furnace.
2. Determination of thermal efficiency of the fluidised bed rice husk furnace.
3. Determination of thermal efficiency of the agricultural waste fuel furnace.
4. Experiments on fuel briquetting machine.
5. Experiments on production of fuel briquetting by batch pressing.
6. Evaluation of physical characteristics and burning performance of fuel briquettes.
7. Experiments on production of alcohol from agricultural waste materials - I.
8. Experiments on production of alcohol from agricultural waste materials - II.
9. Experiments on production of alcohol from agricultural waste materials - III.
10. Production of paper boards from agricultural waste materials.
11. Determination of tensile, tearing, bursting and water absorption characteristics of paper boards.
12. Experiments on production of particle boards - I.
13. Experiments on production of particle boards - II.
14. Determination of modulus of rupture, tensile strength, screw and nail holding strength and impact strength of particle boards.
15. Determination of water absorption and swelling characteristics of particle boards.
16. Determination of acoustic properties and thermal conductivity of particle board.

### 9 SEED PROCESSING TECHNOLOGY LAB.

Name of course: Diploma in Agricultural Engineering  
 Course Code: Agr. E      Course Duration: 6 semester  
 Subject Code:              Question Code:

Subject: Seed Processing Technology Lab.  
 Subject offered in semester: Fifth  
 Marks: 50

Teaching Scheme	Examination Scheme
Theory : Nil	Term work (TW) – 25

Tutorial: 4 periods/wk	Practical (PR) – 25
Practical: 12	Total marks – 50
Credit:- 2	

**Aim:-**

The aim of the subject is to develop the basic concept on seeds, its management, pricing and marketing.

**Objective :-**

This subject deals with studies related to different topic of seed processing in which the study will make the students a basic concept on seed processing such as seed drying, seed storage, marketing and its management in industrial level.

**Content:** Practical (Seed Processing Technology Lab.)      3 hrs/wk

1. Seed sampling
2. Physical purity analysis by weight
3. Outer distinguishing varieties test (ODV)
4. Seed germination test
5. Biochemical test for viability
6. Determination of seed moisture content by oven dry method and universal moisture meter
7. Seed vigour test (performance test)
8. Seed vigour test (electrical conductivity test)
9. Seed treatment
10. Seed priming
11. Seed pelleting
12. Seed packaging

**10 FARM POWER AND AGRICULTURAL TRACTORS AND MACHINERIES LAB.**

Name of course: Diploma in Agricultural Engineering

Subject: Farm Power And Agricultural Tractors And  
Machineries Lab.

Course Code: Agr. E      Course Duration: 6 semester

Subject offered in semester: Fifth

Subject Code:      Question Code:

Marks: 100

Teaching Scheme	Examination Scheme
Theory : Nil	Term work (TW) – 50
Tutorial: 6 periods/wk	Practical (PR) – 50
Practical: 32	Total marks - 100
Credit:- 2	

**Aim:-**

The aim of the subject is to develop the basic concept of different power source used on agricultural farms, their principles of operation and application in agricultural production system.

**Objective :-**

This subject deals with studies related to different sources of power available for agricultural use and their details for agricultural production. It includes both animate and inanimate sources of power like bullock tractors, power tiller and small engines. The study also include the working principles of an IC engine, constructional details, and their working efficiency.

**Content:** Practical (Farm Power And Agricultural Tractors And Machineries Lab.) 3 hrs/wk

1. Familiarization of tractor systems and controls; determination of tractor speed and slip
2. Study of working of two-stroke and four-stroke cycle SI & CI engines, firing interval firing order and valve timing diagram
3. Study of cooling system of tractor engines
4. Study of lubrication system of tractor engine
5. Study of air cleaners and fuel systems of SI & CI engine
6. Assembling and disassembling of an IC engine used on agricultural farms
7. Study of different types of governors and methods of governing
8. Study of electrical system of tractors
9. Study of different types of clutches and brakes
10. Study of different types of gear transmission systems; calculation of speed ratio for different gears
11. Study of differential and final drives of tractors; planetary and speed ratios
12. Study of Ackerman's steering geometry; measuring and adjustment of caster and camber, toe-in and toe out
13. out
14. Study of hydraulic system of tractor
15. Study of the tyres, rims and ballasting of tractors
16. Calculation on different horse powers and cylinder pressures
17. Calculation on specific fuel consumption and power requirement on full and partial load operations.
18. Specific practicals will include:
19. Field operation of agricultural tractors
20. Hitching of various agricultural machineries and trailers
21. Field operation of power tillers
22. Field operation and adjustments of ploughs
23. Field operation and adjustments of harrows
24. Field operation and adjustments of cultivators
25. Field operation of sowing and planting equipment and their adjustments
26. Field operation of plant protection equipment
27. Field operation on mowers and reapers
28. Field operation of combine and determination of field losses
29. Field operation of threshers and their performance evaluation
30. Studies on methods of repair, maintenance and off-season storage of farm equipment
31. Opening and reassembly of disc harrows, determination and adjustment of tilt and disc angles
32. Visit to agro machinery manufacturers