

**NEP-2020 Aligned Curriculum for
Three Year (Six Semester) Diploma Programme in**

**AGRICULTURAL ENGINEERING
(5th and 6th semester)**

For the State of Uttar Pradesh



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PREFACE

An important issue generally debated amongst the planners and educators world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and opens economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

Director

Institute of Research Development & Training

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1. SALIENT FEATURE

- 1) **Name of the Programme** : Diploma Programme in Agriculture Engineering
- 2) **Duration of the Programme** : Three years (Six Semesters)
- 3) **Entry Qualification** : Matriculation or equivalent NSQF Level as Prescribed by State Board of Technical Education, UP
- 4) **Pattern of the Programme** : Semester Pattern
- 5) **NSQF Level** : Level - 5
- 6) **Ratio between theory and Practical:** 40 : 60 (Approx.)
- 7) **Industrial Training**

Four and six weeks of industrial training is made mandatory after the II and IV semesters during summer vacation. Total marks allotted to industrial training will be respectively 50 & 100.

In the last (6th Semester) we have made the one semester Industrial training/Internship as optional along with usual classroom training.
- 8) **Ecology and Environment**

As per Govt. of India directives a subject on Environmental Science has been incorporated in the curriculum.
- 9) **Entrepreneurship and Start-ups**

A full subject Entrepreneurship & Start-ups has been incorporated in the curriculum.
- 10) **Student Centered Activities**

A provision of 4-8 hrs. per week has been made for organizing Student Centered Activities for overall personality development of students. Such activities will comprise of co-curricular activities such as expert lectures, self-study, games, hobby classes like photography, and painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS, library and other cultural activities.
- 11) **Project work**

A project work has been included in the curriculum to enable the student get familiarize with the practices and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

2. PROGRAM OUTCOMES (POs)

PO1: Basics and Discipline specific Knowledge

Assimilate knowledge of basic mathematics, science and engineering fundamentals.

PO2: Problem's Analysis and solution

Identify, analysis and solve problems using standard methods and established techniques.

PO3: Design and Development

Design solutions for technical problems.

Assist in designing components, systems, or processes to meet specific requirements.

PO4: Engineering Tools, Experimentation, and Testing

Use modern engineering tools and appropriate techniques to conduct experiments as per BIS standard.

PO5: Socio/Economic/Environmental impact assessment/remedy.

Apply relevant technologies while considering societal needs, environmental impact keeping in view sustainable and ethical responsibilities.

PO6: Project Management and Communication

Apply engineering management principles, work effectively as an individual or in a team, and communicate clearly on activities.

PO7: Lifelong Learning

Recognize the importance of continuous learning and actively pursue self-improvement to keep pace with technological developments.

3. EMPLOYMENT OPPORTUNITIES FOR DIPLOMA HOLDERS IN AGRICULTURAL ENGINEERING

The following are the major employment opportunities for diploma holders in Agricultural Engineering:

- a. After pursuing diploma course in Agricultural Engineering student offers job opportunities in Horticulture, Poultry farming, Plant science, Soil science, Food science, Animal science, etc.
- b. A diploma in Agricultural Engineering give provides the skills and knowledge to deal with agricultural sales, agriculture business, food production, etc.

S.No.	Branch	Degination
1.	Agriculture • Ground water cell (Tube well & minor irrigation) • Soil & Water Conservation • Non Conventional Energy Sources • Agricultural Engineering	Supervisor/J.E Supervisor/J.E Supervisor/J.E Supervisor/J.E
2.	Minor Irrigation & Tube well Corporation	Supervisor/J.E
3.	Command Area Development Project	Supervisor/J.E
4.	Soil Conservation	Supervisor/J.E
5.	Agro Industrial Corporation • Work Shop • Marketing of Tractors, Implement, Seeding & Harvesting Equip.	Foreman/Supervisor
6.	Development Corporation	Supervisor/J.E
7.	National Seed Corporation	Supervisor/J.E
8.	State Formers Corporation	Supervisor/J.E
9.	Fertilizer Carporation of India • Feed plant • Fertilizer Plant	Incharge
10.	Ware Housing Corporation	J.E
11.	UP State Krishi Utpadan Mandi Parishad	J.E
12.	Rice Mills	Supervisor/J.E
13.	State Forest Department	Supervisor Machinery (Soil Conservate)
14.	Banks, UP State Coop Krishi Avam Gramya Bank Ltd.	Technical Supervisor/J.E.
15.	Research & Extention Deptt. of Agriculture	Research Assistant

16.	Manufactures of Tractors & Agro implements	Supervisor/Foreman/Sales Representative
17.	Teaching Institute	Assistant Lecturer/Foreman
18.	Mandal Vikas Nigam	J.E.
19.	Krishi Vigyan Kendra	J.E.
20.	Town & Country Planning	J.E.
21.	Gram Vikas Sansthan, Bakshi Ka Talab	Supervisor
22.	U.P. Jal Nigam	Supervisor/J.E
23.	U.P. Khadi Gramodyog	Supervisor/J.E.
24.	Tractor Krishi Yantra Workshop	Supervisor/Foreman
25.	Auto Tractors Ltd.	Supervisor/Foreman
26.	Appropriate Technology Deve. Association	J.E.
27.	Zila Gram Vikas Abhikaran	A.D.O.
28.	Entrepreneurs	
	(a) Manufacturers of	
	i. Agricultural implements	
	ii. Pump sets	
	iii. Fiber Processing	
	iv. Crop Processing	
	(b) Repair & Maintenance Centre of Agriculture Implements, Pump Set etc.	

4. LEARNING OUTCOMES OF DIPLOMA PROGRAMME IN AGRICULTURAL ENGINEERING

After undergoing this programme, students will be able to:

1.	Surveys the land and water resources of command areas.
2.	Supervises Land levelling operations
3.	Prepares plans for surface & sub surface water conveyance system.
4.	Supervises construction of farm structures.
5.	Assists in planning and execution of the schemes for (i) Rain fall (ii) Run off (iii) Water harvesting and its recycling (iv) Water shed management
6.	Interprets production drawings.
7.	Procures raw materials.
8.	Assists in quality control in production process of the products
9.	Controls labour for optimum production.
10.	Diagnose faults in equipment/machinery.
11.	Estimates the repair cost including requirement of spares.
12.	Procures spares and prepare their inventory.
13.	Tests the equipment and machinery for desired performance.
14.	Conducts demonstration of various products.
15.	Markets the products.
16.	Provides customer hire service.
17.	Assists farmer in arranging finance for land development work.
18.	Plans and executes land reclamation works.
19.	Supervises land development work.
20.	Performs after sales service to agricultural implements.
21.	Survey for the feasibility of tube wells.
22.	Installs trial bores for the area where such sources are lacking
23.	Selects bore size for a given situation.
24.	Selects pumps, power units and pipe line for a pump house.
25.	Prepare estimates and cost for distribution lines for installation of tube wells.
26.	Supervises installation and trial run of a tube well.
27.	Supervises rejoinment of old choked tube wells.
28.	Assists in determining aquifer parameters by performing pump test.
29.	Supervises operations, maintenance and repair of irrigation pumping sets.
30.	Demonstrates and popularise use of improved agricultural implements.
31.	Guides the farmers for the efficient use of tube wells, pumping sets and other lifting devices like wind mill etc.
32.	Collects data for pre & post monsoon water table of observation well.
33.	Supervises installation & maintenance of bio gas plant, wind mills, solar pumps, solar crop dryer and other non conventional energy equipments.

34.	Guides the farmers in arranging finance for purchasing non conventional energy source equipments.
35.	Guides the fabricators for standard design and quality of equipments.
36.	Guides the farmers for operation and maintenance of tractors and other allied equipments
37.	Supervises the construction of drainage & irrigation system of fields.
38.	Plans and constructs soil and water conservation structure.
39.	Plans the layout of farms.
40.	Supervises operation maintenance & servicing of land development equipments.
41.	Supervises installation, erection and commissioning of seed processing plants.
42.	Supervises storing of processed seeds.
43.	Supervises storage of food grains.
44.	Operates and maintains grain handling equipments and storage structures.
45.	Supervises handling, operations & Maintenance of rice processing machinery.
46.	Assists farmers in preparing loan application for agricultural equipments.
47.	Prepares feasibility report for loan.
48.	Scrutinises applications for loan with reference to assets & liabilities.
49.	Does liaison between bank & loanee.
50.	Suggests new schemes for advances for new Bank Loan.
51.	Assists in testing and evaluation of finished products as per BIS.
52.	Trains the trade men.
53.	Conducts experiments on soil and water
54.	Helps in research and extension works to engineers.
55.	Supervises flow operation of the manufacture of tractors & other implements.
56.	Estimates the cost of materials and equipments.
57.	Establishes services & customer hiring service centers for related agricultural deptt.
58.	Supervises handling, operation & maintenance of vegetable & fruit storage machines
59.	Prepares ketchup, Jam, Jelly and squash of different fruit & vegetable.
60.	Supervises the preservation of different fruit & vegetable

5. ABSTRACT OF CURRICULUM AREAS

i. HUMANITIES & SOCIAL SCIENCE COURSES (HS)

1. Communication Skills in English
2. Sports & Yoga
3. Entrepreneurship and Starts-ups

ii. BASIC SCIENCES COURSE (BS)

4. Mathematics
5. Applied Physics
6. Applied Chemistry

iii. ENGINEERING SCIENCE COURSE (ES)

7. Engineering Graphics
8. Engineering Workshop Practice
9. Introduction to Information Technology
10. Fundamental of Mechanical and Electrical Engineer
11. Engineering Mechanics

iv. PROGRAMME CORE COURSE (PC)

1. Agriculture and Soil Sciences
2. Surveying And Leveling
3. Material and Rural Construction Technology
4. Fundamental of Fluid Mechanics
5. Agriculture Equipment Workshop Practices
6. Soil Mechanics
7. Agricultural and soil Science Lab.
8. Surveying And Leveling Lab.
9. Summer Internship-I
10. Strength of Material
11. Farm Power and Machinery
12. Hydraulics
13. Hydraulics Lab.
14. Farm Mechanisation and Land Development
15. Engineering Drawing

16. Irrigation and Drainage Engineering
17. Protected Cultivation Technology
18. Strength of Material Lab.
19. Farm Mechanisation and Land Development Lab.
20. Minor irrigation and tube well Engineering
21. Post-Harvest Technology, Seed processing and Agro based industry.
22. Estimating and Costing
23. Soil and Water Conservation Engineering
24. Dairy and Food Engineering

OPEN ELECTIVE COURSES [OE]

Open Elective -I

- Internet of Things
- Energy Conservation and Audit

Open Elective -II

- Project Management
- Renewable Energy Technologies

• PROGRAM ELECTIVE COURSES [PE]

Program Elective -01

- Precision Agriculture and System Management
- Remote Sensing and GIS

Program Elective -02

- Sprinkler and Micro Irrigation System
- Agriculture structure and Environment control

v. PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSE WHERE

- Summer Internship-I (4 weeks) after IIInd Semester.
- Summer Internship-II (6 weeks) after IVth Semester.
- Major Project (In-House)/Internship/Industrial Training.

vi. AUDIT COURSES (AU)

- Environmental Science
- Essence of Indian Knowledge and Tradition (Q)
- Indian Constitution

OR
OPEN ELECTIVE ADVANCE SKILL CERTIFICATE COURSE

SR.NO.	COURSE NAME
1.	Course conducted by INFOSYS PRINGBOARD.
2.	Course conducted by TCS ION.
3.	Course conducted by nasscom – future skills.
4.	Course conducted by NPTEL.
5.	Moocs through Swayam.
6.	Conducted by aicte-elis and centrally funded technical institutes
7.	Conducted by C-DAC
8.	Conducted by certifications conducted by the institute of national importance (iit, nit, iiit etc.)
9.	Conducted by ISRO e-learning.
10.	Conducted by other relevant government, international/national platforms of repute.
11.	Conducted by NEILIT.

OR

Proposed Courses from TATA Technologies Ltd.

1. Fundamentals of Innovation and Design Thinking
2. Product Design and Development
3. Product Verification and Analysis
4. Advanced Automobile
5. Electric Vehicle
6. Internet of Things
7. Advanced Manufacturing
8. Advanced Welding & Painting using Simulator
9. Process Control & Automation
10. Industrial Robotics
11. Artisan using advanced tool
12. Advanced Plumbing

Note: Students may opt for any of the above advanced skill development courses and may get certificate against 02 credits (as mentioned in open elective-01).

6. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 50 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i.** 15 Marks for general behavior and discipline
(by HODs in consultation with all the teachers of the department)
- ii.** 10 Marks for attendance as per following:
(by HODs in consultation with all the teachers of the department)
 - a)** 75 - 80% 6 Marks
 - b)** 80 - 85% 8 Marks
 - c)** Above 85% 10Marks
- iii.** 25 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a)** 25 - State/National Level participation
 - b)** 20 - Participation in two of above activities
 - c)** 15 - Inter-Polytechnic level participation

Note: There should be no marks for attendance in the internal sessional of different subjects.

**STUDY AND EVALUATION SCHEME FOR AGRICULTURAL ENGINEERING
FIFTH SEMESTER**

Sr. No.	SUBJECTS	COURSE TYPE & CATEGORY	STUDY SCHEME			Credit(C) (L+T)+P =C	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External
			Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
			L	T	P/Drg		Th	Pr	Total	Th	Hrs	Pr	Hrs	Total		
5.1	Minor irrigation and tube well Engineering	PROGRAM CORE (PRACTICUM/THEORY)	2	-	2	2+1=3	20	20	40	60	3	-	-	60	100	
5.2	Post-Harvest Technology, Seed processing and Agro based industry	PROGRAM CORE (PRACTICUM/THEORY)	2	-	2	2+1=3	20	20	40	60	3	-	-	60	100	
5.3	Estimating and Costing	PROGRAM CORE (THEORY)	2	1	-	3+0=3	40	-	40	60	3	-	-	60	100	
5.4	Soil and Water Conservation Engineering	PROGRAM CORE (PRACTICUM/THEORY)	2	-	2	2+1=3	20	20	40	60	3	-	-	60	100	
5.5	Dairy and Food Engineering	PROGRAM CORE (THEORY)	3	-	-	3+0=3	40	-	40	60	3	-	-	60	100	
5.6	Program Elective -01 A) Precision Agriculture and System Management b) Remote Sensing and GIS	PROGRAM CORE (PRACTICUM/THEORY)	2	-	2	2+1=3	40	-	40	60	3	-	-	60	100	
5.7	(Q)Indian Constitution	AUDIT COURSE	2	-	-	0	50*	-	50*	-	-	-	-	-	-	
5.8	Summer Internship -II (6Weeks after 4 TH Sem.)	INTERNSHIP	-	-	-	2	-	100	100	-	-	-	-	-	100	
#Student Centred Activities (SCA)			-	-	12	0	-	50	50	-	-	-	-	-	50	
Total			15	1	20	20	180	210	390	360		-		360	750	

1) Students will present report/ presentation of summer internship completed after fourth semester in SCA period.

(Q) - It is compulsory to appear & to pass in internal assessment, but marks will not be included for division and percentage of obtained marks.

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visit, Library, N.C.C., NSS, Cultural Activities and self-study etc.

* **Practicum subjects** are to be evaluated by theory or practical examinations as mentioned in above scheme.

The lecture allotted to SCA can also be utilized for the course completion of other subjects.

**STUDY AND EVALUATION SCHEME FOR THREE YEAR DIPLOMA IN AGRICULTURAL ENGINEERING
SIXTH SEMESTER (NORMAL PATHWAY)**

Sr. No.	SUBJECTS	COURSE TYPE & CATEGORY	STUDY SCHEME			Credit(C) (L+T)+P =C	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External
			Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
			L	T	P/Drg		Th	Pr	Total	Th	Hrs	Pr	Hrs	Total		
6.1	Program Elective -02 A) Sprinkler and Micro Irrigation System B) Agriculture structure and Environment control	PROGRAM CORE (THEORY)	3	1	-	4+0=4	40	-	40	60	3	-	-	60	100	
6.2	Entrepreneurship and start-up**	PROGRAM CORE (THEORY)	2	-	-	2+0=2	40	-	40	60	3	-	-	60	100	
6.3	In-House project	PROGRAM CORE (PRACTICAL)	4	-	16	4+8=12	-	240	240	-	-	160	3	160	400	
6.4	(Q) Open Elective a) Project Management b) Renewable Energy Technology	Open Elective (THEORY) Qualifying	2	-	-	2+0=2	50*	-	50*	-	-	-	-	-	NA	
	Advance skill Development	CERTIFICATION COURSE					-	-	-	-	-	-	-	NA		
#Student Centred Activities (SCA)			-	-	8	0	-	50	50	-	-	-	-	-	50	
Total			11	01	24	20	80	290	370	120		160		280	650	

NOTE:-

** Common with other engineering diploma courses

(Q) - It is compulsory to appear & to pass in internal assessment, But marks will not be included for division and percentage of obtained marks.

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visit, Library, N.C.C., NSS, Cultural Activities and self-study etc.

OR

INDUSTRIAL PATHWAY

Sr. No.	SUBJECTS	Category & Course Type	STUDY SCHEME			Credits(C) (L+T)+P=C	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External	Assessment
			Periods/ Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT							
							T h	Pr	To t	Th	Hr s	P r	Hrs	To t			
6.1	Entrepreneurship and Start-ups (ONLINE Mode)	Humanities & Social Science (Theory)	-	-	-	2	-	-	-	100	03	-	-	100	100	Theory	
6.2	Industrial Hands On Practice	Industrial Training	-	-	-	12	150*			200**						350	
6.3	Industrial Project	Industrial Training	-	-	-	4	50*			50**						100	
6.4	# Seminar	In House	-	-	-	2	-	100	100	-	-	-	-	-	100		
Total			-	-	-	20	-							-	650		

NOTE:

1. The Industrial training tenure should not be less than 14 Weeks.
2. Industry must be registered with MSME / Directorate of industries/Limited Organization/ State/Central Government establishments.
3. Monthly progress reports of Intern/ Trainee should be attested and forwarded by industrial supervisor (allotted to Intern/Trainee) during industrial Internship/Training.
4. The Industrial unit/organisation must evaluate students using the format provided by polytechnic in the form of marks.
5. The Industrial Hands on Practice, Industrial Project and seminar must be evaluated on the basis of the AICTE Internship Policy: Guidelines and procedures (Chapter -9 Procedures / format for organizing internship)
6. “*Entrepreneurship and Start-up*” course is also mandatory in Industrial internship/training mode. It will be conducted online mode by his/her polytechnic institute. After completing the online course, students must appear for exam conducted by the Board of Technical Education, Lucknow.

7. *Evaluation by faculty mentor

The institute will depute one faculty member for mentoring at least 20-30 students undertaking apprenticeship training. Such mentors will monitor, guide and provide counselling to the students as and when required. Faculty mentor of the institute(s) may make a surprise visit to the internship/apprenticeship site to check the student's presence physically. (The Proforma of the evaluation is attached as the Annexure -1)

8. **** Evaluation by industry** : The industry shall assess the candidates based on the following parameters attendance, discipline and punctuality, familiarity of tools and material, engineering skills, application of knowledge and problem-solving skills, comprehension and observation, professional ethics, safety and environmental consciousness, communication skills, supervisory skills and general conduct during the period (The Proforma of the evaluation is attached as the Annexure -2)
9. **# Evaluation through seminar presentation/Viva-Voce at the institute** : The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

PRATICUM/ THEORY	5.1 MINOR IRRIGATION AND TUBE WELL ENGINEERING	L	T	P
		2	-	2

Course objective:

"Minor Irrigation and Tube Well Engineering," equips learners with essential knowledge for enhancing agricultural production. It covers the importance, concepts, and scope of minor irrigation, including state tube wells and their role in increasing yields. Students will learn about various water sources like wells, tanks, and ponds, along with planning minor irrigation channels. The curriculum details traditional and modern water-lifting equipment, including different pump types (centrifugal, submersible, turbine), windmills, hydrams, and solar pumps. Tube well engineering is extensively covered, encompassing site selection, drilling methods, different tube well types, and strainer design.

Course outcomes:

Upon completing this course, students will be able to:

- CO1- Identify and explain the importance, necessity, and scope of minor irrigation and tube wells for agricultural development.
- CO2- Analyze and select appropriate sources of minor irrigation, including well types and aquifer characteristics.
- CO3- Describe and differentiate between traditional and modern water-lifting and pumping equipment, including their working principles.
- CO4- Design and plan minor irrigation channels and tube well systems, considering site selection, drilling methods, and strainer types.
- CO5- Understand the design, construction and operation of open wells and pumping equipment, including types, working principles, selection, installation, alignment, operation and maintenance of centrifugal, submersible and turbine pumps.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	1	-	-	2	2
CO2	3	3	2	1	-	2	1
CO3	2	3	2	2	1	1	1
CO4	3	3	3	2	1	2	1
CO5	3	3	2	3	2	2	1

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

Minor irrigation

Unit 01: Introduction (5 Periods)

- Importance, necessity and advantages of minor irrigation, Concept, application and scope of minor irrigation.
- State Tube wells: Importance in increasing agriculture production, command area and government policy about tube wells.

Unit 02: Sources of minor Irrigation and Planning: (5 Periods)

- Shallow & deep wells, water tanks and ponds, Confined and unconfined aquifer, development of well.
- Planning and layout of minor irrigation channel.

Unit 03: (6 Periods)

- a) **Minor irrigation equipment:** Introduction of the following traditional water lifting devices: Swing basket, mhot, rahat, charas, dhenkuli, Egyptian screw, Propeller pump, Axial flow pump.
- b) **Water pumping equipment:** Wind mills, hydram, solar water pumps, principles, constructional details & working.

Unit 04: Tube well Engineering (6 Periods)

- a) **Introduction:** Definition of tube well, need, advantages & disadvantages.
- b) **Selection of Site:** Characteristics of tube well site, factor affecting site selection.
- c) **Drilling methods:** Types of drilling methods, advantages of different methods. Types of rigs; Rotary & percussion rigs, their construction, installation and working.
- d) **Types of Tube well:** Types of tube well, advantages & disadvantages of each type, selection of tube well for a given site.
- e) **Strainers:** Types, method of design, comparison of different types of strainers

Unit 05: Open wells and pumping equipment (6 Periods)

- a. **Open wells:** Design and construction of open wells.

- b. Pump and Pumping equipment's:** Types, main features, working principle, selection of pumps and pumping equipment, centrifugal pump, Submersible and turbine pumps, performance, installation and Alignment of centrifugal pump. Submersible pumps, installation, operation and maintenance

Practical Exercises:

1. Study and sketch of spill ways and outlet.
2. Study of different types of methods of irrigation adopted for different crops at formers field.
3. Study and sketch of infiltration and actual determinations of infiltration rate of soil in field.
4. Study and sketch different weirs, notches, orifices and flumes and flow measurement us channel.
5. Determination of discharge of a channel by:
 - (a) Float method
 - (b) Current meter method
6. Study and sketch of Tensiometer and its use in determination of soil moisture.
7. To measure pressure head in saturated soil by piezometer.
8. To determine irrigation efficiencies in field:
 - i. Water application
 - ii. Water conveyance
 - iii. Water distribution
9. To determine consumptive use by weighing type evapo-transpiration pan.
10. Preparation of drainage plans.
11. To determine yield of a tube well.
12. Study and sketch of the following: (Any two)
 - i. Sprinkler Irrigation
 - ii. Drip Irrigation
 - iii. Wind Mill

Instructional strategy:

Teacher may use demonstration of different materials that can make the subject interest and develop knowledge of building materials and construction methods in the student. In additions student give more emphasis on explaining practical application of construction of related structures efficiently and economically and encouraged study those processes which may find practical application in future career.

Means of assessments

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva Voce

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (hrs.)	Marks Allotted (%)
1	5	20
2	5	20
3	6	20
4	6	20
5	6	20
Total	28	100

PRATICUM/ THEORY	5.2 POST-HARVEST TECHNOLOGY, SEED PROCESSING AND AGRO BASED INDUSTRY	L	T	P
		2	-	2

Course Objective:

This course aims to equip students with essential knowledge and practical skills in post-harvest technology, addressing the critical need for efficient handling, processing, and value addition of agricultural produce. It covers key operations such as drying, cleaning, grading, storage, and specialized processing of cereals, pulses, oilseeds, fruits, and vegetables. Emphasizing the government's focus on conservation and economic optimization, the objective is to enable students to effectively operate and maintain post-harvest equipment, manage storage systems, and utilize agricultural by-products, ultimately contributing to reduced losses and enhanced profitability in the agricultural sector.

Course Outcomes:

Upon completion of this course, students will be able to:

- CO1- Apply principles of drying, cleaning, and grading for various agricultural commodities.
- CO2- Design and manage effective storage systems to minimize post-harvest losses and preserve quality.
- CO3- Operate and maintain a range of post-harvest equipment used in processing cereals, pulses, oilseeds, fruits, and vegetables.
- CO4- Understand and implement techniques for value addition, including canning, dehydration, and by-product utilization.
- CO5- Contribute to the economic optimization of agricultural produce handling from farm to market.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	2	1	-	2	1
CO2	3	3	2	3	1	2	1
CO3	2	3	3	2	2	1	1
CO4	2	2	3	2	2	2	1
CO5	3	2	2	3	1	3	2

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

Unit 01 Introduction:

(7 Periods)

Importance of grain and seed processing principles of agricultural processing, sequence of operations, flow diagram, services offered by processor to farmers and under water grain storage.

DIFFERENT STEPS INVOLVED IN GRAIN AND SEED PROCESSINGS:

- **Drying:** Importance of moisture in seed and grain representation. Determination of moisture, direct and indirect methods, process of drying such as constant rate period and falling rate period. Drying kinds: thin layer and deep-bed drying. Temperature and air flow requirement, natural air and heated air drying, solar drying. Direct and Indirect dryers, their efficiency and economics.
- **Cleaning and Grading:** Importance, elementary, study of related machines, their operations and maintenance such as scalper, air screen cleaner, rotary cleaner, spiral separator, indented cylinder separator, gravity separator, debearder.
- **Seed treatment:** Seed treatment methods, elementary study of seed treating equipment such as powder and slurry seed treater and their advantages.
- **Bagging & Packaging:** Manual bagging, semi-automatic bagging, Machines and automatic bagging machines. Packaging materials and their utilization.

Unit 02 Storage:

(5 Periods)

- **Storage:** Storage of seed and grain, respiration and factors affecting it, changes in stored product during storage, loss of germination and seed viability. Design of storage system and equipment. I.S.I. code practice. Storage of fresh fruits, vegetables and dairy products.
- **Material Handling Equipment:** Belt conveyor, screw conveyor, pneumatic conveyor, bucket elevator, their operation and maintenance.

Unit 03 Cereals, pulses, oilseeds and spices processing:

(5 Periods)

- **Pretreatment/Conditioning:** Parboiling of paddy, Methods and machinery used for parboiling, pretreatment of pulses and oil seeds for milling.
- **Milling and processing:** Methods and machinery used for milling for cereals pulses and oil seeds such as paddy, wheat, arhar and mustard. Elementary knowledge of solvent

extraction and spices grinding.

Unit 04 processing of fruits and vegetables:

(6 Periods)

- **Canning of Fruits and Vegetables:** Methods and machinery used for canning, advantages of canning.
- **Dehydration of Fruits and Vegetables:** Methods and machinery used for dehydration of fruits and vegetables such tray drier, solar drier, Advantage of dehydration.
- **Processing of Fruits & vegetables for Preparation of Jam, Jelly, Squash, and Ketchup:** Methods and machinery used for preparation of Jam, Jelly, Squash, Ketchup, Chutney, Murabba etc. Seed extraction from fruits and vegetables.

Unit 05 By product utilization and agro-based industry:

(5 Periods)

- **Utilization of Byproducts:** Utilization of paddy husk, rice bran, paddy straw, corn cob; Biomethanation of fruits and vegetable waste, Gasification of agricultural based cellulosic materials.
- **Agro-based Industries:** Sugarcane crushing, khandsari and Gur making process and equipment; Preparation of Soybean and Potato based products such as Soyamilk, Soypaneer, Soybiscuits Papad, chips Waffers, etc.; Briquetting of agricultural waste to use as fuel, Card Board preparation from paddy straw.

Practical exercises:

Study and operation of the following:

1. Air screen cleaner and other cleaning equipment.
2. Heated air dryer.
3. Screw conveyor, bucket elevator & belt conveyer
4. Slurry seed treater and mixer
5. Case Study of the following available in through visits:
 - a. Modern Rice Mill

- b. Cold Storage/Appropriate technology for short duration storage at village level.
- c. Specific gravity separator
- d. Processing and storage plant
- e. Gur making unit
- f. Soybean processing unit
- g. Canning and packaging of fruits and vegetables.
- h. Khandsari sugar making unit
- i. Vegetable dehydrating unit
- j. Seed germinating unit
- 6. Preparation of Mango, Guava, Karaunda and Apple jelly.
- 7. Preparation of Orange squash and Lemon squash.
- 8. Preparation of ketchup of different fruits.
- 9. Agro waste composite materials

INSTRUCTIONAL STRATEGY:

Teacher may use demonstration of different materials that can make the subject interest and develop knowledge of building materials and construction methods in the student. In additions student give more emphasis on explaining practical application of construction of related structures efficiently and economically and encouraged study those processes which may find practical application in future career.

MEANS OF ASSESSMENTS:

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva Voce

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (hrs.)	Marks Allotted (%)
1	7	20
2.	5	20
3.	5	20
4.	6	20
5.	5	20
Total	28	100

THEORY	5.3 ESTIMATING AND COSTING	L	T	P
		2	1	-

COURSE OBJECTIVES:

This course aims to equip students with the ability to estimate costs for both civil engineering agricultural structures and mechanical machinery. Students will learn to analyze material, labor, and overhead expenses, understand contractor operations, and become proficient in supervision, estimation, and valuation. The objective is to develop efficient professionals capable of managing financial aspects of agricultural engineering projects.

COURSE OUTCOMES:

Upon successful completion of this course, students will be able to:

- CO1- Accurately prepare various types of cost estimates for agricultural civil engineering works, including detailed item rate and preliminary estimates.
- CO2- Perform quantity surveying using established methods and analyze rates for different construction activities.
- CO3- Estimate costs for specific components of buildings, roads, and farm structures.
- CO4- Calculate material quantities for complete structures and determine earthwork volumes for irrigation/drainage channels.
- CO5- Estimate costs for mechanical engineering works, encompassing material weight, welding, and forging operations.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	3	2	2	1	2	1
CO2	3	3	3	2	1	2	1
CO3	3	2	3	2	1	2	1
CO4	3	3	2	3	1	2	1
CO5	2	3	3	2	2	1	1

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

(A) Cost estimating of civil engineering works:

Unit 01 Introduction:

(8 Periods)

Definition of estimating, purpose, types of estimate, preliminary estimate,

cubical content estimate, plinth area estimate, approximate quantity method estimate, detailed or item rate estimate, revised supplementary estimate, annual repair cost and special repair estimate. Bill of quantities, abstract of cost, prerequisites of estimating that is drawing, specification, rates, general and detailed specifications.

Unit 02 Measurements of works & analysis of rates:

(8 Periods)

Units of measurement, general rules of taking measurement, units of payment, method of measuring quantities- Centre line method, long and short wall or out and in to in methods.

Schedule of rate, need of analysis of rates, requirement of labour for different works as per NBO, requirement of material for different works, preparation of analysis of rate of 10 important works.

Unit 03 estimate of different work of a building, roads & farm structure:

(9 Periods)

- (a) Earth work in foundation, steps, dwarf wall, boundary wall
- (b) Concrete in foundation
- (c) Brick masonry in footings
- (d) Brick masonry upto plinth
- (e) Brick masonry in super structure
- (f) D.P.C.
- (g) R.B. and R.C. works
- (h) Flooring
- (i) Sand/earth filling
- (j) Plastering and pointing
- (k) White washing and colour washing
- (l) Site development
- (m) Antitermite treatment
- (n) Arches and roofs
- (o) Water supply and sanitary works:
 - (i) Bath room and W.C. including fittings
 - (ii) Septic tank and soakpit
 - (iii) P.R.A. type latrine
- (p) Doors and windows
- (q) Misc. other works

Unit 04 Estimate of a complete village house, irrigation and drainage channels:

(8 Periods)

I. Calculation of materials:

Calculation of quantities of different materials from estimated quantities of items like brick work, cement concrete R.B. and R.C. work for village house, irrigation and drainage channels.

II. Estimate of earth work of road, Irrigation and drainage channels:

Calculation of land areas and volumes-Prismoidal formula, mass diagram, methods of taking out and scheduling quantities for various items such as culverts and bunds. Earth work volumes by spot levels and contours, Calculation of Earth work for irrigation and drainage channels.

(B) Cost estimating of mechanical engineering works

Unit 05:

(9 Periods)

a) Estimation of materials:

Estimation of weight of a simple machine part.

b) Estimation of Welding:

Material cost, fabrication cost, welding cost & finishing cost, overhead cost, labour accomplishment factor and cumulative effects of poor practices on cost.

Calculation of cost of welding, gas consumption and welding electrodes.

c) Estimation of Forging: Concept of losses in forging operation. Estimation for the tuck required for hard forging considering scale and shear losses.

d) Estimation of cost: Concept of costing, brief discription of direct materials, indirect materials, direct labour, indirect labour and overhead expences.

INSTRUCTIONAL STRATEGY:

Teacher may use demonstration of different materials that can make the subject interst and develop knowledge of building materials and construction methods in the student. In additions student give more emphasis on explaing practical application of construction of related structures efficiently and economically and encouraged study those processes which may find practical application in future career.

MEANS OF ASSESSMENTS

- Assignment & Quiz,
- Mid-Term and End-Term written test

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (hrs.)	Marks Allotted (%)
1.	8	20
2.	8	20
3.	9	20
4.	8	20
5.	9	20
Total	42	100

PRATICUM/ THEORY	5.4 SOIL AND WATER CONSERVATION ENGINEERING	L	T	P
		2	-	2

COURSE OBJECTIVE:

The primary objective of this course is to equip learners with comprehensive knowledge and practical skills in soil and water conservation. It aims to enable them to effectively implement measures against soil erosion, including various mechanical and agronomic techniques. Learners will gain proficiency in the construction and maintenance of water conservation structures, such as bunds, check dams, and farm ponds. Furthermore, the course focuses on developing the capability to plan and execute land development for irrigation and agricultural purposes, encompassing aspects like watershed management, land leveling, and ravine reclamation. Ultimately, the goal is to foster economically and environmentally sound practices for sustainable land and water resource management.

COURSE OUTCOMES:

- CO1:** Understand the principles of watershed management, hydrology, runoff measurement, rainfall analysis, groundwater recharge, and water harvesting techniques for effective soil and water conservation.
- CO2:** Explain the causes, types, and control measures of soil and wind erosion, including agronomic, vegetative, and mechanical methods for soil and water conservation.
- CO3:** Apply conservation measures for hill slopes and gullies, including trenching, terracing, gully control structures, and reclamation techniques for sustainable land management.
- CO4:** Understand forestry management, grassed waterways, dry farming practices, and watershed-based approaches for improving soil conservation and agricultural productivity.
- CO5:** Design and manage water conservation structures, land grading, land leveling, flood control, ravine reclamation, and command area development programs for efficient land and water resource utilization.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	1	2	2	3	2
CO2	3	3	2	2	1	3	2
CO3	2	3	3	2	2	3	2
CO4	2	2	1	3	2	3	3
CO5	3	3	3	2	3	3	2

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

Unit 01: Water shed management, run-off & hydrology: (4 Periods)

- Concept, objectives, use of remote sensing in water shed management, Planning, Ground water recharging, Water-harvesting.
- Definition, phenomenon and forms of run off characteristics of run off, factors affecting run off, measurement of run off by float, current meter and weirs, time of concentration and its impact on run off, estimation of peak run off rate by rational equation.
- Hydrology: Hydrologic cycle, importance, its components, occurrence and forms of precipitation; Characteristics of rainfall in India, rain fall intensity, measurement of rain fall by non- recording and recording type of rain gauges, method of computing average rainfall, reoccurrence interval.

Unit 02: (6 Periods)

1. Soil erosion, wind erosion & mechanical methods of erosion control:

- Mechanics, types and causes of erosion, factors affecting erosion, damages caused by soil erosion.
 - Principles, vegetative and mechanical practices for control of wind erosion.
- 2.** Study the elementary idea of basin listing, sub-soiling, field bunding, contour bunding, graded bunding, ridge and channel terraces, and the cost of narrow-base and broad-base bunds as earthwork and sodding cost.

3. Agronomic measures for soil & water conservation:

Crop classification on the basis of soil conservation value, contour forming, mulching, strip cropping, cover cropping, mixed cropping, conservation crop rotation, ley forming, monoculture, role of grasses in soil conservation.

Unit 03: (6 Periods)

1. Conservation measures for hill slopes:

Contour trenching, specification of trenching, alignment and construction of trenches, bench terracing- types, construction and maintenance, elementary idea of stone terracing and its specification.

2. Gully erosion control & reclamation:

- Classification of gullies, principles of prevention and control of gullies by vegetative and mechanical measures, contour and peripheral bunding, ditches, gully plugging. Temporary and permanent structures: Earthen check dams, wooven wire check dams, Brush dams, loose rock dams, log and plank dams, straight drop spillway.
- Reclamation of gullies for cultivation.

Unit 04:

(7 Periods)

1. Forestry management in soil conservation:

Effects of forests on soil and water conservation and climate, classification of forests, elementary idea of farm and social forestry, Taungya system and forest protection, selection, development, tillage, irrigation protection and management of nurseries, Bamboo Production Methods.

2. Grassed waterways & dry farming:

- Use, design of waterways, grasses for waterways, construction of water ways, establishment of grasses on waterways, maintenance of waterways.
- Definition, climetic classification, elementary idea of various crop management & tillage practices. Land management practices in dry farming e.g. sub-soiling and tied ridging. Water shed based soil and water conservation.

Unit 05:

(7 Periods)

1. Water conservation reservoirs & flood control:

- Types and uses of water conservation reservoirs, site selection & storage capacity of farm ponds, design principles of water harvesting bunds and structures, digging of ponds, construction and maintenance of water conservation structures.
- Types of flood, damages caused by floods, elementary idea of head water flood control methods.

2. Land Grading, Land Leveling, Land, Ravine reclamation & Command Area

Development:

- Water harvesting, Scope, need types, long term and short term water harvesting techniques, design of ponds.

- Classification of usar soils, salt resistant crops, reclamation of usar soils. Reclamation of waste lands forest lands and sandy soils, sanddunes stabilization.
- Classification of ravines and various measures for ravine reclamation.
- Advantage and disadvantages, Command area development, Component of C.A.D.A., Various C.A.D.A. programmes in India.

PRACTICAL:

- 1) Study of Rain gauges, their operation & installation.
- 2) Computation of average rainfall depth over an area by symous rai gauge.
- 3) Study and use of float & current menter to measure runoff.
- 4) Demonstration of various types of soil erosion.
- 5) Preparation of land use capability map for a given area.
- 6) Survey and planning of soil conservation measures in a given area.
- 7) Cost estimation of bunding.
- 8) Cost estimation of leveling of a field with slope either lengthwise or breadthwise.
- 9) Cost estimation of digging of farm ponds of definite dimensions.
- 10) Study of layout and management of forest nurseries.
- 11) Visit to various areas of soil-water conservation and land reclamation activities and structures.
- 12) Construction of Vermi compost pit and its operation.

INSTRUCTIONAL STRATEGY:

Teacher may use demonstration of different materials that can make the subject interest and develop knowledge of building materials and construction methods in the student. In additions student give more emphasis on explaing practical application of construction of related structures efficiently and economically and encouraged study those processes which may find practical application in future career.

MEANS OF ASSESSMENTS:

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva Voce

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (hrs.)	Marks Allotted (%)
1.	4	20
2.	6	20
3.	6	20
4.	7	20
5.	7	20
Total	28	100

THEORY	5.5 DAIRY AND FOOD ENGINEERING	L	T	P
		3	-	-

COURSE OBJECTIVE:

The primary objective of this course is to equip students with a comprehensive understanding of dairy and food engineering principles, focusing on milk and food collection, storage, and preprocessing. Students will learn about sanitary systems, various equipment for handling, heat exchange, homogenization, and product manufacturing (cream, butter, ghee, paneer, ice cream, cheese, casein), and evaporation and drying technologies. A key emphasis is placed on preventing microbiological contamination through effective methods and proper equipment handling. Furthermore, the course covers essential food engineering unit operations, packaging, preservation, and plant layout.

COURSE OUTCOMES:

Upon successful completion of this course, students will be able to:

- CO1 Identify and apply sanitary design principles in the selection, operation, and maintenance of milk and food processing equipment.
- CO2 Operate and maintain dairy processing equipment such as pumps, receiving tanks, chillers, separators, homogenizers, and pasteurizers.
- CO3 Explain the theory and working principles of specialized dairy and food processing equipment used for butter, ice cream, cheese manufacture, and drying operations.
- CO4 Analyze the physical properties of food materials and apply fundamental food engineering unit operations such as grinding, mixing, thermal processing, and dehydration.
- CO5 Select suitable packaging materials, packaging methods, and processing equipment for different food products to ensure quality and safety.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning
CO1	3	2	1	2	2	3	2
CO2	3	2	3	2	2	2	1
CO3	3	3	2	2	1	2	1
CO4	3	3	3	3	2	2	1
CO5	2	3	3	2	3	2	2

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

(A) Dairy engineering:

Unit 01: Sanitary system & milk receiving equipment: (7 Periods)

Sanitary features, sanitary pipes and fittings stainless steel pipes, glass pipes, plastic tubing, pipe and fitting standards, sanitary pipe and fitting. Sanitary pumps, centrifugal pump. Positive displacement pumps specification, stuffing box, rotary seal.

Weigh can and receiving tank, chilling equipment, weighing and measuring milk standards Can washers-principles of operation. Rotary and straight through can washer.

Unit 02: Storage & heat exchange equipment: (8 Periods)

- Insulated storage tank, refrigerated storage tanks specification for the storage tanks. Milk transport tank. Milk processing equipment, separators-warm, milk separators- cold milk separators, Centrifugal cream separators.
- Heat exchangers, Pasteurization - Batch type and continuous type Pasteurizing plants, purpose and special requirement. High temperature short time pasteurizer, utilities, regeneration, holding time. Metering pump and drive F.D.V. UHT (Ultra High Temperature) Pasteurizers.

Unit 03: Homogenizers & milk product conveying system: (7 Periods)

- Theory of homogenization, design, material, single stage and two stage homogenizers, efficiency of homogenization.
- Different types of conveyors used in dairy industry, their drives, take up units. Conveyor components, Case stackers and unstackers, platishing milk cases, handling of dispenser milk containers, handling of ice cream.

Unit 04: Cream, butter , ghee, paneer & ice cream manufacturing equipment:

(7 Periods)

- Cream ripening tanks, design, material, automatic control, operation, cleaning.

- maintenance of Continuous Butter making equipment. Wooden churn, metal churn.
- Ghee pan and Ghee making equipment,
- Paneer manufacturing Equipment.
- Ice cream freezer batch freezer, Continuous freezers, type of designs, air incorporation, over run, control systems, freezing cylinder, dasher, scrapping blades, controls of refrigeration.

Unit 05: Cheese, casein, evaporators & drying equipments: (7 Periods)

- Cheese manufacturing equipment.
- Casine manufacturing equipments.
- Introduction of evaporators, Construction and Operation of single and multiple effect evaporators.
- Introduction of drum dryer and spray dryer.

B. Food engineering:

Unit 06: (6 Periods)

Physical properties of food materials, Unit operation in food engineering : Grinding, Crushing, Mixing, Blending, Thermal processing, Dehydration. Packaging materials and methods of packing of different food products. Preservation of food product, site selection and plant layout and their cost economics.

NOTE:

For Practical knowledge of above subject one week summer in plant training must be provided in Dairy Plant and report should also be submitted in the department by each student.

INSTRUCTIONAL STRATEGY:

Teacher may use demonstration of different materials that can make the subject interest and develop knowledge of building materials and construction methods in the student. In additions student give more emphasis on explaing practical application of construction of related structures efficiently and economically and encouraged study those processes which may find practical application in future career.

MEANS OF ASSESSMENTS:

- Assignment & Quiz,
- Mid-Term and End-Term written test.

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (hrs.)	Marks Allotted (%)
1	7	20
2.	8	20
3	7	20
4	7	10
5	7	10
6	6	20
Total	42	100

PRATICUM/ THEORY	5.6 PE 01 (A) Precision Agriculture and System Management	L	T	P
		2	-	2

Course Objective:

This course aims to equip students with a comprehensive understanding of precision agriculture. You'll learn its definitions, evolution, benefits, and challenges, along with the pivotal role of technology. The curriculum covers essential precision agriculture technologies like GPS, GIS, remote sensing, and key system components such as sensors and decision support systems. Furthermore, you'll familiarize yourself with specialized farm equipment, grasp the principles and technologies of precision irrigation and water management, and delve into advanced soil and nutrient management techniques, including variable rate application and real-time monitoring. Practical sessions will reinforce theoretical knowledge, addressing real-world problems and machine applications.

Course Outcomes:

Upon successful completion of this course, students will be able to:

- CO1- Define and explain key concepts and the evolution of precision agriculture.
- CO2- Identify and analyze the benefits and challenges, recognizing the role of technology.
- CO3- Apply knowledge of GPS, GIS, remote sensing, sensors, and decision support systems.
- CO4- Recognize and describe various precision agriculture equipment.
- CO5- Understand and implement principles of precision irrigation and water management.
- CO6- Explain and utilize precision soil and nutrient management techniques.
- CO6- Critically analyze precision agriculture problems and machine applications.

DETAILED CONTENTS

Unit 1: Overview of precision agriculture (5 Periods)

Definition and key concepts, Evolution of precision agriculture, Benefits and challenges, The role of technology in precision agriculture.

Unit 02: (6 periods)

(a) Precision agriculture technologists:

GPS and GIS technologies, Remote sensing (satellite and drone technology), Geographic Information Systems (GIS) in farm management

(B) Components of precision system:

Sensors and actuators, Decision support systems

Unit 03: Familiarization with equipment for precision agriculture: (5 Periods)

Sowing and planting machines, power sprayers, land clearing machines, laser-guided land levellers, straw-chopper, straw-balers, grain combines, etc.

Unit 04: Precision irrigation and water management: (6 Periods)

(A) Principles of Precision Irrigation

Water use efficiency in agriculture, Types of irrigation systems: Drip, sprinkler, surface, Soil-water-plant relationships.

(B) Irrigation Technologies in Precision Agriculture

Sensors for soil moisture and weather data, Automated irrigation systems, Remote-controlled irrigation equipment, Variable rate irrigation (VRI) technology.

Unit 05: Soil and nutrient management in precision agriculture: (6 Periods)

(A) Precision Fertilizer Application:

Variable rate technology (VRT) for fertilizers, Nutrient prescription maps, Benefits of precision fertilizer application in yield enhancement and cost reduction.

(B) Nutrient Monitoring and Management Tools:

Real-time soil and nutrient monitoring systems, Using sensors for nutrient detection (N, P, K, etc.).

PRACTICAL

1. Familiarization with precision agriculture problems and issues.
2. Familiarization with various machines for resource conservation.
3. Sensors and their applications in various precision machinery

INSTRUCTIONAL STRATEGY:

Teacher may use demonstration of different materials that can make the subject interest and develop knowledge of building materials and construction methods in the student. In additions student give more emphasis on explaining practical application of construction of related structures efficiently and economically and encouraged study those processes which may find practical application in future career.

MEANS OF ASSEMENTS

- Assignment & Quiz,
- Mid-Term and End-Term written test.

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (hrs.)	Marks Allotted (%)
1	5	20

2	6	20
3	5	20
4	6	20
5	6	20
Total	28	100

PRATICUM/ THEORY	5.6 P.E.- 01 (B) REMOTE SENSING AND GIS	L	T	P
		2	-	2

COURSE OBJECTIVE:

The objective of this course is to provide diploma-level students with a foundational understanding of Remote Sensing and GIS, emphasizing their applications in agriculture. It covers the principles of remote sensing, electromagnetic spectrum, sensor platforms, and different types of resolutions. Students will learn to use remote sensing data for monitoring crop health, soil moisture, and detecting pests and diseases. The course also introduces GIS components, data models, and spatial data types. By integrating Remote Sensing and GIS, students will gain practical skills for agricultural monitoring, soil and water management, and climate and disaster analysis to support sustainable farming practices.

COURSE OUTCOMES:

Upon successful completion, students will be able to explain remote sensing fundamentals and the electromagnetic spectrum, and differentiate active/passive sensing and resolution types. They will competently apply remote sensing for agricultural monitoring, including calculating vegetation indices and detecting crop stress. Furthermore, students will demonstrate proficiency in GIS concepts, data models, and QGIS software to perform spatial analysis for informed decision-making in crop, soil, and water management within agriculture.

DETAILED CONTENTS

Unit 01: Basics of remote sensing (6 Periods)

Definition of remote sensing, Electromagnetic spectrum: Visible, Infrared, Microwave regions, Principles of remote sensing: Reflection, absorption, transmission, Remote sensing platforms: Satellites, UAVs (Drones), Aerial photography.

Unit 02: Types of remote sensing (5 Periods)

Active vs. passive remote sensing, Spatial, spectral, temporal, and radiometric resolution
Examples of remote sensing satellites (Landsat, Sentinel, MODIS).

Unit 03: Applications of remote sensing in agriculture (6 Periods)

Monitoring crop health and stress, Vegetation indices: NDVI (Normalized Difference Vegetation Index), EVI (Enhanced Vegetation Index), Soil moisture monitoring, Pest and disease detection using remote sensing, Weather and climate monitoring for agriculture.

Unit 04: Introduction to GIS:

(6 Periods)

Definition and components of GIS: Hardware, software, data, people, and methods, Types of GIS: Desktop GIS, Web GIS, Mobile GIS, GIS data models: Vector, Raster, Spatial data types: Points, Lines, Polygons, Grid cells.

Unit 05: Remote sensing and gis applications in agriculture:

(5 Periods)

Spatial Data Analysis for Agriculture, Remote Sensing and GIS for Crop Monitoring, Soil and Water Management with Remote Sensing and GIS, Disaster Management and Climate Monitoring.

PRACTICAL:

1. Hands-on QGIS software
2. setting up QGIS: Interface
3. Tools, and features
4. Applications of Remote sensing and GIS in agriculture
5. Precision Machineries

INSTRUCTIONAL STRATEGY:

Teacher may use demonstration of different materials that can make the subject interest and develop knowledge of building materials and construction methods in the student. In additions student give more emphasis on explaing practical application of construction of related structures efficiently and economically and encouraged study those processes which may find practical application in future career.

Means of assements

- Assignment & Quiz,
- Mid-Term and End-Term written test.

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (hrs.)	Marks Allotted (%)
1	6	20
2	5	20
3	6	20
4	6	20
5	5	20
Total	28	100

AUDIT COURSE	5.7 INDIAN CONSTITUTION	L	T	P
		2	-	-

COURSE OBJECTIVES:

1. Understand the history, principles, and key interpretations of the Indian Constitution.
2. Understand the structure and key roles of the Indian Union Government, including the President, Prime Minister, and Council of Ministers.
3. Understand the composition, powers, and functions of the Lok Sabha, Rajya Sabha, and the Supreme Court.
4. Understand the roles and powers of the Governor, Chief Minister, Council of Ministers, and the State Secretariat.
5. Understand the structure and functions of local administration, including District, Municipal, and Zila Panchayat levels.
6. Understand the structure, role, and functions of the Election Commission of India.

COURSE OUTCOMES: (COs)

Upon completion of the course, the student will be able to demonstrate knowledge of the following topics:

- CO1:** Understand the historical background, philosophy, and process involved in the making of the Indian Constitution.
- CO2:** Analyze the structure and functioning of the Union Government, including the roles, powers, and relationships of the President, Prime Minister, Council of Ministers, Lok Sabha, and Rajya Sabha.
- CO3:** Explain the organization and working of the State Government.
- CO4:** Evaluate the system of Local Administration in India by understanding the structure and functions of District Administration, Municipal Corporations, and Zila Panchayats.
- CO5:** Understand the role, powers, and significance of the Election Commission of India in ensuring free and fair elections in a democratic system.

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	2	-	-	2	-	2	*	*
CO2	3	3	2	-	2	1	2	*	*
CO3	3	2	1	-	2	1	2	*	*
CO4	3	3	2	-	3	2	2	*	*
CO5	3	2	-	-	3	1	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

DETAILED CONTENTS

Unit 1: The Constitution – Introduction

(05 Periods)

- The History of the Making of the Indian Constitution

- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation

Unit 2 – Union Government

(06 Periods)

- Structure of the Indian Union Government
- President – Election, Role and Power
- Prime Minister and Council of Ministers

Unit 03- Indian legislature & judiciary

(06 Periods)

- Composition of Lok Sabha and Rajya Sabha
- Powers & Functions of Lok Sabha and Rajya Sabha
- Structure of Supreme Court including Appointment of Judges
- Powers & Functions of Supreme Court

Unit 04 – State Government

(05 Periods)

- Governor – Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

Unit 05 – Local Administration

(03 Periods)

- District Administration
- Municipal Corporation
- Zila Panchayat

Unit 06 – Election Commission

(03 Periods)

- Structure of Election Commission of India
- Role and Function of Election Commission

INSTRUCTIONAL STRATEGY:

Teacher may use demonstration of different materials that can make the subject interest and develop knowledge of building materials and construction methods in the student. In additions student give more emphasis on explaing practical application of construction of related structures efficiently and economically and encouraged study those processes which may find practical application in future career.

MEANS OF ASSESSMENTS:

- Assignment & Quiz,
- Mid-Term and End-Term written test.

RECOMMENDED BOOKS:

1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008
2. The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition
4. Our Constitution Subhash Chand Kashyap NBT New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (hrs.)	Marks Allotted (%)
1	5	20
2	6	20
3	6	20
4	5	20
5	3	10
6	3	10
Total	28	100

THEORY	SPRINKLER AND MICRO-IRRIGATION SYSTEM	L	T	P
6.1 PE 02 (A)		3	1	-

Course Objective:

This course aims to equip students with a comprehensive understanding of micro-irrigation and sprinkler irrigation systems. You'll learn their fundamental principles, design considerations, installation techniques, and maintenance procedures. The curriculum also covers latest innovations like smart irrigation and solar pumps, and explores the future of irrigation in the context of climate change and sustainable practices. Through practical demonstrations and case studies, you'll gain hands-on experience in designing and troubleshooting these crucial water management systems.

Course Outcomes:

Upon successful completion of this course, students will be able to:

- CO1- Understand the fundamental principles and components of micro-irrigation (drip, bubbler, micro-sprinklers) and sprinkler irrigation systems.
- CO2- Design efficient drip and sprinkler irrigation systems by considering crop water requirements, soil type, water quality, and climate conditions, including hydraulic calculations and component selection.
- CO3- Implement and maintain both drip and sprinkler irrigation systems, troubleshooting common issues and performing routine maintenance.
- CO4- Identify and explain latest innovations in irrigation technology, such as smart irrigation, solar pumps, and water-saving techniques.
- CO5- Analyze the future of irrigation in the context of climate change and sustainable water management practices.

DETAILED CONTENTS

Unit 01:

(12 periods)

(A) Introduction to micro-irrigation:

Definition and principles of micro-irrigation systems, Types of micro-irrigation systems: Drip irrigation, bubbler irrigation, and micro-sprinklers, Components of a micro-irrigation system: Emitters, pipes, filters, and pumps, Advantages of micro-irrigation over traditional methods.

(B) Fundamentals of Sprinkler Irrigation:

Definition and principles of sprinkler irrigation, Types of sprinkler systems: Fixed, portable, and semi- portable system, Components of a sprinkler system: Pump, pipes, valves, filters, and sprinkler heads, Water distribution patterns in sprinkler systems.

Unit 02: Design of drip Irrigation Systems: (10 Periods)

Design considerations: Crop water requirements, soil type, and water quality, Types of emitters: Pressure-compensating, non-pressure compensating, and multi-outlet emitters, Pipe sizing, lateral design, and spacing calculations, Hydraulic design of drip systems: Flow rates, pressure loss, and emitter distribution uniformity, Filtration and fertigation systems in drip irrigation.

Unit 03: Design of Sprinkler Systems (10 Periods)

- Design considerations: Crop type, soil type, water quality, and climate conditions
- System components selection: Sprinklers, pumps, pipes, and controllers
- Pressure and flow rate calculations
- Head selection and spacing for uniform distribution
- Application efficiency and uniformity of sprinklers

Unit 04: (12 Periods)

(A) Drip Irrigation System Installation and Maintenance

- Layout design for drip systems: Lateral placement, spacing, and depth of emitters
- Installation of filters, pipes, emitters, and connectors
- Checking for clogging and maintenance of drip emitters
- Periodic maintenance procedures: Cleaning, filter replacement, and pressure testing
- Fertilizer application through fertigation systems

(B) Installation and Maintenance of Sprinkler Systems

- Site survey and layout planning
- Installation procedures for pipes, pumps, valves, and sprinklers
- Troubleshooting and maintenance of sprinkler components
- Adjusting sprinkler heads for uniform water distribution
- Common issues and preventive measures (clogging, pressure problems, leaks)

Unit 05: (12 Periods)

(A) Latest Innovations in Irrigation Technologies

- Automation in irrigation: Smart irrigation controllers, sensors, and IoT-based systems
- Use of solar-powered pumps in irrigation systems

- Water-saving technologies: Subsurface drip irrigation, soil moisture sensors, and variable rate irrigation

(B) Future of Irrigation Systems

- Climate change and its impact on irrigation management
- Integration of GIS and remote sensing in irrigation management
- Global trends in sustainable and efficient irrigation systems

PRACTICAL:

Practical demonstration of designing and installing a small-scale sprinkler or micro-irrigation system;

Design and troubleshooting of a sprinkler or micro-irrigation system based on case study data.

MEANS OF ASSESSMENTS:

- Assignment & Quiz,
- Mid-Term and End-Term written test.

RECOMMENDED BOOKS:

1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008
2. The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition
5. Our Constitution Subhash Chand Kashyap NBT New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (hrs.)	Marks Allotted (%)
1	12	20
2	10	20
3	10	20
4	12	20
5	12	10
Total	56	100

6.1 PE 02 (B)	AGRICULTURAL STRUCTURES AND ENVIRONMENTAL CONTROL	L	T	P
THEORY		3	1	-

COURSE OBJECTIVE:

This course aims to equip students with a comprehensive understanding of agricultural structures and environmental control systems. You'll learn about the design, construction, and management of essential farm buildings like greenhouses, storage facilities, and livestock housing. The objective is to foster the ability to create sustainable and efficient agricultural environments that enhance productivity, ensure animal welfare, and minimize

post-harvest losses, optimizing resource use through automation and modern technologies.

COURSE OUTCOMES:

Upon completion, students will be able to design and select appropriate agricultural structures (e.g., greenhouses, silos, livestock housing) based on functional and environmental considerations. They will proficiently manage environmental control systems for optimal crop production and animal welfare, including temperature, humidity, and ventilation. Furthermore, students will competently implement storage solutions to minimize post-harvest losses and integrate automation technologies for efficient farm management and enhanced productivity.

DETAILED CONTENTS

Unit 01 Introduction to Agricultural structures: (10 Periods)

1.1 Importance of Agricultural Structures

- Role of agricultural structures in enhancing farm productivity
- Types of agricultural structures: Sheds, barns, warehouses, silos, greenhouses, poultry houses, and dairy barns
- Functions and benefits of agricultural structures: Protection from environmental stresses, storage, and crop preservation

1.2 Planning and Design Considerations

- Site selection for agricultural buildings
- Design considerations: Climate, soil conditions, topography, and environmental factors
- Materials used in the construction of agricultural structures: Wood, steel, concrete, and plastic
- Cost analysis and economic feasibility studies for agricultural buildings

Unit 02 Greenhouses and protected cultivation structures (12 Periods)

2.1 Types of Greenhouses

- Definition and purpose of greenhouses in controlled environment agriculture
- Types of greenhouses: Single-span, multi-span, and gothic greenhouses
- Materials used in greenhouse construction: Glass, polycarbonate, polyethylene, and shade nets

2.2 Design of Greenhouses

- Site selection and orientation of greenhouses
- Structural design of greenhouses: Roof shape, truss design, and foundation
- Ventilation systems in greenhouses: Natural and mechanical ventilation
- Temperature, humidity, and light control systems in greenhouses

2.3 Environmental Control in Greenhouses

- Temperature regulation and heating systems (solar, electrical, hot water)
- Cooling systems: Evaporative cooling, misting, and shading
- Irrigation systems in greenhouses: Drip irrigation, hydroponics, and fertigation
- Automation and control systems in modern greenhouses

Unit 03 Storage structures and silos

(12 Periods)

3.1 Importance of Storage Structures

- Role of storage structures in preventing post-harvest losses
- Types of storage structures: Warehouses, cold storage, silos, and grain bins
- Factors influencing the design of storage structures: Storage capacity, ventilation, and pest control

3.2 Grain Storage and Silos

- Types of silos: Metal silos, concrete silos, and fabric silos
- Design of silos: Structural components, silo height, diameter, and foundation design
- Grain aeration systems: Forced and natural ventilation systems for maintaining grain quality
- Methods of pest control in grain storage: Fumigation, pest-resistant materials

3.3 Cold Storage Systems

- Design and operation of cold storage for perishable produce (fruits, vegetables, dairy)
- Refrigeration systems and their components: Compressors, evaporators, condensers
- Temperature and humidity control in cold storage
- Energy-efficient cold storage technologies

Unit 04 Livestock housing and animal shelters

(12 Periods)

4.1 Livestock Housing Design Principles

- Importance of animal welfare in livestock housing
- Types of livestock housing: Poultry houses, dairy barns, pigsties, and cattle sheds
- Factors influencing housing design: Animal behavior, size, ventilation, and space requirements
- The role of flooring, roofing, and walls in livestock comfort

4.2 Ventilation and Air Quality Management in Livestock Housing

- Importance of ventilation in livestock housing
- Types of ventilation systems: Natural ventilation, mechanical ventilation (fan, tunnel ventilation)
- Principles of air exchange: Airflow, temperature, humidity, and ammonia control
- Monitoring air quality and maintaining a healthy environment for animals

4.3 Waste Management in Livestock Housing

- Types of waste produced in livestock housing (manure, urine, feed waste)
- Methods of waste disposal: Composting, biogas production, and recycling
- Waste treatment technologies and their impact on the environment.

Unit 05 Environmental control systems in agricultural structures (10 Periods)

5.1 Environmental Control for Crop Production

- Temperature control in greenhouses and indoor farms
- Humidity control and its effects on crop health
- Carbon dioxide enrichment for enhancing plant growth
- Light control and artificial lighting systems for optimized crop production

5.2 Heating and Cooling Systems for Agricultural Buildings

- Types of heating systems: Hot water, steam, and forced-air heating systems
- Cooling systems: Evaporative cooling, misting, and fan systems
- Energy-efficient heating and cooling technologies
- Solar heating and cooling in agricultural buildings

5.3 Automation in Environmental Control

- Climate control systems and their components
- Sensors and controllers in environmental management
- Automation in irrigation, temperature, and humidity control systems
- Use of IoT (Internet of Things) in agricultural building management

PRACTICAL:

Greenhouse structures, storage structures, and environmental control systems

MEANS OF ASSESSMENTS:

- Assignment & Quiz,
- Mid-Term and End-Term written test.

RECOMMENDED BOOKS:

1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008
2. The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition
6. Our Constitution Subhash Chand Kashyap NBT New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (hrs.)	Marks Allotted (%)
1	10	20
2	12	20
3	12	20
4	12	20
5	10	10
Total	56	100

THEORY	6.2 ENTREPRENEURSHIP AND START-UPS	L	T	P
		2	-	-

COURSE LEARNING OBJECTIVES:

1. Acquiring Entrepreneurial spirit and resourcefulness.
2. Familiarization with various uses of human resource for earning dignified means of living.
3. Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
4. Acquiring entrepreneurial quality, competency, and motivation.
5. Learning the process and skills of creation and management of entrepreneurial venture.

COURSE OUTCOMES

CO 1- Understand the basic of Entrepreneurship and Business Structures

CO 2- Planning and implementation of Business ideas

CO 3- Understanding Strategically Market Analysis

CO 4- Manage Organizational roles

CO 5- Understanding various financial schemes

SUGGESTED COURSE ARTICULATION MATRIX (CAM):

CO No.	PO1 Basic and Discipline Specific Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Engineering Tools	PO5 Practices for Society, Sustainability and Environment	PO6 Project Management	PO7 Life Long Learning	PSO1	PSO2
CO1	3	1	1	-	-	-	2	*	*
CO2	2	3	3	2	1	3	2	*	*
CO3	2	2	2	2	1	-	2	*	*
CO4	2	1	2	-	2	3	2	*	*
CO5	3	2	2	2	2	1	2	*	*

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

DETAILED CONTENT

Unit 1 - Introduction to Entrepreneurship and start – ups:

(05 Periods)

- Definitions, Classification of Entrepreneur.
- Traits of an Entrepreneur, Intrapreneurship, Motivation
- Types of Business Structures- On the Basis of size and On the basis of ownership
- Similarities/differences between entrepreneurs and managers

Unit 02 – Business ideas and their Implementation:

(05 Periods)

- Discovering ideas and visualizing the business
- Activity map
- Business Plan (Case Study)

Unit 03 – Ideas to Start-up:

(04 Periods)

- Marketing and Accounting- Definition and Importance.
- Market Analysis – STP (Segmentation, Targeting, Positioning)
- Competition evaluation and Strategy Development – Vision, Mission, Goal, Objectives.
- Risk analysis- SWOT Analysis.

Unit 04 – Management:

(05 Periods)

- Definition Concept and Functions of Management
- Company's Organization Structure- Concept and Classification
- Recruitment and Selection- Definition,
- Training and Development- Importance.

Unit 05 - Financing and Protection of ideas:

(05 Periods)

- Financing methods available for Entrepreneurship/ Startups in India (Government Scheme, Banking, NBFCs, SHG and Micro Financing).
- Intellectual Property Rights- Overview of - Copyrights, Trademark, Geographical Indicators, Patenting and Licenses
- Communication of Ideas to potential investors – Investor Pitch.

Unit 06: Succession, dissolution and harvesting strategy:

(04 Periods)

- Ways of succession
- Types of Dissolution

Suggested learning resources:

S. No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN – 978-0984999392
2.	Entrepreneurship Development (A new Venture creation)	Vasant Desai	Himalya Publication
3.	Entrepreneurship Development	Khanka S.S.	S Chand & Company Limited New Delhi

4.	Entrepreneurship Development	Gupta and Srinivsan	S Chand & Company Limited New Delhi
5	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN – 978-0755388974
6	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN – 978-0670921607
7	The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business	Clayton M. Christensen	Harvard business ISBN: 978-142219602

SUGGESTED SOFTWARE/LEARNING WEBSITES:

- <https://www.fundable.com/learn/resources/guides/startup>
- <https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate-structure/>
- <https://www.finder.com/small-business-finance-tips>
- <https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/>
- NPTEL Course on Entrepreneurship https://onlinecourses.nptel.ac.in/noc23_mg74/preview
- National Geographic Channel you tube Video on “GI Tag Crafts of Bharat”

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (Hrs.)	Marks Allotted (%)
1	05	20
2	05	20
3	04	10
4	05	20
5	05	20
6	04	10
Total	28	100

PRACTICAL	6.3 Industry Internship OR Major Project	L	T	P
		4	-	-

Course Objective:

Major projects for mechanical engineering diploma students are essential because it

provides them advantage like apply theoretical knowledge to real-world problems, develop critical skills like problem-solving and teamwork, provide hands-on experience with tools and technologies, encourage innovation and creativity, prepare students for their careers by demonstrating initiative and independence, Familiarize students with industry standards.

Course Outcomes:

After undergoing this subject, the student will be able to:

- Use effectively oral, written and visual communication
- Demonstrate skill and knowledge of current technological tools and techniques specific to the professional field of study.
- Identify, analyse and solve problems creatively through sustained critical investigation.
- Develop leadership abilities.
- Apply fundamental and disciplinary concepts and methods in ways appropriate to their areas of study.

Major projects are crucial for mechanical engineering diploma students for several reasons:

1. **Application of Knowledge:** They allow students to apply theoretical concepts learned in class to practical, real-world problems, reinforcing their understanding.
2. **Skill Development:** Projects help in developing essential skills such as problem-solving, critical thinking, teamwork, and project management, which are highly valued in the engineering industry.
3. **Hands-On Experience:** Students gain hands-on experience with tools, materials, and technologies used in mechanical engineering, which is invaluable for their future careers.
4. **Innovation and Creativity:** Working on projects encourages students to think creatively and come up with innovative solutions to engineering challenges.
5. **Career Preparation:** Completing projects demonstrates a student's ability to take initiative, work independently, and successfully complete tasks, making them more attractive to potential employers.
6. **Industry Standards:** Projects familiarize students with industry standards and practices, preparing them for professional work environments.
7. **Networking:** Collaborating on projects provides opportunities to build networks with peers, faculty, and industry professionals, which can be beneficial for future career prospects.

Note: The Project selected in the 5th semester will be continued in 6th Semester.

As a major project activity each student is supposed to study the operations at site and prepare a detail project report of the observations/processes/activities by him/her. The students should be guided by the respective subject teachers. Each teacher may guide a group of 4 to 5 students.

The teachers along with field supervisors/engineers will conduct performance assessment of students. Criteria for assessment will be as follows:

S.NO.	CRITERIA	MARKS
1.	Attendance and Punctuality	40
2.	Project Progress Presentation-I	50
3.	Project Progress Presentation-II	50
4.	Project Model & final Presentation	90
5.	Report Writing	60
Total		240

6.4 OE-I (A)	PROJECT MANAGEMENT	L	T	P
THEORY		2	-	-

COURSE LEARNING OBJECTIVES:

- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- CO1 Understand the importance of projects and its phases.
- CO2 Analyze projects from marketing, operational and financial perspectives.
- CO3 Evaluate projects based on discount and non-discount methods.
- CO4 Develop network diagrams for planning and execution of a given project.
- CO5 Apply crashing procedures for time and cost optimization.

DETAILED CONTENT

Unit-01: Concept of a project: (05 Periods)

Classification of projects- importance of project management- The project life cycle- establishing project priorities (scope-cost-time) project priority matrix- work break down structure.

Unit-02: Capital budgeting process: (05 Periods)

Planning- Analysis-Selection-Financing-Implementation-Review. Generation and screening of project ideas- market and demand analysis- Demand forecasting techniques. Market planning and marketing research process- Technical analysis

Unit –03: Financial estimates and projections: (06 Periods)

Cost of projects-means of financing-estimates of sales and production-cost of production-working capital requirement and its financing-profitabilityprojected cash flow statement and balance sheet. Break even analysis.

Unit-04: Basic techniques in capital budgeting: (06 Periods)

Non discounting and discounting methods- pay- back period- Accounting rate of return-net present value-Benefit cost ratio-internal rate of return. Project risk. Social cost benefit analysis and economic rate of return. Non-financial justification of projects.

Unit-05: Project administration: (06 Periods)

- Progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade off.
- Concepts and uses of PERT cost as a function of time, Project Evaluation and Review Techniques/cost mechanisms. Determination of least cost duration. Post project evaluation. Introduction to various Project management softwares.

REFERENCE BOOKS:

1. Project planning, analysis, selection, implementation and review – Prasannachandra – Tata McGraw Hill
2. Project Management – the Managerial Process – Clifford F. Gray & Erik W. Larson - McGraw Hill
3. Project management - David I Cleland - McGraw Hill International Edition, 1999
4. Project Management – Gopala krishnan – Mcmillan India Ltd.
5. Project Management-Harry-Maylor-Pearson Publication

MEANS OF ASSESSMENTS:

- Assignment & Quiz,
- Mid-Term and End-Term written test.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	05	20
2	05	20
3	06	20
4	06	20
5	06	20
Total	28	100

6.4 OE-I (B)	RENEWABLE ENERGY TECHNOLOGIES	L	T	P
THEORY		2	-	-

Course learning objectives:

- To understand present and future scenario of world energy use.
- To understand fundamentals of solar energy systems.
- To understand basics of wind energy.
- To understand bio energy and its usage in different ways.
- To identify different available non-conventional energy sources.

Course outcomes:

At the end of the course, the student will be able to:

CO1	Understand present and future energy scenario of the world.
CO2	Understand various methods of solar energy harvesting.
CO3	Identify various wind energy systems.
CO4	Evaluate appropriate methods for Bio energy generations from various Bio wastes.
CO5	Identify suitable energy sources for a location.

DETAILED CONTENT**Unit-01: Introduction:****(05 Periods)**

World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilisation; Renewable Energy Scenario in India and around the World; Potentials;

Achievements / Applications; Economics of renewable energy systems.

Unit-02: Solar energy: (05 Periods)

Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrating Collectors; Solar direct Thermal Applications; Solar thermal Power Generation Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications.

Unit-03: Wind energy: (06 Periods)

Wind Data and Energy Estimation; Types of Wind Energy Systems; Performance; Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects.

Unit-04: Bio-energy: (06 Periods)

Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Ethanol production; Bio diesel; Cogeneration; Biomass Applications.

Unit-05: Other renewable energy sources: (06 Periods)

Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.

Reference books:

1. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi (ed. 2018)
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, BNatarajan, P Monga, Tata McGraw Hill.
7. Energy and The Environment, RA Ristinen and J J Kraushaar, Second Edition, John Willey & Sons, New York, 2006.
8. Renewable Energy Resources, JW Twidell and AD Weir, ELBS, 2006.

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (Hrs.)	Marks Allotted (%)
1	05	20
2	05	20
3	06	20
4	06	20
5	06	20
Total	28	100

9. EQUIPMENT REQUIREMENT FOR AGRICULTURAL ENGINEERING

Sr. No.	Description	Qty	Total Price (Rs)
COMMUNICATION LABORATORY			
1.	Stools	40	10,000

2.	Display Board/Screen	2	6,000
3.	Sound recording and playing system	1	6,000
4.	Audio cassettes	60	2,000
5.	Overhead Projector	1	5,000
6.	Transparencies slides	100	500
7.	TV, VCR and camera for video recording	1 each	20,000
8.	English spoken course	1	2,000
9.	A Quiz room equipped with two way audio system, back projection system and slide projector	1	30,000
10.	Miscellaneous	LS	1,500

APPLIED PHYSICS LABORATORY

1.	Vernier calipers Working length 160 mm, Internal and external dia with locking arrangement	12	2,000
2.	Screw Gauges Working length 15 mm, pitch 0.5 mm, least count .005 mm	12	2,000
3.	Spherometers Distance between legs 2.5 mm, pitch 0.5 mm, least count .005 mm.	12	2,000
4.	Mirrors (convex, concave)	5 Each	1,500
5.	Pendulum Setup	02	4,000
6.	Gravesand's Apparatus	02	3,000
7.	Inclined Plane Setup	02	2,000
8.	Flywheel Setup	02	4,000
9.	Prism	05	1,500
10.	Spectrometer	02	25,000
11.	DC Ammeters Moving coil weston-type ammeter with ebonite stand	10	3,500
12.	DC Miliammeters	2	1,000
13.	DC Microammeters	2	700
14.	DC voltmeters	10	700
15.	DC Millivoltmeters	10	2,000
16.	Sensitivity Galvanometer	2	800
17.	Student Galvanometers	10	4,000
18.	Demonstration type DC Ammeters Range; 0 to 1 Amp.	2	1,000
19.	D type DC Voltmeter Range : 0 to 1 Volt	2	1,000
Sr. No.	Description	Qty	Total Price (Rs)

20.	D type Galvanometers Sensitivity : 20 microamperes per scale division,	8	8,000
21.	Resistance boxes (dial type) assorted	8	8,000
22.	Rheostats	10	4,000

23.	Miscellaneous items (Spring, Pan, Glycerine, Optic fibre, Ferromagnetic material)	LS	2,000
24.	Fortin's Barometer (Wall type)	2	20,000
25.	Stoke's Apparatus	2	10,000
26.	Gumther's Apparatus	2	16,000
27.	Resonance Tube Apparatus with accessories and Tuning fork set	2	14,000
28.	Sodium Lamp setup with Biprism	2	10,000
29.	Ohmic resistance coil	10	5,00
30.	Slide wire bridge	2	8,000
31.	PN Junction diode Apparatus	2	10,000
32.	Laser (as per requirement)	1	1,00,000
33.	Numerical aperture setup	1	25,000
34.	Miscellaneous	LS	3,000
APPLIED CHEMISTRY LABORATORY			
1.	Digital Balance	1	80,000
2.	Burette 50ml	30	3,000
3.	Pipette 25ml	60	4,000
4.	Beakers 100ml	60	4,000
5.	Burette stand	30	30,000
6.	Glazed tile	30	1,000
7.	Conical flask 50ml (Titration flask)	60	4,000
8.	Standard (Measuring) flask (to prepare standard solution) 250ml/100ml	30	6,000
9.	Able's Flash Point apparatus	2	10,000
10.	(1/10)°C thermometer	06	6,000
11.	Candles	20	100
12.	Crucible with lid	06	2,000
13.	Muffle furnace	1	18,000
14.	Decicators	06	8,000
15.	Pair of tongue (small and big)	24 (small) 2 (big)	2,000
Sr. No.	Description	Qty	Total Price (Rs)
16.	Chemicals - EDTA-1 kg - Eriochrome Black-T(solochrome black T)- 200g - Buffer solution (NH ₃ - 2.5 ltr, NH ₄ Cl – 1 kg) - Zinc sulphate- 500g - H ₂ SO ₄ - 2.5 ltr - Phenolphthalein indicator (as per requirement) - Methyl orange indicator (as per requirement) - Charcoal (as per requirement) - Kerosene- 1 ltr	LS	20,000
17.	Miscellaneous	LS	2,000

ENGINEERING DRAWING			
1.	Drawing Boards (700 x 500mm)	60	25,000
2.	Draughtsman Tables	60	1,80,000
3.	Draughtsman Stools	60	40,000
4.	Computer Aided Drawing (CAD) Software	30 User	5,00,000
5.	Model of different wooder joints	1	1,000
6.	Model of different screw threads	1	1,000
7.	Model of various locking devices	1	1,000
8.	Model of various joints	1	1,000
9.	Cut section Model of various couplings	1	3,000
10.	Miscellaneous	LS	5,000
APPLIED MECHANICS LABORATORY			
1.	Polygon law of forces apparatus	1	2,000
2.	Jib crane	1	4,000
3.	Apparatus for reaction at supports	1	5,000
4.	Inclined plane and friction apparatus	1	2,500
5.	Screw jack	1	1,000
6.	Worm and worm wheel	1	3,500
7.	Single Purchase Winch Crab	1	4,000
8.	Miscellaneous	LS	1,000
BASICS OF IT LABORATORY/COMPUTER LABORATORY			
1.	Computer System with latest configuration	30	8,00,000
2.	Printer (MFP)	1	25,000
3.	Printer (Laser)	1	35,000
4.	Plotter	1	75,000
5.	Digitiser	1	50,000
6.	Antivirus Software	LS	10,000
7.	Internet Facility on Computers	LS	2,00,000
Sr. No.	Description	Qty	Total Price (Rs)
8.	AutoCAD/Solid Works/Unigraphics/Pro-C (any one software)	30 user	5,00, 000
9.	LCD Projector	1	35,000
10.	UPS	60	1,20,000
11.	Software (latest windows, latest MS Office)	1	1,00,000
12.	Scanner	1	10,000
13.	Miscellaneous	LS	5,000
CARPENTRY SHOP			
1	Work benches fitted with carpenter vices	5	20,000
2.	Circular saw grinder	1	6,000
3.	Wood cutting band saw-vertical	1	10,000
4.	Bench grinder	1	5,000
5.	Drilling machine	1	8,000
6.	Wood turning lathe	1	40,000

7.	Wood Planner	1	20,000
8.	Tool accessories measuring and marking Instruments	25	25,000
9.	Band saw blade brazing unit	1	10,000
10.	Miscellaneous	LS	1,500
PAINTING AND POLISHING SHOP			
1.	Spray gun with hose pipe	1	1,000
2.	Paint brushes	20	2,000
3.	Paint/Varnish	LS	2,000
4.	Air Compressor with 2 hp motor	1 set	10,000
5.	Miscellaneous	LS	2,000
ELECTRICAL SHOP			
1.	Tool kit (Plier, Srew driver, Knife, Steel rule, hammer, sciber, pincer steel tape etc.)	20	20,000
2.	Fuses, Switches, Plugs, Sockets, Ceiling rose, Wires, cleats, Clamps, Test lamp, Tester.(as per requirement)		8,000
3.	Electric Iron	1	1,500
4.	Electric kettle	1	1,500
5.	Ceiling fan/table fan	1	2,500
6.	Desert cooler	1	5,000
7.	Lead acid battery	2	8,000
8.	Battery Charger	1	6,000
9.	Miscellaneous		3,000
Sr. No.	Description	Qty	Total Price (Rs)
SMITHY SHOP			
1.	Black smithy forge (with open hearths, accessories to match the forge)	20	40,000
2.	Wrought iron anvils	20	20,000
3.	Swage blocks	4	8,000
4.	Blower with accessories, motor switch etc	1	6,000
5.	Work benches with vices	2	6,000
6.	Power hammer	1	20,000
7.	Tools and accessories – hammers, swages, tongs, pokers, pullers etc	20	10,000
8.	Miscellaneous	LS	1,500
FITTING AND PLUMBING SHOP			
1.	Work benches with vices (4 vices on each bench)	5	30,000
2.	Marking tables with scribes	4	24,000

3.	Surface plates	5	20,000
4.	Accessories like calipers, V blocks, height, gauges steel rules and scribes	25	50,000
5.	Tool kits – taps, dies, drills	25	40,000
6.	Tool kits – chisels, hammers, files, hacksaw	25	25,000
7.	Drilling machine	2	12,000
8.	Pipe vice	4	1,000
9.	Chain wrenches	5	1,250
10.	Ring spanner set	5	600
11.	Pipe die set 2"	2 set	1,000
12.	Pipe bending device	1	5,000
13.	Various plumbing fittings	LS	2,000
14.	Miscellaneous	LS	1,500
SHEET METAL			
1.	Hammers	8	3,000
2.	Mallets (Hard & Soft)	5	2,000
3.	Sheet and wire Ganges	LS	8,00

Sr. No.	Description	Qty	Total Price (Rs)
4.	Shearing Machine	1	20,000
5.	Bar folding Machine	1	20,000
6.	Burring machine	1	10,000
7.	Various sheet (black plain, galvanized iron, corrugated, Aluminium)	1 Each	1,000
8.	Hand Shears/Snippers	4	2,000
9.	Nuts, Bolts, Rivets, Screw	LS	5,00
10.	Miscellaneous	LS	1,000
WELDING SHOP			
1.	Electrical welding transformer set with accessories	3	30,000
2.	Gas Cutting Unit	1	3,000
3.	Work benches with vices	3	5,000
4.	Welding generator set	1	10,000
5.	Oxy acetylene welding set with accessories	1	7,000
6.	Acetylene generating set	1	6,000
7.	Electric welder tool kit	10	10,000
8.	Projection welding machine	1	15,000
9.	Brazing equipment with accessories	1	10,000
10.	Soldering irons	3	1,000

11.	Pedestal grinder	1	10,000
12.	Metal spraying gun	1	10,000
13.	Spot welder	1	25,000
14.	TIG welding set	1	1,00,000
15.	MIG welding set	1	1,00,000
16.	Welding Partition Screen	5	2,500
17.	Miscellaneous	LS	3,000

Sr. No.	Description	Qty	Total Price (Rs)
FOUNDRY SHOP			
1.	Moulding boxes	40	8,000
2.	Ladles	5	2,000
3.	Tool Kits	10 set	5,000
4.	Quenching tanks	2	5,000
5.	Portable grinder	1	3,000
6.	Pit furnace with blower	1	10,000
7.	Miscellaneous	LS	1,000
MACHINE SHOP			
1.	Centre lathes	10	6,00,000
2.	Grinder	1	10,000
3.	Universal milling machine	1	1,25,000
4.	Shaper	2	1,20,000
5.	Plainer	2	1,20,000
6.	Work bench	3	10,000
7.	Precision instruments	1	10,000
8.	Hand tools and accessories	2	8,000
9.	CNC trainer lathe	1	4,00,000
10.	Miscellaneous	LS	5,000
FARM STRUCTURES MATERIALS AND CONSTRUCTION LAB			
1.	Kit of stone specimens containing at least 10 types of commonly used stones	1	1,000
2.	Kit of specimens of timber containing at least 10 types of commonly used timbers	2	2,000
3.	Vicat needle apparatus with all accessories	2 Set	2,000
4.	Apparatus for determining Specific gravity of cement	1 Set	2,600
5.	Air Permeability Apparatus Blains type for fineness of cement	1 Set	1,600
6.	Compression Testing Machine 200 Tones Capacity with	1 Set	70,000

	pumping unit Eclectically and manually operated		
7.	Model of bricks made of timber(8cm*4cm*4cm) containing queen closer, King closer, half and $\frac{3}{4}$ brick bats set of 1000 bricks packed in a wooden box	2 Set	3,000 each
8	Electric Oven with thermostat arrangement	1	5,000
9	Single Pan Balance 10 Kg capacity with set of weight 1kg to 10 Kg & weight box for fractional weights	1Set	2,000
10	Picnometer 900ml capacity	2	5,00
11	Slump Cone Apparatus complete with all accessories and base plate	2 Set	1,000 Each
12	Bar bending table with all accessories	1Set	1,000
13	Steel tape 30 meter	5	2,00 Each
14	Metallic tape 30m,20m,and 10m 2 nos of each size	6	1,00 Each
15	Misc. for scales, jars, weights, beakers, measuring cylinders, enamel plates, sample containers etc.	L.S.	5,000
AGRICULTURAL SCIENCE LAB			
1.	Specimen of crop and vegetable seed placed in a wooden box and properly levelled. (10 types of each)	2 Set	5,00 Each
2.	Specimen of different types of fertilizers kept in a wooden box and properly levelled. (10 types)	2 Set	5,00 Each
3.	Specimens of various types of Insecticides, fungicides and weedicides kept in a wooden box properly levelled (4 types of each)	2 Set	5,00 Each
4.	Seed Treatment Machine with all accessories	1	10,000
5	Plastic Containers (Transparent) 250 ml.	50	5 Each
6.	Plastic Containers (Transparent) 500 ml.	30	10 Each
7.	Plastic Containers (Transparent) 1000 ml.	20	15 Each
8.	Packer	1	1,500
9.	Roller wooden	1	1,000
10.	Hoe (Different types)	2 Set	5,00 Each
11.	Patela wooden	2	5,00 Each
12.	Pruning Knife	10	1,50 Each
13.	Secateurs	10	2,00 Each
14.	Budding & grafting knife	10	2,00 Each
15.	Footapenated ayor and duster hand operated	10	2,500 Each
16.	Mislaneous (Kudal, Khurpi,spade, garden scissors, hazara and gamla, patri dishes, pvc pipe etc)	L.S.	10,000
M.O.S. & HYDRAULICS LAB			
1.	Universal Testing Machine of 40 T Capacity with changeable load scale to 4t,20t & 40 T.	1	4,00,000
2.	Simply supported beam apparatus for determination of	1	1,000

	shear force		
3.	Simply supported beam apparatus for determining bending moment	1	1,000
4.	Steel beam apparatus to determine E by method of deflection for different loading condition	1 Set	1,000
5	Brinell Rockwell Hardness Tester with all accessories complete	1 Set	15,000
6.	Torsion Testing Apparatus complete with all accessories	1	2,000
7.	Bernoulli's Theorem Apparatus with ball accessories and collecting tank	1 Set	4,500
8.	Venturimeter Apparatus with all accessories, pipe, fittings and storage tank	1Set	12,000
9.	Apparatus for determining coef. of velocity, Coef. of contraction and coef. of discharge of an orifice	1Set	12,000
10.	Reynold's apparatus for determining critical velocity and Reynold's number.	1Set	8,000
11.	Apparatus for determining Darcy's Coefficient of friction in pipes	1Set	8,000
12.	Apparatus for determining losses due to sudden enlargement and sudden contraction	1Set	8,000
13.	Current meter	1	5,000
14.	Notch Apparatus with discharge tank, set of notches and other supporting structure	1Set	9,000
15.	Sectional model of the Reciprocating pump	1	2,000
16.	Sectional model of the Centrifugal pump	1	2,000
17.	Sectional model of the Impulse Turbine	1	2,000
18.	Sectional model of the Reaction Turbine	1	2,000
HYDRAULICS & PNEUMATIC LABORATORY			
1.	Piezometer tube	2	100
2.	U tube differential manometer	2	2,000
3.	Bourdon's Tube pressure gauge	1	1,000
5.	Hydraulic jack	1	4,000
6.	Hydraulic press Working Model	1	5,000
7.	Bernoulli's apparatus	1	15,000
Sr. No.	Description	Qty	Total Price (Rs)

8.	Venturimeter apparatus with differential manometer	1	10,000
9.	Pipe friction apparatus	1	15,000
10.	Reciprocating pump- Cut Section Model	1	20,000
11.	Centrifugal pump	1	25,000
12.	Working Model of Pelton Wheel Turbine	1	20,000
13.	Working Model of Francis Turbine	1	20,000
14.	Working Model of Kaplan Turbine	1	20,000
15.	Hydraulic Circuit Trainer Kit	1	50,000
16.	Pneumatic Circuit Trainer Kit	1	50,000
17.	Working Model of Hydraulic Brake system	1	50,000
18.	Working Model of Hydraulic Ram	1	5,000
SURVEY LAB			
1.	Vernier Theodolite	2	10,000 Each
2.	Dumpy Level	4	1,500 Each
3.	I.O.P. Level	4	2,000 Each
4.	Surveyor's Compass	2	6,00 Each
5.	Box Sextant	1	1,200
6.	Abney's Level	10	2,00 Each
7.	Clinometer	2	6,00 Each
8.	Optical Square	2	2,00 Each
9.	Folding Staff	2	9,00 Each
10.	Telescopic Staff	10	1,000 Each
11.	Plane Table with all accessories	4	1,200 Each
12.	Metric Chain 20m & 30m	10	2,40 Each
13.	Steel Tap 30m	2	1,50 Each
14.	Metallic Tap 20m	10	1,00 Each
15.	Steel Band	1	5,00
16.	Cross Staff	2	50 Each
17.	Penta Graph	2	1,000 Each
18.	Planimeter	1	7,50
19.	Telescopic Alidade	1	1,500
20.	Ranging Rod steel conduit 2m	50	60 Each
21.	Line Ranger	1	2,50
22.	Quick set Level	1	2,500
23.	Cylone Ghat Tracer	1	1,000
24.	Prismatic Compass	5	5,00 Each
25.	Boning rod set	1Set	4,00

26.	Invar Tap	1	7,50
27.	Engineers , Revenue and Gunter's Chain one each	3	1,50 Each
28.	Scientific Calculator	2	7,50 Each
29.	Miscellaneous	L.S.	10,000
SOIL MECHENICS AND SOIL SCIENCES LAB			
1.	Direct Shear Box Apparatus Complete with all accessories	1	10,000
2.	Permometer (Constant and Variable head)	1 Set	8,000
3.	Standard Procter Compaction Test Apparatus with all accessories	1 Set	1,000
4.	Split Spoon Sampler	1	8,00
5.	Thin Walled Sampler	1	5,00
6.	Hydrometer with 1000ml. jar	1	1,00
7.	Liquid Limit Apparatus With revolution counter and other accessories complete	2 Set	5,00
8	Set of BIS standard Sieve	1Set	4,000
9	Sieve Shaker Electrically operated	1	4,000
10.	Oven electrically operated medium	1	5,000
11.	Sample Extractor	1	5,00
12.	Core Cutter apparatus for determining field density of soil	1 Set	2,000
13.	Sand Replacement Apparatus for determining field density of soil	1	2,500
14.	Triple Beam Balance 3 Kg. Cap.& .1 Kg Accuracy	1	8,00
15.	Triple Beam Balance 1 Kg, Cap, & 0.1 Kg Accuracy	2	5,00 Each
16	Single Pan Balance 5Kg Cap. 1 Kg. Cap	1	6,00
17	Physical Balance with weight box	1	1,000
18	Dial Gauge .01 least count	1	1,000
19	Platform Weighing Machine 100 Kg.	1	6,000
20	Capillary Test Apparatus	1	5,00
21	pH meter	1	5,000
22.	Tensiometer	1	2,000
23	Post hole and helical auger hand operated three sets of each	6	1,000 Each
24	Aluminum Sample Container with lid	20	5 Each
25	Cell Tester	LS	10,000
26	Misc. for minor equipment , tools, glass ware, heating and storing vessels etc.	1	2,000
ELECTRICAL ENGINEERING AND RURAL ELECTRIFICATION LAB			
1.	Three point starter	8	3,000 Each
2.	Ammeter A.C. and D.C. 4no each	8	6,00 Each
3.	Voltmeter A.C. and D.C. 4 no. each	8	6,00 Each
4.	Single phase transformer	2	3,000 Each
5.	Rheostat of different values	10	2,00 Each
6.	Wattmeter	5	5,00 Each

7.	Energy meter	5	6,00 Each
8	Earth Tester	1	4,000
9	Power Factor meter	1	6,000
10.	Star Delta Starter	4	2,000 Each
11.	Speedometer	1	4,000
12.	Motor A.C. 5 HP	5	5,000 Each
13.	Motor D.C. 5 HP	5	5,000 Each
14.	Alternator	1	10,000
15.	Connecting wires and accessories	L.S.	5,000
16	Cables and cable fittings	L.S.	10,000
17	Wooden Board and switches etc.	L.S.	5,000
18	Miscellaneous	L.S.	10,000
RURAL AND ENTREPRENEURSHIP DEVELOPMENT LAB			
1.	Colour T.V.	1	20,000
2.	C.D. Player	1	5,000
3.	Portable Generator Set	1	25,000
4.	Camp furniture	L.S.	20,000
5.	Dari and bed sheets etc.	10 Set L.S.	5,000
6.	Ring Toss Game Kit	1Set	5,00
7.	Tower Building Game Kit	1 Set	4,00
8	Boat making Papers	10 Set	3,00 Each
9	Broken Squares	1	2,50
10.	Trainer's Manual	1	2,50
11.	Tent	1	8,000
12	Miscellaneous	L.S.	5,000
FARM POWER ENGINEERING WORKSHOP			
1.	Tractor with full accessories 35 BHP	1	35,0000
2.	Solar Pump	1	10,000
3.	Motorcycle complete engine(second hand)	1	8,000
4.	Various Types of Carbonator	1Set	8,000
5.	Diesel Pump Set complete (Slow speed)	1	10,000
6.	Diesel Pump Set complete (High speed)	1	10,000
7.	High Tension Battery	1	5,500
8	Spark Plug Tester	1	4,500
9	Old Diesel Vehicle Complete (need not in working order)	1	40,000
10.	Power Tiller with full attachments	1	2,00,000
11.	Tractor Trailer Cap. 3 Tones	1	35,000
12.	Air Compressor with pipe hose & 3 HP Motor with Car washer jet & Tele hoist	1	80,000
13.	High Pressure Water Pump for servicing of vehicle	1	8,000

14.	Gobar Gas Plant and Installation expenses (Model)	1 Set	4,000
15.	Solar Collector flat plate	1	5,000
16	Solar Cooker, Solar crop drier & solar water heater	L.S.	75,000
17	Cut section and working Models of form power Equipments	L.S.	20,000
18	Miscellaneous for meters, scales, storage and other common assorted materials	L.S.	10,000
POST HARVEST TECHNOLOGY AND AGRO BASED INDUSTRY LAB			
1.	Air Screen Cleaner Farm Model two sieve with motor complete	1	10,000
2.	Elevator (Conveyer belt type)	1	25,000
3.	Heated Air Drier	1	50,000
4.	Screw conveyer with motor	1	20,000
5.	Thin Walled Sampler	1	20,000
6.	Slurry seed creator with motor	1	15,000
7.	Dal Mill (mini unit) rubber role type for demonstration	1	20,000
8	Rice Mill (Mini unit) with 5 HP motor complete	1	60,000
9	Model of cold storage (Mini Plant)	1	25,000
10.	Various types of grain bins	1 Set	8,000
11.	Oil expeller 1/2 Qnt/hour capacity	1	30,000
12.	Ground nut decorticator	1	3,000
13.	Potato grader power operated	1	25,000
14.	Corn Sheller hand operated	1	8,00
15.	Winnower Hand operated	1	1,000
16	Juice Extractor Hand operated	2	5,00 Each
17	Juice Extractor Power operated	1	5,000
18	Gas Oven Complete	2	2,500 Each
19	Hammer Mill	1	50,000
20	Soya Bean Grinder (Net Type)	1	25,000
21	Misc. (Fruit preservation equipment and other minor tools etc.)	L.S	20,000
ENVIRONMENT ENGINEERING LABORATORY			
1.	pH Meter	01	500
2.	Turbidity Meter	01	5000
3.	Oven with Temperature Controller and Forced Air Circulation Type	01	20000
4.	B.O.D. Incubator	01	25000
5.	Water Analysis Kit	01	5000
6.	High Volume Sampler	01	40000
7.	Electrical Balance for weighing up to 1/10 of milligram (capacity)	01	1000
ENERGY CONSERVATION LABORATORY			
1	Clamp meter	02	5000

2	Multi meter	02	2000
3	Power Analyser	01	20000
4	Different types of lamps (LS) - 60 W lamp, 230 V , 100 V - 200 W lamp - 500 W lamp - 100 W lamp, 110 V, 150 V	10	500
5	Lux meter	02	5000
6	Centrifugal pump, 1 KW	1	15,000
7	Standard window A.C.	01	20000
8	Anemometer	02	5000
9	Thermometer	03	2000
10	Flow meter	02	10000
11	Pumping set with at least two pumps of different capacity.	1 set	10000
12	Pressure gauge fitted on discharge lines	1 set	2000
13	Variable Frequency Drive	02	50000
14	A small compressor with a small network of pipe line fitted with suitable pipeline, pressure gauge, safety valve and loading / unloading pressure switch.	1	3000
15	Stop watch	2	1000
16	Small blower (1.5 kW motor) with inlet and outlet ducts of approximately one meter length on both sides	1	10000
17	Black Box (for checking lamp efficacy including stand and lux meter)	1	25000

Note:

1. The specifications and price of equipment mentioned above used as broad guidelines for purchase of equipment.
2. Any other items not mentioned in the list of equipment can be purchased as provision has been made for purchase under the item miscellaneous for each lab/shop.
3. Any additional equipment, already available in the institute, may be used for demonstration to the students.

NOTE:

In addition to the above, laboratories in respect of physics, chemistry, Computer Centre etc will be required for effective implementation of the course. Provision for photocopiers, PC facilities along with LCD Projection System etc. has also to be made.

(A) Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

10.1 Human Resources Development:

Weekly work schedule, annual work schedule, student teacher ratio for various

group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE.

11. EVALUATION STRATEGY

11.1 INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavor is to ensure the quality of the product which can be assessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

11.2 STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section- II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table II: Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent

Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis, Synthesis and Evaluation	Upto 10 percent

B. Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals / field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

C. Project Work

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

D. Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

12. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM

IMPLEMENTATION

This curriculum document is a Plan of Action and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of

polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated students behaviour as in the curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every teacher to read them carefully, comprehend and start using them.

(A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.
2. An academic plan needs to be prepared and made available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics, in turn are supposed to prepare institutional academic plan.
3. HOD of every Programme Department along with HODs and incharges of other departments are required to prepare academic plan at department level referring to institutional academic plan.
4. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

(B) Course Level Suggestions

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its objectives.

Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practicals, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out

progressive assessment of theory, assignments, library, practicals and field experiences. Teachers are also required to do all these activities within a stipulated period of time. It is essential for them to use the given time judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available and courses to be taught.
2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcomes and reinforce learning etc.
3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.
4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.
5. Concept and content based field visits may be planned and executed for such content of course which is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.
6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.
7. Planning of progressive assessment encompasses periodical assessment in a semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive feedback to every student
8. The student centred activities may be used to develop generic skills like task

management, problem solving, managing self, collaborating with others etc.

9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time.
10. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.
11. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.
12. Students may be given relevant and well thought out project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment.
13. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, research institutes and other relevant field organizations in the state.

13 - List of Participants / Experts

The following experts have participated/ contributed in workshop for Developing Curriculum Scheme /Competency Profile according to AICTE and NEP-2020, of Three Year Diploma course in Agriculture Engineering at IRDT Kanpur.

1. Dr. Devendra Caturvedi, Retired Professor, Dr Bheem Rao Ambedkar College of Agriculture Etawah
2. Dr. Lalmani Verma, Retired Associate Professor, CSA, Kanpur
3. Dr. A.K Singhal, Retired Associate Professor, CSA, Kanpur
4. Dr. Prasoon Verma, Senior Scientist, IIPR, Kanpur
5. Dr. Shashindra Sachan, Associate Professor, Agronomi Department, CSA, Kanpur
6. Dr. M.M. Deo, Scientist(Senior Scale), IIPR, Kanpur
7. Dr. Anita Yadav, Professor, Agriculture Deptt. Agriculture Deptt. Rama University Mandhna, Kanpur
8. Dr. Kartikey Bisen, Assistant Professor, Agriculture Deptt. Rama University Mandhna, Kanpur
9. Dr. S.K. Singh, Secretary , Fee Regulatory Committee, Lucknow
10. Dr. H.S. Abbas , Principal, GLI, Agra
11. Sri Chandrabhan, Lecturer, J.L.N. Polytechnic, Mahmoodabad.
12. Sri Shivam Bharti Lecturer Mechanical (prod) G.P. Sikandra, Kanpur dehat

PROCEDURES / FORMATS FOR ORGANIZING INTERNSHIPS.

STUDENT INTERNSHIP PROGRAM APPLICATION

Complete and submit to the TPO/ Internship Program Coordinator.

1. Student Name:		Enroll. No.:	
2. Campus Address:		Phone:	
3. Home Address:		Phone:	
4. Student email address:			
5. Branch:	6. Internship Semester: _____		
7. Internship Preferences			
	Company/Industry	Core Area	Location
Preference-1			
Preference-2			
Preference-3			
Faculty mentor Signature: _____ Date _____.			
Student Signature: _____ Date _____.			
Signature confirms that the student agrees to the terms, conditions, and requirements of the Internship Program			

Signature with seal
HOD/Principal

(ANNEXURE-I)

REQUEST LETTER FROM INSTITUTE TO INTERNSHIP/INDUSTRIAL TRAINING PROVIDER

Ref. No.: _____

Date: _____

To,
The HR Manager/Training Coordinator
.....
.....

Subject: Request for Internship/Industrial Training for Diploma Students

Sir/Madam,

We are pleased to introduce....., a premier institution affiliated with Board of Technical Education, Uttar Pradesh, offering diploma programs in various diploma disciplines.

As a part of the curriculum, our students are required to undergo Internship/Industrial Training to gain practical exposure and enhance their technical competencies. Therefore, we kindly request your esteemed organization to provide Internship/Training opportunities to our students during the period from to

S. No.	Name	Enroll. No.	Semester/Year	Discipline

Yours sincerely,

(Head of Department/Principal)

PROFORMA FOR EVALUATION OF INTERNSHIP BY INDUSTRY

Student Name:Evaluation Date:

Industry Supervisor Name:

Company/Organization:

Title of the Project:

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Max. Marks	Marks Given
Attendance and Punctuality	20	
Discipline and Professional Behavior	20	
Technical Knowledge and Understanding of Processes	30	
Practical Skills and Quality of Work	20	
Ability to Apply Theoretical Knowledge	20	
Problem Solving and Analytical Ability	10	
Communication and Interpersonal Skills	20	
Teamwork and Collaboration	10	
Internship Report/Documentation	20	
Presentation and Viva-Voce	30	
Total Marks	200	

Additional comments, if any:

Signature with seal of Industry supervisor

HR Manager

INTERNSHIP REPORT

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and got ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Drawings, sketches and data recorded.
- Thought process and recording techniques used.
- Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

- i. Originality.
- ii. Adequacy and purposeful write-up.
- iii. Organization, format, drawings, sketches, style, language etc.
- iv. Variety and relevance of learning experience.
- v. Practical applications, relationships with basic theory and concepts taught in the course.

MONITORING & EVALUATION OF INTERNSHIP

The industrial training of the students will be evaluated in three stages:

1. Evaluation by Industry.
2. Evaluation by faculty supervisor of Industry.
3. Evaluation through seminar presentation/viva-voce at the Institute.

1. EVALUATION BY INDUSTRY

The industry will evaluate the students based on the Punctuality, eagerness to learn, Maintenance of Daily Diary and skill test in addition to any remarks.

2. MONITORING/ SURPRISE VISIT BY TPO/ STAFF/ FACULTY MENTOR

TPO/Staff/ Faculty Mentor of the institutes will make a surprise visit to the internship site, to check the student's presence physically, if the student is found absent without prior intimation to the T & P Cell, entire training will be cancelled. Students should inform the TPO, faculty mentor as well as the industry supervisor at least one day prior to availing leave by email. Students are eligible to avail 1-day leave in 4 weeks and 2 days leave in 6 weeks of the internship period apart from holidays and weekly offs.

3. EVALUATION THROUGH SEMINAR PRESENTATION/VIVA-VOCE AT THE INSTITUTE

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.

Seminar presentation will enable sharing knowledge & experience amongst students & teachers and build communication skills and confidence in students.