GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

IRRIGATION TECHNOLOGY
(Code: 3346306)

Diploma Programme in which this course is offered	Semester in which offered
Agricultural Engineering	4TH

1. RATIONALE.

Irrigation is very important for growing of crops. Different types of crop requires different amount of water. In India, various irrigation systems are practised like Surface Irrigation, Drip irrigation, Sprinkler irrigation etc.. Students have to study these various parameters related to Irrigation Technology. They will have to apply these knowledge for better farming on the field using optimal quantity of irrigation water.

2. COMPETENCY (Programme Outcomes (POs) According to NBA terminology)

The course content should be taught and implemented with the aim to develop required theoretical knowledge & associated practical significance so that they acquire competencies in the following activities.

1. Irrigation methods with respect to agriculture
2. Design parameters of various irrigation systems
3. Determination of evapotranspiration
4. Determination of water requirements of crops.

3. TEACHING AND EXAMINATION SCHEME.

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical;
C – Credit, ESE -End Semester Examination; PA - Progressive Assessment

4. COURSE DETAILS.

Unit	Outcomes (in cognitive domain)	Major Learning Topics and Sub-topics
Unit – I Introduction	1.1 Discuss irrigation, its necessity 1.2 Discuss irrigation water	1.1 Irrigation, necessity of irrigation and advantages and disadvantages of irrigation. 1.2 Sources of irrigation water 1.3 Quality of irrigation water
Unit– II Water requirements of crops	2a. Discuss evaporation, evapotranspiration, infiltration, water requirements, duty, delta, base period and irrigation efficiencies.	**2.1** Water Requirement of Crops 2.1.1. Evaporation, measurement of evaporation by pan evaporimeter. Transpiration and transpiration ratio. Evapotranspiration or consumptive use, seasonal consumptive use, peak period consumptive use. 2.1.2 Measurement of evapotranspiration by direct methods viz. Lysimeter experiment, Field experimental plots. 2.1.3 Water infiltration and determination of infiltration rate. 2.1.4 Water requirement, net and gross irrigation requirement of crops. Irrigation frequency and irrigation period. Estimation of irrigation depth and irrigation scheduling, irrigation intensity 2.1.5. Duty and Delta; factors affecting duty and methods of improving duty. 2.1.6 Irrigation efficiencies- water conveyance, application, storage, distribution, water use, project, operational and economic efficiency. Uniformity coefficient.
Unit–III Water application methods	3a. Discuss various types of irrigation systems viz. drip and sprinkler irrigation and its importance	**3.1 Irrigation systems** 3.1.1 Introduction to Surface, Subsurface, Sprinkler and Drip Irrigation Systems. 3.1.2 Surface methods of irrigation viz. Border, Check Basin and Furrow Irrigation, their basic details, Design and their Adaptability. Measurement of Irrigation Water. 3.1.3 Concept of subsurface irrigation method, its importance and adaptability. Sprinkler irrigation-its adaptability and limitations, types components, operation and maintenance of sprinkler systems. Layout and various design parameters of sprinkler irrigation system. 3.1.4 Determination of Pump Capacity for Sprinkler System. Numerical Problem on

Unit	Outcomes (in cognitive domain)	Major Learning Topics and Sub-topics
		Pump Capacity 3.1.5 Drip irrigation- its adaptability and limitations, types, components, operation and maintenance of sprinkler systems. Layout and various design parameters of drip irrigation system. 3.1.6 Determination of Uniformity of water application, uniformity coefficient for Sprinkler and Drip Irrigation.
Unit–IV Water lifting devices	4a. Introduction of Water lifting devices 4b. Classify different Types of pumps with its Adaptability, limitations, Installation, operation and maintenance	4.1. Introduction to various water lifting devices viz. manual, animal and power operated. 4.2. Classification of pumps-positive displacement (reciprocating and rotary), variable displacement of pumps. Pump terminology. Principle of operation of centrifugal pumps (volute and diffuser type, single stage and multistage type) 4.3. Types of impellers of centrifugal pump; Installation, operation and maintenance of centrifugal pumps, Centrifugal Pump Characteristics. submersible pump and vertical turbine pumps; their common troubles and remedies. 4.4. Principles of operation of propeller and jet pumps, their adaptability and limitations. 4.5. Criteria and procedures for selection of irrigation pumps, power requirements, efficiency and economics of irrigation water Pumping.
Unit–V Conveyance of irrigation water	5a. Classify Canals, Canal Lining 5b. Explain Various water conveyance structures	5.1. Canals and their classification (brief description only), seepage from canals and field channels.. 5.2. Canal lining-various types. Their advantages and disadvantages. 5.3. Introduction to various water conveyance structures and their functions e.g. flumes, tunnels, inverted siphons, flexible tubing and gated pipes. 5.4. Open channels, their types, layout and design of Open Channels. 5.5. Subsurface systems of water conveyance, their components, hydraulics and layout.

5. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction	06	3	2	2	07
2	Water requirements of crops	10	7	7	7	21
3	Water application methods	08	3	2	4	09
4	Water lifting devices	08	4	3	5	12
5	Conveyance of irrigation water	10	7	5	9	21
	Total	**42**	**24**	**19**	**27**	**70**

Legends: R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy).

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

General Notes:

1. If midsem test is part of continuous evaluation, unit numbers I and II are to be considered.
2. Ask the questions from each topic as per marks weightage. Numerical questions are to be asked only if it is specified. Optional questions must be asked from the same topic.
3. In examination, example of same chapter is to be asked in place of example.

6. SUGGESTED LIST OF EXERCISES/PRACTICALS.

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

Sr. No.	Unit No.	Practical Exercises (outcomes in Psychomotor Domain)	Teaching Hours
1	3	Installation, operation and maintenance of Sprinkler and Drip Irrigation systems, Determination of Uniform Coefficient and testing.	06
2	4	Installation and operation and testing of centrifugal pump.	04
3	4	Dismantling of centrifugal pump, study of its constructional features of its components and assembly	04
4	4	Installation, operation and maintenance of submersible pump.	02
5	4	Determination of infiltration rate of soil	02
6	4	To survey market and field for the availability, adaptability and selection of various types of pumps and irrigation systems in the region	04
7	2	Measurement of irrigation water in the field channel with the help of Parshall flume and Current meter. Weir, Measurement of water flow in pipes.	04
8	5	Study tours to watershed management, irrigation and drainage	02

		project sites.	
		Total	**28**

7. LIST OF STUDENT ACTIVITIES:

1. Identify the quality of soil: colour, type, grain size
2. Soil investigation and soil exploration

8. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr No.	Title Of Book	Author	Publication
1	1. Ground Water and Well Drilling by Parveen Kumar; CBS Publishers and Distributors, Delhi	**Parveen kumar**	CBS publishers and distributors.
2	2. Sprinkler Irrigation	**Sivanappan**	**IBH publications**
3	Irrigation Engineering	M. lal and Etal	NEW INDIA PUBLICATIONS
4	Water use Efficiency in Agriculture	**Giriappa**	**IBH publications**
5	Irrigation Practice &Water Management	FAO	**IBH publications**
6	Irrigation Engineering	Sharma and Bari	Satya prakash publishers
7	Irrigation Water Power & Water Resource Engineering	K.R Arora	Standard publications

B. List of Major Equipment/ Instrument

- Sprinkler System
- Pumps
- Drip System
- Flumes
- Watermeter
- Pump Testing Rig
- Infiltrometers
- Current meter
- Stop watch

C. List of Software/Learning Websites

- http://www.agricoop.nic.in/dacdivision/mmsoil280311.pdf
- http://www.nrcs.usda.gov/internet/FSE_DOCUMENTS/stelprdb1044820.pdf
- http://nptel.ac.in/courses/105101084/