

**COURSE NAME : Civil Engineering Group**

**COURSE CODE : CE/CS/CR/CV**

**SEMESTER/YEAR : Fifth Semester**

**SUBJECT TITLE : Irrigation Engineering**

**SUBJECT CODE :**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
04	--	---	03	100	---	---	---	100

**NOTE:**

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

**RATIONALE:**

Agriculture is the main occupation of majority of Indian Population. But Agricultural productivity is very low because of uncertainty of rainfall. Scientifically planned and developed Irrigation systems have been ensuring enhanced productivity of agriculture sector due to assured water supply to crops . There are inherent huge amount water losses in major projects and major projects are complex from the view point of operation, management and maintenance. Medium , minor and micro irrigation schemes have proved to be easier to develop and maintain and are highly efficient also.

The topics on hydrology, rainfall, runoff, yield and maximum flood discharge will be useful for reservoir planning. Information on duty, delta, base period, crop pattern and command area will be used for ascertaining crop water requirement. Various topics on data collection for irrigation project will be useful for irrigation site investigation.

Topics on earthen, gravity dams and spillway will be useful during construction of medium, minor irrigation schemes. The contents on Bandhra Irrigation, Percolation Tank and micro irrigation will be useful, for construction, maintenance of minor irrigation scheme. Topics on Diversion headwork will be useful for efficient and effective planning of barrages and weirs

Topics on canals with their types, canal, CD works and canal maintenance will be guiding factor for deciding canal alignment, location of various CD works, various maintenance parameters for a canal including the prevailing field practices.

Thus the diploma engineer is exposed to understand various factors at the planning, construction, operation, maintenance and repairs of various irrigation schemes. This will further enable a learner to come up as resourceful professional in the area of irrigation engineering. This

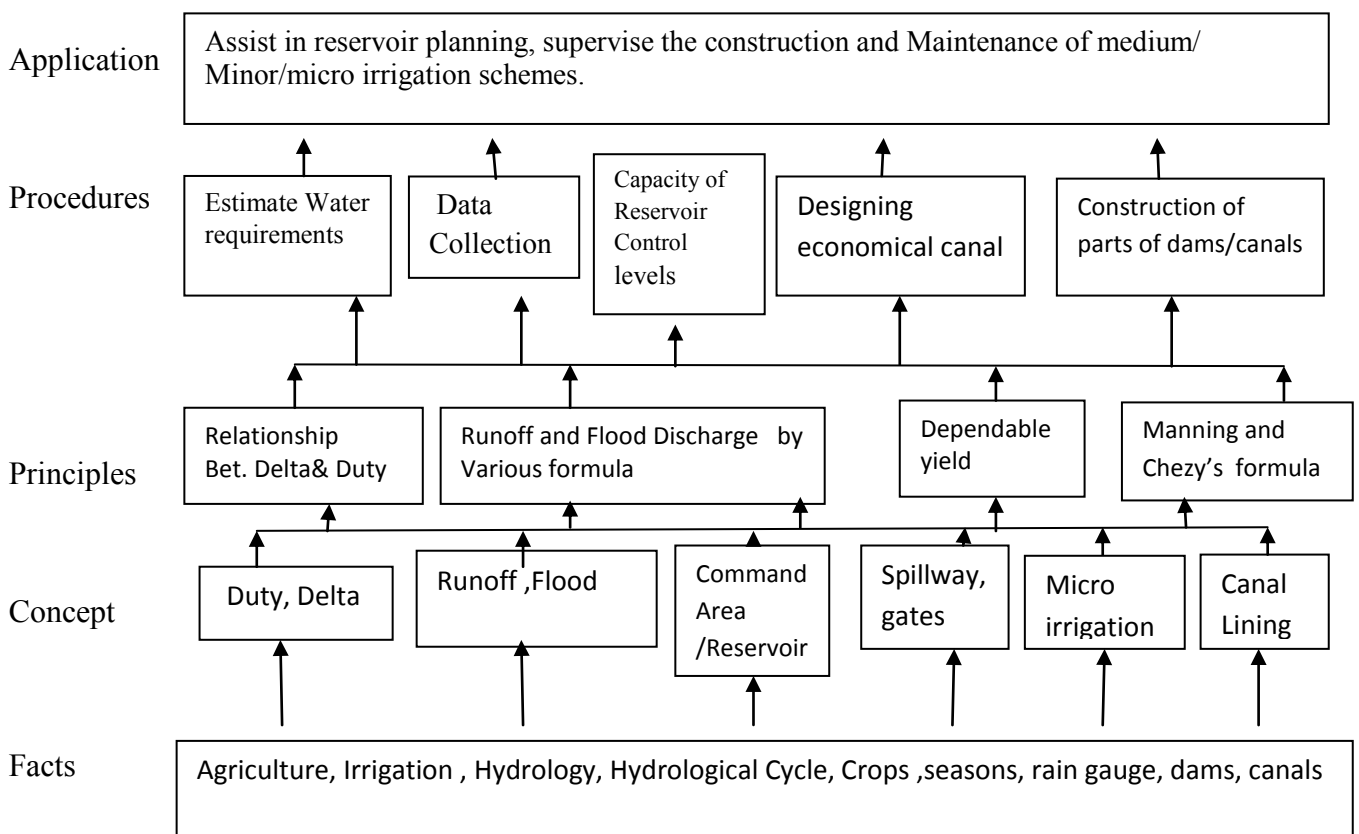
may aim at optimum use of water with minimum loss of water and achieve maximum productivity and yield.

**General Objectives:**

**Students will be able to**

1. Appreciate need of Irrigation
2. Understand Water Requirements of a command area
3. Understand aspects of Reservoir Planning.
4. Understand Construction and maintenance of Earthen and Gravity Dams
5. Understand Minor / Micro Irrigation Schemes.
6. Understand Construction and Maintenance of Canals and structures.

**Learning Structure:**



## Theory

Topic and Contents	Hours	Marks
<p><b>1.0 Introduction to Irrigation and Hydrology:</b></p> <p><b>Specific Objectives</b></p> <ul style="list-style-type: none"> <li>➤ Classify irrigation projects.</li> <li>➤ Classify irrigation.</li> <li>➤ Estimate runoff and flood discharge.</li> <li>➤ Calculate dependable yield from a catchment</li> </ul> <p>1.1 Concept of Irrigation, Classification of irrigation on the basis of purpose and administration.</p> <p>1.2 Advantages and ill effects of irrigation, methods of irrigation-such as surface</p> <p>1.3 Concept of hydrology, Hydrologic cycle, Definition of rain fall ,rainfall intensity</p> <p>1.4 Rain Gauge-Symons rain gauge, automatic rain gauge, its construction and functioning average rainfall, methods of calculating average rainfall.</p> <p>1.5 Runoff, Factors affecting Run off, Computation of run off Using Inglis formula, Stranges and Binnie's tables.</p> <p>1.6 Concept of Maximum Flood Discharge (MFD), Computation of Maximum Flood Discharge by Physical indication of past floods and by flood discharge formulae-Inglis and Dicken;s formula. Simple numerical problems.</p> <p>1.7 Yield and Dependable yield of a catchment, determination of dependable yield.</p>	10	12
<p><b>2.0 Water Requirement Of Crops And Reservoir Planning:</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Estimate crop water requirement of a command area.</li> <li>➤ Calculate reservoir capacity to meet the crop water demand of a command area.</li> <li>➤ Enlist data required to be collected for the planning of a reservoir.</li> <li>➤ Fix control levels of a reservoir.</li> </ul> <p>2.1 ..... (08)</p> <ul style="list-style-type: none"> <li>➤ Cropping seasons in Maharashtra.</li> <li>Definition of terms – Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty , relation between duty, delta and base period.</li> <li>➤ Problems on water requirement and capacity of canal. Modified Penman method .Assessment of irrigation water.</li> </ul> <p>2.2 ..... (10)</p> <ul style="list-style-type: none"> <li>➤ Survey for irrigation project, data collection for irrigation project. area capacity curve,</li> <li>➤ Silting of reservoir, rate of silting , factors affecting silting ,</li> <li>➤ Fixing Control levels and respective storage in reservoir. Simple numerical problems on Fixing Control levels.</li> </ul>	12	18
<p><b>3.0 Dams And Spillways</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Classify dams.</li> <li>➤ Describe construction and operation of Earthen and Gravity Dam.</li> <li>➤ Describe operation of spillway and gates.</li> <li>➤ List various repairs and maintenance works for an earthen dam.</li> </ul> <p>3.1 ..... (12)</p>	14	24

<p>➤ Dam, Types of dams – Earthen dams and Gravity dams ( masonry and concrete) Comparison of earthen and gravity dams with respect to foundation, seepage, construction and maintenance</p> <p>➤ Earthen Dams – Components and their function, typical cross section seepage through embankment and foundation seepage control through embankment and foundation. Methods of constructions, types of failure of earthen dams and remedial measures.</p> <p>3.2 (12)</p> <p>➤ Gravity Dams Theoretical and practical profile, typical cross section, drainage gallery, joint in gravity dam, high dam and low dam</p> <p>➤ Spillways-Definition, function, location and components. Emergency and services, ogee spillway and bar type spillway, discharge over spillway. Energy dissipation Spillway with and with out gates, Gates- Radial and Vertical, procedure of maintenance and repairs of the gate (no numerical problems).</p>		
<p><b>4.0 Minor and Micro Irrigation</b>  <b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe construction and operation of Bandhara irrigation and Percolation tanks.</li> <li>➤ Describe construction and operation of Micro/Lift Irrigation systems.</li> <li>➤ Distinguish Bandhara irrigation with Percolation tanks/ Micro irrigation.</li> </ul> <p>4.1 Bandhara, construction and working Advantages and disadvantages of bandhara irrigation layout and component parts, solid and open bandhara.</p> <p>4.2 Percolation Tanks – Need, selection of site, construction</p> <p>4.3 Lift irrigation scheme-Components and their functions ,lay out</p> <p>4.4 Drip and Sprinkler Irrigation- Need, components, Layout, operation and Maintenance.</p>	10	16
<p><b>5.0 Diversion Head Works</b>  <b>Specific Objectives</b></p> <ul style="list-style-type: none"> <li>➤ Describe construction and operation of Weirs.</li> <li>➤ Describe construction and operation of barrage.</li> </ul> <p>5.1 Weirs – components parts, types, layout of diversion head works with its components and their function,</p> <p>5.2 Barrages – components and their function. Difference between weir and barrage</p>	08	12
<p><b>6.0 Canals</b>  <b>Specific Objectives</b></p> <ul style="list-style-type: none"> <li>➤ Classify canals</li> <li>➤ Describe construction of canal.</li> <li>➤ List various repairs and maintenance works for canals.</li> <li>➤ Design a most economical section for the designed discharge.</li> </ul> <p>6.1 (10)</p> <p>➤ CANALS – Classification of canals according to alignment and position in the canal network. Cross section of canal in embankment and cutting , partial embankment and cutting , balancing depth. Design of most economical canal section.</p> <p>➤ Canal lining - Purpose, material used and its properties.  Advantages of canal lining</p> <p>6.2 (08)</p> <p>➤ CD works- Aqueduct , siphon aqueduct, super passage, level crossing</p>	10	18

➤ Canal regulators- Head regulator, Cross regulator, Escape, Falls and Oulets.		
➤ Canal maintenance.		
➤ Water logging- Causes, effects and Measures.		
<b>Total</b>	<b>64</b>	<b>100</b>

## Learning Resources:

### 1. Book:

Sr. No	.Author	Title	Publisher
1	S. K. Garg	Irrigation and hydraulic structure	Khanna publisher New Delhi
2	Dr. B.C.Punmia and Dr. B.B. Pande	Irrigation Engineering and water power Engineering	Stanadard Publisher
3	N.N.Basak	Irrigation Engineering	Tata Mc graw Hill
4	J.G.Dahigaonkar	Text Book of Irrigation Engineering	Wheeler
5	A.M.Maichael	Irrigation Theory and Practice	Dhanpat rai and sons

### 2. CDs, PPTs Etc.:

### 3. IS, BIS and International Codes:

IS :4410-Part-V-1982-Canals

IS :4410- Part-VI-1983-Reservoirs.

Part-VII-1968-Dams.

Part-XVII-1977-Water Requirement of Crops

IS :5477-Part-II,III and IV -1969-71-Storage zones of reservoirs.

### 4.Websites:

[www.damsinternational.com](http://www.damsinternational.com)

[www.dams.org](http://www.dams.org)

[www.narmada.org](http://www.narmada.org)

[www.guj.nwrws.gujrat.gov.in](http://www.guj.nwrws.gujrat.gov.in)

[www.rajirrigation.gov.in](http://www.rajirrigation.gov.in)

[www.mahairrigation.gov.in](http://www.mahairrigation.gov.in)