B.E. Semester: VIII

Department of Civil Engineering

Subject Name: Design of Hydraulic Structures (CV801-N)

Course Category: Program Course Core (PCC)

A. Objectives of the Course:

- Demonstrate and understanding of advanced fluid mechanics principles
- Implementation of geotechnical engineering principles
- To get a knowledge of various types of dam
- Understand the different elements of dam

B. Teaching & Evaluation Scheme:

Teaching Scheme				Credit	Evaluation Scheme					Total Marks
L hrs	T hrs	P hrs	Total Hrs		Theory		IE	CIA	Pra/Viva	
					Hrs	Marks	Marks	Marks	Marks	
2	2	0	4	4	3	70	30	20	30	150

C. Detailed Syllabus:

1. **Elements of Dam Engineering:** Introductory Perspectives, Embankment Types and Characteristics- Concrete Dams and Characteristics- Spillways and Ancillary Works – Site Assessment and Selection of Type of Dam

2. **Embankment dam engineering:** Nature and Classification of Soil- Engineering Characteristics of Soil, Principles of Design – Material and Construction- Internal Seepage – Stability and Stresses, Settlement and Deformation in Rock Fill Embankments

3. **Concrete dam engineering:** Loading -Concepts and criteria, Gravity Dam Analysis Design Features and Stability Elementary Profile of Gravity Dam- Concrete for Dams – Roller Compacted Concrete Gravity Dams

4. **Dam outlet works:** Spillways – Ogee Spillway - Cavitations on Spillway – Design Feature- Design Principles and Design of Spillways – Chute Spillways –Energy Dissipation – Stilling Basins – Plunge Pools
5. **Drop Structures:** Sarda fall – Glacis fall –Design Principles- Cross Regulator, Head Regulator and Functions

D. Lesson Planning:

Unit No	Title of the Unit	Minimum Hours	Weightage (%)
1	Elements of Dam Engineering	02	07
2	Embankment Dam Engineering	10	33
3	Concrete Dam Engineering	10	33
4	Dam Outlet Works	05	16
5	Drop Structures	03	11
	Total:	30	100

E. Assignments:

- Minimum 6 questions and examples from each subject topics

F. Instructional Method and Pedagogy (Continuous Internal Assessment Scheme CIA):

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures, practical and Tutorial which carries 05 Marks.
- At regular intervals assignments is given. In all, a student should submit all assignments of 05 marks each.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries 05 Marks.

- Viva Voce will be conducted at the end of the semester of 05 Marks.
- One internal exam of 30 marks is conducted as a part of Mid Semester evaluation.

G. Students Learning Outcomes:

On the completion of the course one should be able to understand:

- Select hydraulic structural elements.
- Evaluate surface water dam.
- Be able to integrate relevant concept and methodologies in the area of hydraulics, hydrology and geotechnical engineering.
- Be able to select the type of dam, design and to construct

H. Recommended Study Materials:

a. Text book & Reference Books:

1. Arora, K.R., Irrigation, Water Power and Water Resources Engineering, Standard PublishersDistributors, Delhi
2. Garg, S.K., Irrigation Engineering and Hydraulic Structures Khanna Publishers
3. Modi, P.N., Introduction To Water Resources And Waterpower Engineering, Standard Publication, Delhi
4. Asawa, G, L Irrigation and Water Resources Engineering, New Age Int. Ltd.
5. Handbook of Applied Hydraulics, by C.V. Davis and K.E. Sorensen, McGraw Hill

b. Web Materials:

1. http://nptel.iitm.ac.in/video.php?courseId=1029&v=XmO2pltg7YBz
2. http://nptel.iitm.ac.in/video.php?courseId=1029&v=SO0suW7TLiCs
3. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Water%20Resource%20Engg/New_index1.html

4. http://nptel.iitm.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l02.pdf
5. http://nptel.iitm.ac.in/courses/Webcourse contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l03.pdf
6. http://nptel.iitm.ac.in/courses/Webcourse contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l05.pdf
7. http://nptel.iitm.ac.in/courses/Webcourse contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l07.pdf

c. Indian Codes of Practice:

1. IS: 12966(Part 2)-1990 "Code of practice for galleries and other openings in dams" (Part 2: Structural design)
2. IS: 13551-1992 "Structural design of spillway piers and crest–criteria"
3. IS: 12720-1992 "Criteria for structural design of spillway training and divide walls
4. IS: 95-1993 "Design aid for anchorages for spillway structures"
5. IS: 6512-1984 "Indian Standard Criteria For Solid Gravity Dam"
6. IS: 7894-1975Code of "practice for stability analysis of earth dams"
7. IS: 1893-2002, "Criteria for earthquake resistant design of structures – Part 1: General provisions and buildings,"