INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

CIVIL ENGINEERING
COURSE DESCRIPTION FORM

Course Title	**Water Resources Engineering - II**			
Course Code	**A70133**			
Regulation	**R15 – JNTUH**			
Course Structure	**Lectures**	**Tutorials**	**Practicals**	**Credits**
	4	**-**	**-**	**4**
Course Coordinator	**Ms. B. Navya, Assistant Professor, Department of Civil Engineering.**			
Team of Instructors	**Ms. B. Navya, Mr. R. Suresh Kumar, Assistant Professor, Department of Civil Engineering.**			

I. COURSE OVERVIEW:

This course address the concept of dam, earth dam, gravity dam, canals structures, diversion head works, spillways and drainages works, constitutes to be the most common type, Since it is generally built of locally available in their natural state with a minimum of processing .The responsibility of maintenance of the distributing channel and the whole canal networks lies with government, while that of the field channel lies with the farmers. Know about canal regulation works. Ground water, reservoir water and rain water storing

II. PREREQUISITE(S):

Level	Credits	Periods/ Week	Prerequisites
UG	4	5	Water Resources Engineering-I

III. MARKS DISTRIBUTION:

Sessional Marks	University End Exam marks	Total marks
Midterm Test There shall be two midterm examinations. Each midterm examination consists of essay paper, objective paper and assignment. The essay paper is for 10 marks of 60 minutes duration and shall contain 4 questions. The student has to answer 2 questions, each carrying 5 marks. The objective paper is for 10 marks of 20 minutes duration. It consists of 10 multiple choice and 10 fill-in-the blank questions, the student has to answer all the questions and each carries half mark. First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion. Five marks are earmarked for assignments. There shall be two assignments in every theory course. Assignments are usually issued at	75	100

Sessional Marks	University End Exam marks	Total marks
the time of commencement of the semester. These are of problem solving in nature with critical thinking. Marks shall be awarded considering the average of two midterm tests in each course.		

IV. EVALUATION SCHEME:

S. No	Component	Duration	Marks
1.	I Mid Examination	80 minutes	20
2.	I Assignment	-	5
3.	II Mid Examination	80 minutes	20
4.	II Assignment	-	5
5.	External Examination	3 hours	75

V. COURSE OBJECTIVES:

The objective of the teacher is to impart knowledge and abilities to the students to:

I. Introduce students to the structure of the dams, earth dam, canals, spillways and cross drainage works.
II. Learn to estimate the capacity of reservoir using mass curve.
III. Design the principle of Sarda type, trapezoidal notch, straight glacis fall.
IV. Necessity and importance of diversion, storage head works, weir and barrages.
V. Determine the uplift pressure, impervious floors using the theory.

VI. COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

1. Create a new technology for construction of dam, canals, and spillways.
2. Definitions related to water resources engineering.
3. It can know about the merits and demerits of dams, factor effecting selection of dams, gravity dams, earth dams, canals, and spillways.
4. It can also deal the causes of failure of the dams, canals and spillways.
5. Mainly it deals the design of reservoir, canals, diversion; storage head works by the Bligh's and Khosla's theory.
6. Understand about the types of fall in canals and its application which have designed in the all cases.
7. It understands and develops the modern techniques which used for irrigation. Thus it develops the storage of water which requires for drinking and irrigation by wells through tanks.
8. It demonstrates the knowledge about water which is used for certain sequence only and it gives a particular way to supply in particular time only.
9. Able to communicate both the design and planning of the dams, canals, spillways which used for irrigation process.
10. It can develop the design principle of the types of spillways, and can able to design of aqueduct, siphon aqueduct and super passage.
11. Develop confidence for self education and ability for life-long learning.
12. Can participate and succeed in competitive examinations like GATE, PSU.

VII. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	H	Assignments, Exams
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	H	Assignments, Exams
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	-	-
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	S	Assignments
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	-	-
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	-	-
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	-	-
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	-	-
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	-	-
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	S	Lectures, Discussions
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	-	-
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	-	-

N – Not Applicable **S – Supportive** **H - Highly Related**

VIII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	**ENGINEERING KNOWLEDGE:** Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.	H	Lectures, Assignments, Exam
PSO2	**BROADNESS AND DIVERSITY:** Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.	S	Projects
PSO3	**SELF-LEARNING AND SERVICE:** Graduates will be motivated for continuous self-learning in engineering practice and/ or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.	-	-

N – None **S - Supportive** **H - Highly Related**

IX. SYLLABUS:

Unit - I

STORAGE WORKS – RESERVOIRES- Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve- Reservoir Sedimentation- Life of Reservoir. Types of dams, factors affecting selection of type of dam, factors governing selection of site for a dam.

Unit – II

GRAVITY DAMS: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety-stability analysis, Foundation for a Gravity Dam, drainage and inspection galleries

Unit – III

EARTH DAMS: Types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage.

SPILLWAYS: Types of spillways, design principles of Ogee spillways, types of spillway gates. Energy Dissipaters and stilling basins Significance of jump height Curve and tail water rating curve-USBR and Indian types of stilling Basins.

Unit - IV

DIVERSION HEAD WORKS: Types of Diversion head works-weirs and barrages, layout of diversion head works, components. Causes and failure of weirs and barrages on permeable foundations-silt Ejectors and silt Excluders.

WEIRS ON PERMEABLE FOUNDATIONS-Creep Theories- Bligh's, Lane's and Khosla's theories, Determination of uplift pressure, Various correction Factors-Design principles of weirs on permeable foundations using creep theories -exit gradient, functions of U/s and d/s sheet piles-launching Apron

Unit - V

CANAL FALLS- Types of falls and their location, design principles of notch fall and Sarda type fall. Canal regulation works, principles of design of distributory and head regulators, canal Cross Regulators- canal outlets, types of canal modules, proportionality, sensitivity and flexibility.

CROSS DRAINAGE WORKS: Types, selection of site, design principles of aqueduct, siphon aqueduct and super passage. Design of Type II Aqueduct (Under Tunnel)

Textbooks:

1. Irrigation engineering and hydraulic structures by S.K Garg, Khanna publishers.
2. Irrigation and water power engineering by punmia & Lal, Laxmi publications pvt. Ltd. New Delhi.

Reference Books:

1. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers
2. Theory and Design by of Hydraulic structures by Varshney, Gupta & Gupta
3. Irrigation engineering by K.R Arora.
4. Irrigation Engineering by R.K Sharma and T.K sharma , S. Chand Publishers.
5. Introduction to hydrology by Warren Viessvann, Jr, Garyl. Lewis, PHI
6. Engineering Hydrology by CS pojha, R. Berndtsson and P.Bhunya, Oxford University Press.

X. COURSE PLAN:

At the end of the course, the students are able to achieve the following course learning outcomes:

Lecture No.	Topics to be covered	Course Learning Outcomes	References
1-2	Storage Works Reservoirs Types of Reservoirs, zones of storage of a reservoirs	To know the types of Reservoir	T1: 1.1-3, 2.1-5
3-4	Reservoir yield , estimation of capacity of reservoirs using mass curve	Able to know the selection of site for reservoir. Zones of storage and reservoir yield	T1: 2.4
5-6	Reservoir sedimentation – Life of Reservoir	Able to know life of Reservoir	T1: 2.6-14
7-8	**UNIT - II** Types of dams, factors governing selection of site for a dam.	Able to understand the factors governing selecting site for dam.	T1: 2.15-20
9-10	Forces acting on gravity dam, causes of failure of gravity dam.	Able to know about gravity dam and forces action on its.	T1: 3.1-.3
11-12	Elementary profile and practical profile of a gravity dam	To understand about Elementary profile and practical profile of a gravity dam	T1: 3.5-14
13-14	Limiting height of gravity dam, factors of safety- stability analysis	Able to know limiting height of gravity dams.	T1: 6.1-5
15-16	Foundation for a gravity dam, Drainage and inspection galleries	Able to know the foundation of gravity dams	T1: 9.1-5
17-19	**UNIT -III** Types of earth dams, Causes and failure of earth dams	To know about earth dams and its types	T1: 9.6-7
20-22	Criteria for safe design of earth dam. method	An able to design the criteria for safe design of earth dams	T1: 9.6-7

23-25	Seepage through earth dam-graphical method	Able to design earth dam through dam- graphical method	T1: 9.6-7
26	Measures for control of seepage	Able to measure for control for seepage	T1:9.6-11
27-28	Types of spillways, Design principles of ogee spillways- spill gates,	To know about the spillways and its types	T1: 10.1-5
29-30	Energy dissipaters and stilling basins. Significance of Jump Height Curve and Tail Water Rating curve	Able to know the Significance of Jump height Curve and Tail Water Rating curve.	T1: 10.5-7
31-32	UBBR and Indian types of stilling basin	Able to know the Indian types of stilling basins	T1: 10.7
33-34	**UNIT-IV** Types of Diversion head works- weirs and barrages	Able to know the types of Diversion head works- weirs and barrages	T1: 10.7
35-38	Layout of diversion head work-components.	Able to Design the diversion head works components.	T1: 11.1-7
39	Causes and failure of weirs and barrages on permeable foundations	To understand the causes and failure of weirs and barrages	T1: 4.1
40-42	Silt Ejectors and silt Excludes	Able to know about silt ejectors and silt Excludes	T1: 4.2 - 4.11
42-45	Weirs on Permeable foundations- creep theories	Able to understand permeable foundations through creep theories	T1: 5.1-8
46-47	Bligh's Lane's and Khosla's theories, determinations of uplift pressure	To know bligh's theories, able to understand the Khosla's theory. And able to understand uplift pressure.	T1: 7.1-3
48-49	Various correction factors- Design principles of weirs on permeable foundations using creep theories.	To understand various correction factors. And design principles of weirs on foundations	T1: 7.4-7
50-52	Canal fall- types of falls and their location, Design principles of notch fall and Sarda type fall.	To know about the type of falls and their location and able to design principles of notch fall and sarda type fall.	T1: 12.1-3
53-56	Canal regulation works, principles of design of distributor and head regulators	To understand canal regulation works	T1: 12.4-11
57-58	Canal cross regulators- canal outlets	Able to understand the canal cross regulators	T1: 13.1-9
59-62	Type of canal modules, proportionality, sensitivity and flexibility	To know about the types of canal modules, Proportionality sensivity and flexibility	T1: 14.1-8
60-61	Cross Drainage works: types selection of site.	To know about cross drainage works and its types and selection of sites	T1: 15.4-11
62-63	Design principles of aqueduct,	To understand about design principles of aqueduct.	T1: 13.1-9
64-65	Siphon aqueduct and super passage.	To understand siphon aqueduct and super passage	T1: 14.1-8

65-66	Design of type II Aqueduct (under Tunnel)	Able to design of type II Aqueduct	T1: 12.4-11

XI. MAPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Objectives	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I	H	S								S			S	S	
II		H												S	
III	H			H									H		
IV	S									S				H	
V	H			H						S			H	H	

S – Supportive **H - Highly Related**

XII. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	S	H											H		
2	H	S		H						S			H	S	
3	H			H									H	S	
4	S												S	H	
5				S						S			S	H	
6	H												H		
7	H									S			H	S	
8		H		S						S			H		
9	H												H	S	
10	S	H											H		
11	H	S		H						S			H	S	
12	H			H									H	S	

S – Supportive **H - Highly Related**

Prepared by: Ms. B. Navya, Assistant Professor, Department of Civil Engineering
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