



# INSTITUTE OF AERONAUTICAL ENGINEERING

Dundigal, Hyderabad - 500 043

## CIVIL ENGINEERING

### COURSE DESCRIPTION FORM

<b>Course Title</b>	Water Resource Engineering-I			
<b>Course Code</b>	A50122			
<b>Regulation</b>	R15 - JNTUH			
<b>Course Structure</b>	Lectures	Tutorials	Practicals	Credits
	4	1	-	4
<b>Course Coordinator</b>	Dr.G.V.Ramana, Professor, Department of Civil Engineering			
<b>Team of Instructors</b>	Dr.G.V.Ramana, Professor, Department of Civil Engineering Ms.B.Navya Assistant Professor, Department of Civil Engineering			

#### I. COURSE OVERVIEW:

This course address the concept of present science of the practice of irrigation engineering which comprising partially all the modern developments which occurs in irrigation purpose. In this mainly the units are taken as metric unit which covers the total area which need for irrigation. In this we can know about water requirement of crops by hydrology, ground water, reservoir water and rain water storing. By this water recourses engineering we can know about design of irrigation structures and planning of reservoir as for flood control

#### II. PREREQUISITE(S):

Level	Credits	Periods/ Week	Prerequisites
UG		5	Fluid mechanics.

#### III. MARKS DISTRIBUTION:

Sessional Marks	University End Exam marks	Total marks
<b>Midterm Test</b> 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 the time of commencement of the semester. These are of problem solving in nature with course. Critical thinking. Marks shall be awarded considering the average of two midterm tests in each.	75	100

#### 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:

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

- I. Apply concepts of hydrologic cycle and precipitation and its applications
- II. Learn how to measure base flow and find the analysis of base flow separation
- III. Evaluate the unit, S, SUH and synthetic hydrograph.
- IV. Design the discharge of flood frequency
- V. Apply the concept of ground water and its occurrence

#### VI. COURSE OUTCOMES:

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

1. Analyze the importance of hydrology, able to calculate the average rainfall over a basin.
2. Understand the infiltration methods, evaporation and evapotranspiration.
3. Apply hydrograph base flow concept,
4. Understand hydrograph methods, the types of hydrograph and their applications.
5. Understand the concept of ground water and its occurrence.
6. Know the about the complete concept of well development.
7. Know the importance of irrigation, types and methods.
8. Analyze soil-water plant relationship, duty & delta and factors affecting them.
9. Analyze the design of canals by using different methods.

#### VII. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
PO1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	S	Assignments, Tutorials.
PO2	<b>Problem analysis:</b> 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, Tutorials, Exams.
PO3	<b>Design/development of solutions:</b> 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.	H	Assignments, Tutorials, Exams
PO4	<b>Conduct investigations of complex problems:</b> 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.		
PO5	<b>Modern tool usage:</b> 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.	--	Assignments, Exams
PO6	<b>The engineer and society:</b> 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	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	--	--
PO8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	S	Assignments, Exams.
PO9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	H	Assignments and Exams
PO10	<b>Communication:</b> 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.	H	Assignments and Exams
PO11	<b>Life-long learning:</b> 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.	H	Assignments and Exams
PO12	<b>Project management and finance:</b> 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.	--	--

S – Supportive

H - Highly Related

### VIII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	<b>ENGINEERING KNOWLEDGE:</b> 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	Assignments, Tutorials, Exams
PSO2	<b>BROADNESS AND DIVERSITY:</b> 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.	H	Projects
PSO3	<b>SELF-LEARNING AND SERVICE:</b> 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.	S	Guest Lectures

Program Specific Outcomes	Level	Proficiency assessed by
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**S - Supportive**

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## **IX. SYLLABUS:**

### **UNIT - I:**

Introduction to engineering hydrology and its applications, Hydrologic cycle, types and forms of precipitation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data-Adjustment of record-Rainfall Double Mass Curve. Runoff - factors affecting runoff-Runoff over catchment-Empirical and Rational Formulae.

Abstraction from rainfall, Evaporation - factors affecting evaporation, measurement of evaporation – Evapotranspiration-Penman and Blaney & Criddle Methods- Infiltration - factors affecting infiltration, measurement of infiltration, infiltration indices.

### **UNIT – II:**

Distribution of Runoff-Hydrograph analysis flood hydrograph-Effective Rainfall Base Flow Separation-Direct Runoff Hydrograph-Unit Hydrograph, definition, and limitations of applications of Unit Hydrograph, derivation of unit Hydrograph from direct runoff hydrograph and vice versa –S-hydrograph,Synthetic Unit Hydrograph.

### **UNIT – III:**

Ground water - Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy’s law, radial flow to wells in confined and unconfined aquifers. Types of wells, Well construction-Well Development

### **UNIT – IV:**

Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility-Crop Rotation, preparation of land for Irrigation, standards of quality for Irrigation water.

Soil-water plant relationship, vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive Use, Duty and delta, factors affecting duty-Design discharge for water course. Depth and frequency of Irrigation, irrigation efficiencies-Water Logging.

### **UNIT – V:**

Classification of canals, Design of irrigation canals by Kennedy’s and Lacey’s theories, balancing depth of cutting, IS Standards for a canal design canal lining

Design Discharge over a catchment, Computation of design discharge - rational formula, SCS Curve number method, flood frequency analysis-introductory part only. Stream gauging-measurement and estimation of stream flow..

### **Textbooks:**

- 1. Engineering hydrology by Jayaram Reddy, Laxmi Publications Pvt.Ltd., New Delhi**
- 2. Irrigation and water power engineering by Punmia, Lal (2010), Laxmi publications Pvt. Ltd., New Delhi,**

**Reference Books:**

1. Elementary hydrology by V.P.Singh, PHI publications.
2. Irrigation and water Resources & Water power by P.N.Modi,Standard Book House.
3. Water Resources Engineering-I by Dr.G.Venkata Ramana,Academic Publishing Company
4. Irrigation and water Management by Dr.Majumdar,Printice Hall of India.
5. Irrigation and Hydraulic Structures by S.K. Garg
6. Applied hydrology by Ven Te Chow, David R.Mays Tata Mc Graw Hill.
7. Introduction to hydrology by Warren Viessvann,Jr ,Garyl.Lewis,PHI.

**X. COURSE PLAN:**

Unit	Lecture Number	Topics Planned to cover	Learning Objectives	References
<b>I</b>	1	Introduction to engineering hydrology and its applications, Hydrologic cycle.	<b>Understand</b> the applications of Engg. Hydrology and its cycle.	<b>T2:24.6</b> <b>T2:24.7</b> <b>T2:24.8</b>
	2-3	Types and forms of precipitation.	<b>Derive</b> the kinds and forms of precipitation.	<b>T7:12.14</b>
	4-5	Rainfall measurement, types of rain gauges, Computation of average rainfall over a basin.	<b>Understand</b> the rain fall measurement and to know the types of rain gauges.	<b>T4:3.10</b>
	6-7	Processing of rainfall data. Abstraction from rainfall. Adjustment of record	<b>Explain</b> the processing of rain fall and abstraction of its.	<b>T4:3.11</b> <b>T4:3.12</b>
	8-9	Rainfall double mass curve	<b>Evaluate</b> rainfall data in the curve.	<b>T1:16.2</b>
	7-8	Runoff - factors affecting runoff.	<b>Understand</b> about Runoff and factors effecting.	<b>T1:16.5</b>
	9	Runoff over catchment-empirical formulae.	<b>Understand</b> the measurement of runoff	<b>T1:16.6.2</b>
	10-11	Rational formulae.	<b>Evaluate</b> the measurement of runoff	<b>T2:26.9</b>
	12-13	Evaporation - factors affecting evaporation	<b>Understand</b> about evaporation and its effecting factors.	<b>T2:26.11</b>
	14-16	Measurement of evaporation and evaptranspiration.- penman method	<b>Evaluate</b> measurement of evaporation and evaptranspiration.	<b>T1:16.7</b>
	17-18	Evaptranspiration.- criddle method	<b>Evaluate</b> the measurement evaptranspiration.	<b>T2:26</b>
19-21	Infiltration - factors affecting infiltration, measurement of infiltration, infiltration indices.	<b>understand</b> the infiltration and its factors effecting and able to measure the filtration	<b>T2:20.4</b>	
<b>II</b>	23-24	Distribution of runoff-Hydrograph analysis flood hydrograph.	<b>Define</b> hydrograph analysis and flood hydrograph	<b>T2:23.4</b>
	25-26	Effective rainfall base Flow separation-direct	<b>Evaluate</b> the measurement of steam and rainfall	<b>T2:20.9</b> <b>T2:20.10</b>

		runoff		
	27-28	Unit hydrograph, Definition, and limitations of applications of Unit hydrograph	<b>Define</b> unit hydrograph and its limitations, applications	<b>T4:5.13</b> <b>T2:34.2</b>
	29-30	Derivation of Unit Hydrograph, S hydrograph, Synthetic unit hydrograph.	<b>Derive</b> the Unit hydrographs -UH, influence UH Derivation of Unit Hydrograph, S hydrograph, SUH.	<b>T2:21.1-21.2</b>
<b>III</b>	31	Ground water - Occurrence, types of aquifers.	Define about Ground water Occurrence, types of aquifers.	<b>T:21.3-</b> <b>T:21.4</b>
	32-33	Aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells.	<b>understand</b> the parameters of aquifer, and types of wells	<b>T2:21.5-21.6</b>
	34-36	Darcy's law, radial flow to wells in confined and unconfined aquifers..	<b>understand</b> the Darcy's law, radial flow of well in types of aquifers	<b>T4:7.1-7.3</b>
	37-38	Types of wells, well construction and development	<b>Define</b> well construction and development	<b>T3:27.2</b>
<b>IV</b>	39-40	Necessity and Importance of Irrigation, advantages and ill effects of Irrigation.	<b>Understand</b> irrigation and its Necessity, Importance, advantages, ill effects.	<b>T3:27.9</b>
	41-42	types of Irrigation, methods of application of Irrigation water	<b>Define</b> types of Irrigation, methods and its application.	<b>T3:27.9</b>
	43-44	Indian agricultural soils, methods of improving soil fertility.	<b>understand</b> the Indian agricultural soils, methods of improving soil fertility	<b>T3:27.10</b>
	45	Soil-water plant relationship	understand Soil-water plant relationship	<b>T3:27.11</b>
	46-47	Vertical distribution of soil moisture, Soil moisture constants.	<b>Understand</b> the vertical distribution of soil moisture and its constants.	<b>T3:27.12</b>
	48-50	Soil moisture tension, consumptive use	<b>Define</b> soil moisture tension, consumptive use.	<b>T4:10.7</b>
	50-51	Duty and delta, Factors affecting duty.	<b>understand</b> about Duty and delta and factors affecting duty	<b>T4:10.8</b> <b>T4:10.9</b>
	52-53	Factors affecting duty, Irrigation efficiencies. Water logging	<b>calculate</b> factors affecting duty and to know the Irrigation efficiencies	<b>T4:10.10</b>
<b>V</b>	54-56	Classification of canals, Design of irrigation by Kennedy's and lacey's theories	<b>Design</b> the irrigation canals	<b>T5:13.8</b>
	57-58	Balancing depth of cutting ,IS Standard for canal design canal lining	<b>Understand</b> the balancing depth and cutting	<b>T5:13.9</b>
	59-61	Design discharge over a catchment, Computation	<b>understand</b> the design of discharge - rational formula	<b>T4:9.8</b> <b>T4:9.9</b>

		of design discharge - rational formula.		
	62-63	SCS Curve number method, flood frequency analysis –introductory part only	<b>Understand</b> SCS method, flood frequency analysis,	<b>T4:9.10</b>
	64-65	Stream gauging- measurement and estimation of stream flow	<b>Evaluate</b> the measurement of stream and rainfall	<b>T3:27.12</b>
	66-67	Duty and delta, Factors affecting duty.	<b>understand</b> about Duty and delta and factors affecting duty	<b>T4:10.8</b> <b>T4:10.9</b>
	67-68	Factors affecting duty, Irrigation efficiencies. Water logging	<b>calculate</b> factors affecting duty and to know the Irrigation efficiencies	<b>T4:10.10</b>
	68-69	Classification of canals, Design of irrigation by Kennedy’s and lacey’s theories	<b>Design</b> the irrigation canals	<b>T5:13.8</b>
	69-70	Duty and delta, Factors affecting duty.	<b>understand</b> about Duty and delta and factors affecting duty	<b>T4:10.8</b> <b>T4:10.9</b>

**XI MAPPING 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
<b>I.</b>	H	S		S		S		S			S	S	H	S	S
<b>II.</b>		H	S			S		S		S		S	H		S
<b>III.</b>		H		S			S		S	S	S		H	S	
<b>IV.</b>	H			S	H		H					S	H	S	
<b>V.</b>	H		S		H			S				S	S	H	

**S – Supportive**

**H - Highly Related**

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

Course s	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1.	S	H				S			S			S	H		S
2.	H	S		H				S		S			H	S	
3.	H			H			S						H	S	

4.	S				S			H		S		S	H	
5.			H	S					S			S	H	S
6.	H				H		S	S			S	H		S
7.	H				S				S			H	S	
8.		H		S	H				S			H		S
9.	H		H		S		H		H		S	S	H	S

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**Prepared by:** Dr. G.V. Ramana, Professor, Department of Civil Engineering.  
Ms.B.Navya Assistant Professor, Department of Civil Engineering.  
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