

Course Information Sheet

Programme: UG	Degree: B. Tech (AGRI)	
Course Code:	Course Title: Ground Water Hydrology, Wells And Pumps	
Year: II Sem: II A.Y. : 2025-26	Regulation: IS23 University: JNTU Kakinada.	
L T/P/D C: 3/0/0/3	Credits: 3	Contact Hrs: 5
Mid Marks: 30	External Marks: 70	Total Marks: 100
Teaching Hrs: 60	Exam Duration1: 3 hrs.	

Course Pre-Requisites: Agricultural Engineering

Course Code	Course Name	Description	Year-Sem
	Ground Water Hydrology, Wells And Pumps	<p>1.: Groundwater hydrology is the study of the movement, distribution, and behavior of water beneath the Earth's surface. It focuses on how water infiltrates through soil and rock layers, its storage in aquifers, and its interaction with surface water bodies such as rivers, lakes, and wetlands.</p> <p>2. A well is a structure created to access groundwater for various uses, such as drinking, irrigation, and industrial applications. Wells are categorized into different types based on depth, construction method, and water extraction techniques:</p> <ul style="list-style-type: none"> • Dug Wells – Shallow wells manually excavated and lined with stones, bricks, or concrete rings. • Driven Wells – Constructed by driving a small-diameter pipe into shallow groundwater sources. 	II AGRI Semester -2

		<p>3.: Pumps are mechanical devices used to extract and transport water from wells to the surface. The selection of a pump depends on the depth of the well, required discharge rate, and energy efficiency. Common types of pumps include:</p> <ul style="list-style-type: none"> • Centrifugal Pumps – Use rotating impellers to move water; suitable for shallow wells. • Submersible Pumps – Placed inside deep wells and push water to the surface; highly efficient for deep water sources. 	
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Course outcomes:
Student will able to

No.	Description	Skill /Bloom's Taxonomy Level
CO1	Skill development on principles of ground water resources development, different acquaintance and their principles.	Remember Understand TL1/TL2
CO 2	Imparting knowledge on theory of open well hydraulics and drilling methods.	Apply/TL3
CO 3:	Skill development on aquifers characteristics under steady and unsteady state conditions, multiples well systems for coastal areas.	Create /TL4
CO4	Knowledge development to students on artificial ground water recharge classification of indigenous pumps, solar pumps, wind mill pumps etc.,	Design/TL 6
CO5	Skill development on principles of Centrifugal pumps, principles & characteristics, High lift pumps, mixed flow pumps and vertical turbine pump sets.	Derived it from lower-level Blooms /TL5

Course Articulation Matrix:

Mapping of Course Outcomes (CO) with Program Outcomes (PO) and Program Specific Outcomes (PSO's):

Course Outcomes (CO)	Program Outcomes (PO)												Program Specific Outcomes (PSO's)	
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	1	-	-	-	-	-	-	-	-	2	1
CO2	2	3	1	2	-	-	1	-	-	-	-	1	2	1
CO3	2	2	1	2	1	1	3	-	-	1	-	1	2	--
CO4	2	3	3	3	1	1	2	-	-	-	2	1	2	2
CO5	2	3	3	2	1	1	2	-	-	-	2	1	1	2
Overall	2	2.8	2	2	0.6	0.6	1.6	-	-	0.2	0.8	0.8	1.8	1.2

Level: 1- Low correlation (Low), 2- Medium correlation (Medium), 3-High correlation (High)

JUSTIFICATIONS OF CO –PO MAPPING

AGE402.1		
AGE402.2-P01	2	Apply the knowledge of Mathematics,science,Engineering Fundamentals and an Engineering Specialization to the Solution of complex Engineering problems.
AGE402.2-P02	3	Identify formulate, review Research literature and Analyze Complex Engineering Problems reaching Substantiated conclusions using first principles of Mathematics, Natural Sciences, and Engineering Sciences
AGE402.2-P03	2	Design Solutions for Complex Engineering and Problems and design System Components are processes that meet the specified needs with appropriate Consideration for the public health and Safety and the cultural, Societal and Environmental Considerations
AGE402.2-P04	1	Use research-based Knowledge and research Methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide conclusions
AGE402.2-P05	-	
AGE402.2-P06	-	
AGE402.2-P07	-	
AGE402.2-P08	-	
AGE402.2-P09	-	
AGE402.2-P10	-	
AGE402.2-P11	-	
AGE402.2-P12	-	

AGE402.2		
AGE402.2-P01	2	Apply the knowledge of Mathematics,science,Engineering Fundamentals and an Engineering Specialization to the Solution of complex Engineering problems.
AGE402.2-P02	3	Identify formulate, review Research literature and Analyze Complex Engineering Problems reaching Substantiated conclusions using first principles of Mathematics , Natural Sciences , and Engineering Sciences
AGE402.2-P03	1	Design Solutions for Complex Engineering and Problems and design System Components are processes that meet the specified needs with appropriate Consideration for the public health and Safety and the cultural,Societal and Environmental Considerations
AGE402.2-P04	2	Use research-based Knowledge and research Methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide conclusions
AGE402.2-P05	-	

AGE402.2-P06	-	
AGE402.2-P07	1	Understand the impact of the professional Engineering Solutions in Social and Environmental Contexts, and demonstrate the knowledge of, and need for sustainable development.
AGE402.2-P08	-	
AGE402.2-P09	--	
AGE402.2-P10	-	
AGE402.2-P11	-	
AGE402.2-P12	1	Recognize the need for, and have the preparation and ability to engage in independent and life long learning in the broadest context of technical change

AGE402.3		
AGE402.2-P01	2	Apply the knowledge of Mathematics,science,Engineering Fundamentals and an Engineering Specialization to the Solution of complex Engineering problems.
AGE402.2-P02	2	Identify formulate, review Research literature and Analyze Complex Engineering Problems reaching Substantiated conclusions using first principles of Mathematics , Natural Sciences , and Engineering Sciences
AGE402.2-P03	1	Design Solutions for Complex Engineering and Problems and design System Components are processes that meet the specified needs with appropriate Consideration for the public health and Safety and the cultural,Societal and Environmental Considerations
AGE402.2-P04	2	Use research-based Knowledge and research Methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide conclusions
AGE402.2-P05	1	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
AGE402.2-P06	1	Apply reasoning informed by the contextual knowledge to assess social, health, safety legal cultural issues and the consequent responsibilities relevant to the professional Engineering practice
AGE402.2-P07	3	Understand the impact of the professional Engineering Solutions in Social and Environmental Contexts, and demonstrate the knowledge of, and need for sustainable development.
AGE402.2-P08	-	
AGE402.2-P09	-	
AGE402.2-P10	1	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 presentation, and give and receive clear instructions

AGE402.2-P11		
AGE402.2-P12	1	Recognize the need for, and have the preparation and ability to engage in independent and life long learning in the broadest context of technical change

AGE402.4		
AGE402.2-P01	2	Apply the knowledge of Mathematics,science,Engineering Fundamentals and an Engineering Specialization to the Solution of complex Engineering problems.
AGE402.2-P02	3	Identify formulate, review Research literature and Analyze Complex Engineering Problems reaching Substantiated conclusions using first principles of Mathematics , Natural Sciences , and Engineering Sciences
AGE402.2-P03	3	Design Solutions for Complex Engineering and Problems and design System Components are processes that meet the specified needs with appropriate Consideration for the public health and Safety and the cultural,Societal and Environmental Considerations
AGE402.2-P04	3	Use research-based Knowledge and research Methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide conclusions
AGE402.2-P05	1	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
AGE402.2-P06	1	Apply reasoning informed by the contextual knowledge to assess social, health, safety legal cultural issues and the consequent responsibilities relevant to the professional Engineering practice
AGE402.2-P07	2	Understand the impact of the professional Engineering Solutions in Social and Environmental Contexts, and demonstrate the knowledge of, and need for sustainable development.
AGE402.2-P08	-	
AGE402.2-P09	-	
AGE402.2-P10	-	
AGE402.2-P11	2	Demonstrate knowledge and understanding of the Engineering and management principles and apply these to once own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments
AGE402.2-P12	1	Recognize the need for, and have the preparation and ability to engage in independent and life long learning in the broadest context of technical change

AGE402.5		
AGE402.2-P01	2	Apply the knowledge of Mathematics,science,Engineering Fundamentals and an Engineering Specialization to the Solution of complex Engineering problems.
AGE402.2-P02	3	Identify formulate, review Research literature and Analyze Complex Engineering Problems reaching Substantiated conclusions using first principles of Mathematics , Natural Sciences , and Engineering Sciences

AGE402.2-P03	3	Design Solutions for Complex Engineering and Problems and design System Components are processes that meet the specified needs with appropriate Consideration for the public health and Safety and the cultural,Societal and Environmental Considerations
AGE402.2-P04	2	Use research-based Knowledge and research Methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide conclusions
AGE402.2-P05	1	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
AGE402.2-P06	1	Apply reasoning informed by the contextual knowledge to assess social, health, safety legal cultural issues and the consequent responsibilities relevant to the professional Engineering practice
AGE402.2-P07	2	Understand the impact of the professional Engineering Solutions in Social and Environmental Contexts, and demonstrate the knowledge of, and need for sustainable development.
AGE402.2-P08	-	
AGE402.2-P09	-	
AGE402.2-P10	-	
AGE402.2-P11	2	Demonstrate knowledge and understanding of the Engineering and management principles and apply these to once own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments

Justification for Avg CO-PO Mapping

Mapping	Level	Justification
AGE402.2-P01	1	Apply the knowledge of Mathematics,science,Engineering Fundamentals and an Engineering Specialization to the Solution of complex Engineering problems.
AGE402.2-P02	2	Identify formulate, review Research literature and Analyze Complex Engineering Problems reaching Substantiated conclusions using first principles of Mathematics , Natural Sciences , and Engineering Sciences
AGE402.2-P03	1	Design Solutions for Complex Engineering and Problems and design System Components are processes that meet the specified needs with appropriate Consideration for the public health and Safety and the cultural,Societal and Environmental Considerations
AGE402.2-P04	1	Use research-based Knowledge and research Methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide conclusions
AGE402.2-P05	1	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
AGE402.2-P06	1	Apply reasoning informed by the contextual knowledge to assess social, health, safety legal cultural issues and the consequent responsibilities relevant to the

		professional Engineering practice
AGE402.2-P07	1	Understand the impact of the professional Engineering Solutions in Social and Environmental Contexts, and demonstrate the knowledge of, and need for sustainable development.
AGE402.2-P08	--	
AGE402.2-P09	--	
AGE402.2-P10	--	
AGE402.2-P11	--	
AGE402.2-P12	-	

Justification for CO-PSO Mapping

Topics beyond Syllabus

S.No.	Description	Proposed Actions
1		Assignment
2		Seminar

TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/PROJECTS/NPTEL ETC

Topic beyond Syllabus: Mapping with PO and PSO:

Topic beyond syllabus	Program Outcomes (PO)												Program Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1.	3	3	2	3	3	-	-	-	-	-	-	2	3	2

Justification for Topic beyond the Syllabus (TBS) -PO Mapping.

Mapping	Level	Justification
TBS-PO1	3	Apply the knowledge of Mathematics, science, Engineering Fundamentals and an Engineering Specialization to the Solution of complex Engineering problems.
TBS-PO2	3	Identify formulate, review Research literature and Analyze Complex Engineering Problems reaching Substantiated conclusions using first principles of Mathematics , Natural Sciences , and Engineering Sciences

TBS-PO3	2	Design Solutions for Complex Engineering and Problems and design System Components are processes that meet the specified needs with appropriate Consideration for the public health and Safety and the cultural,Societal and Environmental Considerations
TBS -PO4	3	Use research-based Knowledge and research Methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide conclusions
TBS -PO5	3	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

Justification for Topic Beyond the Syllabus (TBS) -PSO Mapping.

Mapping	Level	Justification
TBS-PSO1	3	Ability in terms of innovative and creative thinking, formulate problem solutions towards real and practical field problems in Agricultural Engineering(Core Skills).
TBS-PSO2	2	Ability to learn new Scientific technologies by acquiring knowledge in agricultural engineering to generate employment and entrepreneurship opportunities in agricultural engineering(Professional Development).

WEB SOURCE REFERENCES :

1	https://online.vtu.ac.in/course-details/groundwater-hydrology-and-management?utm_source=chatgpt.com
2	https://onlinecourses.swayam2.ac.in/cec25_ce01/preview?utm_source=chatgpt.com

Syllabus / Lesson Plan:

S.No	SYALLABUS	Periods	Methodology	Text book/references /web references and additional text book reference
UNIT – I				
1	Water resources status of India—	1	Chalk & Talk	T2, A1
2	Occurrence and Movement of ground water and aquifers	1		
3	— Types of water bearing formations	1	Chalk & Talk,	T1, T2, A1
4	Unconfined, confined, semi confined aquifers Perched water table condition	1	Chalk & Talk,	T2, A1
5	Diagrammatic representation of water table conditions	1	Chalk & Talk,	T1,T2
	Total	05		
Unit II				
10	Classification of wells	1	Chalk & Talk	T1, A1,A2
11	Design of open wells	1	Chalk & Talk	T1, A1,A2
12	Ground water replenishment	1	Chalk & Talk	T1, A1,A2
13	Ground water exploration	1	Chalk & Talk	T1, A1,A2
14	Methods of drilling of wells	1	Chalk & Talk	T1, A1,A2
15	Common well drilling difficulties Gravel packing	1	Chalk & Talk	T1, A1,A2
16	well screens – Development of well.	1	Chalk & Talk	T1, A1,A2
	Total	12		
Unit III				
24	Aquifer characteristics	1	Chalk & Talk	T2, A1, A2
25	- Influencing yield of wells -	1	Chalk & Talk	T2, A1, A2

26	Determination of aquifer parameters	1	Chalk & Talk	T2, A1, A2
27	Well interference and multiple well point systems in coastal areas.	1	Chalk & Talk	T2, A1, A2
	Total	16		
Unit IV				
33	Artificial ground water recharge—	1	Chalk & Talk	T2, A1, A2
34	Ground water project formulation	1	Chalk & Talk	T2, A1, A2
35	Classification of indigenous pumps	1	Chalk & Talk	T2, A1, A2
36	Wind powered water lifts	1	Chalk & Talk	T2, A1, A2
37	Solar powered and bio gas operated water lifts Reciprocating pumps.	1	Chalk & Talk	T2, A1, A2
	TOTAL	21		
UNIT - V				
46	Centrifugal pumps---	1	Chalk & Talk	T2, A1, A2
47	Terminology on horse power	1	Chalk & Talk	T2, A1, A2
48	Selection of pump installation and troubleshooting of pumps	1	Chalk & Talk	T2, A1, A2
49	Performance characteristic curves	1	Chalk & Talk	T2, A1, A2
50	— Effect of change of impeller dimensions on performance characteristics.	1	Chalk & Talk	T2, A1, A2
51	Hydraulic ram	1	Chalk & Talk	T2, A1, A2
52	Propeller pumps –	1	Chalk & Talk	T2, A1, A2
53	Mixed flow pumps	1	Chalk & Talk	T2, A1, A2
54	Air lift pumps–	1	Chalk & Talk	T2, A1, A2
55	Priming–Vertical turbine pumps	1	Chalk & Talk	T2, A1, A2
56	Submersible pumps.	1	Chalk & Talk	T2, A1, A2
	TOTAL	32		
	GRAND TOTAL	32		

Topic Beyond Syllabus:

S.No.	Topic Beyond Syllabus Planning	PERIODS	Methodology	Text book/references/web references and additional text book reference
1		2	Seminar	T1, T2,A1
2		2	Industrial visit	

Note: Bloom's Taxonomy Levels

BTL1-Remember	BTL2 – Understand	BTL3 –Apply
BTL4-Analyze	BT56 –Evaluate	BTL6–Create

Text books (T) / Reference books (R)/Additional text books (A):

T/R/A	Book Title/Author/Publication
T1	Ground Water and Tube Wells-Garg SP1985. Oxford and IBH publish in company limited, New Delhi.
T2	Water Well land Pump Engineering–Michael AM and Khepar ST1989 Tata McGraw-Hill Publishing company limited, New Delhi.
R1	Irrigation Theory and Practice–Michael AM2008 Vikas Publishing House Pvt.Ltd,New Delhi.
R2	Groundwater Hydrology by <i>David Keith Todd and Larry W. Mays</i>
R3	Groundwater and Wells by <i>F. G. Driscoll</i>
A1	Engineering Hydrology by <i>K. Subramanya</i>
A2	Water Resources Engineering by <i>R. K. Linsley, M. A. Kohler, and J. L. H. Paulhus</i>

Web References:

W1	https://www.usgs.gov/special-topics/water-science-school/science/aquifers-and-groundwater?utm_source=chatgpt.com
W2	https://www.waterencyclopedia.com/A-Bi/Aquifer-Characteristics.html?utm_source=chatgpt.com
W3	https://pib.gov.in/PressReleasePage.aspx?PRID=2090573&utm_source=chatgpt.com

ASSESSMENT METHODOLOGIES-DIRECT

<input checked="" type="checkbox"/> ASSIGNMENTS	<input checked="" type="checkbox"/> STUD. SEMINARS	<input checked="" type="checkbox"/> TESTS/MODEL EXAMS	<input checked="" type="checkbox"/> UNIV. EXAMINATION
<input type="checkbox"/> STUD. LAB PRACTICES	<input type="checkbox"/> STUD. VIVA	<input type="checkbox"/> MINI/MAJOR PROJECTS	<input type="checkbox"/> CERTIFICATIONS
<input type="checkbox"/> ADD-ON COURSES	<input type="checkbox"/> OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

<input checked="" type="checkbox"/> ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	<input checked="" type="checkbox"/> STUDENT FEEDBACK ON FACULTY (TWICE)
<input type="checkbox"/> ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	<input type="checkbox"/> OTHERS

Prepared by

Approved by