SEMESTER S3

SURFACE AND GROUNDWATER HYDROLOGY

Course Code	**PBAGT304**	**CIE Marks**	60
Teaching Hours/Week (L: T:P: R)	3:0:0:1	**ESE Marks**	40
Credits	4	**Exam Hours**	2 Hrs 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

1. To familiarize the students with the important aspects of watershed hydrology.
2. To impart knowledge about the various hydrologic phenomena and their relevance in the field of soil and water conservation.

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	Hydrologic cycle, precipitation and its forms, rainfall measurement and estimation of mean rainfall, frequency analysis of point rainfall. Mass curve, hyetograph, depth-area-duration curves and intensity-duration-frequency relationship. Hydrologic processes-interception, infiltration –factors influencing, measurement and indices.	9
2	Evaporation - estimation and measurement, Runoff - factors affecting, measurement, stage-discharge rating curve, estimation of peak runoff rate and volume, Rational method, Cook's method and SCS curve number method. Hydrograph - components, base flow separation, unit hydrograph theory, S-curve, synthetic hydrograph, applications and limitations.	9

3	Floods – terms and definitions head water flood control- method. Stream gauging - discharge rating curves, flood peak, design flood and computation of probable flood, Flood routing – channel and reservoir routing. Drought – classification causes and impacts, drought management strategy.	**9**
4	Occurrence and movement of ground water; aquifer and its types; Specific yield and storage coefficient. Steady unidirectional flow in an unconfined and confined aquifer. Steady radial flow to a well in an unconfined and confined aquifer. Surface investigation of groundwater: Geologic methods, Geophysical exploration, electrical resistivity method. Subsurface investigation of groundwater: Test drilling, Water level measurement, Geophysical logging, electrical resistivity logging.	**9**

Course Assessment Method

(CIE: 60 marks, ESE: 40 marks)

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Continuous Internal Evaluation Marks (CIE):

Attendance	Project	Internal Ex-1	Internal Ex-2	Total
5	**30**	**12.5**	**12.5**	**60**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 2 marks **(8x2 =16 marks)**	• 2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 sub divisions. Each question carries 6 marks. **(4x6 = 24 marks)**	**40**

Course Outcomes (COs)

At the end of the course students should be able to:

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	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand the key drivers on water resources, hydrological processes and their integrated behaviour in catchments	**K2**
CO2	Explain the runoff characteristics of a watershed and estimate the streamflow	**K4**
CO3	Understand the different components of hydrograph and its types, applications and limitations	**K2**
CO4	Study the principles of ground water hydrology and apply them for computing yield of aquifers	**K3**
CO5	Explain the natural disasters like floods and droughts that affect agricultural land	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		2	1								2
CO2	3	2		1	1		1					
CO3	3	2	1	1					1			2
CO4	3	2	1	1	1		1					
CO5	3		1				1					2

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Engineering Hydrology	Subramanya, K	Tata McGraw-Hill Publishing Co., New Delhi.	5th Edition, 2020
2	Watershed Hydrology	Suresh, R	Standard Publishers Distributors, New Delhi-6	2nd Edition , 2005
3	Hydrology: Principles Analysis and Design.	Raghunath, H.M	New Age International (P) Limited Publishers, New Delhi.	2nd Edition, 2006
4	Hydrology and Soil Conservation Engineering, Including Watershed Management	Ghanshyam Das	Prentice Hall India Learning Private Limited	2nd Edition, 2009
5	Water well and pump engineering	A.M.Michael and S.D.Khepar	Tata McGraw-Hill publishing Company Ltd. New Delhi	9th Edition, 2005
6	Groundwater hydrology	David Keith Todd and Larry W. Mays	John Wiley and sons, New York (International Book Disturbing Co. Lucknow)	3rd Edition, 2011

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Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Applied Hydrology	Chow, V.T., D.R. Maidment and L.W. Mays.	McGraw Hill Publishing Co., New York	2nd Edition, 2010
2	Land and Water Management Engineering,	V.V.N. Murthy	Kalyani Publishers, New Delhi	6th Edition, 2013
3	Irrigation Engineering and Hydraulic Structures	S.K.Garg	Khanna Publisher	38th Edition, 2023

PBL Course Elements

L: Lecture (3 Hrs.)	**R: Project (1 Hr.), 2 Faculty Members**		
	Tutorial	**Practical**	**Presentation**
Lecture delivery	Project identification	Simulation/ Laboratory Work/ Workshops	Presentation (Progress and Final Presentations)
Group discussion	Project Analysis	Data Collection	Evaluation
Question answer Sessions/ Brainstorming Sessions	Analyticalthinking and self-learning	Testing	Project Milestone Reviews, Feedback, Project reformation (If required)
Guest Speakers (Industry Experts)	Case Study/ Field Survey Report	Prototyping	Poster Presentation/ Video Presentation: Students present their results in a 2 to 5 minutes video

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Assessment and Evaluation for Project Activity

Sl. No	Evaluation for	Allotted Marks
1	Project Planning and Proposal	5
2	Contribution in Progress Presentations and Question Answer Sessions	4
3	Involvement in the project work and Team Work	3
4	Execution and Implementation	10
5	Final Presentations	5
6	Project Quality, Innovation and Creativity	3
Total		**30**

1. **Project Planning and Proposal (5 Marks)**

   - Clarity and feasibility of the project plan
   - Research and background understanding
   - Defined objectives and methodology

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2. **Contribution in Progress Presentation and Question Answer Sessions (4 Marks)**

   - Individual contribution to the presentation
   - Effectiveness in answering questions and handling feedback

3. **Involvement in the Project Work and Team Work (3 Marks)**

   - Active participation and individual contribution
   - Teamwork and collaboration

4. **Execution and Implementation (10 Marks)**

   - Adherence to the project timeline and milestones
   - Application of theoretical knowledge and problem-solving
   - Final Result

5. **Final Presentation (5 Marks)**

- Quality and clarity of the overall presentation
- Individual contribution to the presentation
- Effectiveness in answering questions

6. **Project Quality, Innovation, and Creativity (3 Marks)**

- Overall quality and technical excellence of the project
- Innovation and originality in the project
- Creativity in solutions and approaches

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