Subject Code	CSE20354
Subject Title	Hydraulics and Hydrology
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: CSE10252 Fluid Mechanics
Objectives	(1) To enable students to learn the basic knowledge of hydraulics and hydrology; (2) To enable students to acquire basic laboratory techniques of hydraulics and hydrology; (3) To train students to apply the basic principles to solve practical problems in hydraulics and hydrology.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. apply the basic principles of fluid mechanics to analyse and formulate effective solutions to hydraulic engineering and engineering hydrology problems; b. design logical and cost-effective solutions utilizing pipes or open channels as conveyors; c. evaluate the performance of pipe networks and channel control structures, and to establish local rainfall-runoff correlations through a combination of theoretical and empirical studies; d. explain hydraulic and hydrological problems and their solutions logically and lucidly through design calculations, drawings and technical reports; e. embrace more advanced hydraulic theories and analysis techniques after graduation based on a thorough understanding of basic hydraulic principles, including their practical applications. f. recognize the need for, and to engage in life-long learning.
Subject Synopsis/ Indicative Syllabus	1. Similitude and Models (1 week) Geometric, kinematic and dynamic similitude. Dimensional analysis: Buckingham method. Similitude and physical models. 2. Pipe Flow (3 weeks) Darcy equation, friction factor, effect of roughness; head loss and minor losses; quasi-steady flow and calculation in parallel and branching pipes. 3. Hydrology (4 weeks) The hydrological cycle. Measurement of precipitation. Estimation of evaporation and other losses. Infiltration and percolation. Groundwater flow, Darcy's Law, flow in confined and unconfined aquifer, yield of wells. Surface runoff: flow rating curves, mass curves and reservoir capacity. Hydrograph analysis: baseflow, unit hydrographs. 4. Open Channel Flow (5 weeks) Types of flow in open channels, application of Bernoulli's equation, development of the Chezy and Manning equations, optimum cross-

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<tr><td></td><td>sectional shapes; specific energy, normal depth, critical depth, hydraulic jumps; occurrence of critical conditions; gradually varied flow and profile classifications.

5. Laboratory Work
Yield of wells, pipe friction, uniform open channel flow, gradually varied flow.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>In the lecture programme, fundamental knowledge relating to model similitude, pipe flow, open channel flow and hydrology will be established. Students will be required to undertake various coursework activities which will enable them to thoroughly digest the taught materials. Tutorials will provide opportunities for students and lecturers to communicate and discuss any difficulties relating to lecture programme. It will also provide a forum for students and lecturer to discuss the ongoing coursework and laboratory activities.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td></tr>
<tr><td>1.Assignments, laboratory and seminar reports and mid-term test</td><td>40</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Final Examination</td><td>60</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td>100</td><td colspan="5"></td><td></td></tr>
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Students must attain at least grade D in both coursework and final examination (whenever applicable) in order to attain a passing grade in the overall result.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Students are required to submit individual reports for the laboratory experiments, which will test the understanding of basic principles as well as the application of different laboratory techniques. The mid-term test and examination will assess the competence of students in applying the basic principles to solve typical problems in hydraulics and hydrology, examples of which will be discussed in the tutorials.

Students will also be provided with problems to be solved during tutorial sessions and private study to gauge their level of understanding and problem-solving skills. To widen our students' exposure in their field of study, students are required to attend 1 seminar for submission of seminar report pertinent to this subject.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td></td><td>Average hours per week</td></tr>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures/ Tutorials/Laboratory sessions</td><td>3 Hrs.</td></tr>
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	Other student study effort:	
	▪ Reading and private study	3 Hrs.
	▪ Completion of seminar report, laboratory Reports and Assignments	3 Hrs.
	Total student study effort	9 Hrs.
Reading List and References	Y.A. Cengel and J.M. Cimbala, *Fluid Mechanics: Fundamentals and Applications*, 2nd edition in SI units, McGraw Hill, 2010 K. Subramanya, *Engineering Hydrology*, Tata McGraw Hill, 4th Edition, 2013. L.W. Mays, *Water Resources Engineering*, John Wiley & Sons, 2011.	