

1.	Name of Course					Engineering Hydrology				
2.	Course Code					JEHY3243				
	JEHY = the first alphabet identify the faculty within which the subject is offered., JEHY = the remaining three alphabet identify the course that offers the subject, 3243 = the first digit identify level of study; in this case undergraduate level, 3243 = the second and third digits identify subject identity and 3243 = the fourth digit identify credit value or credit hours									
3.	Name(s) of academic staff					To be Assigned				
4.	Rationale for the inclusion of the course/module in the programme					Knowledge and understanding in engineering hydrology are essential for civil engineers to measure quantity of rainfall, quantity of water flow in streams and rivers, flood estimation, water storage in dam and reservoir.				
5.	Semester and Year offered					1/3				
6.	Total Student Learning Time (SLT)			Face to Face			Total Guided and Independent Learning			
	L = Lecture T = Tutorial P = Practical S=Studio Works O= Others			L	T	P/S	O	Independent Study(IS)=70		
				42	14	-	-	Total =126		
7.	Credit Value					3.0				
	Lecture (3 hours per week x 14 weeks) Tutorial (1hour per week x 14 weeks)									
8.	Prerequisite (if any)					Hydraulics (JHYB2193)				
9.	Course Objectives									
	1. The objective of This course is to equip the students with knowledge of hydrology: flood frequency analysis, runoff, routing; analysis, ground water hydrology and design of watershed models									
	Course Learning Outcomes (CLO)									
	At the end of the semester students should be able to:									
	CLO1: Understand the hydrologic cycle, stream flow and hydrograph analysis. CLO2: Understand the probability in hydrology, hydrologic and hydraulic routing. CLO3: Understand groundwater hydrology including aquifers, basin development, hydrology and groundwater simulations. CLO4: Understanding urban, small watershed hydrology and Malaysian hydrology.									
10.	Transferable Skills: This course is expected the development of the following transferable skills: a) Self-management – an ability to manage time and task b) Learning skills - An ability to learn both independently and co—operatively; - An ability to use library skills, to find and organize information ; - An ability to use a wide range of academic skills (research, analysis, synthesis etc.); - An ability to identify and evaluate personal learning strategies. c) Teamwork - An ability to take responsibility and carry out agreed task; - An ability to take initiative and lead other; - An ability to identify and evaluate personal learning strategy. d) Problem solving									

	▪ An ability to analyse; ▪ An ability to think laterally about a problem; ▪ An ability to identify strategy options; ▪ An ability to solve the problems e) Information technologies ▪ An ability to use specialist software where relevant to the discipline.												
11.	Teaching-learning and assessment strategy A variety of teaching strategies are used throughout the course, including the following: • Classroom Lessons; Lecturer and power point presentations • Tutorial Session; • Student-Lecturer Discussion • Collaborative and Co-operative learn; • Independent study. Assessment: <table> <tr> <td>Coursework</td><td>40%</td></tr> <tr> <td>Assignment</td><td>10%</td></tr> <tr> <td>Tutorials/Quizzes</td><td>10%</td></tr> <tr> <td>Test</td><td>20%</td></tr> <tr> <td>Examination</td><td>60%</td></tr> <tr> <td><u>Total</u></td><td><u>100%</u></td></tr> </table>	Coursework	40%	Assignment	10%	Tutorials/Quizzes	10%	Test	20%	Examination	60%	<u>Total</u>	<u>100%</u>
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<u>Total</u>	<u>100%</u>												
12.	Synopsis: The course covers topics on hydrology: flood frequency analysis, regionalization, runoff, routing; analysis, use and design of watershed models.												
13.	Mode of Delivery: Lectures, Tutorials.												

14.	Performance Criteria :						
	CLO-PLO	Assessment Tool	1	2	3	4	5
	Marks		0-39	40-49	50-59	60-74	75-100
	Grade		(F)	(D,D+)	(C-,C,C+)	(B-,B,B+)	(A-,A,A+)
	CLO1: Understand the hydrologic cycle, stream flow and hydrograph analysis.	Assignment Test Tutorial Quiz Examination	Fail to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Poor to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Satisfactory to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Good to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Excellent to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)
	CLO2: Understand the probability in hydrology, hydrologic and hydraulic routing.	Assignment Test Tutorial Quiz Examination	Fail to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills	Poor to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills	Satisfactory to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills	Good to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills	Excellent to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills

			(research, analysis, synthesis etc.)	(research, analysis, synthesis etc.)	(research, analysis, synthesis etc.)	of academic skills (research, analysis, synthesis etc.)	skills (research, analysis, synthesis etc.)
CLO3: Understand groundwater hydrology including aquifers, basin development, hydrology and groundwater simulations.	Assignment Test Tutorial Quiz Examination	Fail to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Poor to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Satisfactory to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Good to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Excellent to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	
CLO4: Understanding urban, small watershed hydrology and Malaysian hydrology.	Assignment Test Tutorial Quiz Examination	Fail to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Poor to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Satisfactory to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Good to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	Excellent to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range of academic skills (research, analysis, synthesis etc.)	

15.	Mapping of the Programme Objectives to the Programme Learning Outcomes											
	Programme Learning Outcomes (PLO) Programme Objectives (PO)	PLO1: Ability to acquire and apply knowledge of science and engineering fundamentals;	PLO2: Acquired in-depth technical competence in civil engineering discipline;	PLO3: Ability to undertake problem identification, formulation and solution;	PLO4: Ability to utilize systems approach to design and evaluate operational performance;	PLO5: Understanding of the principles of design for sustainable development;	PLO6: Understanding of professional ethics, Islamic values, social, cultural, global and environmental responsibilities of a professional engineer and commitment to them;	PLO7: Ability to communicate effectively, not only with engineers but also with the community at large;	PLO8: ability to function effectively as an individual;	PLO9: Ability to function effectively in group with the capacity to be a leader or manager;	PLO10: Recognizing the need to undertake lifelong learning, and possessing /acquiring the capacity to do so;	PLO11: ability to become Entrepreneur;
	PEO1: To produce graduates with proficient knowledge and competency in various areas in Civil/ Electrical/ Mechanical Engineering	✓	✓	✓								
	PEO2: To produce graduates with professional, generic attributes to meet the present and future global demands.				✓	✓	✓			✓	✓	
	PEO3: To produce graduates with Islamic humanistic values and reinvention skills to meet the requirement of a dynamic environment. These skills include Civil Intelligence, Moral Intelligence, Self-Reliance and Communication Skills							✓	✓	✓		✓

16.	Mapping of the course Learning Outcome to the Programme Outcome											
	Programme Learning Outcomes (PLO) Course Learning Outcome (CLO)	PLO1: Ability to acquire and apply knowledge of science and engineering fundamentals;	PLO2: Acquired in-depth technical competence in civil engineering discipline;	PLO3: Ability to undertake problem identification, formulation and solution;	PLO4: Ability to utilise systems approach to design and evaluate operational performance;	PLO5: Understanding of the principles of design for sustainable development;	PLO6: Understanding of professional ethics, Islamic values, social, cultural, global and environmental responsibilities of a professional engineer and commitment to them;	PLO7: Ability to communicate effectively, not only with engineers but also with the community at large;	PLO8: ability to function effectively as an individual;	PLO9: Ability to function effectively in group with the capacity to be a leader or manager;	PLO10: Recognising the need to undertake lifelong learning, and possessing /acquiring the capacity to do so;	PLO11: ability to become Entrepreneur;
	CLO1: Understand the hydrologic cycle, stream flow and hydrograph analysis.	✓										
	CLO2: Understand the probability in hydrology, hydrologic and hydraulic routing.	✓										
	CLO3: Understand groundwater hydrology including aquifers, basin development, hydrology and groundwater simulations.	✓	✓	✓								

	CLO4:	✓	✓	✓								
	Understanding urban, small watershed hydrology and Malaysian hydrology.											

17.	Content outline of the course/module and the SLT per topic					
	Details	SLT (Hour)				
		L	T	P	IS	Total
Topic 1	Stream flow and Hydrograph Analysis - Introduction to engineering hydrology and its application to civil engineering - Hydrology cycle Surface flow, components of hydrograph, groundwater recession, separation techniques, time of hydrograph, basic lag, time of concentration, unit hydrograph development, derivation of unit hydrograph, S-Hydrograph and Lagging methods. Matric method, synthetic method, Cylinder method, SCS method, Gray method, simulation methods in hydrology	9	3	-	15	27
	Probability in Hydrology Statistical and probability approaches to runoff determination, Frequency analysis, Gumble, Pearson Flood probability, precipitation probability, plotting positions.	6	2	-	10	18
	Hydrologic and Hydraulic Routing Hydrologic river, reservoir routing by storage indication method; hydrologic watershed routing. Hydraulic reservoir routing, hydraulic watershed routing.	6	2	-	10	18
	Groundwater Hydrology Flow lines, types of aquifers, unconfined and confined steady radial flow in aquifers, well fields, method of images, unsteady flow, leaky equifers, partially penetrating wells, salt water intrusion. Groundwater basin development. Subsidence. Specific gravity, specific yield. Hydrologic synthesis and simulation, major hydrologic simulation models, continuous stream flow simulation model studies, rainfall-runoff, event simulation models, groundwater simulation, and hydrologic simulation application.	9	3	-	15	27
	Urban and Small Watershed Hydrology Peak flow formula for urban and small watersheds, urban runoff models, land use effects.	3	1	-	5	9

	Topic 6	Application of Hydrology Introduction to various hydrological procedures. Estimation of Design Rainstorm, magnitude and frequency of floods in Peninsular Malaysia, Rational Method of flood estimation for rural catchments, stage discharge curves, design flood hydrographs estimation for rural catchment in Malaysia. Magnitude and frequency of low flows in Peninsular Malaysia, estimation storage draft rate characteristics for rivers in Peninsular Malaysia. River discharge measurement by current meters; regionalization of flood peak relations	9	3	-	15	27
	Total (Hour)		42	14	-	70	126
18.	Main references supporting the course - Engineering Hydrology, 3e by K Subramanya (Apr 6, 2009) - Hydrology and Hydraulic Systems by Ram S. Gupta (Nov 30, 2007)						
	Additional references supporting the course Engineering Hydrology (Macmillan Civil Engineering Hy) by Eric Montgomery Wilson (May 1990)						
19.	Other additional information All materials will be available to the students in the library.						