

1.	Name of Course					Fluid Mechanics							
2.	Course Code					JFLM1063							
	JFLM = the first alphabet identify the faculty within which the subject is offered., JFLM = the remaining three alphabet identify the course that offers the subject, 1063 = the first digit identify level of study; in this case undergraduate level, 1063 = the second and third digits identify subject identity and 1063 = 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					Fundamental subject for Engineering							
5.	Semester and Year offered					1/2							
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)=56 Total =126				
					42	14	14	-					
7.	Credit Value					3.0							
Lecture (3 hours per week x 14 weeks) Tutorial (1hour per week x 14 weeks) Practical (2 hours fortnightly x 7 weeks)													
8.	Prerequisite (if any)					None							
9.	Course Objectives: 1. This course is to equip the students with the basic knowledge of fluid mechanics including its basic properties, concept of pressure, buoyancy and flow. Course Learning Outcomes (CLO) At the end of the semester students should be able to: CLO1: Understand the properties of fluid such as density, viscosity, capillary and surface tension. CLO2: Understand the concept of hydrostatics pressure and determine the forces exerted by fluid on plane and curve surface. CLO3: Understand the concept of upthrust, buoyancy of objects immersed in fluid and determine the stability of floating body. CLO4: Understand the concept of fluid flow, principle of conservation of energy and momentum. CLO5: Understanding flow in pipe and closed conduit, laminar/turbulent flow, losses, energy equation, waterhammer and its analysis.												
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 leaching 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>Course Work</td><td></td><td>40%</td></tr><tr><td>Assignment</td><td>5%</td><td></td></tr><tr><td>Tutorials /Quizzes</td><td>5%</td><td></td></tr><tr><td>Laboratory work</td><td>10%</td><td></td></tr><tr><td>Test</td><td>20%</td><td></td></tr><tr><td>Examination</td><td></td><td>60%</td></tr><tr><td colspan="2"> </td><td></td></tr><tr><td>Total</td><td></td><td>100%</td></tr></table>	Course Work		40%	Assignment	5%		Tutorials /Quizzes	5%		Laboratory work	10%		Test	20%		Examination		60%				Total		100%
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Total		100%																							
12.	Synopsis: This course introduces students to the concept of fluid mechanics, including its various properties, concept of floatation, stability, pressure, fluid flow, continuity and momentum.																								
13.	Mode of Delivery: Lectures; Tutorial, Practical.																								

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 properties of fluid such as density, viscosity, capillary and surface tension.	Assignment Tutorials Quizzes Laboratory work Test Examination	Fail to: - Learn both independent and cooperatively - Use library skills, to find and organize information - Take responsibility and carry out laboratory test - Manage time and task	Poor to: - Learn both independent and cooperatively - Use library skills, to find and organize information - Take responsibility and carry out laboratory test - Manage time and task	Satisfactory to: - Learn both independent and cooperatively - Use library skills, to find and organize information - Take responsibility and carry out laboratory test - Manage time and task	Good to: - Learn both independent and cooperatively - Use library skills, to find and organize information - Take responsibility and carry out laboratory test - Manage time and task	Excellent to: - To: Learn both independent and cooperatively - Use library skills, to find and organize information - Take responsibility and carry out laboratory test - Manage time and task
	CLO2: Understand the concept of hydrostatic pressure and determine the forces exerted by fluid on plane and curve surface	Assignment Tutorials Quizzes Laboratory work Test Examination	Fail to: - Learn both independent and cooperatively - Use library skills, to find and organize information - Take responsibility and carry out laboratory test - Manage time and task	Poor to: - Learn both independent and cooperatively - Use library skills, to find and organize information - Take responsibility and carry out laboratory test - Manage time and task	Satisfactory to: - Learn both independent and cooperatively - Use library skills, to find and organize information - Take responsibility and carry out laboratory test - Manage time and task	Good to: - Learn both independent and cooperatively - Use library skills, to find and organize information - Take responsibility and carry out laboratory test - Manage time and task	Excellent to: - To: Learn both independent and cooperatively - Use library skills, to find and organize information - Take responsibility and carry out laboratory test - Manage time and task

	CLO3: Understand the concept of upthrust, buoyancy of objects immersed in fluid and determine the stability of floating body.	Assignment Tutorials Quizzes Laboratory work Test Examination	Fail to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Poor to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Satisfactory to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Good to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Excellent to: • To: Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task
	CLO4: Understand the concept of fluid flow, principle of continuity and use the Bernoulli Equation	Assignment Tutorials Quizzes Laboratory work Test Examination	Fail to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Poor to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Satisfactory to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Good to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Excellent to: • To: Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task

	CLO5: Understanding flow in pipe and closed conduit, laminar/turbulent flow, losses, energy equation, waterhammer and its analysis.	Assignment Tutorials Quizzes Laboratory work Test Examination	Fail to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Poor to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Satisfactory to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Good to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task	Excellent to: • To: Learn both independent and cooperatively • Use library skills, to find and organize information • Take responsibility and carry out laboratory test • Manage time and task
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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; ethics, Islamic values, social, cultural, global and environmental responsibilities of a professional engineer and	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 properties of fluid such as density, viscosity, capillary and surface tension.	✓									
	CLO2: Understand the concept of hydrostatic pressure and determine the forces exerted by fluid on plane and curve surface	✓									
	CLO3: Understand the concept of upthrust, buoyancy of objects immersed in fluid and determine the stability of floating body.	✓	✓	✓							
	CLO4: Understand the concept of fluid flow, principle of	✓	✓	✓							

	conservation of energy and momentum.											
	CLO5: Understanding flow in pipe and closed conduit, laminar/turbulent flow, losses, energy equation, waterhammer and its analysis.	✓	✓	✓								

17.	Content outline of the course/module and the SLT per topic						
		Details	SLT (Hour)				
			L	T	P	IS	Total
	Topic 1	Properties of Fluids - Fluid as a continuum - Units and dimensions used in Engineering Fluids - Density, relative density, specific weight, specific gravity, specific volume, weight, viscosity, compressibility and bulk modulus, vapors pressure, surface tension and capillarity.	6	2	-	8	16
	Topic 2	Fluid Statics (Hydrostatics) - Concept of pressure, pressure difference and head (elevation head and pressure head) in a static fluid. - Pressure measurements - Hydrostatic thrusts on plane, curved surfaces and dams and use of pressure diagrams.	9	3	-	12	24
Topic 3	Buoyancy - Upthrust (buoyant force) by a fluid on a body (submerged or floating). - Metacenter and metacentric height - Stability of a floating body	6	2	-	8	16	
Topic 4	Concepts of Fluid Flow and Its Measurements - Concept of fluid flow, velocity, average velocity, discharge 1-D ,2-D flow - Principle of conservation of mass and the continuity equation. - Principle of the conservation of energy - Bernoulli Equation and Energy Equation. - Principle of conservation of momentum - momentum equation - Measurements of flow – pitot tube, orifice and venturimeter.	9	3	-	12	24	

	Topic 5	Flow in pipe and closed conduit - Laminar and turbulent flows in bounded system. Incompressible, steady and uniform laminar flow in circular cross-section pipes. Incompressible, steady and uniform turbulent flow in bounded conduits. Incompressible, steady and uniform turbulent flow in circular cross-section pipes. Chezy equation. Darcy-weisbach equation. Colebrook-White equation. Moody diagram. Separation losses in pipe flow due to sudden contractions and expansions. Losses due to pipe fittings, bends and at pipe entry. - Use of the Energy equation as applied to pipe flows. Darcy's formula for head loss due to friction. Flow through pipes in series and flow through pipes in parallel. Flow through branching pipes - the Three- Reservoir problem. Resistance coefficients for pipelines in series and in parallel pipe networks. - Basic differential equations of waterhammer (continuity and dynamic equations) and analysis.	12	4	-	16	32
	Practical	Practical Determination center of pressure and metacentric height - Application of Bernoulli equation - Pitot tube, venturimeter and orifice - Application of momentum equation in jet impact test - Head loss due to friction, fittings, and sudden expansion-contraction in pipe flow - Separation losses of flow in piping system - Study of characteristics of centrifugal pumps in series and parallel.	-	-	2 4 2 2 2 2	-	14
	Total (Hour)		42	14	14	56	126
18.	Main references supporting the course						
	1. Fluid Mechanics with Student CD (McGraw-Hill Series in Mechanical Engineering) by Frank M. White (Oct 17, 2006)						
	Additional references supporting the course						
	1. Fundamentals of Fluid Mechanics by Bruce R. Munson, Donald F. Young, Theodore H. Okiishi and Wade W. Huebsch (Jan 9, 2009)						
19.	Other additional information All materials will be available to the students in the library.						