

1.	Name of Course					Geotechnical Engineering						
2.	Course Code					JGTE3253						
	JGTE = the first alphabet identify the faculty within which the subject is offered., JGTE = the remaining three alphabet identify the course that offers the subject,3253 = the first digit identify level of study; in this case undergraduate level, 3253 = the second and third digits identify subject identity and 3253 = 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					Design of foundations for structures, earth structures, slopes and improvement of poor ground are all related to civil engineering projects.						
5.	Semester and Year offered					2/3						
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 Total =126				
				42	14	-	-					
7.	Credit Value					3.0						
	Lecture (3 hours per week x 14 weeks) Tutorial (1hour per week x 14 weeks)											
8.	Prerequisite (if any)					Soil Mechanics II (JSOM3233)						
9.	Course Objectives 1. To equip the students with the knowledge of subsurface exploration, slope stability, earth retaining structures and soil improvement methods. Course Learning Outcomes (CLO) At the end of the semester students should be able to: CLO1: Understand and analyse stability of soil slope. CLO2: Design reinforced earth retaining structure and cofferdam CLO3: Provide a geotechnical proposal for improvement of problematic soil condition. CLO4: Determine bearing capacity of shallow foundation, pile carrying capacity for deep foundation and prediction of settlement.											
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 colspan="2"> </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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12.	Synopsis: This course deals with geotechnical principles related to stability of soil and rock slopes, design of reinforced earth structure, cellular cofferdam, shallow and deep foundation and techniques of improving problematic ground condition.														
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 and analyse stability of soil slope.	Assignment Tutorials Quizzes Test 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: Design reinforced earth retaining structure and cofferdam	Assignment Tutorials Quizzes Test Examination	Fail to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range	Poor to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range	Satisfactory to: • Learn both independent and cooperatively • Use library skills, to find and organize information • Use wide range	Good to: • Learn both independent and cooperatively • Use library skills, to find and organize information	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.)	of academic skills (research, analysis, synthesis etc.)	of academic skills (research, analysis, synthesis etc.)	• Use wide range of academic skills (research, analysis, synthesis etc.)	of academic skills (research, analysis, synthesis etc.)
	CLO3: Provide a geotechnical proposal for improvement of problematic soil condition.	Assignment Tutorials Quizzes Test 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: Determine bearing capacity of shallow foundation, pile carrying capacity for deep foundation and prediction of settlement.	Assignment Tutorials Quizzes Test 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,	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.)

						synthesis etc.)	
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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;	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 and analyse stability of soil slope.	✓									
	CLO2: Design reinforced earth retaining structure and cofferdam	✓									
	CLO3: Provide a geotechnical proposal for improvement of problematic soil condition	✓	✓	✓							
	CLO4: Determine bearing capacity of shallow foundation, pile carrying capacity for deep foundation and prediction of settlement.	✓	✓	✓							

17.	Content outline of the course/module and the SLT per topic					
	Details	SLT (Hour)				
		L	T	P	IS	Total
Topic 1	Soils and rock slope stability - Type of soil and rock slope failures - Factors influencing stability of slopes - Slope stability analysis: - Total stress analysis and Swedish method of slices. - Effective stress analysis - Bishop's Simplified Method, Bishop's and Morgenstern Chart, Taylor's method and Felleniuss construction - Soil and Rock Slope protection methods.	12	4	-	20	36
	Reinforced earth retaining structure - Reinforced earth retaining wall - basic principles, mechanism analysis and design. - Cofferdams - types and purpose. - Cellular cofferdam analysis and design.	9	3	-	15	27
	Soil Improvements Techniques - Introduction to mechanical, hydraulic and physical method. - Mechanical Method - compaction vibroflotation, vibroplacement, blasting, heavy tamping. - Chemical Method - lime, cement and asphalt stabilizations; injection and grouting. - Hydraulic method - seepage into excavation; groundwater controls; drainage by sand, drains and filters.	9	3	-	15	27

	Topic 4	Bearing Capacity and Settlement - Shallow Foundations - Types and functions of shallow foundations. - Terzaghi bearing capacity theory and general bearing capacity formula. - Ultimate bearing capacity and allowable bearing capacity - Influence of groundwater level - Depth factor, shape factor, incline load and foundation on/near slope - Immediate, consolidation and total settlements - Differential/relative settlement - Settlement criteria and limit for design - Design base on probe test, plate load test, standard penetration test and cone penetration test, - Deep Foundations - Types and functions of deep foundations - Static formulae - methods of analysis for a single pile and pile groups under compressive load and negative skin friction. - Dynamic formulae - Pile wave equations, Hiley formular - Pile load test and failure criteria - Piles under uplift and lateral loadings - uplift resistance, lateral resistance.	12	4	-	20	36
		Total (Hour)	42	14	-	70	126
18	Main references supporting the course - Soil Mechanics and Foundations by M. Budhu (Dec 14, 2010) - Soil Mechanics Laboratory Manual by Braja M. Das (Oct 17, 2008) Additional references supporting the course - American Society of Civil Engineers (ASCE) - 'Soil Improvement - History, Capabilities and Outlook' N.Y. - Tomlinson M.J. - 'Foundation Design & Construction', 3rd Ed. Pitman Publishing London, 1975. - Bowles J.E. - 'Foundation Analysis & Design', Mc Graw Hill. - T.W. Lambe, R.V. Witman 1979 - Series in Soil Engineering. - Smith & Geoffrey, - 'Element of Foundation Design'. - EJFP Jones, 1985 - 'Earth Reinforcement and Soil Structures'.						
19	Other additional information All materials will be available to the students in the library.						