

LECTURE PLAN							
1	Name and Code of Course	REINFORCED CONCRETE DESIGN 1/ BFC32102					
2	Synopsis	Reinforced concrete is a composite material made of concrete and steel is widely used to construct the building structures. Plain concrete possesses high compressive strength but little tensile strength. However, steel reinforcement possesses high tensile strength. Therefore, by combining concrete and steel, reinforced concrete attains high utility and versatility. This course introduces students to limit state design for reinforced concrete structures. Scope of study includes introduction to reinforced concrete design, flexure and shear design, checking for deflection, cracking and detailing. Finally is the design for reinforced concrete beams and solid slabs.					
3	Name(s) of academic staff	Dr. Masni A Majid (C), Dr. Zainorizuan Mohd Jaini, Dr. Shahiron Shahidan, En Koh Heng Boon, Pn Zalipah Jamellodin					
4	Semester and Year offered	Year 3, Semester 1					
5	Credit Value	2					
6	Pre-requisite (if any)	BFC 21403 STRUCTURAL ANALYSIS					
7	Course Learning Outcome(s)	<p>CLO 1: Design reinforced concrete beams and slabs according to BS 8110 / BSEN 1992 (EC2).</p> <p>CLO 2: Manipulate structural design processes to complete the assigned project.</p> <p>CLO 3: Report design works which comprise of ideas and problem solving through suitable tools or methods</p>					
8	Mapping of the course/module to the Programme Learning Outcomes						
Course LOs / Program LOs		Programme Learning Outcomes (PLO)				Teaching Methods	Assessment/
		PLO 10	PLO 9	PLO 5			
1. Design reinforced concrete beams and slabs according to BS 8110 / BSEN 1992 (EC2).		√				Lecture/ Practical	Test 1 & 2/ Quiz /Project
2. Manipulate structural design processes to complete the assigned project.			√			Lecture/ Practical	Individual Assignment / Project
3. Report design works which comprise of ideas and problem solving through suitable tools or methods				√		Group Discussion/ Practical	Project (Report & Presentation)
*Indicate the primary causal link between the CLO and PLO by ticking "√" the appropriate box.							

9	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilised in other settings)	Skill(s)	How to instill/develop the skills	Assessment Method
		Practice in-depth technical skill in producing civil and structural engineering engineers (PLO10)	The technical skill will be develop by designing reinforced concrete beams and slabs according to BS 8110 / BSEN 1992 (EC2).	Test 1 & 2 / Individual Assignment / Project
		Instill and practice leadership quality in managing projects and teams. (PLO 9 & PLO 5)	The leadership skill will be instill through group discussion and presentation	Project Presentation/ Project Report

10	Content outline of the course/module and the student learning time (SLT) per topic									
	Week	Course Content	CLO	Teaching and Learning Activities						Total SLT
				Guided Learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
				Lecture	Tutorial	Practical	Others			
1-2	1.0 INTRODUCTION TO REINFORCED CONCRETE DESIGN 1.1 Reinforced concrete structure 1.2 Structural design 1.3 Code of practice 1.4 Design life 1.5 Limit state design 1.6 Actions 1.7 Characteristics strength 1.8 Stress-strain relationship 1.9 Behaviour of beam in bending 1.10 Basic assumption in design 1.11 Distribution of stresses and strains 1.12 Type of structure failure	CLO 1 CLO 2	1	0	4	0	0	0	5	

3-4	2.0 DESIGN FOR FLEXURE 2.1 Introduction 2.2 Rectangular section 2.2.1 Singly reinforced section 2.2.2 Doubly reinforced section 2.2.3 Stress in compression steel 2.2.4 Moment redistribution 2.2.5 Derivation of equation 2.2.6 Design procedure 2.3 Flanged section 2.3.1 Analysis of section 2.3.2 Design procedure	CLO 1 CLO 2	2	0	8	0	0	0	10
5-7	3.0 DESIGN FOR SHEAR 3.1 Introduction 3.2 Shear in homogeneous beam 3.3 Design method 3.4 The diagonal compressive strut 3.5 The vertical shear reinforcement 3.6 Additional longitudinal force 3.7 Shear on flanged section 3.8 Design procedure	CLO 1 CLO 2	2	0	8	0	0	0	10
9-10	4.0 SERVICEABILITY AND DURABILITY 4.1 Introduction 4.2 Deflection 4.2.1 Limiting span to depth ratio 4.3 Cracking 4.3.1 Control of cracking 4.3.2 Crack width 4.4 Detailing 4.4.1 Spacing of reinforcements 4.4.2 Curtailment and anchorage 4.4.3 Lapping	CLO 1 CLO 2	2	0	8	0	0	0	10
11-12	5.0 DESIGN OF BEAMS 5.1 Introduction 5.2 Preliminary size of beam 5.3 Concrete cover 5.4 Area of reinforcement 5.5 Simply supported and continuous beams 5.5.1 Load arrangements 5.5.2 Method of analysis 5.6 Design procedure	CLO 1 CLO 2 CLO 3	2	0	8	0	10	0	20

		5.6.1 Analysis of actions 5.6.2 Design of flexural reinforcement 5.6.3 Design of shear 5.6.4 Check for deflection 5.6.5 Check for cracking 5.6.6 Detailing								
13-14	6.0 DESIGN OF SLABS 6.1 Introduction 6.2 Type of slabs 6.3 Design procedure 6.3.1 Analysis of actions 6.3.2 Shear force and bending moment 6.3.3 Design of flexural reinforcement 6.3.4 Design of shear 6.3.5 Check for deflection 6.3.6 Check for cracking 6.3.7 Detailing 6.4 Design of solid slabs 6.4.1 Simply supported slab 6.4.2 Continuous slab 6.4.3 One-way spanning slab 6.4.4 Two-way spanning slab	CLO 1 CLO 2 CLO 3	5	0	20	0	0	10	35	
TOTAL			14	0	56	0	10	10	90	
Continous Assessment		CLO	Percentage (%)						Total SLT	
1. Test 1 & 2		1	20						20	
2. Individual Assignment		2	10						10	
3. Group Project		3	20						35	
TOTAL									65	
Final Assessment		CLO	Percentage (%)						Total SLT	
Final examination			50						55	
TOTAL										
TOTAL SLT								120		
*F2F = face to face, NF2F=Non Face to Face										
11	Identify special requirement of resources to deliver the course (e.g., software, nursery, computer lab, simulation room)	- Nil								
12	Main references supporting the course and Additional references supporting the course	1. H. Gulvanessian, J.A. Calgaro and M. Holicky. <i>Designers Guide to EN 1990: Eurocode : Basis of Structural Design</i> . London: Thomas Telford, 2002. (TA658 .G84 2002) 2. H. Gulvanessian, P. Formichi and J.A. Calgaro. <i>Designers Guide to Eurocode 1: Actions on Buildings: EN1991-1-1 and -</i>								

		<p>1-3 to -1-7. London: Thomas Telford, 2009. (TA658.2 .G84 2009)</p> <p>3. B. Mosley, J. Bungey and R. Hulse. <i>Reinforced Concrete Design to Eurocode 2</i>. London: Palgrave Macmillan, 2007. (TA683.2 .M68 2007)</p> <p>4. P. Bhatt, T.J. MacGinley and B.S. Choo. <i>Reinforced Concrete: Design Theory and Examples</i>. London: Taylor and Francis, 2005. (TA683.2 .M33 2005)</p>
13	Other additional information	Nil
14	Course Attendance / Regulations	<p>1. Pelajar mesti hadir tidak kurang dari 80% masa pertemuan yang ditentukan bagi setiap kursus termasuk kursus Hadir Wajib (HW) dan kursus Hadir Sahaja (HS).</p> <p><i>Students must attend not less than 80% of the contact hours for every course including Compulsory Attendance Course (Hadir Wajib – HW) and Attendance Only Course (Hadir Sahaja – HS).</i></p> <p>2. Pelajar yang tidak memenuhi perkara (1) di atas tidak dibenarkan menghadiri kuliah dan tidak dibenarkan menduduki sebarang bentuk penilaian selanjutnya. Markah sifar (0) akan diberikan kepada pelajar yang gagal memenuhi perkara (1). Manakala untuk kursus Hadir Wajib (HW), pelajar yang gagal memenuhi perkara (1) akan diberi Hadir Gagal (HG).</p> <p><i>Student who does not fulfill (1) of the above is not allowed to attend further lectures and is not allowed to sit for any further assessment. Zero mark (0) will be given to student who fails to comply with (1). As for Compulsory Attendance Course (Hadir Wajib – HW), student who fails to comply with (1) will be given Failure Attendance (Hadir Gagal – HG).</i></p> <p>3. Pelajar perlu mengikut dan patuh kepada peraturan berpakaian Universiti yang berkuatkuasa dan menjaga disiplin diri masing-masing untuk mengelakkan dari tindakan tatatertib diambil terhadap pelajar.</p> <p><i>Student must follow and obey all the University dress rules and regulations and must discipline themselves to avoid any disciplinary action.</i></p> <p>4. Pelajar perlu mematuhi peraturan keselamatan semasa pengajaran dan pembelajaran.</p> <p><i>Student must obey safety regulations during the learning and teaching process.</i></p>
15	<p>Prepared by:</p> <p>Name: DR MASNI BT A MAJID</p> <p>Position: SUBJECT COORDINATOR</p> <p>Date: 19 AUGUST 2018</p>	<p>Verified by:</p> <p>Name: DR. AHMAD ZURISMAN B. MOHD ALI</p> <p>Position: HEAD OF DEPARTMENT OF STRUCTURE AND MATERIALS</p> <p>Date: 19 AUGUST 2018</p>