

## 8- Course Specification of Advanced Bridge Engineering

I. Course Identification and General Information:					
1.	<b>Course Title:</b>	<i>Advanced Bridge Engineering</i>			
2.	<b>Course Code &amp; Number:</b>	CE 509			
3.	<b>Credit hours:</b>	C.H			<b>Credit Hours</b>
		<b>Lecture.</b>	<b>Laboratory</b>	<b>Seminars.</b>	
		3	-	-	
4.	<b>Study semester at which this course is offered:</b>	2 <sup>nd</sup> semester,			
5.	<b>Pre –requisite (if any):</b>	Pre-Stressed Reinforced Concrete, Bridges Engineering, Steel Structures.			
6.	<b>Co –requisite (if any):</b>	Non			
7.	<b>Program (s) in which the course is offered:</b>	Master of Science in structural engineering program			
8.	<b>Language of teaching the course:</b>	English+ Arabic			
9.	<b>Course type</b>	Elective Course			
10	<b>Location of teaching the course:</b>	Class room			
11	<b>Prepared By:</b>	Dr. Mohammad Abdulla Algorafi			
12	<b>Date of Approval</b>				

### II. Course Description:

This course deal with analysis and design the components of bridge using LRFD code under advanced loads. Students will learn the Introduction of bridge, Bridge Loading, Bridge Analysis, Design concrete Bridge, Prestressed Concrete Bridge Design.

<b>III. Course Intended learning outcomes (CILOs) of the course</b>		<b>Reference PILOs</b>
a.1	Define the compound and type of bridges, Planning of Bridges and Loads on Bridges.	A1,A3
a.2	Identify how to Load, analyze, and design the different bridge elements.	A2,A3
b.1	Develop accurate structural modeling of bridges to analyze all components	B2,B3
b.2	Evaluate the LRFD code requirements for each components of the bridge	B1,B3
c.1	Design bridge system and components using code of practice considering all design criteria.	C2,C3
c.2	Use techniques to model the load, analyze and design of bridge elements.	C2
d.1	Present the project design report including calculation and drawing	D1
d.2	Demonstrate ethical principles related to this course	D2

<b>(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:</b>		
<b>Course Intended Learning Outcomes</b>	<b>Teaching strategies</b>	<b>Assessment Strategies</b>
a1. Define the compound and type of bridges, Planning of Bridges and Loads on Bridges.	Lecture self-study presentation	Written exam Assignment Student presentation
a2. Identify how to Load, analyze, and design the different bridge elements.		

<b>(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:</b>		
<b>Course Intended Learning Outcomes</b>	<b>Teaching strategies</b>	<b>Assessment Strategies</b>
b1. Develop accurate structural modeling of bridges to analyze all components	Lecture self-study presentation Analysis and Problem Solving.	Written exam Written assignment Presentations/ Presenting researches
b2. Evaluate the LRFD code requirements for each components of the bridge		

<b>(C) Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:</b>		
<b>Course Intended Learning Outcomes</b>	<b>Teaching strategies</b>	<b>Assessment Strategies</b>
c1. Design bridge system and components using code of practice considering all design criteria.	Lecture self-study presentation Analysis and Problem Solving.	Written exam Written assignment Presentations/ Presenting researches
c2. Use techniques to model the load, analyze and design of bridge elements.		

<b>(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:</b>		
<b>Course Intended Learning Outcomes</b>	<b>Teaching strategies</b>	<b>Assessment Strategies</b>

d1. Present the project design report including calculation and drawing	presentation, independent study, Presenting reports, Presenting researches	presentation, written report.
d2. Demonstrate ethical principles related to this course		

#### IV. Course Content:

##### A – Lecture Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	Introduction to Bridge Engineering	a1, b1	Introduction to Bridge Engineering	1	3
2	AASHTO Methods	a2,b2,c1	Load & Resistance Factor Design method	1	3
3	Primary Bridge Loading	a2,b1,b2, c1	Dead Load, Wearing load, Live load, pedestrian load	1	3
4	Advance Bridge Loading	a2,b1,b2, c1	Impact load, CE, Traction load, Fatigue load, Wind load, Forces due to deformation (Temperature, Creep and Shrinkage, Settlement)	3	9
5	Bridge Analysis	a2,b1,b2, c1,d1,d2	Influence Lines, analysis bridge components, computer application using software package	2	4
6	Concrete Bridges	a1,a2,b1,c 2,d1	(planning, alignment, loading, analysis, design, drawing) according to LRFD, computer application using software package	3	6
7	Prestressed Concrete Bridges	a1,a2,b1,c 2,d1	(planning, alignment, loading, analysis, design, drawing), according to LRFD, computer application using software package	3	6
<b>Number of Weeks /and Units Per Semester</b>				<b>14</b>	<b>34</b>

##### B - Laboratory Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1				
2				
3				
4				
5				
<b>Number of Weeks /and Units Per Semester</b>				

## V. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	assignment	2,6, 8	15	10	a1, a2,b1,b2,c1,d2
2	Report	11,14	7.5	5	a1,a2,b1,c2,d1
3	Project	During class	37.5	25	a1,a2,b1,b2, c1,c2,d1,d2
5	Midterm Exam	8	30	20	a2,b1,b2,c1
6	Final-exam	16	60	40	a2,b1,b2,c1,c2
7					
<b>Total</b>			<b>150%</b>	<b>100%</b>	

## VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	AASHTO Methods	a1,b1	2	5
2	Bridge Loading	a2,b1,b2,c1	6	5
3	Bridge Analysis	a2,b1,b2,c1,d2	8	5
	<b>Number of Weeks /and Units Per Semester</b>			

## VII. Report:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Concrete Bridges	a1,a2,b1,c2,d1	11	3.5
2	Prestressed Concrete Bridges	a1,a2,b1,c2,d1	14	4
3				
4				
5				
6				

## VIII. Learning Resources and Facilities:

- Written in the following order: ( Author - Year of publication – Title – Edition – Place of publication – Publisher).

### 1- Required Textbook(s) ( maximum two ).

8. Washington State Department of Transportation (WSDOT), “Bridge Design Manual(LRFD)”, M 23-50.13 February 2014.
9. Richard Barker & Jay Puckett, Design of Highway Bridges, (2013), John Wiley & Sons, Inc..

### 2- Essential References.

5. AASHTO (2002) Standard Specification for Highway Bridges, (17th Edition).
6. AASHTO (2012) LRFD Bridge Design Specifications, Customary U.S. Units (6th Edition).
7. Chen, W.F. and Duan, L. (2000) (Editors), Bridge Engineering Handbook, CRC Press.
8. David Collings, "Steel Concrete Composite Bridges" (2005) Thomas Telford.

### 3- Electronic Materials and Web Sites etc.

- 1. Sap2000, bridge V15 is used for structural analysis and design. Students can also download ASEC Bridge Analysis System from <http://www.qikdraw.com.au/aces/>
2. <http://www.wsdot.wa.gov/eesc/bridge/bdm/>
3. <http://www.fhwa.dot.gov/bridge/>

Educational and research Facilities and Equipment Required

### Technology Resources

(AV, data show, Smart Board, software, etc.)

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### Other Resources

(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)

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## IX. Course Policies:

50.	<b>Class Attendance:</b> The students should have more than 75 % of attendance according to rules and regulations of the faculty.
51.	<b>Tardy:</b> The students should respect the timing of attending the lectures. They should attend within 10 minutes from starting of the lecture.
52.	<b>Exam Attendance/Punctuality:</b> The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for midterm exam and final exam.
53.	<b>Assignments &amp; Projects:</b> The assignment is given to the students after each chapter, the student has to submit all the assignments for checking on time.
54.	<b>Cheating:</b> If any cheating occurred during the examination, the student is not allowed to continue and he/she has to face the examination committee for enquires.
55.	<b>Plagiarism:</b> The student will be terminated from the Faculty, if one student attends the exam on another behalf according to the policy, rules and regulations of the university.
56.	<b>Other policies:</b> <ul style="list-style-type: none"><li>• All the teaching materials should be kept out the examination hall.</li><li>• the mobile phone is not allowed.</li><li>• There should be a respect between the student and his teacher.</li></ul>

<b>Reviewed By</b>	<b><u>Vice Dean for Academic Affairs and Post Graduate Studies</u></b> <b><u>Dr. Tarek A. Barakat</u></b> <b><u>Dr. Ahmed Alwathaf</u></b> <b><u>Dr. Mohammad Algorafi</u></b>
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