Module (Course Syllabus) Catalogue

2022-2023

College/ Institute	Erbil Technical Engineering College	
Department	Civil Engineering Department	
Module Name	STEEL STRUCTURE	
Module Code	STS705	
Degree	Technical Diploma [ ] Bachelor [ ] High Diploma [ ] Master [ ] PhD [x]	
Semester	Seven Semester - Fourth Stage -	
Qualification	B. Sc.	
Scientific Title	Engineer	
ECTS (Credits)	6	
Module type	Prerequisite [ ] Core [x] Assist. [ ]	
Weekly hours	4	
Weekly hours (Theory)	(4)hr Class	(162)Total hrs Workload
Weekly hours (Practical)	(0)hr Class	(0)Total hrs Workload
Number of Weeks	15	
Lecturer (Theory)	Dr. Aras Jalal JalyZada	
E-Mail & Mobile NO.	aras.jalyzada@epu.edu.iq	
Lecturer (Practical)	-	
E-Mail & Mobile NO.	-	
Websites	Epu.edu.iq	

Course Book

Course Description	Structural Steel is one of the most popular materials for construction of buildings, bridges and other structures. This class is about studying properties of steel, behaviour of structural steel elements, and design procedures for these elements to withstand structural loads. Load and Resistance Factor Design (LRFD) will be introduced to the students and will be used throughout the class. Tension members, compression members, flexural members, and finally members subject to combined bending and axial load will be studied. In addition, simple and eccentric steel connections will be discussed. As a result of taking the course, a. The students will understand the behaviour of steel elements under structural loading. b. Will be familiar LRFD steel design procedures. c. Will be able to design primary steel structural elements of a building and their connections.
Course objectives	The successful goals for completing of this course: 1. To expand the student's knowledge and understanding of the field of structural engineering, with particular emphasis placed upon designing steel structures. 2. To present methods for designing steel members and connections using the Load and Resistance Factor Design (LRFD) approach. 3. To introduce the student to the organization and use of the AISC Manual of Steel Construction. 4. To develop skills in completing and checking individual component and complete structural system designs using the AISC Manual of Steel Construction.
Student's obligation	The students should be available during lecture time table when the student absence more than the allowed hours the student will be dismissed. Students should be doing quizzes, seasonal tests and final exams in order to able to collect required mark to success
Required Learning Materials	Different pedagogical methods are used in this course; for example, project, report, and homework, easy. Student will receive the required handouts such as the references.

	Task		Weight (Marks)	Due Week	Relevant Learning Outcome
Evaluation	Paper Review				
	Assignments	Homework	10%	5, 7,11,13	
		Class Activity	2%	1-12	
		Report			
		Seminar	8%	7,10	
		Essay			
		Project	8%	13	
	Quiz		8%	5,9,12	
	Lab.				
	Midterm Exam		24%	8	
	Final Exam		40%	15	
	Total		100		

Specific learning outcome:	On successful completion of this course, each student is able to **Analysis,** and **design** steel structure. **i. Design and analysis of Tension members.** **ii. Design and analysis of compression members.** **iii. Design of base plate.** **iv. Design of beam-column.** **v. Design of bolts and welds.**
Course References:	[1] Steel Design, 5th ed by William T. Segui (Major) [2] Unified Design of Steel Structures, Judy Liu. (Minor)

Course topics (Theory)	**Week**	**Learning Outcome**
Introduction to steel, material, standard	1,2	1
Tension Members: Strength, Effective Area, Staggered Bolts, Block Shear, design, examples	3-5	i
Compression Members: Euler's Method, Local Buckling, Elastic and Inelastic	6-9	ii
buckling	10	ii
Connection, bolts and welding	11,12	v
Beams – columns, : Interaction, Moment, Members in Unbraced Frames	13-14	Iii, iv

Questions Example Design

EXAMPLE (P. 143): A W10×49 column with a length of 20.0 ft, one end pinned and the other end fixed for the y-axis, and both ends pinned for the x-axis. Use A992 steel. Determine the available column strength.

SOLUTION:

From *Manual* Table 1-1, $r_x = 4.35$ in., $r_y = 2.54$ in., and $A = 14.4$ in.^{2}

Determine the effective length factors from the Figure (Ky = 0.7 and Kx = 1.0.)

Determine the x- and y-axis slenderness ratios

$$\frac{L_{cx}}{r_x} = \frac{K_x L}{r_x} = \frac{1.0(20.0)(12)}{4.35} = 55.2 \qquad \frac{L_{cy}}{r_y} = \frac{K_y L}{r_y} = \frac{0.7(20.0)(12)}{2.54} = 66.1$$ Use the larger

Determine which column strength equation to use. Since

$$\frac{L_c}{r} = 66.1 < 4.71\sqrt{\frac{E}{F_y}} = 4.71\sqrt{\frac{29{,}000}{50}} = 113,$$

Determine the Euler buckling stress.

$$F_e = \frac{\pi^2(29{,}000)}{(66.1)^2} = 65.5 \text{ ksi}$$

Determine the critical stress from Equation E3-2.

$$F_{cr} = 0.658^{\left(\frac{F_y}{F_e}\right)} F_y = 0.658^{\left(\frac{50}{65.5}\right)}(50) = 36.3 \text{ ksi}$$

Determine the nominal strength.

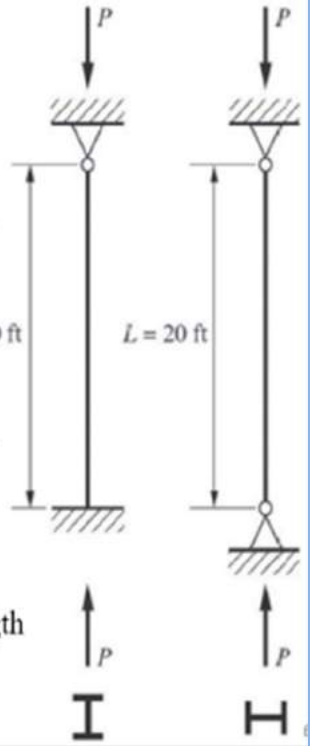
$$P_n = 36.3(14.4) = 523 \text{ kips}$$

Determine the design strength for LRFD.

$$\phi P_n = 0.9(523) = 471 \text{ ki}$$

Determine the allowable strength for ASD.

$$P_n/\Omega = 523/1.67 = 313 \text{ kips}$$



Extra notes:

Lecturer Name:	Dr. Aras Jalal Jalyzada				1.0 ECTS =	27	working hours	
Module Name:	STEEL Structure				X	Y	Z	
Module Code:	STS705				4	0	0	

ECTS Workload Calculation Form

Activity	S	Description		Activity Type	No.	T.F. Range		Time Factor	Workload
						Min	Max		
Course	1	Theory	In class	f	12			4	48
	2		Online	f	0			4	0
	3	Preparation: (1-2)* X)		h	12	4	8	6	72
	4	Practical		f	0			0	0
	5	Preparation: (1-1.5)* Y		h	0	0	0	2.5	0
	6	Tutorial		f	0	1	1	0	0
	7	Preparation (0.5-1.5) * Z)		h	0	0	0	1.5	0
Site Visists and Lab Experiments	8	Scientific/Field Trips		f	0	2	6	4	0
	9	Practical/Lab Reports		h	0	1	2	1.5	0
Assignment	10	Homework		h	2	1	4	4	8
	11	Report		h		1	4		0
	12	Seminar		h	1	2	10	10	10
	13	Paper		h		4	15		0
	14	Essay		h		1	6		0
	15	Project/Poster		h	1	4	15	4	4
Assessment	16	Quiz		h	2	1	2	1	2
	17	Mid Term	Theory	f	1			1	1
	18		Preparation: (1.5-3)*X	h	1	6	12	6	6
	19		Practical	f	0			1	0
	20		Preparation: (1-2)*Y	h	0	0	0	3	0
	21	Final	Theory	f	1			2	2
	22		Preparation: (3-5)*X	h	1	12	20	12	12
	23		Practical	f	0			1	0
	24		Preparation: (2-4)*Y	h	0	0	0	5	0
Face to face hours (f)/12 week			4.25	Face to face hours (f)					51
Home hours (h)/15 week			7.60	Home hours (h)					114
Total hours/15 week			11.00	Total hours					165
ECTS (Total hours/ 27)									**6.111**

External Evaluator

The course program is covering all the required syllabus, contents and aspects of civil engineering drawing module. It satisfies and adequate for the third year of civil engineering department.

Mr. Saad Bilbas
M.Sc. in Civil Engineering.