

((Module Name))
Welding Technology
Course Catalogue
2024-2023

College/ Institute	Erbil Technical engineering	
Department	Mechanical and Energy Tech. Engineering	
Module Name	Welding Technology	
Module Code	WET305	
Degree	Technical Diploma <input type="checkbox"/>	Bachler <input checked="" type="checkbox"/>
	High Diploma <input type="checkbox"/>	Master <input type="checkbox"/> PhD <input type="checkbox"/>
Semester	3	
Qualification	PhD in Mechanical Engineering	
Scientific Title	Assistant professor	
ECTS (Credits)	6	
Module type	Prerequisite <input type="checkbox"/>	Core <input checked="" type="checkbox"/> Assist. <input type="checkbox"/>
Weekly hours	2+2= 4	
Weekly hours (Theory)	(2)hr Class	(28) hr Workload
Weekly hours (Practical)	(2)hr Class	(26) hr Workload
Number of Weeks	12	
Lecturer (Theory)	Assist. Prof. Dr. Gailan Ismail Hasan	
E-Mail & Mobile NO.	Gailan.hassan@epu.edu.iq , 07504671533	
Lecturer (Practical)	Engineer:	
E-Mail & Mobile NO.		
Websites		

Course Book

<p>Course Description</p>	<p>Welding is process of materials joining two pieces by partially melting their surfaces and allowing them to flow together. Welding is important subject to student when they deal as engineer with maintenance and repairing different mechanical apparatus. Due to all parts and elements of mechanical apparatus made from different metals (steel, stainless steel, cast iron, aluminum, copper, brass, bronze, etc.) and to joining these metals we need some time permanent joint like welding. Welding performance go one with all parts and elements of mechanical apparatus which is general repair work so they must learn and training on different types of welding process and understanding the different welding application methods.</p> <p>Theoretical hours will be enough to the student to learn different welding process and their principles, equipment, application, limitation, how they work...etc.</p> <p>Practical hours will be helpful to the students to get good training on different welding processes. All these types of welding which student training on it available in local market and workshops</p>				
<p>Course objectives</p>	<p>The main objectives:</p> <ol style="list-style-type: none"> 1. Contribute student to recognition different welding process, how they applied in respect to different materials (steels and non-steels) as base metal 2. To working on different welding equipment. 3. To realizing different welding electrodes and fluxes. 4. To working in mechanical workshops especially welding operations. 5. Preparing mechanical path to execute different welding types. 6. Applying special instruction of occupational safety. 				
<p>Student's obligation</p>	<p>Class attendance, preparing yearly one seminar by each student using power point not less than 10 slides with the video shot and during practical hours they must be ready to show it as presentation. Quiz for each chapter. (2 quiz at the end), individual project for every students. Attendance at practical hours in welding workshop, training on different types of welding to writing report at the end weekly, also practical examination on each test.</p>				
<p>Required Learning Materials</p>	<p>Data show, power point, white board, seminar, pictures and video, training on different types of welding in workshop.</p>				
<p>Evaluation</p>	<p>Task</p>	<p>Weight (Marks)</p>	<p>Due Week</p>	<p>Relevant Learning Outcome</p>	
	<p>Paper Review</p>				
	<p>Assignments</p>	<p>Homework</p>	<p>5%</p>		
		<p>Class Activity</p>	<p>2%</p>		
		<p>Report</p>			
		<p>Seminar</p>	<p>5%</p>		
<p>Essay</p>					

	Project	5%		
	Quiz	8%		
	Lab.	10%		
	Midterm Exam	10+15%		
	Final Exam	20+20%		
	Total	100%		
Specific learning outcome:	<p>The main outcome:</p> <ol style="list-style-type: none"> 1. Welding is most efficient way to joint metals, and more flexible design provider. 2. Training on different lowest cost joining methods like manual arc welding, gas welding, spot welding...etc in different welding positions (flat, vertical, horizontal and overhead) to get high labour cost. 3. Identifying different commercial materials like different steels, aluminium, copper, brass, bronze...etc 4. Learning how selecting different electrodes, filler metals. 5. Preparing different work pieces to design different welding joints. 6. Learning how select different welding process in respect to economic factors. 7. Learning how cutting materials by oxy-fuel gas cutting process. 			
Course References:	<ul style="list-style-type: none"> ▪ Key references: <ol style="list-style-type: none"> 1. H. B. Cary; "Modern welding technology" 5th edition, 2002 2. Md. Ibrahim khan," Welding Science and Technology" 2007 3. Kalpakjian; "Manufacturing Engineering and Technology", 2009. ▪ Useful references: <ol style="list-style-type: none"> 4. Welding Consumable Catalogue, C1.10, 2017 5. M. G. Nicholas;" Introduction to diffusion bonding", 1998. 6. P. J. Harris; "Manufacturing technology 3", 1981. 7. D. Brandon and W. Kaplan;" Joining processes; an Introduction", 1997. ▪ Magazines and review (internet): <ol style="list-style-type: none"> 1. www.lincolnelectric.com 2. www.thefabricator.com 3. www.fmametalfab.com 			
Course topics (Theory)	Week	Learning Outcome		
<i>Welding technology, Definition, electrical arc welding, its principles, open circuit voltage, welding power source, duty cycle, CC & CV systems.</i>	1	To study electricity of welding process		
<i>Manual arc welding, SMAW, striking and maintaining the arc, its principles, equipment, filler metal, electrode coating and its</i>	2	To study shielded metal arc welding		

<i>composition.</i>		SMAW process
<i>Welding position capabilities, designed of weld joint and welds, types of welding joints, welding types (shapes), tips for using the welding process.</i>	3	To sort out welding position, joint and types.
<i>TIG welding, notes and major uses, Equipment, tungsten electrode, shielded gas, Types of filler materials, TIG variables, safety consideration.</i>	4	To study tungsten inert gas welding process
<i>MIG/MAG welding, it's principle, metal transfer mode, equipment's, welding circuit, electrode and shielded gas, deposition rates and MIG quality,</i>	5	To study MIG/MAG process
<i>Gas shielding and mixtures, properties of gases. Arc spot welding in MIG/MAG, its principle, welding position and joints. Comparing between gases, TIG with MIG/MAG, and metal transfer modes.</i>	6	To sort out different shielded gas and different between them
<i>Electrical resistance welding, its principles, factors involved in making resistance welding, weld-able metal. Types and process, spot welding machine, electrodes, its shape welding controllers, welding joints.</i>	7	Principle of resistance welding for example spot welding.
<i>Resistance seam welding basic principle, types of seam welding joints, flash welding, its principle, projection welding, its principles and advantages.</i>	8	To study different resistance welding like seam, flash and projection
<i>Stud welding, its principles, application, joint designs, equipment, welding variables and tips for use. Variations of stud welding. Stud friction welding, its principle.</i>	9	To study stud welding and its variation.
<i>Gas welding, types of process, flame types, advantage and major uses. Gas equipments. Fuel gas for welding. Gas welding technique, welding joint design, filler metal & flux, gas welding variation.</i>	10	To study gas welding process
<i>Metal cutting by gas, general concept, chemical formula for oxidation reaction, principle of oxygen cutting, types of flame cutting, equipments. Torches. Metal powder cutting, its principle. Air carbon arc cutting, electrode holder.</i>	11	To recognize cutting process by gas and sort out different techniques
<i>Brazing, its principles, surface preparation, filler metals. Brazing steps, equipment, heat sources. Soldering, soft soldering, steps, material used (base metal, flux, solder, lead), soldering defect.</i>	12	To study brazing and soldering process as welding technology
Course topics (Practical)	Week	Learning Outcome
Arc welding (manual, mechanical)	2	Manual Training
TIG welding	2	Manual Training
MIG/MAG welding	2	Manual Training

Spot welding techniques with different thickness and metals.	2	Manual Training
Gas welding and cutting	2	Manual Training
Brazing techniques, torch brazing, furnace brazing.	1	Manual Training
Soldering, preparation of surfaces, soldering techniques with different of filling materials.	1	Manual Training

Questions Example Design:

Each student has been taken examination samples for four years 2017-2018, 2018-2019. 2019-2020 and 2020-2021)

1. Compositional:

-Why the deposition rates of gas metal arc welding (MAG) are higher for the same current than shielded metal arc welding (SMAW).

Answer: *These higher rates occur because there is no electrode coating that must be melted.*

- Give reason why the excessive Oxygen is not preferred in Oxyacetylene Welding.

Answer: *oxygen combines with iron to form inclusions and remain in weld metal, also combines with carbon of steel to form carbon monoxide. The gases collect into pockets that cause pores or hollow space.*

2. True or false type of exams: non

3. Multiple choices:

- Choose clearly the purpose of using shielded gas in gas metal arc welding process: (MIG/MAG)

a- to protect the arc area from the atmosphere..

b- to establish the metal transfer mode and deposited weld characteristics.

c- to form a protective envelope around the weld area.

d- all of them.

e- not each of them.

Answer: *(d) all of them*

Drawing	1. Draw with referring to the main parts TIG welding process diagram . Summarize two advantages of using this type of welding.
Comparing	2. Compare between shielded metal arc welding (SMAW) and gas tungsten arc welding (TIG).
Choosing	3. Suppliers provide a thin copper coating on the solid electrode wire to improve: A) deposition rate. B) current pickup between contact tip and electrode. C) slag coverage. D) mechanical properties.
Analysis	4. Explain why Application of argon with small amount 5% of hydrogen in (MIG/MAG) process.
Explanation	

	5. Give the benefits or usage using stud gun with special design in arc stud welding.
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External Evaluator

I reviewed this course book it is will organized and satisfied the qualification of 2^{ed} year.



Assist Prof. Dr. Youns Khalid Khdr