(Module Name)

Advanced Manufacturing Process

Course Catalogue

2023-2024

College/ Institute	Erbil Technical engineering	
Department	Mechanical and Energy Tech. Engineering	
Module Name	Advanced Manufacturing Processes	
Module Code	AMP205	
Degree	Technical Diploma ☐ Bachler ☐ High Diploma ☐ Master ☑ PhD ☐	
Semester	2	
Qualification	PhD in Mechanical Engineering	
Scientific Title	Assistant professor	
ECTS (Credits)	7	
Module type	Prerequisite ☑ Core ☐ Assist. ☐	
Weekly hours	3	
Weekly hours (Theory)	(3)hr Class	(11)Total hrs Workload
Weekly hours (Practical)	( )hr Class	( )Total hrs Workload
Number of Weeks	12	
Lecturer (Theory)	Assist. Dr. Gailan Ismail Hasan	
E-Mail & Mobile NO.	Gailan.hassan@epu.edu.iq , 07504671533	
Lecturer (Practical)		
E-Mail & Mobile NO.		
Websites		

Course Book

<table>
<tr><td>Course Description</td><td colspan="5">This course covers different advanced manufacturing process like metal forming, advanced welding, casting forging, and advanced techniques for material processing, micro machining process and its measurement techniques and additive manufacturing processes.</td></tr>
<tr><td>Course objectives</td><td colspan="5">Introducing students with advanced manufacturing processes, advanced techniques for Material Processing, measurement techniques for micro machining, and to select suitable material combination for different manufacturing process. Also Introduction and principles of additive Manufacturing Processes.</td></tr>
<tr><td>Student's obligation</td><td colspan="5">Midterm examinations. Paper review</td></tr>
<tr><td>Required Learning Materials</td><td colspan="5">Data show, power point, white board, seminar, pictures.</td></tr>
<tr><td rowspan="12">Evaluation</td><td colspan="2">Task</td><td>Weight (Marks)</td><td>Due Week</td><td>Relevant Learning Outcome</td></tr>
<tr><td colspan="2">Paper Review</td><td>10 %</td><td></td><td></td></tr>
<tr><td rowspan="6">Assignments</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Seminar</td><td>5%</td><td></td><td></td></tr>
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<tr><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Quiz</td><td>10 %</td><td></td><td></td></tr>
<tr><td colspan="2">Atten</td><td>5 %</td><td></td><td></td></tr>
<tr><td colspan="2">Midterm Exam</td><td>20 %</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>50 %</td><td></td><td></td></tr>
<tr><td colspan="2">Total</td><td>100 %</td><td></td><td></td></tr>
<tr><td>Specific learning outcome:</td><td colspan="5">The main outcome:
1. Advanced manufacturing process is most efficient way to study different production methods of product.
2. Design and processing of different manufacturing process dealing with different materials.</td></tr>
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	3. Identifying different modern manufacturing process like metal forming, casting, stir welding, micro machining processes and discharge machining. **4. Dealing with different advanced techniques for materials processing.** **5. Learning how additive manufacturing processes developed and it is application**.
Course References:	1. Principles of Modern Manufacturing -- Groover, WILEY, India 2. Technology of Metal Forming processes -- Surender Kumar PHI Publication 3. Friction Stir welding and Processing -- Rajiv S.Mishra ASM International 4. High Integrity Die casting Processes -- Edward J vinarcik John Wiley and Sons 5. Advanced Methods of Machining -- J.A. Mcgeough Chapman & Hall 6. Micro machining of Engineering Materials -- Joseph Mcgeough Marcel Dekker, Inc.

Course topics (Theory)	**Week**	**Learning Outcome**
Introduction to advanced manufacturing processes. Metal Forming: Roll forming, High velocity hydro forming, Electro-magnetic forming, High energy rate forming, Spinning, Flow forming, Shear forming.	2-----1	
Advanced Welding, Casting and Forging processes: Friction stir welding: Tooling, Temperature distribution and resulting melt flow. Advanced Die casting- Vacuum die casting, squeeze casting	4-----3	
Advanced techniques for Materials processing: Shape tube electrolytic machining, Electro jet machining, Electrolytic in process dressing, Electrochemical grinding, Electrochemical etching laser based heat treatment.	7-------5	
Micro Machining processes: Diamond micro machining, Ultrasonic micro machining, Micro electro discharge machining	10------8	
Additive Manufacturing processes: principles, development and general processes. Powder based fusion process, extrusion based system, sheet lamination process, direct write technologies.	13------11	
Measurement techniques in Micro machining: classification of measuring system, Microscopes: Optical microscope, Electron microscope, Laser based system, Interference microscopes and comparators, Surface profiler, Scanning tunnelling microscopes, Atomic fore microscope, Application	15------14	

Questions Example Design:

A- Discuss the ability of determining the wear rate of the micro-tool during micro-electro discharge machining **(**Micro-EDM).

B- Discuss the effect of combination of (power density, interaction time) on processing of materials with different hardenability by laser heat treatment process.

C- Explain why diamond as ultra-precision cutting tools unsuitable for machining of steels and nickel alloys.

D- Explain briefly using sketch a close-loop control strategy with force feedback used in ultrasonic micro machining (UMM) process.

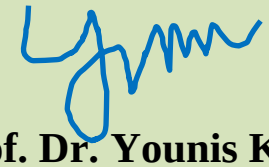
By sketch compare between electron beam melting and laser based systems used in powder based fusion process (PBF).

Extra notes:

Titles for article reviews selected from all five chapters.

External Evaluator

The course topics reviewed, it is organized will, it is suitable, satisfied for the qualification of MSc students and it covered most manufacturing process curriculum.



Assist. Prof. Dr. Younis Khalid Khdir