

Course Title	Advanced Manufacturing Processes				
Course Code	ME411				
Course Type	Elective				
Level	BSc (Level 1)				
Year / Semester	3 rd Year / 5 th Semester				
Teacher's Name	Dr. Antonios Lontos				
ECTS	6	Lectures / week	3	Laboratories/week	0
Course Purpose	The purpose of the course is to learn and apply advanced manufacturing processes in order to create new products with superior properties.				
Learning Outcomes	<p>By the end of the course, students must be able to:</p> <ol style="list-style-type: none"> 1. Identify CIM, CAD and other manufacturing systems. 2. Use various software for manufacturing simulation. 3. Explain powder metallurgy, sintering and mechanical properties of sintered mechanical parts. 4. Describe rapid prototyping technologies and their applications. 5. Explain nanofabrication, Chemical Machining, Electrochemical Machining and Electrochemical Grinding. 6. Explain Electrical-Discharge Machining and Wire EDM cutting. 7. Describe laser technology, Electron-Beam Machining, Plasma-Arc Cutting and Water-Jet Machining and how they are been used in manufacturing. 8. Describe abrasive-Jet Machining and Micromachining. Analyze the Economics of Advanced Machining Processes. 9. Explain hard coatings technology, Identify superior mechanical properties of coatings and make suggestions for various applications. 				
Prerequisites	ME201	Corequisites	None		
Course Content	<ul style="list-style-type: none"> • Computer Aided Design and Engineering: Computer Aided Manufacturing, Computer Aided Process Planning, Computer Simulation of Manufacturing Processes and Systems • Powder metallurgy: Processing of powder metals, ceramics, glass, and superconductors, Production of Metal Powders, Compaction of Metal Powders, Sintering • Rapid prototyping: Subtractive Processes, Additive Processes, Virtual Prototyping, Applications • Advanced Machining Processes: Nanofabrication, Chemical Machining, Electrochemical Machining, Electrochemical Grinding, Electrical-Discharge Machining, Wire EDM, Laser-Beam Machining, Laser applications in manufacturing. Electron-Beam Machining and Plasma-Arc Cutting, Water-Jet Machining. Abrasive-Jet Machining, Nanofabrication, Micromachining. The Economics of Advanced Machining Processes. 				

	<ul style="list-style-type: none"> • Surface treatment: Mechanical Surface Treatment and Coating, Case Hardening and Hard Facing, Thermal Spraying, Vapor Deposition, Ceramic Coating, Diamond Coating.
Teaching Methodology	<p>The material is mostly presented by lectures although demonstration of some manufacturing methods and site visits are performed. Student evaluation is based on assignments or mini projects, tests and final exam. A description is given at the beginning of the course in order for the students to get enough information on the making breakdown, assignment instructions, and tutorial sessions as well as the recommended bibliography for their use during the course.</p>
Bibliography	<p>(a) <u>Textbooks:</u></p> <ul style="list-style-type: none"> • Manufacturing Processes for Engineering Materials, Fourth Edition, Serope Kalpakjian, Steven R. Schmid, Prentice Hall • Manufacturing Engineering and technology, Fourth Edition, Serope Kalpakjian, Steven R. Schmid, Prentice Hall <p>(b) <u>References:</u></p> <ul style="list-style-type: none"> • Fundamentals of Modern Manufacturing: Materials, Processes, and Systems by Mikell P. Groover, John Wiley & Sons, 2nd edition 2001. • Metal Cutting and High Speed Machining by D. Dudzinski, A. Molinari, H. Schulz, Plenum Pub Corp, 2002. • Applied Manufacturing Process Planning: With Emphasis on Metal Forming and Machining by Donald H. Nelson, George, Jr. Schneider, Prentice Hall, 1st edition, 2000.
Assessment	<p>The assessment consists of following methods for both the theoretical and practical part of the course. Each assessment method is assigned with a weight which is used for the calculation of the final grade.</p> <p style="text-align: center;">Mid-term exam: 40% Final Exam (written): 60%</p>
Language	English