

Course Title	Manufacturing Processes with the Aid of CAD/CAM Systems				
Course Code	ME405				
Course Type	Compulsory				
Level	BSc (Level 1)				
Year / Semester	3 <sup>rd</sup> / Spring				
Teacher's Name	Dr. Sotiris Omirou				
ECTS	6	Lectures / week	3	Laboratories/week	1
Course Purpose	This course aims to (1) provide students with a basic understanding of the working principles and applications of CAD/CAM and CNC technologies; (2) enable students to practice CAD/CAM tools and techniques.				
Learning Outcomes	<ol style="list-style-type: none"> <li>1. Describe the capabilities of modern computer aided designing and manufacturing systems in the manufacturing industry.</li> <li>2. Compare the operation and programming of a CNC machine tool using manual programming and a CAM system.</li> <li>3. Create G-code programs on CNC simulator for simple mechanical parts.</li> <li>4. Employ advanced techniques in CNC programming: a) canned cycles of drilling, slotting, pocketing, taping etc. b) coordinate transformation cycles such as rotating, scaling, mirror imaging etc. and c) sub-programming and program section repeats</li> <li>5. Operate the panel of a modern CNC Controller (Heidenhain iTNC 530) for editing, selecting cutting tools and test running CNC programs</li> <li>6. Exchange data between CAD and CAM systems.</li> <li>7. Plan manufacturing operations using modern CAM software packages.</li> <li>8. Generate NC-code using the appropriate post-processors for various types of CNC machine tools</li> <li>9. Use effectively CAD / CAM systems in order to produce the final NC code for the manufacturing of various mechanical parts</li> <li>10. Prepare a project for producing a mechanical part applying the CAD/CAM and CNC technology.</li> </ol>				
Prerequisites	ME113, ME201	Corequisites	None		
Course Content					

	<ul style="list-style-type: none"> <li>• Introduction to modern manufacturing technology: Principles of various manufacturing processes, material removal, optimization of cutting processes using flexible manufacturing systems.</li> <li>• CAD Systems: Principles of computer aided designing systems, CAD systems for designing automotive parts, creation and designing of mechanical part and elements in 2D and 3D dimension, construction of mechanical parts in 3D dimension by means of CAD system.</li> <li>• CAM Systems: Principles of CAM systems, post-processor operation and typical examples. Introduction to different CAD/CAM neutral files, Importing and exporting CAD/CAM electronic neutral files (IGES, STEM, DXF, ....).</li> <li>• NC code generation by CAD/CAM: Production processes using CAD/CAM systems and CNC machine tools, NC Code in the material removal (milling, turning, etc).</li> <li>• Manual programming of a CNC machine tool: Operation and programming of a CNC machine tool using advanced programming capabilities: canned cycles, coordinate transformations, subprograms and parameters.</li> <li>• CAD/CAM programming of a CNC machine tool: Operation and programming of CNC machine tool using CAM systems. Machining of mechanical parts with complex geometry such as dies with sculptured surfaces, pockets with intricate form and internal islands, etc.</li> <li>• Laboratory work: A series of machining applications on a CNC machine.</li> </ul>
Teaching Methodology	<ul style="list-style-type: none"> <li>• Lectures for learning the methodology of manufacturing based on CAD/CAM Systems. Lecture notes and presentations are available through the web for students to use in combination with the textbooks.</li> <li>• Computer-assisted simulation examples of representative mechanical parts.</li> <li>• Laboratory experiments: Actual machining on modern CNC machines. (Carried out in small groups.)</li> </ul>
Bibliography	<p>Textbook:</p> <ul style="list-style-type: none"> <li>• Mikell P. Groover, “Automation, Production Systems, and Computer-Integrated Manufacturing”, Prentice Hall, 2014.</li> </ul> <p>References:</p> <ul style="list-style-type: none"> <li>• S. Omirou, Technology and Programming of CNC machine tools, Kleidarithmos press, 2018</li> <li>• Peter Smid, CNC Programming Techniques, Industrial Press, 2006</li> <li>• Zeid, Ibrahim. “Mastering CAD/CAM”, McGraw Hill, 2005</li> </ul>

Assessment	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.	
	Coursework 60% Final Exam 40%	<p style="text-align: center;">Coursework</p> <ul style="list-style-type: none"> <li>• Test: 20%</li> <li>• Lab: 50%</li> <li>• Mini-project: 30%</li> </ul>
Language	English	