

Class Syllabus – Fall Semester, 115 Academic Year

Department of Mechanical Engineering, National Chung Cheng University

Course Name: : Advance Machining Practice				Dept.		IBPME	
				Course Code		4232007	
Instructors	Hsiang-chiu Wu	Credits	3	Elective	Grade	Second-Year	
EMI	☒ Yes ☐ No						
Course type	☐ Humanistic Care Course ☐ Problem-oriented Course ☐ Integrate the curriculum ☒ Internship ☐ Competition Special Course ☒ Topic-based courses ☒ Practical courses ☐ Other						

Prerequisites:

Students should have completed introductory courses in:

Engineering Drawing

Manufacturing Processes

Machine Shop Practice

CNC Machining Fundamentals

Basic knowledge of conventional lathes and milling machines is recommended.

Class Description :

This course provides students with fundamental knowledge and practical skills in CNC turning and 3-axis CNC milling operations. Students will learn machine structures, coordinate systems, tooling selection, workpiece setup, CNC programming using G-codes and M-codes, machining simulation, machine operation, and quality inspection. Practical exercises focus on machining real workpieces using CNC lathes and 3-axis machining centers. Students will develop the ability to independently perform machining operations while emphasizing safety, precision, efficiency, and industrial manufacturing practices.

Class Objective :

Upon completion of this course, students will be able to:

1. Understand the structure and operation of CNC lathes and 3-axis CNC milling machines.
2. Read and interpret engineering drawings.
3. Develop CNC turning and milling programs using G-code and M-code.
4. Set work coordinate systems and tool offsets correctly.
5. Select appropriate cutting tools and machining parameters.
6. Operate CNC machines safely and efficiently.
7. Verify CNC programs through simulation.
8. Manufacture precision workpieces according to engineering specifications.
9. Inspect machined parts using precision measuring instruments.
10. Solve common machining and programming problems encountered in industrial applications.

Textbooks	CNC Lathe and CNC Milling Programming and Operation Practice (Instructor's Notes)					
An overview of the main points of teaching						
Teaching Materials	☒ PPT ☒ Self-edited textbooks ☐ Self-made instructional videos		☒ Course handouts ☒ Teaching Procedures ☐ Other			
Teaching Methods	☒ Lectures ☒ Oral presentation ☒ Case studies		☐ Group discussion ☒ Problem-oriented learning ☐ Other			
Evaluation Tools	☒ Mid-term Exam ☒ In-class Quiz ☐ Homework ☒ Final Report ☐ Other		☐ Final Exam ☐ In-class homework ☐ Mid-term Report ☐ Special Report ☐ Scales			
Teaching Resources	☒ Course website ☐ Electronic files of textbooks are available for download ☐ Internship website					
Instructor's Information	Hsiang-chiu Wu 0928911273 hpuselighnel@gmail.com					
Course Outlines		Teaching Hours				Core Competence
Unit Title	Contents	Lectures	Demo	Practice	Other	
1	Course Introduction & Industrial Safety	2	1	1		
2	CNC Lathe Structure and Operation	2	1	2		
3	Turning Coordinate System & Tool Offset	2	1	2		
4	Basic CNC Turning Programming	2	2	3		
5	Turning Practice (Facing, OD, ID, Grooving)	2	2	3		
6	Thread Cutting and Advanced Turning Cycles	2	1	3		
7	3-Axis CNC Milling Machine Structure	2	1	2		
8	Coordinate Systems & Tool Length Compensation	2	1	2		
9	Mid-term Practical Examination	0	0	3		
10	Basic Milling Programming	2	2	3		
11	Pocket, Slot, and Contour Machining	2	2	3		
12	Drilling, Reaming, and Tapping	2	1	3		
13	Integrated Turning & Milling Project	1	2	3		

14	Quality Inspection & Machining Optimization	2	1	2		
15	Final Project Practice	1	1	4		
16	Final Practical Examination & Project Presentation	0	0	4		
Achievable Core Competence		Achievable Objective				
1	B1	Possess the ability of basic engineering analysis				
2	B3	Experimental operation and data analysis				
3	B4	CNC programming and computer-aided manufacturing				
4	B5	Mechanical component design and process planning				
5	B9	Teamwork and communication				
6	B10	Engineering ethics and sustainable development				

Core competencies of the University Division

B1 Possess the ability of basic engineering mathematics, solid mechanics, heat flow mechanics, automatic control, materials science and opto-mechanical integration engineering practical analysis

B2 Ability to absorb and integrate cross-domain knowledge

B3 Ability to perform solid force experiments, heat flow experiments, mechanical project implementation, optoelectronic engineering experiments and analyze data

B4 Ability to write programming languages and computer-aided design

B5 Mechanical and opto-electromechanical systems, component design and process planning capabilities

B6 Ability to identify, analysis and solve professional problems

B7 Ability to implement and innovate

B8 Ability to engage in scientific writing and presentations

B9 Ability to work as a team, communicate effectively and manage the program

B10 Learn general knowledge and demonstrate the ability of engineering ethics, social responsibility and sustainable development

Weekly teaching plan				
Course Time	Course Location	Grading	Office hour	Teaching quality evaluation method
Thursday 13:00– 16:00	Engineering Building II R433, Machine Shop 102	Attendance: 20% Mid-term Exam: 15% Final Practical Examination: 30% Final Machined Workpiece: 35%	Thursday 13:00– 16:00	Questionnaire
Weeks	Teaching & Homework Progress			Note
1	Course introduction and workshop safety regulations			
2	Introduction to CNC lathe structure and machine operation			
3	Coordinate systems, work offsets, and tool offsets			
4	Basic turning programming (G-code & M-code)			
5	External turning, facing, grooving, and boring			
6	Thread cutting and canned cycles			
7	Introduction to 3-axis CNC milling machines			
8	Tool setting and coordinate systems			
9	Mid-term practical examination			
10	Basic milling programming			
11	Pocket milling, contour milling, and slot machining			
12	Drilling, tapping, and hole machining			
13	Integrated machining project			
14	Workpiece inspection and machining optimization			
15	Final project machining and troubleshooting			
16	Final practical examination and presentation			