



Universitas Negeri Surabaya
Faculty of Engineering,
Mechanical Engineering Education Undergraduate Study
Program

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date																																																	
CNC	8320302224	MK Strengthening Study Programs	T=0	P=2	ECTS=3.18	4	April 28, 2023																																																	
AUTHORIZATION	SP Developer		Course Cluster Coordinator			Study Program Coordinator																																																		
	Nur Aini Susanti, S.Pd., M.Pd		Nur Aini Susanti, S.Pd., M.Pd			Ir. Wahyu Dwi Kurniawan, S.Pd., M.Pd.																																																		
Learning model	Project Based Learning																																																							
Program Learning Outcomes (PLO)	PLO study program which is charged to the course																																																							
	PLO-5	Have social competence and personality competence in mechanical engineering education																																																						
	PLO-7	Have an understanding of technopreneurship in the field of automotive/production technology																																																						
	PLO-9	Able to carry out research in the field of mechanical engineering																																																						
	PLO-10	Have an understanding of mathematics and basic mechanical engineering																																																						
	Program Objectives (PO)																																																							
	PO - 1	Students have the skills to program and operate CNC machines according to developments in science and technology to produce a product.																																																						
	PLO-PO Matrix																																																							
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 15%;">P.O</td> <td style="width: 15%;">PLO-5</td> <td style="width: 15%;">PLO-7</td> <td style="width: 15%;">PLO-9</td> <td style="width: 15%;">PLO-10</td> </tr> <tr> <td>PO-1</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>						P.O	PLO-5	PLO-7	PLO-9	PLO-10	PO-1																																											
	P.O	PLO-5	PLO-7	PLO-9	PLO-10																																																			
PO-1																																																								
PO Matrix at the end of each learning stage (Sub-PO)																																																								
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td rowspan="2" style="width: 10%;">P.O</td> <td colspan="16" style="text-align: center;">Week</td> </tr> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td> </tr> <tr> <td>PO-1</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>						P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PO-1																
P.O	Week																																																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																																								
PO-1																																																								
Short Course Description	This course is an understanding of programming, programmatic mastery of making workpieces using a Turning (Computer Numerically Controlled) machine and its development.																																																							
References	Main :																																																							
	<ol style="list-style-type: none"> 1. Emco. 1992. Student handbook TU 2A. Austria. 2. Mesin CNC TU-2A Emco Austria 3. Tim. 2013. Modul CNC Basic Machining Production dengan software Mach 3. Surabaya 4. Mesin CNC TU-3A Emco Austria 																																																							
	Supporters:																																																							
Supporting lecturer	Nur Aini Susanti, S.Pd., M.Pd. Ali Hasbi Ramadani, S.Pd., M.Pd.																																																							

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (offline)	Online (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Skilled in defining the Basic Concepts of CNC Lathes and Applications of G00 and G01 Functions	Skilled in defining the working principles of CNC machines, designing G01 programs, plotting programs and operating machines	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Form of Assessment : Participatory Activities</p>	Exercise and Practical 4 X 50	Lectures, discussions, questions and answers, exercises, assignments 2x50	<p>Material: basic principles of axis movement on CNC lathes and CNC milling machines</p> <p>Library: <i>Emco. 1992. Student handbook TU 2A. Austria.</i></p>	2%
2	Skilled in using G84 and G88 Function Application tool positioning	Skilled in determining the initial position of the chisel, designing the G84 program, plotting the program and operating the machine	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Form of Assessment : Participatory Activities, Project Results Assessment / Product Assessment</p>	Lectures, discussions, questions and answers, exercises, practice and assignments 4 X 50	Lectures, discussions, questions and answers, 2x50 exercises	<p>Material: G84 & G88 Program</p> <p>Library: <i>Emco. 1992. Student handbook TU 2A. Austria.</i></p>	5%
3	Able to explain G and M code chisel movements (straight cutting, threading, grooves, drilling, radius compensation)	Able to explain G and M code chisel movements (straight cutting, threading, grooves, drilling, radius compensation)	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Form of Assessment : Participatory Activities</p>	Lectures, discussions, questions and answers, exercises and assignments 4 X 50	practice, Practice 2x50	<p>Material: G02 and G03 Programs</p> <p>Library: <i>Emco. 1992. Student handbook TU 2A. Austria.</i></p>	2%
4	Able to explain G and M code chisel movements (straight cutting, threading, grooves, drilling, radius compensation)	Able to explain G and M code chisel movements (straight cutting, threading, grooves, drilling, radius compensation)	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Form of Assessment : Participatory Activities</p>	Lectures, discussions, questions and answers, exercises and assignments 4 X 50	practice, Practice 2x50	<p>Material: G25 Program</p> <p>Library: <i>Emco. 1992. Student handbook TU 2A. Austria.</i></p>	5%

5	Able to explain G and M code chisel movements (straight cutting, threading, grooves, drilling, radius compensation)	Able to explain G and M code chisel movements (straight cutting, threading, grooves, drilling, radius compensation)	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	Lectures, discussions, questions and answers, exercises and assignments 4 X 50	practice, Practice 2x50	<p>Material: M06 Program Library:</p>	20%
6	Able to explain G and M code chisel movements (straight cutting, threading, grooves, drilling, radius compensation)	Skilled in performing G and M code chisel movements (straight cutting, threading, grooves, drilling, radius compensation)	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Form of Assessment : Participatory Activities, Practical Assessment</p>	Lectures, discussions, questions and answers, exercises, practice and assignments 4 X 50	Lectures, discussions, questions and answers, 2x50 exercises	<p>Material: Program G85, G89 Library:</p> <hr/> <p>Material: G85, G89 Program Library: <i>Emco. 1992. Student handbook TU 2A. Austria.</i></p>	5%
7	Able to explain G and M code chisel movements (straight cutting, threading, grooves, drilling, radius compensation)	Able to explain G and M code chisel movements (straight cutting, threading, grooves, drilling, radius compensation)	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Form of Assessment : Participatory Activities</p>	Lectures, discussions, questions and answers, exercises, practice and assignments 4 X 50	Lectures, discussions, questions and answers, exercises, 2x50	<p>Material: G86 and G78 Program Library: <i>Emco. 1992. Student handbook TU 2A. Austria.</i></p>	2%
8	UTS	Skilled in designing programs, plotting programs and operating machines	<p>Criteria: Work procedures Individual student design. Precision of sizes according to drawings, plotter and program. Suitability of execution results of work pieces, plotter, program and working drawings. Work safety. Cleanliness</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	4 X 50 Performance Assessment		<p>Material: UTS Library: <i>Emco. 1992. Student handbook TU 2A. Austria.</i></p>	10%

9	Skilled in defining the Basic Concepts of CNC Milling Machines and Functional Applications of G00 and G01, G02 and G03 without M99, G02 and G03 with M99, M06, G25, G72, G73, G81, G82, G83, G85 and G89	Skilled in defining the working principles of CNC milling machines, skilled in designing G00 and G01, G02 and G03 programs without M99, G02 and G03 with M99, M06, G25, G72, G73, G81, G82, G83, G85 and G89, skilled in plotting programs and operating machine	<p>Criteria: Accuracy of designing programming using G and M codes</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Lectures, discussions, questions and answers, exercises, practice and assignments 2 X 50		<p>Material: Designing programming using G and M codes Library: <i>Emco Austrian TU-3A CNC machine</i></p>	2%
10	Able to analyze CNC program errors	Able to analyze CNC program errors	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Lectures, discussions, questions and answers, exercises, practice and assignments 4 X 50	practice, Practice 2x50	<p>Material: Analyzing CNC program errors Reference: <i>Austrian Emco TU-3A CNC machine</i></p>	2%
11	Able to plot CNC programming	Able to plot CNC programming	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Lectures, discussions, questions and answers, exercises, practice and assignments 4 X 50	Lectures, discussions, questions and answers, exercises, 2 X 50	<p>Material: CNC programming plotter Library: <i>Austrian Emco TU-3A CNC machine</i></p>	10%
12	Able to set tools	Accuracy in setting tools	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Lectures, discussions, questions and answers, exercises, practice and assignments 4 X 50	Lectures, discussions, questions and answers, practice 2 X 50	<p>Material: G25 Program Library: <i>Austrian Emco TU-3A CNC Machine</i></p> <hr/> <p>Material: Setting up the library tool:</p> <hr/> <p>Material: Setting tools Library: <i>Emco Austrian TU-3A CNC machine</i></p>	5%

13	Able to operate CNC machines	Accuracy of operating CNC machines	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Forms of Assessment : Project Results Assessment / Product Assessment, Practical Assessment</p>	Lectures, discussions, questions and answers, exercises, practice and assignments 4 X 50	Lectures, discussions, questions and answers, practice 2 X 50	<p>Material: Operating a CNC machine Reference: <i>Emco Austrian TU-3A CNC machine</i></p>	5%
14	Able to operate CNC machines	Accuracy of operating CNC machines	<p>Criteria: Work procedures, individual student design, precision of size according to drawings, plotter and program, suitability of workpiece execution results, plotter, program and working drawings. work safety. Cleanliness</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Lectures, discussions, questions and answers, exercises, practice and assignments 4 X 50	Lectures, discussions, questions and answers, practice 2 X 50	<p>Material: Program G72, G73 Library: <i>CNC Machine TU-3A Emco Austria</i></p>	5%
15	Able to maintain and clean CNC machines	Able to maintain and clean CNC machines	<p>Criteria: Accurate maintenance and cleaning of CNC machines</p> <p>Forms of Assessment : Project Results Assessment / Product Assessment, Practical Assessment</p>	Lectures, discussions, questions and answers, exercises, practice and assignments 4 X 50	Lectures, discussions, questions and answers, practice 2 X 50	<p>Material: maintaining and cleaning CNC machines Library: <i>CNC Machine TU-3A Emco Austria</i></p>	5%
16	UAS	Comprehension of Meeting Material 1 to 15	<p>Criteria: Programming according to product</p> <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Practice 2x50	Practice 2x50	<p>Material: Meeting Materials 1st to 15th Reference: <i>CNC Machine TU-3A Emco Austria</i></p> <hr/> <p>Material: Material for Meetings 1 to 15 Library: <i>Emco. 1992. Student handbook TU 2A. Austria.</i></p>	15%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	26%
2.	Project Results Assessment / Product Assessment	56.5%
3.	Practical Assessment	17.5%
		100%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.