



# MODULE HAND BOOK

## MECHANICAL ENGINEERING VOCATIONAL EDUCATION STUDY PROGRAM

### FACULTY OF ENGINEERING – UNIVERSITAS NEGERI PADANG

COURSE NAME	CODE	Course classification	CU		Sem	Version
			Theory	Pract		
Machining Process Technology	MES2.61.5104	Study Program Compulsory Courses	3	0	5	1
Responsible Lecturer	Drs. Syahril, ST., MSCE, Ph.D and Budi Syahri, S.Pd., M.Pd.T		Signature			
INFORMATION	Dean	Head of Department	Coordinator of study program			
	<u>Dr. Fahmi Rizal, M.Pd., MT</u> NIP. 195912041985031004	<u>Drs. Purwantono, M.Pd</u> NIP. 196308041986031002	<u>Drs. Purwantono, M.Pd</u> NIP. 196308041986031002			
Learning Outcomes of Graduates	<b>Study Program Graduate Learning Outcomes (CPL):</b> <ol style="list-style-type: none"> <li>1. Able to apply basic science knowledge (mathematics, natural sciences) and other multidisciplinary disciplines which form the basis of Mechanical Engineering Vocational Education in carrying out professional work in their respective fields.(Knowledge-understanding) <ol style="list-style-type: none"> <li>1.1. Able to show good understanding and implement basic mathematical concepts to solve various problems in the field of mechanical engineering</li> <li>1.2. Have a high understanding and can implement the basic concepts of physics in the field of mechanical engineering</li> <li>1.3. Have a high understanding and can implement the basic principles of chemistry in the field of mechanical engineering</li> </ol> </li> <li>2. Able to think critically and creatively in identifying, formulating, problem solving, evaluating various problems in the field of Mechanical Engineering Vocational Education with the most appropriate and effective scientific method.<b><i>(Engineering analysis, investigations and assessment)</i></b></li> </ol>					

- 2.1. Able to identify various technical problems in the field of mechanical engineering
- 2.2. Able to analyze various technical problems in the field of mechanical engineering
- 2.3. Able to evaluate various technical problems in the field of mechanical engineering
3. Have a reliable ability in designing, manufacturing and operating machines. **(Engineering design)**
  - 3.1. Able to pour ideas, innovations and machine concepts into drawings, working papers, and budget plans
  - 3.2. Able to operate machinery and other engineering equipment in accordance with established standards and procedures
  - 3.3. Able to design a machine or machinery system based on appropriate scientific theory
  - 3.4. Able to realize the concept / design created into a workpiece, manufacturing process and system
4. Have a reliable ability to design, implement and evaluate the learning process in Mechanical Engineering Vocational Education. **(Education design)**
  - 4.1. Able to design curriculum and learning process in the field of mechanical engineering by considering various aspects such as psychology, socio-culture of students
  - 4.2. Able to implement, control, evaluate and improve the quality of the learning process
  - 4.3. Able to develop interesting, effective and efficient learning media
5. Having the ability to adapt and innovate to the development of science and technology and implement it into the goals of education and professional work by considering the non-technical risks that may occur. **(Engineering practice)**
  - 5.1. Able to innovate and develop technology in the field of mechanical engineering by considering social, economic and environmental aspects
  - 5.2. Able to carry out the optimization process and increase the efficiency of the machining system
  - 5.3. Implementing information technology & computers into machinery systems to improve performance
6. Have high social and managerial competence who are able to work together, communicate effectively, have an entrepreneurial spirit and character, are environmentally friendly and aware of the importance of lifelong learning. **(Transferable skills / soft skills)**
  - 6.1. Has a religious character which is implemented in all personal and professional activities
  - 6.2. Have a national spirit, social sensitivity and environmental insight
  - 6.3. Able to communicate effectively and work together in a team work

	6.4. Able to transfer science and technology to society to improve the quality of life 6.5. Has an entrepreneurial character										
<b>Subject Learning Outcomes</b>	<b>Subject Learning Outcomes (CP-MK)</b>										
	<table border="1"> <thead> <tr> <th>CPMK</th> <th>CPL</th> </tr> </thead> <tbody> <tr> <td>1. Able classify the machining process in terms of the type of chisel and the relative movement of the chisel and workpiece.</td> <td>2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2</td> </tr> <tr> <td>2. Able to calculate the basic elements of the machining process.</td> <td>2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2</td> </tr> <tr> <td>3. Able to explain the mechanism of the formation of the rattle, the components of the force and the tool cutting system to the workpiece, the life of the tool, the material of the tool.</td> <td>2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2</td> </tr> <tr> <td>4. Be able to explain how to choose a coolant.</td> <td>2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2</td> </tr> </tbody> </table>	CPMK	CPL	1. Able classify the machining process in terms of the type of chisel and the relative movement of the chisel and workpiece.	2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2	2. Able to calculate the basic elements of the machining process.	2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2	3. Able to explain the mechanism of the formation of the rattle, the components of the force and the tool cutting system to the workpiece, the life of the tool, the material of the tool.	2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2	4. Be able to explain how to choose a coolant.	2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2
	CPMK	CPL									
	1. Able classify the machining process in terms of the type of chisel and the relative movement of the chisel and workpiece.	2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2									
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4. Be able to explain how to choose a coolant.	2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 5.1, 5.2										
<b>Short course descriptions</b>	This course discusses the theory and concept of the metal cutting process using cutting tools installed on machine tools. The machining processes in machine tools include: turning, milling, shaping, planing, drilling, and grinding. Besides that, it also discusses the mechanism for the formation of the rake, the tool as a cutting tool and other important matters related to the application of tool use, such as: tool geometry, material, tool wear and coolant.										
<b>References</b>	<b>Main (RU):</b>										
	1) Taufiq Rochim, (1993). Machine Process Theory and Technology. ITB Bandung: Bandung 2) Kalpakjian Serope & Schmid Steven, (2006). Manufacturing Engineering and Technology. Prentice Hall: Singapore.										
	<b>Support (RP)</b>										
	1) Groover P. Mikell, (2010). Fundamentals of Modern Manufacturing. John Wiley & Sons: USA 2) Schey. A John, (2000). Introduction to Manufacturing Processes 3rd Edition. McGraw-Hill Companies. Singapore										
<b>Learning Media</b>	<b>Software:</b>										
	<b>Hardware:</b> Computer, LCD Projector and Whiteboard and peripherals										
<b>Team Teaching</b>											
<b>Assessment</b>	Mid-Term Exam, Final Exam, Independent & group assignments, Group presentations										
<b>Requirements Subject</b>	There is no										

## Course subjects

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
(1)	<b>CPMK-1: (CPL-1.2, 1.3)</b> Students know Machining process classification	Introduction to machining and classification of conventional and non conventional types of machining processes	Material explanation [1x75 ' Question and answer [1x10 ' Discussion [1x15 '	Make a summary and description of the material presented in the resume book	Able to explain conventional and non conventional machining types	RU-1 and RU-2
(2)	<b>CPMK-2.1: [CPL-1.1, 1.2, 5.2]</b> Students are able to explain the basic elements of the lathe process	Cutting conditions for lathes, flat lathes, tapering and facing lathes	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> <li>• Make a summary and description of the material presented in the resume book</li> <li>• Task work on questions</li> </ul>	Be able to explain the basic concepts of the basic elements of the lathe process	RU-1, and RU-2
(3)	<b>CPMK-2.2: [CPL-1.1, 1.2, 5.2]</b> Students are able to explain the basic elements of the scrap process and the gurdy process	Scrap cutting conditions and table scrap. The difference between the shaper and planer scrap machines, the conditions for cutting the drill process, the difference in the helix angle of the drill chisel.	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> <li>• Make a summary and description of the material presented in the resume book</li> <li>• Task work on questions</li> </ul>	Be able to explain the basic elements of the scrap and gurdy process	RU-1 and RU-2
(4)	<b>CPMK-2.3: [CPL-1.1, 1.2, 5.2]</b> Students are capable explain Basic elements of the freis process (milling)	Up milling mechanism, down milling mechanism and cutting conditions for the grinding process	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	<ul style="list-style-type: none"> <li>• Make a summary and description of the material presented in the</li> </ul>	Be able to explain the basic elements of the freis (milling) process.	RU-1, RU-2,

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
				resume book • Task work on questions		
(5)	<b>CPMK-3.1: [CP-1.1, 1.2, 2.1, 2.2, 2.3,5.2]</b> Students are able to explain the mechanism for forming angle	The process of forming a groove, three components of the force on the chisel	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	• Make a summary and description of the material presented in the resume book • Task work on questions	Be able to explain the increment formation mechanism	RU-1, RU-2
(6)	<b>CPMK-3.2: [CP-1.1, 1.2, 2.1, 2.2, 2.3,5.2]</b> Students are able to explain the components of the force forming a groove and define 2 cutting systems	Cutting force circle, net force, cutting system (orthogonal cutting & oblique cutting)	Material explanation [1x60 ' Question and answer [1x10 ' Work on assignments [1x30 '	• Make a summary and description of the material presented in the resume book • Task work on questions	Able to explain the components of the force forming grooves and define 2 cutting systems	RU-1, RU-2
(7)	<b>CPMK-3.3: [CP-1.1, 1.2, 2.1, 2.2, 2.3,5.2]</b> Students are able to identify chisel geometry	Field elements and chisel, lathe chisel parts, drill chisel parts, free chisel parts	Material explanation [1x70 ' Doing the assignment to resume scientific articles [1x30 '	• Make a summary and description of the material presented in the resume book • The task of making a summary of scientific articles	Be able to identify tool geometries Summary of scientific articles on gas turbines	RU-1, RU-2
(8)	<b>Mid-Semester Evaluation through Mid-Semester Examination</b>					
(9)	<b>CPMK-3.4: [CP-1.1, 1.2,</b>	Optimization of lathe	Material explanation [1x60 '	• Make a summary	Able to understand	RU-1, RU-2,

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
	<b>2.1, 2.2, 2.3,5.2]</b> Students are able to understand the concept of tool geometry optimization	chisel, optimization of chisel angle, optimization of tool angle of freis	'] Question and answer [1x10'] Work on assignments [1x30']	and description of the material presented in the resume book • Task work on questions	the concept of tool geometry optimization	RP-1
(10)	<b>CPMK-3.5: [CP-1.1, 1.2, 2.1, 2.2, 2.3,5.2]</b> Students are able to understand changes in cutting temperature and the occurrence of tool wear	Variables that affect the tool working temperature, tool wear mechanism, crater wear and edge wear	Material explanation [1x60'] Carry out the task of summarizing scientific articles [1x40']	• Make a summary and description of the material presented in the resume book • Task summarizes scientific articles related to tool wear	Able to understand changes in cutting temperature and the occurrence of tool wear	RU-1, RU-2, RP-1, RP-2
(11)	<b>CPMK-3.6: [CP-1.1, 1.2, 2.1, 2.2, 2.3,5.2]</b> Students are able to analyze the tool life in the machining process	Criteria for tool life, impact of tool wear, analysis of tool life.	Material explanation [1x70'] Question and answer [1x10'] Discussion [1x20']	• Make a summary and description of the material presented in the resume book • Task work on questions	Able to analyze tool life in the machining process	RU-1, RU-2, RP-1, RP-2
(12)	<b>CPMK-3.7: [CP-1.1, 1.2, 2.1, 2.2, 2.3,5.2]</b> Students are able to understand the type of chisel material used in the machining process	Type of chisel material, content of chisel elements.	Material explanation [1x60'] Question and answer [1x10'] Discussion [1x30']	• Make a summary and description of the material presented in the resume book	Able to understand the type of chisel material used in the machining process	RU-1, RP-1
(13)	<b>CPMK-4: [CPL-2.1, 2.2, 2.3, 5.2]</b>	Type of coolant, coolant use mechanism	Material explanation [1x60']	• Make a summary and description of	Able to understand the use of coolant	RU-1, RU-2,

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
	Students are able to understand the use of coolant in the machining process		Question and answer [1x10 '] Discussion [1x30 ']	the material presented in the resume book	in the machining process	
(14)	<b>CPMK-2.4: [CPL-21.1, 1.2, 5.2]</b> Students are able to classify the grinding process and calculate the basic elements of the grinding process	Grinding process classification, the basic elements of the grinding process, the cutting conditions of the grinding process	Group percentage [1x70 '] Question and answer [1x10 '] Discussion[1x20 ']	<ul style="list-style-type: none"> <li>• Make a summary and description of the material presented in the resume book</li> <li>• Discussion</li> </ul>	Able to classify the grinding process and calculate the basic elements of the grinding process	RU-1, RU-2, RP-2
(15)	<b>CPMK-2.5: [CPL-1.1, 1.2, 5.2]</b> Students are able to understand the specifications of grinding stones and abrasive powders	Grinding stone characteristics, grinding stone condition, abrasive powder stone specifications	Group percentage [1x80 '] Question and answer [1x10 '] Discussion[1x10 ']	<ul style="list-style-type: none"> <li>• Make a summary and description of the material presented in the resume book</li> <li>• Discussion</li> </ul>	Able to understand the specifications of grinding stones and abrasive powders	RU-1, RU-2, RP-1, RP-2
(16)	<b>Final Semester Evaluation (Evaluation which is intended to determine the final achievement of student learning outcomes)</b>					

**Note** :1 credit = (50 'TM + 60' BT + 60 'BM) / Week  
 TM = Face to Face (Lecture)  
 BT = Structured Learning.

BM = Independent Study  
 PS = Simulation Practicum (160 minutes / week)  
 PL = Laboratory Practicum (160 minutes / week)

T = Theory (aspects of science)  
 P = Practice (aspects of work skills)

### The linkage between CPMK and CPL and assessment methods

MES2.61.5104	Assessment	Weight (%)	CPL-1			CPL-2			CPL-3				CPL-4			CPL-5			CPL-6					
			1	2	3	1	2	3	1	2	3	4	1	2	3	1	2	3	1	2	3	4	5	
CPMK-1	UTS. 1	10		V	V																			
CPMK-2.2	UTS. 2	5	V	V																				
CPMK-2.1	UTS. 3.1	20	V	V																				
CPMK-2.1	UTS.3.2		V	V																				
CPMK-2.1	UTS.3.3		V	V																				
CPMK-2.1	UTS.3.4		V	V																				
CPMK-3.5	UAS. 1	7.5	V	V		V	V	V																
CPMK-3.6	UAS. 2	7.5	V	V		V	V	V																
CPMK-3.7	UAS. 3	7.5	V	V		V	V	V																
CPMK-4	UAS. 4	7.5				V	V	V																
CPMK-2.5	UAS. 5	5	V	V																				
CPMK-4	Presentation	20				V	V	V																
CPMK-3.7	Presentation	20				V	V	V																
Presence		10																						
TOTAL		100																						

### Assessment Component

Midterm exam	: 35%
Final exams	: 35%
Duty	: 20%
<u>Presence</u>	<u>: 10%</u>
Total	: 100%



### Rating level description

	<b>Excellent</b>	<b>Good</b>	<b>Satisfy</b>	<b>Fail</b>
Description	Be able to describe with <b>right</b> and <b>complete</b>	Be able to describe with <b>right</b> but <b>less complete</b>	Be able to describe but <b>unclear</b> and <b>less complete</b>	<b>Not capable</b> describe
Formulations	Able to formulate correctly and completely	Able to formulate correctly but incomplete	Able to formulate but less clear and incomplete	Not able to formulate
Calculate	Able to calculate correctly and completely	Able to calculate correctly but not complete	Able to count but less clear and incomplete	Not able to count
Analysis	Able to analyze correctly and completely	Able to analyze correctly but incomplete	Able to analyze but less clear and incomplete	Not able to analyze

### Scoring system

Score	Quality Value	Quality Score	Designation of Quality	Score	Quality Value	Quality Score	Designation of Quality
85 - 100	A	4.0	With compliments	55 - 59	C	2.0	Enough
80 - 84	A-	3.6	Very very good	50 - 54	C-	1.6	Not enough
75 - 79	B +	3.3	Very well	40 - 49	D	1.0	Less
70 - 74	B	3.0	Good	≤ 39	E	0.0	Failed
65 - 69	B-	2.6	Pretty good	-	T	-	Delayed
60 - 64	C +	2.3	More than enough				

