



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		
Technology of Materials	MES1.61.3105	Study Program Compulsory Courses / MEVE Core courses	1	2	1	1
Responsible	Hendri Nurdin, ST, MT; Andril Arafat, ST, M.Eng, Ph.D; Rodesri, ST, MT			Signature		
INFORMATION	Dean		Head of Department		Coordinator of study program	
	Dr. Fahmi Rizal, M.Pd., MT NIP. 195912041985031004		Drs. Purwantono, M.Pd NIP. 196308041986031002		Drs. Purwantono, M.Pd NIP. 196308041986031002	
Program Learning Outcomes	Study Program Program Learning Outcomes (PLO): <ol style="list-style-type: none"> 1. Possess a good ability to apply the basic science (mathematics and natural sciences) and other disciplines in profesional jobs / projects (Knowledge-understanding) <ol style="list-style-type: none"> 1.1. possess a good understanding and can apply the basic concept of mathematics to solve various technical problems 1.2. possess a good understanding and can apply basic the concept of physic to solve various technical problems 1.3. possess a good understanding and can apply basic the concept of chemistry to solve various technical problems 2. Possess a critical and creative thinking in identifying, formulating, problem solving and evaluating various problems in mechanical engineering using the most appropriate and effective scientific method (Engineering analysis, investigations and assessment): <ol style="list-style-type: none"> 2.1. problem identification skills 2.2. problem analysis skills 2.3. problem evaluation skills 3. Possess a good ability in designing, manufacturing and operating machines (Engineering design) 					

- 3.1. able to formulate ideas/concepts into a technical drawing, design and budget plans
- 3.2. able to operate various machines and other engineering equipment with the correct standard operating procedure
- 3.3. able to design a machine or machinery system based on a valid scientific theory
- 3.4. able to realize a concept/design into a prototype, manufacturing process and engineering system
- 4. Possess a good ability to design, organize and evaluate the education and learning process in *mechanical engineering vocational education. (Education design)*
 - 4.1. able to design curriculum and learning process by considering various aspects
 - 4.2. able to organize, control, evaluate and improve the quality of the learning process
 - 4.3. able to develop an interesting, effective and efficient learning medias
- 5. Possess a good ability to adapt to development in science and technology and apply it into professional jobs by considering any non-technical aspects. *(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 machines or machining system.
 - 5.3. able to improve the performance of machine/ machinery system by applying the information technology
- 6. Possess a good softskil and spirit of lifelong learning *(Transferable skill / softskill)*
 - 6.1. possess a religious character
 - 6.2. possess a spirit of nasionalisme, social sensitivity and environmental consevation orientation
 - 6.3. possess the ability to communicate effectively and work together in teamwork
 - 6.4. possess the ability to transfer science and technology to society to improve the quality of life
 - 6.5. possess a good characters of entrepreneur

Course Learning Outcomes

Course Learning Outcomes (CLO)

CLO	PLO
1. Knowing the types of engineering materials	1, .2, 1.3, 2.1, 2.2, 2.3
2. Understand the basic concepts of materials science	1, .2, 1.3, 2.1, 2.2, 2.3
3. Mastering the basic concepts of metal materials	1, .2, 1.3, 2.1, 2.2, 2.3
4. Mastering the basic concepts of ceramic materials	1, .2, 1.3, 2.1, 2.2, 2.3
5. Mastering the basic concepts of polymer materials	1, .2, 1.3, 2.1, 2.2, 2.3
6. Mastering the basic concepts of composite materials	1, .2, 1.3, 2.1, 2.2, 2.3
7. Understand the atomic element structure of the material	1, .2, 1.3, 2.1, 2.2, 2.3
8. Understand the strength, usefulness of various materials in their application	1, .2, 1.3, 2.1, 2.2, 2.3

Short course descriptions	Provide knowledge about technical materials, use of technical materials and the advantages and disadvantages of each technical material	
References	Main references (RU):	
	1. Kompster, MHA (1975). Materials for Engineers. Aylesbury: England. 2. Stewart, P. (1975). Materials and Processes Third Edition. Hedges & Bell Pty Ltd Sutton Road Maryborough: Victoria. 3. Surdia, T. (1985). Engineering Material Knowledge. PT. Pradnya Paramita: Jakarta	
	Additional references (RP)	
Learning Media	Software:	Hardware:
		Computers, whiteboards and accessories, projectors
Team Teaching		
Assessment	Assignments, Quis, UTS, UAS	
Requirements Subject	No	

COURSE SUBJECTS

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
(1)	CLO-1: (PLO-1.1., 1.2, 1.3) Students are able to explain the types of engineering materials.	-Introduction of types of materials - advantages and disadvantages of this type of material	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ']	Make a summary and description of the material presented in the resume book	Be able to explain the types of engineering materials.	RU-1, RU-2 and RU-3

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
(2)	CLO-2.1: [PLO-1.1,1.2, 1.3,] Students are able to master the basic concepts of metal materials.	Metal material <ul style="list-style-type: none"> • Ferrous metal • The advantages and disadvantages of ferrous metal • Mechanical properties of ferrous metals • Physical properties of ferrous metals • Ferro metal chemical properties 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ']	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured assignments 	Able to master the basic concept of ferrous metal	RU-1, RU-2 and RU-3
(3)	CLO-2.2: [PLO-1.1, 1.2, 1.3, 2.1, 2.2] Students are able to master the basic concepts of metal materials.	Metal material <ul style="list-style-type: none"> • Non-ferrous metal • The advantages and disadvantages of Non-ferrous metals • Mechanical properties of non-ferrous metals • Physical properties and chemical properties of non-ferrous metals 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ']	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured assignments 	Able to master non-ferrous metal basic concepts	RU-1, RU-2 and RU-3
(4)	CLO-3.1: [PLO-PLO-1.1, 1.2, 1.3, 2.1, 2.2] Students are able to master the basic concepts of ceramic materials.	Ceramic material <ul style="list-style-type: none"> • Ceramic base material • The process of forming ceramic materials • Types of ceramics and their functions. 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ']	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured 	Able to explain basic materials and ceramic formation	RU-1, RU-2 and RU-3

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
				assignments		
(5)	CLO-3.2: [PLO-PLO-1.1, 1.2, 1.3, 2.1, 2.2] Students are able to master the basic concepts of ceramic materials.	Ceramic material <ul style="list-style-type: none"> • Ceramic calcification • The advantages and disadvantages of ceramics • Ceramic applications • Properties of ceramics 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ']	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured assignments 	Able to classify ceramics, determine the use of ceramics based on the properties of ceramics	RU-1, RU-2 and RU-3
(6)	CLO-4.1: [PLO-PLO-1.1, 1.2, 1.3, 2.1, 2.2] Students are able to master the basic concepts of polymer materials.	Polymer material <ul style="list-style-type: none"> • Polymer base material • The process of forming polymeric materials • Types of polymers and their applications 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ']	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured assignments 	Able to explain basic materials and polymer formation	RU-1, RU-2 and RU-3
(7)	CLO-4.2: [PLO-PLO-1.1, 1.2, 1.3, 2.1, 2.2] Students are able to master the basic concepts of polymer materials	Polymer material <ul style="list-style-type: none"> • Polymer calibration • Polymer advantages and disadvantages • Polymer application. • Properties of polymers 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ']	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured assignments 	Able to classify polymer, determine the use of ceramics based on the properties of the polymer	RU-1, RU-2 and RU-3
(8)	CLO-5.1: [PLO-PLO-1.1, 1.2, 1.3, 2.1, 2.2] Students are able to master the basic	Composite material <ul style="list-style-type: none"> • Composite building blocks • Composite material 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ']	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the 	Able to explain basic materials and composite formation	RU-1, RU-2 and RU-3

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
	concepts of composite materials.	forming process <ul style="list-style-type: none"> • Types of composites based on fibers and their binders 		resume book. <ul style="list-style-type: none"> • Create structured assignments 		
(9)	Mid Test (UTS)					
(10)	CLO-5.2: [PLO-PLO-1.1, 1.2, 1.3, 2.1, 2.2] Students are able to master the basic concepts of composite materials.	Composite material <ul style="list-style-type: none"> • Composites with synthetic fibers • Composite with natural fibers 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ' 	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured assignments 	Able to explain the constituent elements of composites, their advantages and applications.	RU-1, RU-2 and RU-3
(11)	CLO-5.3: [PLO-PLO-1.1, 1.2, 1.3, 2.1, 2.2] Students are able to master the basic concepts of composite materials.	Composite material <ul style="list-style-type: none"> • The advantages and disadvantages of composite materials • Composite material application. 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ' 	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured assignments 	Able to explain the constituent elements of composites, their advantages and applications.	RU-1, RU-2 and RU-3
(12)	CLO-6.1: [CP- PLO-1.1, 1.2, 1.3, 2.1, 2.2] Understand the atomic and crystal structure of the elements that make up the material	Materials Engineering <ul style="list-style-type: none"> • Atomic bonds and metal structures • Crystal bonds 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ' 	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured assignments 	Be able to explain the structure of the material	RU-1, RU-2 and RU-3

Week	Expected competencies	Topics	Method and strategy for learning	Assignment	Criterion / Assessment indicator	References
(13)	CLO-6.2: [CP-PLO-1.1, 1.2, 1.3, 2.1, 2.2] Understand the atomic and crystal structure of the elements that make up the material	Materials Engineering <ul style="list-style-type: none"> • Engineering material grain structure • basic metallographics with phase diagrams, • -Heat treatment steel 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ']	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured assignments 	Be able to explain the grain structure of the material	RU-1, RU-2 and RU-3
(14)	CLO-7.1: [CP-PLO-1.1, 1.2, 1.3, 2.1, 2.2] Understand strength, usefulness of various materials in the application	Materials Engineering: <ul style="list-style-type: none"> • Engineering material characteristics. • Material strength testing 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ']	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured assignments 	Able to understand the strength of engineering materials	RU-1, RU-2 and RU-3
(15)	CLO-7.2: [CP-PLO-1.1, 1.2, 1.3, 2.1, 2.2] Understand strength, usefulness of various materials in the application	Materials Engineering: <ul style="list-style-type: none"> • Engineering material testing methods. • Physical treatment of engineering materials 	Material explanation [1x75 ' Question and answer [1x15 ' Working on structured assignments[1x50 ']	<ul style="list-style-type: none"> • Make a summary and description of the material presented in the resume book. • Create structured assignments 	Able to understand the strength of engineering materials	RU-1, RU-2 and RU-3
(16)	Final Test (UAS)					

Assessment Component

Midterm exam (UTS)	: 35%
Final exams (UAS)	: 35%
Assignment/Presentation	: 20%
<u>Presence</u>	<u>: 10%</u>
Total	: 100%

Scoring/Grading level description

	Excellent	Good	Satisfy	Fail
ability to describe	Able to describe correctly and completely	Able to describe correctly but not complete	Able to describe but less clear and incomplete	Unable to describe
ability to formulate	Able to formulate correctly and completely	Able to formulate correctly but not complete	Able to formulate but less clear and incomplete	Unable to formulate
ability to calculate	Able to calculate correctly and completely	Able to calculate correctly but not complete	Able to calculate but less clear and incomplete	Unable to calculate
ability to analyze	Able to analyze correctly and completely	Able to analyze correctly but not complete	Able to analyze but less clear and incomplete	Unable to analyze

Scoring and grading system

Score	Quality	Quality score	Designation	Score	Quality	Quality score	Designation
85 – 100	A	4.0	Outstanding	55 – 59	C	2.0	Acceptable
80 – 84	A-	3.6	Excellent	50 – 54	C-	1.6	Poor
75 – 79	B+	3.3	Very good	40 – 49	D	1.0	Poor
70 – 74	B	3.0	Good	≤ 39	E	0.0	Fail
65 – 69	B-	2.6	Good	-	T	-	Tertunda
60 – 64	C+	2.3	Acceptable				

