



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

**Document
Code**

SEMESTER LEARNING PLAN

| Courses | CODE | Course Family | Credit Weight | | | SEMESTER | Compilation Date | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|---|-----------------------------------|--------|-----------|---|-------------------------|------|-------|----|----|--------|----|----|------|----|--|--|--|--|--|------|--|---|---|---|---|---|------|---|---|---|----|----|----|------|----|----|----|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Manufacturing Process I | 2120102077 | | T=2 | P=0 | ECTS=3.18 | 3 | January 3, 2022 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AUTHORIZATION | SP Developer | | Course Cluster Coordinator | | | Study Program Coordinator | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Akhmad Hafizh Ainur Rasyid | | Akhmad Hafizh Ainur Rasyid | | | Ir. Priyo Heru Adiwibowo, S.T., M.T. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Learning model | Case Studies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Program Learning Outcomes (PLO) | PLO study program that is charged to the course | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PLO-6 | Experimentation and data analysis | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PLO-14 | Science and engineering knowledge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Program Objectives (PO) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PO - 1 | Mapu demonstrates the use of specific facts of mathematics, science, and engineering to determine cutting parameters | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PO - 2 | Able to design cutting plans | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PO - 3 | Able to evaluate cutting results and produce alternative solutions for cutting parameters | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PO - 4 | Able to apply selected techniques, skills and modern cutting tools to given situations | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PLO-PO Matrix | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>P.O</th> <th colspan="3">PLO-6</th> <th colspan="3">PLO-14</th> </tr> </thead> <tbody> <tr><td>PO-1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-2</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table> | | | | | | P.O | PLO-6 | | | PLO-14 | | | PO-1 | | | | | | | PO-2 | | | | | | | PO-3 | | | | | | | PO-4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P.O | PLO-6 | | | PLO-14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PO-1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PO-2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PO-3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PO-4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PO Matrix at the end of each learning stage (Sub-PO) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">P.O</th> <th colspan="16">Week</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th> </tr> </thead> <tbody> <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> <tr><td>PO-2</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> <tr><td>PO-3</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> <tr><td>PO-4</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> </tbody> </table> | | | | | | P.O | Week | | | | | | | | | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | PO-1 | | | | | | | | | | | | | | | | | PO-2 | | | | | | | | | | | | | | | | | PO-3 | | | | | | | | | | | | | | | | | PO-4 | | | | | | | | | | | | | | | | |
| P.O | Week | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PO-1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PO-2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PO-3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PO-4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Short Course Description | This course provides an understanding of the basic manufacturing processes including machining processes, operations and cutting tools, cutting tool technology, and non-conventional machining. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| References | Main : | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. [1] Darmodiharjo, Darmaji. 2004. Petunjuk Kerja Mesin Bubut, Sekrap, dan Frais 1. Jakarta: Dikmenjur.
2. [2] Kalpakjan, Seroke. 2003. Manufacturing Processes Engineering Materials, Fourth edition, Prentice Hall
3. [3] Krar, S.F., Amand, J.W., Oswald, J.E.St., 1996. Machine Tool Operation & , McGraw Hill, USA.
4. [4] Soetardjo. 1990. Mesin-Mesin Perkakas. Surabaya: Unipress IKIP Surabaya.
5. [5] Stephenson, David A, (2006). Metal Cutting Theory and Practice, Second edition, Taylor & Francis Group
6. [6] Suherman, Wahid. 1987. Pengetahuan Bahan. Jurusan Teknik Mesin & dash ITS
7. [7] Mikell P. Groover. 2012. Introduction to Manufacturing Processes. John Wiley & Sons, INC

Supporters:

Supporting lecturer Akhmad Hafizh Ainur Rasyid, S.T., M.T.

| 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 | Able to understand basic manufacturing processes | Accuracy explains the basis of the manufacturing process | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: introduction & overview of manufacturing References: [2] Kalpakjan, Seroke. 2003. Manufacturing Processes Engineering Materials, Fourth edition, Prentice Hall | 4% |
| 2 | What is manufacturing | 1.accuracy explains what manufacturing is 2.Accuracy of explaining industrial manufacturing & products 3.Accuracy of describing materials in manufacturing | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: Introduction and Overview of Manufacturing References: [7] Mikell P. Groover. 2012. Introduction to Manufacturing Processes. John Wiley & Sons, INC | 4% |
| 3 | What is manufacturing process | 1.accuracy of explaining what process operations are 2.accuracy explains what the assembly process is 3.accuracy in explaining production machines and chisels | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: Introduction and Overview of Manufacturing References: [7] Mikell P. Groover. 2012. Introduction to Manufacturing Processes. John Wiley & Sons, INC | 4% |
| 4 | Able to understand the theory of metal machining | Describe the definition of the theory of metal machining | Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: theory of metal machining References: [2] Kalpakjan, Seroke. 2003. Manufacturing Processes Engineering Materials, Fourth edition, Prentice Hall | 4% |

| | | | | | | | |
|----|---|---|--|---|---|--|-----|
| 5 | 1.Able to understand the cutting process 2.Able to understand the use of machine tools | 1.Identify the angles of the cutting tool. Describe the cutting process. Identify the occurrence of BUE 2.Able to determine cutting parameters | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: Machining operations & machine tools References: [2] Kalpakjan, Seroke. 2003. <i>Manufacturing Processes Engineering Materials, Fourth edition, Prentice Hall</i> | 10% |
| 6 | 1.Understand the turning process 2.Understand the cutting process similar to the turning process | 1.Able to explain the turning process 2.Able to explain the cutting process, similar to the turning process | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities, Portfolio Assessment | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: Machining operations & machine tools References: [7] Mikell P. Groover. 2012. <i>Introduction to Manufacturing Processes. John Wiley & Sons, INC</i> | 10% |
| 7 | 1.Understand the drilling process 2.Understand the cutting process similar to the drilling process | 1.Able to explain the drilling process 2.Able to explain the cutting process, similar to the drilling process | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities, Portfolio Assessment | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: Machining operations & machine tools References: [7] Mikell P. Groover. 2012. <i>Introduction to Manufacturing Processes. John Wiley & Sons, INC</i> | 10% |
| 8 | Sub Summative Exam | able to solve USS problems | Criteria: Complete the questions according to the assessment rubric Form of Assessment : Test | solve the USS 2 X 50 problem | solve the USS 2 X 50 problem | Material: all material References: [7] Mikell P. Groover. 2012. <i>Introduction to Manufacturing Processes. John Wiley & Sons, INC</i> | 5% |
| 9 | Able to understand the milling process | able to explain the milling process | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities, Portfolio Assessment | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: Machining operations & machine tools References: [7] Mikell P. Groover. 2012. <i>Introduction to Manufacturing Processes. John Wiley & Sons, INC</i> | 10% |
| 10 | Able to understand cutting tool technology | defines the technology used in cutting tools | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities, Portfolio Assessment | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: cutting tool technology References: [2] Kalpakjan, Seroke. 2003. <i>Manufacturing Processes Engineering Materials, Fourth edition, Prentice Hall</i> | 8% |

| | | | | | | | |
|----|---|--|--|--|--|--|-----|
| 11 | Able to understand non-conventional machining | Define unconventional machining | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities, Portfolio Assessment | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: non-conventional machining References: [2] Kalpakjan, Seroke. 2003. <i>Manufacturing Processes Engineering Materials, Fourth edition, Prentice Hall</i> | 10% |
| 12 | Able to understand non-conventional machining (Mechanical energy processes) | 1. Define ultrasonic machining 2. Define the water jet cutting process 3. Defining abrasive processes | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: Non traditional machining Reference: [7] Mikell P. Groover. 2012. <i>Introduction to Manufacturing Processes. John Wiley & Sons, INC</i> | 4% |
| 13 | Able to understand non-conventional machining (Electrochemical machining process) | 1. Define electrochemical machining 2. Define electrochemical deburring 3. Define electrochemical grinding | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: Non traditional machining Reference: [7] Mikell P. Groover. 2012. <i>Introduction to Manufacturing Processes. John Wiley & Sons, INC</i> | 4% |
| 14 | Able to understand non-conventional machining (Thermal energy process) | 1. Defining electric discharge processes 2. Define electron beam machining 3. Define laser beam machining | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: non-traditional machining Reference: [7] Mikell P. Groover. 2012. <i>Introduction to Manufacturing Processes. John Wiley & Sons, INC</i> | 4% |
| 15 | Able to understand non-conventional machining (Chemical Machining) | 1. Define mechanics & chemistry of chemical machining 2. Defines CHM processes | Criteria: Explain according to the observation rubric Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Lectures, discussions, questions and answers, exercises and assignments 2 X 50 | Material: non-traditional machining Reference: [7] Mikell P. Groover. 2012. <i>Introduction to Manufacturing Processes. John Wiley & Sons, INC</i> | 4% |
| 16 | Summative Exam | able to solve our problems | Criteria: Complete the questions according to the assessment rubric Form of Assessment : Test | Solve the US 2 X 50 problem | Solve the US 2 X 50 problem | Material: all material References: [7] Mikell P. Groover. 2012. <i>Introduction to Manufacturing Processes. John Wiley & Sons, INC</i> | 5% |

Evaluation Percentage Recap: Case Study

| No | Evaluation | Percentage |
|----|--------------------------|------------|
| 1. | Participatory Activities | 66% |
| 2. | Portfolio Assessment | 24% |
| 3. | Test | 10% |
| | | 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** ability in the process and student learning outcomes are specific and measurable statements that identify the ability 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.