| | Universitas Negeri Surabaya<br>Faculty of Mathematics and Natural Sciences<br>Physics Education Undergraduate Study Program | Document Code |
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# SEMESTER LEARNING PLAN

| Courses | CODE | Course Family | Credit Weight | | | SEMESTER | Compilation Date |
|---|---|---|---|---|---|---|---|
| Basic Electronics II | 8420303051 | Compulsory Study Program Subjects | T=2 | P=1 | ECTS=4.77 | 4 | March 31, 2024 |

| AUTHORIZATION | SP Developer | Course Cluster Coordinator | Study Program Coordinator |
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| | Endah Rahmawati, S.T., M.Si. | Drs. Imam Sucahyo, M.Si. | Mita Anggaryani, M.Pd., Ph.D. |

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| **Learning model** | **Project Based Learning** | |
| **Program Learning Outcomes (PLO)** | **PLO study program which is charged to the course** | |
| | **PLO-3** | Develop logical, critical, systematic and creative thinking in carrying out specific work in their field of expertise and in accordance with work competency standards in the field concerned |
| | **PLO-4** | Develop yourself continuously and collaborate. |
| | **Program Objectives (PO)** | |
| | **PO - 1** | Students are able to explain the working principles and applications of Bipolar Junction Transistor (BJT), Junction Field Effect Transistor (JFET), amplifier circuits, power amplifier circuits, amplifier circuits with feedback, Operational-Amplifier (op-amp), oscillator circuits and basic electronics digital. |
| | **PO - 2** | Able to apply the correct Basic Electronics 2 concepts to obtain solutions to quantitative problems in physics. |
| | **PO - 3** | Able to carry out Basic Electronics 2 practicum activities by applying scientific methods |
| | **PO - 4** | Able to communicate the concepts and application of Basic Electronics 2 effectively during the learning process |
| | **PO - 5** | Able to work independently effectively and collaborate in groups on lecture and practicum assignments |
| | **PO - 6** | Able to demonstrate a scientific attitude and critical thinking in solving problems faced both academically and socially |
| | **PLO-PO Matrix** | |

| P.O | PLO-3 | PLO-4 |
|---|---|---|
| PO-1 | | |
| PO-2 | | |
| PO-3 | | |
| PO-4 | | |
| PO-5 | | |
| PO-6 | | |

**PO Matrix at the end of each learning stage (Sub-PO)**

| 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 | | | | | | | | | | | | | | | | |
| PO-5 | | | | | | | | | | | | | | | | |
| PO-6 | | | | | | | | | | | | | | | | |

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| **Short Course Description** | The Basic Electronics 2 course covers the working principles and application of BJT transistors, JFET field effect transistors, op-amp characteristics and circuits, and basic digital electronics material. | |
| **References** | **Main :** | |

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| | 1. Sutrisno. 1978. Elektronika 2. Teori dan Penerapannya . Penerbit ITB Bandung.<br>2. Rahmawati, E., Sucahyo, I., dan Kholiq, A. 2017. Hand out Elektronika Dasar 2 .<br>3. Rahmawati, E., Sucahyo, I., dan Kholiq, A. 2017. Panduan Praktikum Elektronika Dasar 2.<br>4. Tooley, M. 2006. Electronics Circuit: Fundamentals and Applications . Third Edition. Elesevier Ltd.<br>5. Boylestad, R., and Nashelsky, L. Electronics Devices and Circuits: Theory . Seventh Edition. Prentice Hall. |
| | **Supporters:** |
| | 1. Floyd, T. L. 2012. Electronics Devices . Prentice Hall. |
| **Supporting lecturer** | Drs. Imam Sucahyo, M.Si.<br>Dzulkiflih, S.Si., M.T.<br>Abd. Kholiq, S.Pd., M.T.<br>Endah Rahmawati, S.T., M.Si.<br>Meta Yantidewi, S.Si., M.Si. |

| 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 | 1.Able to master the working principles of BJT transistors<br>2.Able to apply BJT transistors as amplifiers.<br>3.Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning | 1.Identify problem cases<br>2.Identify the concept/working principle of the BJT transistor and relate it to the problem case.<br>3.Analyze the problem and apply BJT transistor to solve the problem | **Criteria:**<br>Complete assignments completely<br><br>**Form of Assessment** :<br>Participatory Activities | Form: Classical classroom<br>Method: Case study<br>Student assignment: Determine an amplifier circuit with a certain gain value. Case study. If a circuit requires 10 times amplification, what will the circuit be like and how to determine the value of each component.<br>3 x 50 minutes | | **Material:**<br>Bipolar Junction Transistor, Amplifier Circuit<br>**Library:**<br>*Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:**<br>Bipolar Junction Transistor, Amplifier Circuit<br>**Reference:**<br>*Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:**<br>Bipolar Junction Transistor, Amplifier Circuit<br>**Library:**<br>*Tooley, M. 2006. Electronics Circuit: Fundamentals and Applications. Third Edition. Elesevier Ltd.*<br><br>**Material:**<br>Bipolar Junction Transistor, Amplifier Circuit<br>**Library:**<br>*Boylestad, R., and Nashelsky, L. Electronics Devices and Circuits: Theory. Seventh Edition. Prentice Hall.* | 4% |

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| **2** | 1. Able to master the working principles of BJT transistors<br>2. Able to apply BJT transistors as amplifiers.<br>3. Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning | 1. Identify problem cases<br>2. Identify the concept/working principle of the BJT transistor and relate it to the problem case.<br>3. Analyze the problem and apply BJT transistor to solve the problem | **Criteria:**<br>Complete assignments completely<br><br>**Form of Assessment** :<br>Participatory Activities | Form: Classical classroom<br>Method: Case study<br>Student assignment: Determine an amplifier circuit with a certain gain value. Case study. If a circuit requires 10 times amplification, what will the circuit be like and how to determine the value of each component.<br>3 x 50 minutes | | **Material:**<br>Bipolar Junction Transistor, Amplifier Circuit<br>**Library:**<br>*Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:**<br>Bipolar Junction Transistor, Amplifier Circuit<br>**Reference:**<br>*Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:**<br>Bipolar Junction Transistor, Amplifier Circuit<br>**Library:**<br>*Tooley, M. 2006. Electronics Circuit: Fundamentals and Applications. Third Edition. Elesevier Ltd.*<br><br>**Material:**<br>Bipolar Junction Transistor, Amplifier Circuit<br>**Library:**<br>*Boylestad, R., and Nashelsky, L. Electronics Devices and Circuits: Theory. Seventh Edition. Prentice Hall.* | 4% |

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| **3** | 1. Able to understand and master the working principles of class A power amplifiers, class B power amplifiers and class C power amplifiers and their applications.<br>2. Able to apply the correct working principles of power amplifiers to obtain solutions to contextual problems.<br>3. Able to carry out practical activities in accordance with systematic procedures or procedures to solve problems that involve careful observation and measurement as well as scientific hypotheses.<br>4. Able to work independently effectively or collaborate in group lecture assignments in the Basic Electronics 2 course.<br>5. Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning and/or research. | 1. Identify problem cases<br>2. Identify the concepts of class A, B and C power amplifiers and relate them to problem cases<br>3. Analyze problems and apply class A, B and C power amplifier concepts to solve problems | **Criteria:**<br>1. Complete assignments completely<br>2. Carrying out a complete series of practicums (pre-lab, data collection, reports).<br><br>**Form of Assessment** : Participatory Activities, Practice/Performance | Form: Classical classroom<br>Method: Case study and practicum (class A power amplifier)<br>3 x 50 minutes | | **Material:** Power amplifier<br>**Reference:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:** Power amplifier<br>**Reference:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:** Power amplifier<br>**Reference:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practical Guide 2.*<br><br>**Material:** Power amplifier<br>**Reference:** *Tooley, M. 2006. Electronics Circuit: Fundamentals and Applications. Third Edition. Elesevier Ltd.* | 5% |

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| **4** | 1. Able to understand and master the working principles of class A power amplifiers, class B power amplifiers and class C power amplifiers and their applications.<br>2. Able to apply the correct working principles of power amplifiers to obtain solutions to contextual problems.<br>3. Able to carry out practical activities in accordance with systematic procedures or procedures to solve problems that involve careful observation and measurement as well as scientific hypotheses.<br>4. Able to work independently effectively or collaborate in group lecture assignments in the Basic Electronics 2 course.<br>5. Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning and/or research. | 1. Identify problem cases<br>2. Identify the concept of feedback loops (positive and negative) and relate them to problem cases<br>3. Analyze problems with mathematical formulas and apply them | **Criteria:**<br>1. Complete assignments completely<br>2. Carrying out a complete series of practicums (pre-lab, data collection, reports).<br><br>**Forms of Assessment** :<br>Participatory Activities, Practical Assessment, Practical / Performance | Form: Classical classroom<br>Method: Case study and practicum (reinforcement with negative feedback)<br>3 x 50 minutes | | **Material:** Power amplifier<br>**Reference:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:** Power amplifier<br>**Reference:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:** Power amplifier<br>**Reference:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practical Guide 2.*<br><br>**Material:** Power amplifier<br>**Reference:** *Tooley, M. 2006. Electronics Circuit: Fundamentals and Applications. Third Edition. Elesevier Ltd.* | 6% |

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| **5** | 1..Able to understand and master the basics of feedback circuits (positive and negative)<br>2.Able to apply the basics of feedback circuits appropriately to obtain solutions to contextual problems.<br>3.Able to carry out practical activities in accordance with systematic procedures or procedures to solve problems that involve careful observation and measurement as well as scientific hypotheses<br>4.Able to work independently effectively and collaborate in group lecture assignments in the Basic Electronics 2 course<br>5.Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning | 1.Identify problem cases<br>2.Identify the concept of feedback loops (positive and negative) and relate them to problem cases<br>3.Analyze problems with mathematical formulas and apply them | **Criteria:**<br>1.Complete assignments completely<br>2.Carrying out a complete series of practicums (pre-lab, data collection, reports).<br><br>**Forms of Assessment** :<br>Participatory Activities, Portfolio Assessment, Practical Assessment, Practical / Performance | Form: Classical classroom<br>Method: Case study and practicum (reinforcement with negative feedback)<br>(3 x 50 minutes) | | **Material:** Power amplifier<br>**Reference:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:** Power amplifier<br>**Reference:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:** Power amplifier<br>**Reference:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practical Guide 2.*<br><br>**Material:** Power amplifier<br>**Reference:** *Tooley, M. 2006. Electronics Circuit: Fundamentals and Applications. Third Edition. Elesevier Ltd.* | 6% |

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| **6** | 1. Able to master the working principles of JFET and its application<br>2. Able to apply JFET working principles correctly to obtain solutions to contextual problems.<br>3. Able to work independently effectively or collaborate in lecture assignment groups in the Basic Electronics 2 course. | 1. Identify problem cases<br>2. Identify the concept/principle of JFET work and relate it to the problem case<br>3. Analyze problems with mathematical formulas and apply them | **Criteria:**<br>Complete assignments completely<br><br>**Forms of Assessment** :<br>Participatory Activities, Practical Assessment, Practical / Performance | Form: Classical classroom<br>Method: Case study and practicum (JFET reinforcement)<br>(3 x 50 minutes) | | **Material:** (JFET, JFET Amplifier)<br>**Library:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:** (JFET, JFET Amplifier)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:** (JFET, JFET Amplifier)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practical Guide 2.*<br><br>**Material:** (JFET, JFET Amplifier)<br>**References:** *Tooley, M. 2006. Electronics Circuit: Fundamentals and Applications. Third Edition. Elesevier Ltd.* | 6% |

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| **7** | 1. Able to master the working principles of JFET and its application<br>2. Able to apply JFET working principles correctly to obtain solutions to contextual problems.<br>3. Able to work independently effectively or collaborate in lecture assignment groups in the Basic Electronics 2 course. | 1. Identify problem cases<br>2. Identify the concept/principle of JFET work and relate it to the problem case<br>3. Analyze problems with mathematical formulas and apply them | **Criteria:**<br>Complete assignments completely<br><br>**Forms of Assessment** :<br>Participatory Activities, Practical Assessment, Practical / Performance | Form: Classical classroom Method: Case study and practicum (JFET reinforcement) (3 x 50 minutes) | | **Material:** (JFET, JFET Amplifier)<br>**Library:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:** (JFET, JFET Amplifier)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:** (JFET, JFET Amplifier)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practical Guide 2.*<br><br>**Material:** (JFET, JFET Amplifier)<br>**References:** *Tooley, M. 2006. Electronics Circuit: Fundamentals and Applications. Third Edition. Elesevier Ltd.* | 6% |
| **8** | Midterm Evaluation | | **Criteria:**<br>Complete the test well and correctly<br><br>**Form of Assessment** :<br>Portfolio Assessment, Test | Form: Written test with material from meetings 1-7 (2 x 50 minutes) | | | 10% |

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| **9** | 1. Mastering the working principles, characteristics and application of Op-Amp<br>2. Able to apply opamps in circuits appropriately to get solutions to contextual problems.<br>3. Able to carry out practical activities in accordance with systematic procedures or procedures to solve problems that involve careful observation and measurement<br>4. Able to work independently effectively or collaborate in lecture assignment groups in the Basic Electronics 2 course<br>5. Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning | 1. Identify problem cases<br>2. Identify the concept/working principle, characteristics and application of Op-Amp and relate it to the problem case<br>3. Analyze problems with mathematical formulas and apply them | **Criteria:**<br>1. Complete assignments completely<br>2. Carrying out a complete series of practicums (pre-lab, data collection, reports).<br><br>**Form of Assessment** : Participatory Activities, Practice/Performance | Form: Classical classroom Method: Case study and practicum (application of Op-Amps for inverting and non-inverting amplifiers) (3 x 50 minutes) | | **Material:** (Op- Amp) **Library:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:** (Op- Amp) **References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:** (Op- Amp) **References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practical Guide 2.*<br><br>**Material:** (Op-Amp) **References:** *Tooley, M. 2006. Electronics Circuits: Fundamentals and Applications. Third Edition. Elesevier Ltd.*<br><br>**Material:** (Op- Amp) **References:** *Boylestad, R., and Nashelsky, L. Electronics Devices and Circuits: Theory . Seventh Edition. Prentice Hall.* | 6% |

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| **10** | 1. Mastering the working principles, characteristics and application of Op-Amp<br>2. Able to apply opamps in circuits appropriately to get solutions to contextual problems.<br>3. Able to carry out practical activities in accordance with systematic procedures or procedures to solve problems that involve careful observation and measurement<br>4. Able to work independently effectively or collaborate in lecture assignment groups in the Basic Electronics 2 course<br>5. Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning | 1. Identify problem cases<br>2. Identify the concept/working principle, characteristics and application of Op-Amp and relate it to the problem case<br>3. Analyze problems with mathematical formulas and apply them | **Criteria:**<br>1. Complete assignments completely<br>2. Carrying out a complete series of practicums (pre-lab, data collection, reports).<br><br>**Forms of Assessment** :<br>Participatory Activities, Portfolio Assessment, Practice / Performance | Form: Classical classroom<br>Method: Case study and practicum (application of Op-Amps for inverting and non-inverting amplifiers)<br>(3 x 50 minutes) | | **Material:** (Op- Amp)<br>**Library:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:** (Op- Amp)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:** (Op- Amp)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practical Guide 2.*<br><br>**Material:** (Op-Amp)<br>**References:** *Tooley, M. 2006. Electronics Circuits: Fundamentals and Applications. Third Edition. Elesevier Ltd.*<br><br>**Material:** (Op- Amp)<br>**References:** *Boylestad, R., and Nashelsky, L. Electronics Devices and Circuits: Theory . Seventh Edition. Prentice Hall.* | 8% |

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| **11** | 1. Mastering the working principles, characteristics and application of Op-Amp<br>2. Able to apply opamps in circuits appropriately to get solutions to contextual problems.<br>3. Able to carry out practical activities in accordance with systematic procedures or procedures to solve problems that involve careful observation and measurement<br>4. Able to work independently effectively or collaborate in lecture assignment groups in the Basic Electronics 2 course<br>5. Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning | 1. Identify problem cases<br>2. Identify the concept/working principle, characteristics and application of Op-Amp and relate it to the problem case<br>3. Analyze problems with mathematical formulas and apply them | **Criteria:**<br>1. Complete assignments completely<br>2. Carrying out a complete series of practicums (pre-lab, data collection, reports).<br><br>**Forms of Assessment** :<br>Participatory Activities, Portfolio Assessment, Practice / Performance | Form: Classical classroom<br>Method: Case study and practicum (application of Op-Amps for inverting and non-inverting amplifiers)<br>(3 x 50 minutes) | | **Material:** (Op- Amp)<br>**Library:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:** (Op- Amp)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:** (Op- Amp)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practical Guide 2.*<br><br>**Material:** (Op-Amp)<br>**References:** *Tooley, M. 2006. Electronics Circuits: Fundamentals and Applications. Third Edition. Elesevier Ltd.*<br><br>**Material:** (Op- Amp)<br>**References:** *Boylestad, R., and Nashelsky, L. Electronics Devices and Circuits: Theory . Seventh Edition. Prentice Hall.* | 8% |

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| **12** | 1. Able to master the working principles of several oscillator circuits (RC, LC, crystal)<br>2. Able to apply the concept of oscillator circuits correctly to obtain solutions to contextual problems.<br>3. Able to carry out practical activities in accordance with systematic procedures or procedures to solve problems that involve careful observation and measurement as well as scientific hypotheses<br>4. Able to work independently effectively or collaborate in lecture assignment groups in the Basic Electronics 2 course<br>5. Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning and/or research | 1. Identify problem cases<br>2. Identify the concept/working principle of several oscillator circuits (RC, LC, crystal) and relate them to problem cases<br>3. Analyze problems with mathematical formulas and apply them | **Criteria:**<br>1. Complete assignments completely<br>2. Carrying out a complete series of practicums (pre-lab, data collection, reports).<br><br>**Form of Assessment** : Participatory Activities, Practical Assessment | Form: Classical classroom Method: Case study and practicum (Wien bridge RC oscillator) (3 x 50 minutes) | | **Material:** (Oscillator) **Library:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:** (Oscillator) **References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:** (Oscillator) **References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practical Guide 2.*<br><br>**Material:** (Oscillators) **References:** *Tooley, M. 2006. Electronics Circuits: Fundamentals and Applications. Third Edition. Elesevier Ltd.*<br><br>**Material:** (Oscillators) **References:** *Boylestad, R., and Nashelsky, L. Electronics Devices and Circuits: Theory . Seventh Edition. Prentice Hall.* | 6% |

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| **13** | 1. Students can understand the basics of digital electronics (number conversion, logic gates, binary code decimal (BCD).<br>2. Able to apply digital electronics concepts appropriately to obtain solutions to contextual problems<br>3. Able to carry out practical activities in accordance with systematic procedures or procedures to solve problems that involve careful observation and measurement as well as scientific hypotheses<br>4. Able to work independently effectively and collaborate in group lecture assignments in the Basic Electronics 2 course<br>5. Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning and/or research | 1. Identify problem cases<br>2. Identify the basic concepts of digital electronics and relate them to problem cases<br>3. Analyze problems with mathematical formulas and apply them | **Criteria:**<br>1. Complete assignments completely<br>2. Carrying out a complete series of practicums (pre-lab, data collection, reports).<br><br>**Form of Assessment** : Participatory Activities, Practical Assessment | Form: Classical classroom<br>Method: Case study and practicum (digital electronics)<br>(3 x 50 minutes) | | **Material:** (digital electronics)<br>**Library:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:** (digital electronics)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:** (digital electronics)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practicum Guide 2.*<br><br>**Material:** (digital electronics)<br>**References:** *Tooley, M. 2006. Electronics Circuits: Fundamentals and Applications. Third Edition. Elesevier Ltd.* | 0% |

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| **14** | 1. Students can understand the basics of digital electronics (number conversion, logic gates, binary code decimal (BCD).<br>2. Able to apply digital electronics concepts appropriately to obtain solutions to contextual problems<br>3. Able to carry out practical activities in accordance with systematic procedures or procedures to solve problems that involve careful observation and measurement as well as scientific hypotheses<br>4. Able to work independently effectively and collaborate in group lecture assignments in the Basic Electronics 2 course<br>5. Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning and/or research | 1. Identify problem cases<br>2. Identify the basic concepts of digital electronics and relate them to problem cases<br>3. Analyze problems with mathematical formulas and apply them | **Criteria:**<br>1. Complete assignments completely<br>2. Carrying out a complete series of practicums (pre-lab, data collection, reports). | Form: Classical classroom<br>Method: Case study and practicum (digital electronics)<br>(3 x 50 minutes) | | **Material:** (digital electronics)<br>**Library:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br><br>**Material:** (digital electronics)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br><br>**Material:** (digital electronics)<br>**References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practicum Guide 2.*<br><br>**Material:** (digital electronics)<br>**References:** *Tooley, M. 2006. Electronics Circuits: Fundamentals and Applications. Third Edition. Elesevier Ltd.* | 0% |

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| **15** | 1. Students can understand the basics of digital electronics (number conversion, logic gates, binary code decimal (BCD).<br>2. Able to apply digital electronics concepts appropriately to obtain solutions to contextual problems<br>3. Able to carry out practical activities in accordance with systematic procedures or procedures to solve problems that involve careful observation and measurement as well as scientific hypotheses<br>4. Able to work independently effectively and collaborate in group lecture assignments in the Basic Electronics 2 course<br>5. Able to analyze data with precise explanations, and conclusions based on data and guided/independent analysis for learning and/or research | 1. Identify problem cases<br>2. Identify the basic concepts of digital electronics and relate them to problem cases<br>3. Analyze problems with mathematical formulas and apply them | **Criteria:**<br>1. Complete assignments completely<br>2. Carrying out a complete series of practicums (pre-lab, data collection, reports). | Form: Classical classroom Method: Case study and practicum (digital electronics) (3 x 50 minutes) | | **Material:** (digital electronics) **Library:** *Sutrisno. 1978. Electronics 2. Theory and Application. ITB Bandung Publisher.*<br>**Material:** (digital electronics) **References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Hand out 2.*<br>**Material:** (digital electronics) **References:** *Rahmawati, E., Sucahyo, I., and Kholiq, A. 2017. Basic Electronics Practicum Guide 2.*<br>**Material:** (digital electronics) **References:** *Tooley, M. 2006. Electronics Circuits: Fundamentals and Applications. Third Edition. Elesevier Ltd.* | 0% |
| **16** | End of Semester Evaluation | | **Criteria:**<br>Complete the test well and correctly<br>**Form of Assessment** : Portfolio Assessment, Test | Form: Written test with meeting material 9-15 (2 x 50 minutes) | | | 13% |

**Evaluation Percentage Recap: Project Based Learning**

| No | Evaluation | Percentage |
|---|---|---|
| 1. | Participatory Activities | 29.34% |
| 2. | Portfolio Assessment | 18.34% |
| 3. | Practical Assessment | 10.5% |
| 4. | Practice / Performance | 18.34% |
| 5. | Test | 11.5% |
| | | 88.02% |

**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.