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

| Courses | CODE | Course Family | Credit Weight | | | SEMESTER | Compilation Date |
|---|---|---|---|---|---|---|---|
| Science Mathematics | 8420103087 | | T=3 | P=0 | ECTS=4.77 | 2 | July 18, 2024 |

| AUTHORIZATION | SP Developer | Course Cluster Coordinator | Study Program Coordinator |
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| | ..... | ..... | Prof. Dr. Erman, M.Pd. |

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| **Learning model** | **Case Studies** |
| **Program Learning Outcomes (PLO)** | **PLO study program that is charged to the course** |
| | **Program Objectives (PO)** |
| | **PLO-PO Matrix** |

| | P.O |
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**PO Matrix at the end of each learning stage (Sub-PO)**

| P.O | Week | | | | | | | | | | | | | | | |
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| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

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| **Short Course Description** | This course discusses the understanding and application of basic mathematical concepts in the field of science, especially the application of mathematical models (vectors, matrices, differentials, integrals and differential equations) in science and determining solutions analytically to support the development of science competencies and their applications. Learning is carried out using Socratic question and answer strategies, case analysis. |
| **References** | **Main :** |


1. Boas.Mery L. 2005.Mathematical Methods in the Physical Sciences.Third Edition.
2. Roswati Mudjiarto, dkk. 2004. Matematika Fisika I. Universitas Pendidikan Indonesia. Bandung.
3. Kreyszig, E. 1995.Advanced Engineering Mathematics.John Wiley & Sons.
4. Strauss. W.A. 1992.Partial Differential Equations.John Wiley & Sons.
5. Allonso, M. and Finn, D.J. 1993. Fundamental University Fisic, Vol I, Edisons Wesley Pub.Co..
6. Sahara Muslim. 2004. Gelombang dan Optik. Jakarta : Depdikbud Dikti.
7. Sahara Muslim. 2004. Gelombang dan Optik. Jakarta : Depdikbud Dikti
8. Wospakrik,H.J.(1993).Dasar-Dasar Matematika untuk Fisika,DirjenDikti, Depdiknas, Jakarta.


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| | **Supporters:** |
| **Supporting lecturer** | Dr. Mohammad Budiyanto, S.Pd., M.Pd.<br>Tutut Nurita, S.Pd., M.Pd.<br>Muhamad Arif Mahdiannur, 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 (%) |
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| | | Indicator | Criteria & Form | Offline ( *offline* ) | Online ( *online* ) | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |

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| **1** | Apply the concept of vectors and their properties to several scientific phenomena. | 1. Identify the properties of vector operations.<br>2. Apply vector concepts by using the operations of addition, subtraction and multiplication of vectors to problems related to scientific phenomena.<br>3. Complete science problem solving using vector operations. Can use ICT to find solutions to science problems that use vector solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |
| **2** | Apply the concept of vectors and their properties to several scientific phenomena. | 1. Identify the properties of vector operations.<br>2. Apply vector concepts by using the operations of addition, subtraction and multiplication of vectors to problems related to scientific phenomena.<br>3. Complete science problem solving using vector operations. Can use ICT to find solutions to science problems using solutions | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |

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| **3** | Applying the concept of matrices and their properties to several scientific phenomena. | 1. Identify the properties of matrix operations.<br>2. Applying matrix concepts using addition, subtraction, multiplication and matrix determinant operations to problems related to scientific phenomena.<br>3. Complete science problem solving using the matrix method via reduction, Cramer and Inverse methods. Can use ICT to find solutions to science problems using matrix solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |
| **4** | Applying the concept of matrices and their properties to several scientific phenomena. | 1. Identify the properties of matrix operations.<br>2. Apply matrix concepts by using addition, subtraction, multiplication and matrix determinant operations to problems related to scientific phenomena.<br>3. Completing scientific problem solving using the matrix method via reduction, Cramer, and Inverse methods.<br>4. Can use ICT to find solutions to science problems using matrix solutions | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |

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| **5** | Applying the concept of matrices and their properties to several scientific phenomena. | 1. Identify the properties of matrix operations.<br>2. Apply matrix concepts by using addition, subtraction, multiplication and matrix determinant operations to problems related to scientific phenomena.<br>3. Completing scientific problem solving using the matrix method via reduction, Cramer, and Inverse methods.<br>4. Can use ICT to find solutions to science problems using matrix solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |
| **6** | Applying differential/derivative concepts and their properties to several scientific phenomena. | 1. Explain the differential form of various forms of function.<br>2. Applying differential concepts using certain functions to problems related to scientific phenomena.<br>3. Complete science problem solving using differentials.<br>4. Can use ICT to find solutions to science problems that use differential solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |

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| **7** | Applying differential/derivative concepts and their properties to several scientific phenomena. | 1. Explain the differential form of various forms of function.<br>2. Applying differential concepts using certain functions to problems related to scientific phenomena.<br>3. Complete science problem solving using differentials. Can use ICT to find solutions to science problems that use differential solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |
| **8** | Applying the concept of vectors and their properties to several scientific phenomena. Applying the concept of matrices and their properties to several scientific phenomena. Applying differential/derivative concepts and their properties to several scientific phenomena. | Study material indicators (vector, matrix, differential) | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Midterm Exam (UTS) 3 X 50 | | | 0% |
| **9** | Applying the concept of antiderivative/integral and its properties to several scientific phenomena. | 1. Explain the integral form of various forms of functions.<br>2. Apply integral concepts by using certain functions to problems related to scientific phenomena.<br>3. Complete scientific problem solving using integrals.<br>4. Can use ICT to find solutions to science problems that use integral solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |

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| **10** | Applying the concept of antiderivative/integral and its properties to several scientific phenomena. | 1. Explain the integral form of various forms of functions.<br>2. Apply integral concepts by using certain functions to problems related to scientific phenomena.<br>3. Complete scientific problem solving using integrals.<br>4. Can use ICT to find solutions to science problems that use integral solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |
| **11** | Applying the concept of antiderivative/integral and its properties to several scientific phenomena. | 1. Explain the integral form of various forms of functions.<br>2. Apply integral concepts by using certain functions to problems related to scientific phenomena.<br>3. Complete scientific problem solving using integrals.<br>4. Can use ICT to find solutions to science problems that use integral solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |

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| **12** | Applying the concept of differential equations and their solutions to several scientific phenomena. | 1. Explain the form of differential equations from various functional forms.<br>2. Explain the form of ordinary differential equations (PDB) of various functional forms by means of general and special solutions.<br>3. Applying the concept of ordinary differential equations using certain functions to problems related to scientific phenomena.<br>4. Complete scientific problem solving using GDP.<br>5. Can use ICT to find solutions to science problems using GDP solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |

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| **13** | Applying the concept of differential equations and their solutions to several scientific phenomena. | 1. Explain the form of differential equations from various functional forms.<br>2. Explain the form of ordinary differential equations (PDB) of various functional forms by means of general and special solutions.<br>3. Applying the concept of ordinary differential equations using certain functions to problems related to scientific phenomena.<br>4. Complete scientific problem solving using GDP.<br>5. Can use ICT to find solutions to science problems using GDP solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |

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| **14** | Applying the concept of differential equations and their solutions to several scientific phenomena. | 1. Explain the form of differential equations from various functional forms.<br>2. Explain the form of ordinary differential equations (PDB) of various functional forms by means of general and special solutions.<br>3. Applying the concept of ordinary differential equations using certain functions to problems related to scientific phenomena.<br>4. Complete scientific problem solving using GDP.<br>5. Can use ICT to find solutions to science problems using GDP solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |

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| **15** | Applying the concept of differential equations and their solutions to several scientific phenomena. | 1. Explain the form of differential equations from various functional forms.<br>2. Explain the form of ordinary differential equations (PDB) of various functional forms by means of general and special solutions.<br>3. Applying the concept of ordinary differential equations using certain functions to problems related to scientific phenomena.<br>4. Complete scientific problem solving using GDP.<br>5. Can use ICT to find solutions to science problems using GDP solutions. | **Criteria:**<br>1. 4: correct description<br>2. 3: the description is generally correct, there is one aspect where the explanation is incorrect<br>3. 2: the description is generally correct, there is more than one aspect where the explanation is incorrect<br>4. 1: the description is wrong | Student-centered learning approach (student-centered learning) Deductive learning method Strategy Lectures, discussions and presentations 3 X 50 | | | 0% |
| **16** | | | | | | | 0% |

**Evaluation Percentage Recap: Case Study**

| No | Evaluation | Percentage |
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| | | 0% |

**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.