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

| Courses | CODE | Course Family | Credit Weight | | | SEMESTER | Compilation Date |
|---|---|---|---|---|---|---|---|
| Molecular Biology | 8420502050 | | T=2 | P=0 | ECTS=3.18 | 5 | July 17, 2024 |

| AUTHORIZATION | SP Developer | Course Cluster Coordinator | Study Program Coordinator |
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| | ..... | ..... | Dr. Rinie Pratiwi Puspitawati, M.Si. |

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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 studies the history and development of the field of Molecular Biology, molecular structure of chromosomes and genes, protein structure and function, omics, genetic recombination mechanisms, central dogma, operon systems, expression and regulation of gene expression in eukaryotes, and applications of Molecular Biology in various areas of life through theoretical studies and assignments. |
| **References** | **Main :** |


1. Allison, Lizabeth. 2007. Fundamental Molecular Biology . Blackwell Publishing. Oxford.
2. Lodish, H., A. Berk, P. Matsudaira, C.A. Kaiser, M. Krieger, M.P. Scott, L. Zipursky, and J. Darnell. 2004. Molecular Cell Biology. WH Freeman. Boston.
3. Primrose, S.B. and R.M. Twyman. 2006. Principles of Gene Manipulation and Genomics . Blackwell Publishing. Oxford.
4. Rahayu, Dwi, A &Nugroho, Endik, D. 2015. Biologi Molekuler Dalam Perspektif Konservasi . Penerbit Plantaxia. Yogyakarta
5. Yuwono, T. 2006. Biologi Molekuler. Penerbit Erlangga. Jakarta.


**Supporters:**

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| **Supporting lecturer** | Dr. Isnawati, M.Si.<br>Lisa Lisdiana, S.Si., M.Si., Ph.D.<br>Erlix Rakhmad Purnama, S.Si., M.Si.<br>Dwi Anggorowati Rahayu, 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 (%) |
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| | | Indicator | Criteria & Form | Offline ( *offline* ) | Online ( *online* ) | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |

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| **1** | Understand the scope of molecular biology, its history and development, and its relationship with other scientific disciplines | 1. Explain the scope of molecular biology and its relationship to other scientific disciplines.<br>2. Describe chronologically its history and development. | **Criteria:**<br>The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10<br><br>**Form of Assessment** : Participatory Activities | Lectures, discussions and digging up information from the 2 X 50 web | | | 5% |
| **2** | Understand the molecular structure of chromosomes and genes. | 1. Distinguish between transcription units in prokaryotes and eukaryotes.<br>2. Explain simple transcription units and complex transcription units in eukaryotes. | **Criteria:**<br>The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10<br><br>**Form of Assessment** : Participatory Activities | Lectures and discussions 2 X 50 | | | 5% |
| **3** | Understand the structure and function of proteins | 1. Explain the primary, secondary, and primary structure of proteins<br>2. Distinguish between motif and domain | **Criteria:**<br>The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10<br><br>**Form of Assessment** : Participatory Activities | Lectures and discussions 2 X 50 | | | 5% |
| **4** | Understanding about omics | 1. Explain the definitions of genomics, transcriptomics, and proteomics<br>2. Distinguish between genomics, transcriptomics and proteomics<br>3. Identify research in the fields of genomics, transcriptomics and proteomics<br>4. Demonstrate an attitude of being able to work together in a team and be disciplined in carrying out the tasks given | **Criteria:**<br>The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10<br><br>**Form of Assessment** : Participatory Activities | Presentation and discussion 2 X 50 | | | 5% |
| **5** | Understand the process of recombination of genetic material | 1. Explain the mechanism of homologous recombination<br>2. Explain the mechanism of site-specific recombination<br>3. Explain the mechanism of transposition | **Criteria:**<br>The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10<br><br>**Form of Assessment** : Participatory Activities | Lectures and discussions 2 X 50 | | | 5% |

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| **6** | Understanding the process of gene expression in prokaryotic cells and eukaryotic cells (part 1: transcription) | 1. Explain the definition of central dogma<br>2. Take an inventory of the components involved in the transcription process and the function of each component<br>3. Comparing the transcription process in prokaryotic cells and eukaryotic cells<br>4. Demonstrate an honest and independent attitude in carrying out the task of looking for DNA transcription visualization displays | **Criteria:**<br>The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10<br><br>**Form of Assessment** : Participatory Activities | Lectures and discussions as well as assignments look for displays that visualize the 2 X 50 DNA transcription process | | | 5% |
| **7** | Understanding the process of gene expression in prokaryotic and eukaryotic cells (part 2: translation) | 1. Take an inventory of the components involved in the translation process and the function of each component<br>2. Describe the translation process in prokaryotic and eukaryotic cells<br>3. Demonstrate the ability to apply Molecular Biology concepts in solving problems related to procedural translation errors for the development of molecular biology-based research | **Criteria:**<br>The final NA is (participation value x2) (assignment value x 3) (UTS value x 2) UAS value (3) divided by 10<br><br>**Form of Assessment** : Participatory Activities | Lectures and discussions as well as assignments look for shows that visualize the 2 X 50 DNA translation process | | | 5% |
| **8** | U.S.S | According to meeting indicators 1-7 | **Criteria:**<br>In accordance with the assessment rubric on the USS grid<br><br>**Form of Assessment** : Test | Written test 2 X 50 | | | 10% |

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| **9** | Understand concepts related to the operon system | 1. Describe the structure of various types of operons (e.g. lactose operon and tryptophan operon)<br>2. Explain the expression process of the lactose operon and tryptophan operon<br>3. Demonstrate an honest and independent attitude in discussing the potential utilization of expression regulation in operons | **Criteria:**<br>The final NA is (participation grade") (assignment grade%2 3) (UTS grade%2 2) UAS grade (3) divided by 10<br><br>**Form of Assessment** :<br>Portfolio Assessment | Lectures and discussions<br>2 X 50 | | | 5% |
| **10** | Understanding gene expression and control of gene expression in eukaryotes | 1. Describe gene expression<br>2. Explain the control of gene expression in eukaryotes | **Criteria:**<br>The final NA is (participation grade") (assignment grade%2 3) (UTS grade%2 2) UAS grade (3) divided by 10<br><br>**Form of Assessment** :<br>Participatory Activities | Lectures and discussions<br>2 X 50 | | | 5% |

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| **11** | Understand the role of Molecular Biology in the biomedical field | 1. Describe the supporting science branches of Molecular Biology<br>2. Describe the role of Molecular Biology in the Biomedical Field.<br>3. Describe five studies related to genes that have often been carried out by scientists in previous years.<br>4. Describe the benefits of DNA microarrays<br>5. Inventory the tools and materials used in gene expression analysis with DNA microarray<br>6. Provide reasons for each step of gene expression analysis with DNA microarray<br>7. Carrying out DNA microarray simulations to find differences in gene expression in cancer cells and healthy cells<br>8. Analyzing microarray results to solve a biomolecular problem<br>9. Able to work in a team and be disciplined in completing assigned tasks | **Criteria:**<br>The final NA is (participation grade") (assignment grade%2 3) (UTS grade%2 2) UAS grade (3) divided by 10<br><br>**Form of Assessment** : Participatory Activities | Cooperative<br>2 X 50 | | | 5% |
| **12** | Understand the role of Molecular Biology in the field of animal science | 1. Describe the role of Molecular Biology in the field of animal science<br>2. Identify molecular biology analysis techniques that can be applied in solving problems in the field of animal science | **Criteria:**<br>The final NA is (participation grade") (assignment grade%2 3) (UTS grade%2 2) UAS grade (3) divided by 10<br><br>**Form of Assessment** : Participatory Activities | Lectures and discussions<br>2 X 50 | | | 5% |

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| **13** | Understand the role of Molecular Biology in the field of plant science | 1. Describe the role of Molecular Biology in the field of plant science<br>2. Identify Molecular Biology analysis techniques that can be applied in solving problems in the field of plant science | **Criteria:**<br>The final NA is (participation grade") (assignment grade%2 3) (UTS grade%2 2) UAS grade (3) divided by 10<br><br>**Form of Assessment** :<br>Portfolio Assessment | Lectures and discussions<br>2 X 50 | | | 5% |
| **14** | Understand the role of Molecular Biology in the environmental field | 1. Describe the role of Molecular Biology in the environmental field<br>2. Identify Molecular Biology analysis techniques that can be applied in solving problems in the environmental field | **Criteria:**<br>The final NA is (participation grade") (assignment grade%2 3) (UTS grade%2 2) UAS grade (3) divided by 10<br><br>**Form of Assessment** :<br>Participatory Activities, Portfolio Assessment | Presentation and discussion<br>2 X 50 | | | 10% |
| **15** | Understand the role of Molecular Biology in the field of microbiology | 1. Describe the role of Molecular Biology in the field of microbiology<br>2. Identify molecular biology analysis techniques that can be applied in solving problems in the field of microbiology | **Criteria:**<br>The final NA is (participation grade") (assignment grade%2 3) (UTS grade%2 2) UAS grade (3) divided by 10<br><br>**Form of Assessment** :<br>Portfolio Assessment | Discussion, assignment to find information from the web related to molecular biology applications in the field of microbiology and<br>2 X 50 presentations | | | 5% |
| **16** | | | **Form of Assessment** :<br>Test | | | | 15% |

**Evaluation Percentage Recap: Case Study**

| No | Evaluation | Percentage |
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| 1. | Participatory Activities | 55% |
| 2. | Portfolio Assessment | 20% |
| 3. | Test | 25% |
| | | 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** 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.