



UNIVERSITAS SEBELAS MARET
FACULTY OF TEACHER TRAINING AND EDUCATION
BACHELOR OF BIOLOGY EDUCATION STUDY PROGRAM

Building D 3rd Floor FTTE UNS Jl Ir. Sutami No. 36 A Kentingan Surakarta 57126 Indonesia

E-mail: biologi@fkip.uns.ac.id; Website: <https://biologi.fkip.uns.ac.id/en/>

Biotechnology

Undergraduate Programme in Biology Education

Module Handbook

Module Name	Biotechnology (Bioteknologi)																		
Module level	Undergraduate Programme																		
Course Code	02013142007																		
Sub-title, if applicable	-																		
Courses included in the module, if applicable	-																		
Semester/Term	3 rd																		
Module coordinator (s)	Prof. Dr.rer.nat Sajidan, M.Si																		
Lecturer (s)	Prof. Dr.rer.nat Sajidan, M.Si Prof Sutarno, M.Sc.Ph.D Dr Umi Fatmawati, M.Si																		
Language	Bahasa Indonesia (Indonesian Language)																		
Classification within the curriculum	Compulsory/ Elective																		
Teaching format/class hours per week during the semester	Direct instruction/face to face/blended learning: 26.7 hours / Week: lecture, discussion Structured Activity: 32 hours / Week (Through the analysis of journal articles, students learn to analyze the abnormalities in metabolic diseases, cellular respiration pathways, and biomolecule metabolism and catabolism) Self-study Activity: 32 hours / Week (Students learn the application of modern biotechnology from various sources)																		
Workload	<table><tr><th>Type</th><th>CSU</th><th>Face to Face</th><th>Structured Activities</th><th>Self-study</th></tr><tr><td>T</td><td>2</td><td>26.7h (0.88 ECTS)</td><td>32h (1.06 ECTS)</td><td>32h (1.06 ECTS)</td></tr><tr><td>Total</td><td>2</td><td colspan="3">90.7 h (3 ECTS)</td></tr></table>				Type	CSU	Face to Face	Structured Activities	Self-study	T	2	26.7h (0.88 ECTS)	32h (1.06 ECTS)	32h (1.06 ECTS)	Total	2	90.7 h (3 ECTS)		
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Total	2	90.7 h (3 ECTS)																	
Requirements	-																		
Credit Point	2 CSU (3 ECTS)																		



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Learning goals/competencies	PLO 2 They are able to apply the basic advance knowledge in biology to solve the problem in biology PLO 7 They are able to solve problem and present the idea argumentatively CLO 1 Students understand the concept of conventional biotechnology. (PLO 2) CLO 2 Students understand the concept of modern biotechnology. (PLO 2) CLO 3 Students master the Recombinant DNA Technique. (PLO 7) CLO 4 Students are able to explain the application of Biotechnology (PLO 7) <table><tr><th>CLO/ PLO</th><th>P L O 1</th><th>P L O 2</th><th>P L O 3</th><th>P L O 4</th><th>P L O 5</th><th>P L O 6</th><th>P L O 7</th><th>P L O 8</th><th>P L O 9</th><th>P L O 10</th></tr><tr><td>CLO1</td><td></td><td>*</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CLO2</td><td></td><td>*</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CLO3</td><td></td><td></td><td></td><td></td><td></td><td></td><td>*</td><td></td><td></td><td></td></tr><tr><td>CLO4</td><td></td><td></td><td></td><td></td><td></td><td></td><td>*</td><td></td><td></td><td></td></tr></table>	CLO/ PLO	P L O 1	P L O 2	P L O 3	P L O 4	P L O 5	P L O 6	P L O 7	P L O 8	P L O 9	P L O 10	CLO1		*									CLO2		*									CLO3							*				CLO4							*			
CLO/ PLO	P L O 1	P L O 2	P L O 3	P L O 4	P L O 5	P L O 6	P L O 7	P L O 8	P L O 9	P L O 10																																														
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CLO4							*																																																	
Content	The Biotechnology course is a compulsory course for a study program that examines: 1. Development of biotechnology, 2. Gene identification and isolation techniques, 3. Recombinant DNA technique, 4. Agricultural biotechnology, 5. Animal Husbandry Biotechnology, 6. Medical and forensic biotechnology, 7. Bioinformatics and bioremediation.																																																							
Attribute Soft skill	1. Able to think conceptually, analytically, and logically 2. Have good communication skills 3. Able to solve the problem related to biotechnology																																																							
Study/exam achievements	Students are required to attend the face-to-face lecture minimum 75% to be able to take the Mid and Final exam. Students are considered to complete the course and pass if they obtain at least 60% of maximum final score. The final score (FS) is calculated based on the following ratio:																																																							



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	<table><tr><td>Aspect</td><td>(%)</td></tr><tr><td>Participation</td><td>10</td></tr><tr><td>Team Based Project (Mid-Term)</td><td>30</td></tr><tr><td>Laboratory Activity</td><td>30</td></tr><tr><td>Final Exam</td><td>30</td></tr><tr><td>Final Score</td><td>100</td></tr></table>	Aspect	(%)	Participation	10	Team Based Project (Mid-Term)	30	Laboratory Activity	30	Final Exam	30	Final Score	100
Aspect	(%)												
Participation	10												
Team Based Project (Mid-Term)	30												
Laboratory Activity	30												
Final Exam	30												
Final Score	100												
Form of Media	Powerpoint slide, teaching video, journal article												
Literature (primary references)	1. Bachman, R. T., Johnson, A.C & Edyvean, R. G. J. (2014). Biotechnology in The Petroleum Industry: An Overview. <i>International Biodeterioration & Biodegradation</i>, 86, 225-237 https://doi.org/10.1016/j.ibiod.2013.09.011 2. Khan, S, et al. (2016). Role of Recombinant DNA Technology to Improve Life. <i>International Journal of Genomics</i> 3. Lavrynenko, A., Shmatko, N & Meissner, D. (2018). Managing Skills for Open Innovation: The Case of Biotechnology. <i>Management Decision</i>, 56(6), 1336-1347 https://doi.org/10.1108/MD-04-2017-0301 4. Reynolds, T. J & Martirosyan, D. M. (2016). Nutrition by Design: a Review of Biotechnology in Functional Food. <i>Functional Foods in Health and Disease</i>, 6(2) DOI: 10.31989/ffhd.v6i2.236 5. Syah, M. P. (2017). Soil Bioremediation. <i>International Journal of Biotechnology and Bioengineering</i> 6. Yuwono, T. (2016). <i>Bioteknologi Pertanian</i>. Yogyakarta: UGM Press 7. Zbuche, A., Pinzaru, F., Busu, M et al. Sustainable Knowledge Management and Its Impact on the Performances of Biotechnology Organizations. <i>Sustainability</i>, 11(2) https://doi.org/10.3390/su1102035												



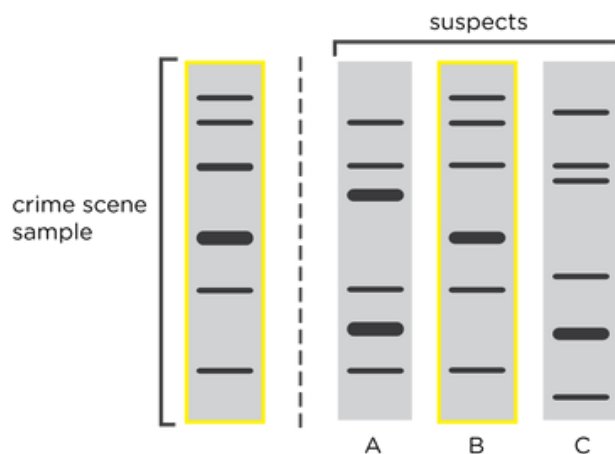
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Mid-Term Exam in Biotechnology

1. In one of the apartment rooms it was found that one of the occupants had died 24 hours earlier, the victim was a 50 year old man who worked as an employee in a government state office and lived alone in the apartment. Inside the apartment, the CCTV did not work, and no evidence was found that the victim had been killed by someone. However, a few hours before his death, the man was seen going out with a colleague (Mr A), then also asked a cleaning service to clean the room in his apartment (Mr B), and in the cell phone contact it was seen that the victim also met one of the members his family in the morning (Mr C). The three suspects also entered the victim's apartment at different times. Only a cigarette butt was found in the ashtray on the table, as the only evidence. The police carried out an investigation related to the case to prove the suspect, one of them with forensic DNA techniques.
 - a. How do the police obtain DNA samples, explain the steps to be taken!
 - b. If DNA samples have already been obtained, why would forensic analysts need to use PCR and RFLP techniques to uncover who was involved in the case?
 - c.



From the results of the following analysis, determine which suspect is involved in the murder case?

(LO 2: Student are able to apply the basic advance knowledge in biology to solve the problem in biology)

2. Human insulin (Humulin) is a synthetic hormone developed for the treatment of diabetes. This hormone was developed by the recombinant protein method by introducing the genes encoding -insulin and -insulin in competent bacterial cells.
 - a. What are the stages of making recombinant proteins using the role of competent bacteria (competent cells)!
 - b. Why is IPTG added to detect recombinant cells!**(LO 2: Student are able to apply the basic advance knowledge in biology to solve the problem in biology)**



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GROUP PRESENTATION ASSESSMENT RUBRIC

Group : _____

Date : _____

A. Presentation

No	Aspect	4 Very Good	3 Good	2 Sufficient	1 less
Kelompok					
1	Presentation Manajemen	The presentation is very systematic and very easy to follow. Transfers between group members are well organized and neatly executed.	The presentation is quite organized and quite easy to follow. Transitions may be a bit cut off but don't take up much time from the whole presentation.	Presentation is not well managed. The transfer of presentations between members does not look smooth.	Presentation is not managed. The transitions between group members in the presentation looked poor. Presentations are less organized and very difficult to follow.
2	Student Colaborative	Very good group cooperation with each other can be seen in the distribution of presentations, work, and answering questions evenly to all group members.	The group worked well with each other and communicated well. Some members participate a little more than others.	Group communication is relatively poor; some members dominate the presentation and others do not participate much.	No teamwork seen. Each member is indifferent and does not help each other.
3	Quality of the media used for presentation	The media/PPT used is effective during the presentation. Group members use the media as a supplement, not as a crutch.	The media/PPT used was somewhat effective but not consistently used during the presentation.	The media/PPT used was somewhat effective but not consistently used during the presentation.	Do not use Media/PPT at all.
4	Performance when delivering material	Group members have very strong material knowledge and the material is delivered thoroughly. No mistakes were	Most group members have a solid understanding of the material. Few material elements are missing or contain minor errors.	Group members have little understanding of the material. Several mistakes were made during the presentation.	Group members have little or no understanding of the material covered in the presentation.



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		made with respect to material knowledge.			
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Final Score : $\frac{\text{Gained Score}}{16} \times 100$

B. Catatan partisipasi peserta:

Name: _____ Question: _____

Name: _____ Question: _____

Name: _____ Question: _____

Moderator: _____

DISCUSSION ASSESSMENT RUBRIC

Class/Group : _____

Date : _____

A. Idea/opinion

No	Aspect	4 Very good	3 Good	2 Sufficient	1 Less
1	Skills in conveying ideas/answers/questions attract attention, motivate, articulation, gesture)	Students can make the audience focus on listening to ideas or answers by showing 4 things, namely being able to attract attention, giving motivation, clear articulation and appropriate gestures.	Shows 3 things from being able to attract attention, giving motivation, clear articulation and appropriate gestures.	Shows 2 things from being able to attract attention, giving motivation, clear articulation and appropriate gestures.	Shows 1 thing from being able to attract attention, giving motivation, clear articulation and appropriate gestures.
2	Attitude to the question asked	Received questions very well and tried to answer	Receive questions and throw them to other members/friends to answer	Shows an attitude of disliking questions	Showing disdain for the question
3	Ability to answer questions	Provide answers according to the questions and in	Gives correct answers but in circles that require	Gives an answer but the questioner is not	Looks less serious by giving the original



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		accordance with the material explained during the presentation and the questioner is satisfied with the answer	repeated explanations	satisfied/understood	answer that is important to answer and not appropriate
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Final Score : $\frac{\text{Gained score}}{12} \times 100$

B. Participant notes:

Name: _____ Question: _____

Name: _____ Question: _____

Moderator: _____