MODUL HANDBOOK

Master's Program of Biotechnology
Postgraduate
UNIVERSITAS JEMBER

Homepage: https://bioteknologi.pasca.unej.ac.id

2019

Module Handbook

Module designation	Biochemistry and Molecular Biology
Semester(s) in which the module is taught	the 1st semester (Odd semester)
Person responsible for the module	Prof. Tri Agus Siswoyo, Ph.D
Language	Indonesian
Relation to curriculum	Compulsory
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1,67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[1]:
Credit points	2 Credits or 2.76 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	Students are able to analyze the Principles of Biotechnology and related sciences in agroindustry
Content	1. Centra Dogma 2. Karbohidrat: Klasifikasi, struktur karbohidrat (monosakarida, disakarida, polisakarida, homo sakarida, dan heterosakarida). 3. Lipid: Klasifikasi, struktur, karakteristik dan fungsi asam lemak, asam lemak esensial, lemak, fosfolipid, spingolipid, serebrosid, steroid, asam empedu, prostaglandin, dan lipoprotein; 4. Asam amino: struktur, klasifikasi, abreviasi, karakter dan fungsi asam amino; 5. Protein: Klasifikasi, struktur dan fungsi protein, protein sequencing; 6. Asam Nukleat: Struktur dan fungsi asam nukleat (DNA dan RNA); 7. Kromatin: protein histone dan non-histone proteins. 8. Replikasi DNA: mekanisme replikasi, replikon, origin, karakteristik polimerisasi DNA pada sel prokariot dan eukariot; 9. Transkripsi DNA: mekanisme dan pengendalian transkripsi pada sel prokariot dan eukariot 10. Translasi: mekanisme translasi pada sel prokariot dan eukariot, struktur dan komponen ribosom, inhibitor biosintesis protein.

[1] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

	11. Regulasi Replikasi, mutasi, dan perbaikan DNA
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module
Reading list	1. Song, Y. Central dogma, redefined. *Nat Chem Biol* **17,** 839 (2021). https://doi.org/10.1038/s41589-021-00850-2 2. Supriyadi, A., LS Arum, AS Nugraha, AAI Ratnadewi, **TA Siswoyo**. 2019. Revealing antioxidant and antidiabetic potency of Melinjo (Gnetum Gnemon) seed protein hydrolysate at different stages of seed maturation Current Research in Nutrition and Food Science Journal 7 (2), 479-487 3. Siswoyo TA. 2018. Bioactive Proteins and Peptides as Potential Components of Nutraceuticals from Melinjo Seed (*Gnetum gnemon*). Agri Res & Tech :Open Access J. 16(1): 555977. DOI: 10.19080/ARTOAJ.2018.16.555977 4. Ratnadewi AAI, MHA Zain, AANN Kusuma, W Handayani, AS Nugraha, TASiswoyo, 2020. Lactobacillus casei fermentation towards xylooligosaccharide (XOS) obtained from coffee peel enzymatic hydrolysate,Biocatalysis and Agricultural Biotechnology 23:101446, https://doi.org/10.1016/j.bcab.2019.101446. 5. Ahmad AA, Addy HS and Huang Q (2021) Biological and Molecular Characterization of a Jumbo Bacteriophage Infecting Plant Pathogenic *Ralstonia solanacearum* Species Complex Strains. *Front. Microbiol.* 12:741600. doi: 10.3389/fmicb.2021.741600 6. Darsono N, Azizah NN, Putranty KM, Astuti NT, Addy HS, Darmanto W, Sugiharto B. Production of a Polyclonal Antibody against the Recombinant Coat Protein of the Sugarcane Mosaic Virus and Its Application in the Immunodiagnostic of Sugarcane. *Agronomy*. 2018; 8(6):93. https://doi.org/10.3390/agronomy8060093 7. Addy HS, Ahmad AA and Huang Q (2019) Molecular and Biological Characterization of Ralstonia Phage RsoM1USA, a New Species of P2virus, Isolated in the United States. *Front. Microbiol.* 10:267. doi: 10.3389/fmicb.2019.00267

Module Handbook

Module designation	Biosynthesis of Primary and Secondary Metabolites
Semester(s) in which the module is taught	the 1st semester (Odd semester)
Person responsible for the module	Dr. Anak Agung Istri Ratnadewi, M.Si,M.Si
Language	Indonesian
Relation to curriculum	Compulsory
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1,67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[2]:
Credit points	2 Credits or 2.76 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. Able to develop the principles of biotechnology and other relevant sciences 2. Evaluate the principles of biotechnology and other relevant sciences in solving agro-industry problems
Content	1. Definition of biosynthesis of primary and secondary metabolites, 2. The energy transformation that obeys the laws of thermodynamics, 3. Energy in the ATP process 4. Primary metabolite biosynthesis includes carbohydrates, amino acids, lipids and secondary metabolites
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module
Reading list	1. Guerriero G, Berni, R, Sanchez, A.M., Apone, F., 2018 Review, Production of Plant Secondary Metabolites: Examples, Tips and Suggestions for Biotechnologists, Genes 2018, 9, 309; doi:10.3390/genes9060309

[2] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

	2. Khatana, S.and Vijayvergia, R., Jain, C., 2019, BIOACTIVITY OF SECONDARY METABOLITES OF VARIOUS PLANTS: A REVIEW, Jain et al., IJPSR, 2019; Vol. 10(2): 494-504 3. Tünde Pusztahelyi , Imre J. Holb and István Pócsi, 2015. Secondary metabolites in fungus-plant interactions, Frontiers in Plant Science, August 2015 | Volume 6 | Article 573 4. Christopher Mathews , Kensal van Holde , Dean Appling, Spencer Anthony-Cahill. 2012. Biochemistry 4th Edition, Pearson; 4th edition (February 10, 2012)

Module Handbook

Module designation	Biostatistics
Semester(s) in which the module is taught	the 2nd semester (Even semester)
Person responsible for the module	**Dr. Alfian Futuhul Hadi, S.Si., M.Si.**
Language	Indonesian
Relation to curriculum	Compulsory
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1,67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[3]:
Credit points	2 Credits or 2.76 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	Able to **develop** the principles of biotechnology and other relevant sciences
Content	1. The role of scientific statistics, the concept of statistical measures, and the basic philosophy of statistics 2. Decision making with statistics 3. Statistics in the concept of Quantitative Traits Loci 4. Definition of Bioinformatics, and its development in Indonesia 5. Application of bioinformatics in biotechnology 6. Molecular Phylogenetic Systematics 7. Stages in molecular phylogenetic analysis 8. Computer programs and DNA sequence phylogenetic applications 9. Gene tracing techniques in the NCBI genebank 10. Conservative region in the same gene 11. Plant relationships based on nucleotide and amino acid sequences 12. Determination of the location of a gene in living things 13. Predict the location of restriction enzymes in DNA 14. Basic concepts of meta-analysis

[3] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module
Reading list	1. Mathé, E. & S. Davis (eds). 2016. Statistical Genomics: Methods and Protocols. Humana Press. New York. 2. Wu, R., G.Casella, & C.X. Ma. 2007. Statistical Genetics of Quantitative Traits: Linkage, Maps, and QTL. Springer. New York 3. Xu, Shizhong. 2013. Principles of Statistical Genomics. Springer. New York.

Module Handbook

Module designation	Biotechnology of Plant Protection
Semester(s) in which the module is taught	The 2nd semester (Even semester)
Person responsible for the module	**Hardian Susilo Addy, S.P., M.P., Ph.D**
Language	Indonesian
Relation to curriculum	Elective Course
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1,67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[4]:
Credit points	2 Credits or 2.76 ECTS
Required and recommended prerequisites for joining the module	PBT 2102 (Biochemistry and Molecular Biology)
Module objectives/intended learning outcomes	1. Able to develop the principles of biotechnology and other relevant sciences, 2. Able to demonstrate the ability to collaborate and communicate scientifically well orally and in writing at the national and/or international level
Content	1. Development and utilization of Biotechnology in Plant Protection, 2. Biotechnology Plant protection against Plant-free Pathogens; 3. Biotechnology Plant protection against pathogens based on molecular biological agents; 4. Biotechnology Crop protection against pests and weeds through transgenic technology; 5. Biotechnology Plant protection against pathogens (PDR Technology) through Coat Protein-Mediated Resistance, RNA interference, and Genome editing (CRISPR/Cas-system) techniques.
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module

[4] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Reading list	1. Widyaningrum S, Pujiasih DR, Sholeha W, Harmoko R, Sugiharto B. 2021. Induction of resistance to sugarcane mosaic virus by RNA interference targeting coat protein gene silencing in transgenic sugarcane. Mol Biol Rep. 48(3):3047–3054. 2. Giudice G, Moffa L, Varotto S, Cardone MF, Bergamini C, De Lorenzis G, Velasco R, Nerva L, Chitarra W. Novel and emerging biotechnological crop protection approaches. Plant Biotechnol J. 2021 Aug;19(8):1495-1510. 3. Karavolias NG, Horner W, Abugu MN and Evanega SN (2021) Application of Gene Editing for Climate Change in Agriculture. Front. Sustain. Food Syst. 5:685801. 4. Turnbull C, Lillemo M and Hvoslef-Eide TAK (2021) Global Regulation of Genetically Modified Crops Amid the Gene Edited Crop Boom – A Review. Front. Plant Sci. 12:630396. 5. Beachy RN. Mechanisms and applications of pathogen-derived resistance in transgenic plants. Curr Opin Biotechnol. 1997 Apr 1;8(2):215-20. 6. Zhao Y, Yang X, Zhou G, Zhang T. Engineering plant virus resistance: from RNA silencing to genome editing strategies. Plant Biotechnol J. 2020 Feb;18(2):328-336.

Module Handbook

Module designation	Plant Physiology
Semester(s) in which the module is taught	The 2nd semester (Even semester)
Person responsible for the module	Wahyu Indra Duwi Fanata, S.P., M.Sc., Ph.D
Language	Indonesian
Relation to curriculum	Elective
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[5]:
Credit points	2 Credits or 2.76 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. Able to evaluate the principles of biotechnology and other relevant sciences in solving agro-industry problems 2. Able to apply the skills and knowledge of DNA and protein molecular based biotechnology
Content	1. Scope of Plant Physiology 2. Plant Cells and Organelle Functions; 3. Plant Bioenergetics: 4. Carbon, Nitrogen and Sulphur Metabolism; 5. Cell Signal Transduction; 6. Function and Biosynthesis of Plant Hormones; 7. Response to Environmental Stresses;
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module
Reading list	1. Buchanan, B.B., Gruissem, W., and Jones, R.L., 2000, Biochemistry and Molecular Biology of Plants, American Society of Plant Physiologists.

[5] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

2. Taiz, L and Zeiger, E., 2006, Plant Physiology, Sinauer Associates Inc
3. Pierella, K.J.J and Carrillo, N., 2017, Evolution of the acceptor side of photosystem I: ferredoxin, flavodoxin, and ferredoxin-NADP+ oxidoreductase, Photosynth. res. doi:10.1007/s11120-017-0338-2
4. Liu, Q., Chen, X., Wu, K., and Fu, X., 2015, Nitrogen signaling and use efficiency in plants: what's new?, Curr. Opinion. Plants. Biol. (27): 192-8.
5. Furbank, R.T., 2017, Walking the C4 pathway: past, present, and future, J. Exp. bots. (68): 4057-4066
6. Zhang, Q., Song, X., and Bartels, D., 2016, Enzymes and Metabolites in Carbohydrate Metabolism of Desiccation Tolerant Plants, Proteomes. 4(4). pi: E40. doi:10.3390/proteomes4040040
7. Calderwood, A., Morris, R.J., and , Kopriva, S., 2014, Predictive sulfur metabolism - a field in flux, Front Plant Sci. (18):646-652
8. Huang, G.T., Ma, S.L., Bai, L.P., Zhang, L., Ma, H., Jia, .P, Liu, J., Zhong, M, Guo, Z.F. , 2012, Signal transduction during cold, salt, and drought stresses in plants, Mol Biol Rep. 39(2):969-87
9. Wastenack, C and Song, S., 2016, Jasmonates: biosynthesis, metabolism, and signaling by proteins activating and repressing transcription, J. Exp. bots. (68): 4057-4066
10. Rejeb, I.B., Pastor, V., Mauch-Mani, B., 2014, Plant Responses to Simultaneous Biotic and Abiotic Stress: Molecular Mechanisms, Plant (Basel).3(4):458-75.

Module Handbook

Module designation	Biopharmaceutical Innovation
Semester(s) in which the module is taught	The 2nd semester (Even semester)
Person responsible for the module	apt. Ari Satia Nugraha, SF., GDipSc., MSc-res., PhD.
Language	Indonesian
Relation to curriculum	Specific Compulsory
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[6]:
Credit points	2 Credits or 2.76 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	Able to develop the biotechnological principles and other relevant sciences
Content	1. Source of biopharmaceutical active ingredients 2. Molecular tracking of biopharmaceutical biomarkers. 3. Biopharmaceutical materials in the form of primary metabolites 4. Biopharmaceutical materials in the form of secondary metabolites 5. Conventional biopharmaceutical production techniques 6. Production of biopharmaceuticals with biotechnological interventions 7. Biopharmaceuticals on an industrial scale in Indonesia and the world 8. Prospects of research and development of bioframe-based products
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module

[6] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Reading list	1. Ali M. Ardekani, 2017, Nutrigenomics and Nutraceuticals Clinical Relevance and Disease Prevention 2. P. S. Kalsi, Sangeeta Jagtap, 2013, Pharmaceutical, Medicinal and Natural Product Chemistry 3. Torssell KBG, 1997, Natural Product Chemistry. A Mechanistic, Biosynthetic and Ecological Approach 4. Donut-P. Häder , 2020, Natural Bioactive Compounds Technological Advancements 5. Anuj Chandel, Madan L. Verma, 2019, Biotechnological Production of Bioactive Compounds

Module Handbook

Module designation	**Plant-Microbe Interaction**
Semester(s) in which the module is taught	The 1st semester (Odd semester)
Person responsible for the module	**Hardian Susilo Addy, S.P., M.P., Ph.D**.
Language	Indonesian
Relation to curriculum	Specific Compulsory
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[7]:
Credit points	2 Credits or 2.76 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. Able to develop the biotechnological principles and other relevant sciences 2. Able to modify skills and knowledge of DNA and Applying the skills and knowledge of DNA and protein-based biotechnology agroindustrial sectors
Content	1. Scope of Interaction of Plants with Microorganisms. 2. Definition and general concept of plant and microorganism interaction 3. Various interactions between plants and microorganisms. 4. Beneficial and detrimental interactions of microorganisms and plants 5. Pathogenesis mechanism of microorganisms in plants 6. Competitive interaction mechanism. PAMP, MAMP, SAR and ISR 7. Incompatible interaction mechanism (Hypersensitivity Mechanism) 8. Beneficial interactions of plant and microorganisms. Direct: Rhizobium Interaction Mechanism and Mycorrhizal Interaction Mechanism, Indirect: PGPR

[7] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module
Reading list	1. Vishwakarma K, Kumar N, Shandilya C, Mohapatra S, Bhayana S and Varma A (2020) Revisiting Plant–Microbe Interactions and Microbial Consortia Application for Enhancing Sustainable Agriculture: A Review. *Front. Microbiol.* 11:560406. doi: 10.3389/fmicb.2020.560406 2. Nadhira, NE., ID Wahyuni, HS Addy. 2021. The potency of plant resistance inducers (PRIs) against bacterial wilt disease on tobacco caused by *Ralstonia solanacearum*. IOP Conference Series: Earth and Environmental Science 759 (1), 012067; doi:10.1088/1755-1315/759/1/012067 3. Rejeki D, HS Addy, E Narulita (2021). Partial characterization of bacteriophages from Indonesia and its potency as biocontrol of *Xanthomonas oryzae* pv. *oryzae*. Intl J Agric Biol 25:75–80 4. Nurcahyanti SD, Wahyuni WS, Masnilah R, Nurdika AAH. 2021. Diversity of *Bacillus* spp. from soybean phyllosphere as potential antagonist agents for *Xanthomonas axonopodis* pv. *glycines* causal of pustule disease. Biodiversitas 22: 5003-5011. 5. Imam J, Singh PK and Shukla P (2016) Plant Microbe Interactions in Post Genomic Era: Perspectives and Applications. *Front. Microbiol.* 7:1488. doi: 10.3389/fmicb.2016.01488 6. Diagne N, Ndour M, Djighaly PI, Ngom D, Ngom MCN, Ndong G, Svistoonoff S and Cherif-Silini H (2020) Effect of Plant Growth Promoting Rhizobacteria (PGPR) and Arbuscular Mycorrhizal Fungi (AMF) on Salt Stress Tolerance of *Casuarina obesa* (Miq.). *Front. Sustain. Food Syst.* 4:601004. doi: 10.3389/fsufs.2020.601004 7. Ha-Tran DM, Nguyen TTM, Hung SH, Huang E, Huang CC. Roles of Plant Growth-Promoting Rhizobacteria (PGPR) in Stimulating Salinity Stress Defense in Plants: A Review. Int J Mol Sci. 2021 Mar 19;22(6):3154. doi: 10.3390/ijms22063154.

Module Handbook

Module designation	**Research Methodology**
Semester(s) in which the module is taught	The 1st semester (Odd semester)
Person responsible for the module	**Dr. Bambang Piluharto, M.Si.**
Language	Indonesian
Relation to curriculum	Specific Compulsory
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 136 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2 hours Private study including examination preparation, specified in hours: 14 × 2.80 hours
Credit points	3 Credits or 3.45 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. Able to develop the biotechnological principles and other relevant sciences 2. Able to demonstrate the ability to collaborate and to communicate well in verbal and in writing national and/or internationally 3. Able to manage biotechnology research comprehensively with a multidisciplinary approach to solve problems in agroindustrial sectors.
Content	1. The nature, paradigm and ethics of research 2. Biotechnology research trends 3. Scientific approach to biotechnology research 4. Title, problem, purpose, and benefits of research 5. Literature review and its relationship with the formulation of research hypotheses 6. Variables, data, population, samples, and research design 7. Methods/techniques and instruments of research data collection and data analysis 8. Research instrument
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module

Reading list	1. Katz, M. (2006). From Research to Manuscript: A Guide to Scientific Writing. London: Springer. 2. Kothari, C. R. (2004). Research Methodology: Methods and Techniques (Second Revised ed.). New Delhi: New Age Internasional (P) Limited. 3. Sugiyono. (2013). Metode Penelitian Kombinasi (Mixed Methods). Bandung: Alfabeta. 4. Sugiyono. (2012). Statistika untuk penelitian. Bandung: Alfabeta. 5. Soetriono, & Rita. (2007). Filsafat Ilmu dan Metodologi Penelitian. Yogyakarta: Andi Offset. 6. Thiel, D. V. (2014). Research Methods for Engineers. Cambridge, United Kingdom: Cambridge University Press. 7. Singh, Y. (2006). Fundamental of Research Methodology and Statistics. New York: New Age International.

Module Handbook

Module designation	**Genetic Engineering and Bioinformatics**
Semester(s) in which the module is taught	The 1st semester (Odd semester)
Person responsible for the module	**Dr. Ir. Sholeh Avivi, MSi**
Language	Indonesian
Relation to curriculum	Specific Compulsory
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[8]:
Credit points	2 Credits or 2.76 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. Able to develop the biotechnological principles and other relevant sciences 2. Able to modify skills and knowledge of DNA and protein-based biotechnology to produce innovative and useful biological products for agroindustrial sectors
Content	1. Introduction Genetic Engineering and Bioinformatics 2. Genetic material and DNA replication 3. Protein Synthesis 4. Recombinant DNA technology 5. PCR & its analysis 6. Sequencing & analysis 7. BLAST analysis 8. Genome editing & golden gate cloning technology 9. Application of genetic engineering in agriculture (high-level crops) 10. Applications of genetic engineering in the health sector
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module

[8] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Reading list	1. AFP. 2020. "US Trial Shows 3 Cancer Patients Had Their Genomes Altered Safely by CRISPR". ScienceAlert. Retrieved 2020-02-09. 2. Cyranoski, David. 2019. “The CRISPR-Baby Scandal: What’s next for Human Gene-Editing.” Nature 566, 440–442; 2019, no. x: 135. https://www.nature.com/articles/d41586-019-00673-1. 3. Enrique Arenas, Nelson, and Luz Mary Salazar. 2019. “Steps and Tools for PCR-Based Technique Design.” Biotechnology and Bioengineering, 1–16. https://doi.org/10.5772/intechopen.83671. 4. Li, Hongyi, Yang Yang, Weiqi Hong, Mengyuan Huang, Min Wu, and Xia Zhao. 2020. “Applications of Genome Editing Technology in the Targeted Therapy of Human Diseases: Mechanisms, Advances and Prospects.” Signal Transduction and Targeted Therapy 5 (1). https://doi.org/10.1038/s41392-019-0089-y. 5. Shanmugam, Sabarathinam, Huu Hao Ngo, and Yi Rui Wu. 2020. Advanced CRISPR/Cas-Based Genome Editing Tools for Microbial Biofuels Production: A Review. Renewable Energy. Vol. 149. Elsevier B.V. https://doi.org/10.1016/j.renene.2019.10.107. 6. Glick B.R. and J.J. Pasternak. 1994. Molecular biotechnology principles & applications of recombinant DNA. American Society for Microbiology. Washington DC. 7. Lewin, B. 1997. Gene VI. Oxford Univ. Press. 8. Transgenic Plant for Herbicide Tolerance Ppt. http://www.authorstream.com/Presentation/dhivya.cobra-1397076-trasgenic-plat-for-herbicide-to 9. Watson, J.D., J. Tooze, and D.T. Kurtz. 1983. Recombinant DNA a short course. W.H. Freeman and Company, New York.

Module Handbook

Module designation	**Scientific Writing**
Semester(s) in which the module is taught	The 4th semester (Even semester)
Person responsible for the module	**Prof. Tri Agus Siswoyo, S.P., M.Agr., Ph.D**
Language	Indonesian
Relation to curriculum	Specific Compulsory
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Independent Study: 14 × 2 hours Private study including examination preparation, specified in hours:
Credit points	2 Credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	Able to demonstrate the ability to collaborate and to communicate well in verbal and in writing national and/or internationally
Content	1. Various types of scientific journals (national and international) 2. Requirements and procedures for registration of scientific articles in scientific journals 3. Scientific publications in journals
Examination forms	Writing reports
Study and examination requirements	Requirements for successfully passing the module
Reading list	1. Letter of the Director General of Higher Education Number 638/E.E4/KP/2020 concerning Operational Guidelines concerning the Assessment of Credit Scores for Promotion of Functional Positions/Lecturer Ranks

Module Handbook

Module designation	**Personalized Medicines**
Semester(s) in which the module is taught	The 2nd semester (Odd semester)
Person responsible for the module	**Dr. rer.biol.hum., dr. Erma Sulistyaningsih, M.Si.**
Language	Indonesian
Relation to curriculum	Elective Courses
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[9]:
Credit points	2 Credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. Able to develop the biotechnological principles and other relevant sciences 2. Able to modify skills and knowledge of DNA and protein-based biotechnology to produce innovative and useful biological products for agroindustrial sectors
Content	1. Basic concepts of Personalized medicine 2. The history of the development of Personalized medicine 3. Pharmacogenomics 4. Genetic testing and pharmacodiagnostics 5. Ethical, legal and regulatory aspects of Personalized medicine 6. Personalized medicine development challenges 7. Personalized medicine in the context of health care reform
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module
Reading list	1. Jain KK. Textbook of Personalized Medicine. Springer. 2009. 2. Prainsack B. Personalized Medicine: Empowered Patients in the 21st century. New York University Press. 2017.

[9] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

	3. Vizirianakis IS. Handbook of Personalized Medicine: Advances in Nanotechnology, Drug Delivery and Therapy. Jenny Standford Publishing. 2014. 4. Cullis P. The personalized medicine revolution: How diagnosing and treating disease are about to change forever. 2015. 5. Snyder M. Genomics and Personalized medicine: What everyone needs to know.ISBN-13: 978-0190234768/ISBN-10: 00190234768. 6. Vogenberg FR, Barash CI, Pursel M, Personalized Medicine. Part 1. Pharmacy and Therapeutic 2010. 35(10): 560-565-567, 576 7. Vogenberg FR, Barash CI, Pursel M, Personalized Medicine. Part 2. Pharmacy and Therapeutic 2010. 35(11): 624-626,628-631,642 8. Vogenberg FR, Barash CI, Pursel M, Personalized Medicine. Part 3. Pharmacy and Therapeutic 2010. 35(12): 670-671, 673-675

Module Handbook

Module designation	**Principles of Biotechnology**
Semester(s) in which the module is taught	The 1st semester (Odd semester)
Person responsible for the module	**Prof. Ir. Bambang Sugiharto, MAgr.Sc., D.Agr.Sc.**
Language	Indonesian
Relation to curriculum	Compulsory Courses
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[10]:
Credit points	2 Credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	Able to **develop** the biotechnological principles and other relevant sciences
Content	1. Biotechnology and its scopes 2. Principal of DNA recombinant technology: gene cloning, restriction enzyme, DNA plasmid vector 3. Genetic Transformation in microbes and animal cells 4. Application of Biotechnology in Biomedicine and Pharmaceutical 5. Challenge and Ethical issue in Biotechnology 6. Genetic Transformation in plant cells. 7. Plant tissue culture 8. Target superior characters 9. Laboratory and field plant GMO analysis
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module

[10] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Reading list	1. Smith, JE. Biotechnology. 5th ed. Cambridge University Press. 2009. 2. Rastogi, SC. Biotechnology: Principles and Applications. Alpha Science. 2009. 3. Clark DP, and Pazdrnik NJ. Biotechnology. Cell. 2020. 4. Glick BR and Patten CL. Molecular Biotechnology: Principles and Application of recombinant DNA. 5th ed. 2020. 5. Peacok, KW. Biotechnology ang Genetic engineering. Global Issues. 2010. 6. Purohit SS. Biotechnology: Fundamentals and Application. 2010. 7. Kulkarni. Biotechnology and its applications in Pharmacy. 2001 8. Walsh G. Pharmaceutical Biotechnology: Concepts and Applications. 9. Nair AJ. Principles of biotechnology. Firewall Media. 2008. 10. Wiseman A. Principles of Biotechnology. 2nd ed. Surrey University Press. USA. 1988.

Module Handbook

Module designation	**Regenerative Medicine**
Semester(s) in which the module is taught	The 2nd semester (Odd semester)
Person responsible for the module	**Prof. Ir. Bambang Sugiharto, MAgr.Sc., D.Agr.Sc.**
Language	Indonesian
Relation to curriculum	Elective Courses
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[11]:
Credit points	2 Credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. Able to develop the biotechnological principles and other relevant sciences 2. Able to demonstrate the ability to collaborate and to communicate well in verbal and in writing national and/or internationally
Content	1. Tissue Engineering 2. Developmental Cell Biology 3. Cellular Therapeutics 4. Genetic Engineering 5. Biomaterials (Scaffolds and Matrices) 6. Chemical Biology 7. Nanotechnology
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module
Reading list	1. Kevin Dzobo , Nicholas Ekow Thomford, Dimakatso Alice Senthebane, Shipanga, Arielle Rowe, Collet Dandara, Michael

[11] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Pillay, and Keolebogile Shirley Caroline M. Motaung. Advances in Regenerative Medicine and Tissue Engineering: Innovation and Transformation of Medicine. Stem Cells International (2018), Article ID 2495848, 24 pages. https://doi.org/10.1155/2018/2495848

2. Seong Gyu Kwon, Yang Woo Kwon, Tae Wook Lee, Gyu Tae Park and Jae Ho Kim. Recent advances in stem cell therapeutics and tissue engineering strategies. Biomaterials Research (2018) 22:36. https://doi.org/10.1186/s40824-018-0148-4
3. Stephanie M. Willertha and Shelly E. Sakiyama-Elbert. Combining Stem Cells and Biomaterial Scaffolds for Constructing Tissues and Cell Delivery. StemJournal 1 (2019) 1–25. DOI 10.3233/STJ-180001
4. Damasceno PKF, de Santana TA, Santos GC, Orge ID, Silva DN, Albuquerque JF, Golinelli G, Grisendi G, Pinelli M, Ribeiro dos Santos R, Dominici M and Soares MBP. Genetic Engineering as a Strategy to Improve the Therapeutic Efficacy of Mesenchymal Stem/Stromal Cells in Regenerative Medicine. Front. Cell Dev. Biol. (2020) 8:737. doi: 10.3389/fcell.2020.00737
5. Robert Langer. Chemical and Biological Approaches to Regenerative Medicine and Tissue Engineering. Molecular Frontiers Journal (2019); 3(2). doi:10.1142/S2529732519400091
6. YafengYang, ∗AdityaChawla, ∗JinZhang, 2 AdamEsa, 4Hae LinJang, Ali Khademhosseini. Applications of Nanotechnology for Regenerative Medicine; Healing Tissues at the Nanoscale. Principles of Regenerative Medicine (Third Edition).2019, Pages 485-504. https://doi.org/10.1016/B978-0-12-809880-6.00029-1

Module Handbook

Module designation	**Regulation of Genetic Engineering Product**
Semester(s) in which the module is taught	The 2nd semester (Odd semester)
Person responsible for the module	**Prof. Ir. Bambang Sugiharto, MAgr.Sc., D.Agr.Sc.**
Language	Indonesian
Relation to curriculum	Compusory Courses
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[12]:
Credit points	2 Credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	1. PBU 2101 (Principles of Biotechnology) 2. PBU 2102 (Biochemistry and Molecular Biology) 3. PBT 2113 (Molecular Detection in Agriculture) 4. PBK 2112 (Molecular Detection in Medicine)
Module objectives/intended learning outcomes	1. Able to internalize an attitude of piety to God Almighty and love their country 2. Able to develop the biotechnological principles and other relevant sciences 3. Able to manage biotechnology research comprehensively with a multidisciplinary approach to solve problems in agroindustrial sectors
Content	1. Definition and scope of Genetically Engineered Products (GMO) 2. Importance and dynamics of GMO Regulation 3. Principles, Forms and Types of Regulations for GMO 4. GMO Regulatory Institutions and Agencies 5. Biosafety Assessment of GMO 6. Documentation of PRG Biosafety test results 7. Dynamics of Regulation and resolution of GMO disputes
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module

[12] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Reading list	1. BPOM. 2006. Genetically Engineered Food Products 2. BPOM. 2017. Clarification of Explanation on the Issue of Food Safety of Genetically Engineered Products 3. Regulation of the President of the Republic of Indonesia Number 39 of 2010 concerning the Commission for the Biosafety of Genetically Engineered Products 4. Law Number 5 of 1994 concerning Ratification of the United Nations Convention on Biological Diversity 5. Law Number 23 of 1997 concerning Environmental Management 6. Estiati, A. & M. Herman. 2015. Regulation of Biosafety of Genetically Engineered Products in Indonesia. Agricultural Policy Analysis 13(2): 129-146. 7. Wasilah, U., Rohimah, S., Su'udi, M., (2019). Development of Biotechnology in Indonesia. Engineering 12(2), 85-9 8. Herman, M. 2011. Fourteen years of development of biosafety and food safety regulations of genetically engineered products and their implementation in Indonesia. Journal of AgroBiogen 6(2):113-125 9. Deputy for Food and Agriculture Coordination, Coordinating Ministry for Economic Affairs of the Republic of Indonesia. 2019. Roadmap for the Development of PRG Seeds 2020-2045. 10. 1Regulation of the Head of the Food and Drug Supervisory Agency of the Republic of Indonesia. 2008. Guidelines for the Assessment of Food Safety of Genetically Engineered Products. 11. Regulation of the Minister of Agriculture of the Republic of Indonesia Number 36/Permentan/LB.070/8/2016 concerning Assessment of Feed Safety of Genetically Engineered Products

Module Handbook

Module designation	**Enzyme Engineering**
Semester(s) in which the module is taught	The 2nd semester (Odd semester)
Person responsible for the module	**Dr. Anak Agung Istri Ratnadewi, S.Si,M.Si**
Language	Indonesian
Relation to curriculum	Elective Courses
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[13]:
Credit points	2 Credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Able to internalize an attitude of piety to God Almighty and love their country 2. Able to develop the biotechnological principles and other relevant sciences
Content	1. Enzyme structure 2. Classification of enzymes 3. Enzyme mechanism of action 4. The role of enzymes in industry 5. Enzyme engineering: Directed Evolution 6. Enzyme engineering: Rational design 7. Enzyme engineering: Semi Rational design 8. Other types of enzyme engineering strategies 9. Examples of Enzyme Engineering 10. Enzyme engineering applications in agroindustry
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module

[13] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Reading list	1. Anshula Sharma, Gaganjot Gupta, Tawseef Ahmad, Sheikh Mansoor & 2. Baljinder Kaur. 2019. Enzyme Engineering: Current Trends and Future 3. Perspectives. Food Reviews International, https://doi.org/10.1080/87559129.2019.1695835 4. Kanwar SS and Kumar R. 2018. Ribonuclease as Anticancer TherapeuticsEnzyme Engineering 5. Lutz, S., and Bornscheuer, U. T. 2013. Protein Engineering Handbook. Volume 3. Wiley-VCH. Germany.

Module Handbook

Module designation	**Gene Therapy**
Semester(s) in which the module is taught	The 2nd semester (Even semester)
Person responsible for the module	**Dr.rer.biol.hum.dr. Erma Sulistyaningsih, M.Si**
Language	Indonesian
Relation to curriculum	Specific Compulsory for Medical Biotechnology
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[14]:
Credit points	2 Credits or 2.76 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. Able to internalize an attitude of piety to God Almighty and love their country 2. Able to develop the biotechnological principles and other relevant sciences
Content	1. Gene therapy: understanding, brief history and development 2. Basic principles and approaches to gene therapy 3. Altering gene expression regulation 4. Gene therapy in disease management 5. Ethical issues related to gene therapy 6. Challenges in gene therapy 7. Gene trapping 8. Gene targeting 9. Gene delivery system 10. Vectors in gene therapy 11. Animal models in gene therapy 12. Gene therapy applications in various fields
Examination forms	Oral presentation, Essay, Quis

[14] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Study and examination requirements	Requirements for successfully passing the module
Reading list	1. Ryuichi Morishita and Hironori Nakagami. Gene Therapy: Technologies & Applications. 2013. doi: 10.2217/9781780842134 2. Andrew Mountain. Gene Therapy: the first decade. Trends in Biotechnology. 18(3): 119-128 3. Nicholl DST. An introduction to genetic engineering. Cambridge University Press. 2008. 4. Primrose SB, Twyman RM. Principles of gene manipulation and genomics. Blackweel publishing. 2006. 5. Silva AJ, Smith AM, Giese KP. Gene targetting and the biolgy of learning and memory. Annu Rev Genet 31:527-546 6. Patil, Rhodes, Burger=ss. DNA based therapeutic and DNA delivery systems: a comprehensive review. AAPS J . 2005: E61-E77. 7. China OK's. Gene therapy drug. Genetic engineering. 2003 8. Cross D, Burmester. Gene therapy for cancer treatment: past, present and Future. Clin med res. 2006: 218-227. 9. Wivel NA, Walters L: Germ-line gene modification and disease prevention: some medical and ethical perspectives. Science 262:533-538, 1993 10. Walters L, Palmer JG. Germ-line gene therapy, in The Ethics of Human Gene Therapy. 1997, Oxford University Press, New York, 80-89 11. Sade RM, Khushf G. Gene therapy: ethical and social issues. J So Carolina Med Assoc 1998;94(9):406-410 12. Cross D, Burmester. Gene therapy for cancer treatment: past, present and Future. Clin med res. 2006: 218-227. 13. Chriss, M, Dunhill P. A brief definition of regenerative medicine. Regenerative medicine. 2008.

Module Handbook

Module designation	**Molecular Virology**
Semester(s) in which the module is taught	The 2nd semester (Even semester)
Person responsible for the module	**Dr.rer.biol.hum.dr. Erma Sulistyaningsih, M.Si**
Language	Indonesian
Relation to curriculum	Elective Course
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2hours Private study including examination preparation, specified in hours[15]:
Credit points	2 Credits or 2.76 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. Able to develop the biotechnological principles and other relevant sciences 2. Able to demonstrate the ability to collaborate and to communicate well in verbal and in writing national and/or internationally
Content	1. Introduction to virology molecular 2. Virus structure, genome and genetics 3. Life cycle and replication 4. Virus assembly 5. Infection basics 6. Innate dan adaptive immunity 7. Mechanism of pathogenesis 8. Emerging viruses 9. Vaccine 10. Therapeutic viruses
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module

[15] When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

Reading list	1. Jane Flint, Vincent R. Racaniello, Glenn F. Rall, Theodora Hatziioannou, Anna Marie Skalka, 2020. Principles of Virology, 5th Edition. Wiley. 2. Wagner E.K., Hewlett M.J., Bloom D.C. and Camerini D. 2015. Basic virology. 3rd edition. Blackwell Publication. 3. Knipe and Howley, Wolters Kluwer, 2013. Fields Virology, 6th edition. Lippincott Williams and Wilkins. 4. Dimmock, N. J.; Easton, A. J. and Leppared, K. N. 2016. Introduction to Modern Virology. 7th Edition. Wiley-Blackwell. ISBN: 978-1-119-97810-7. 5. Gloria-Sánchez. 2013. Hepatitis a virus in food detection and inactivation methods. Chapter 1, Introduction. Available from: http://www.springer.com/series/10203 6. Carter J.B. and Saunders V.A. 2007. Virology: Principles and applications. John Wiley & Sons Ltd. 7. Cheng R.H. and Miyamura T. 2008. Structure based study of viral replication. World Scientific Co. Pvt. Ltd. 8. Dimmock N.J., Easton A.J. and Leppard K.N. 2007. 6th edition. Introduction to modern virology. Blackwell Publication. 9. Flint et al., 2009. Principles of Virology, 3rd edition, ASM Press. 10. Leonard C. 2010. Virology: Molecular Biology and Pathogenesis. ISBN: 9781555814533. DOI: 10.1128/9781555814533.

Module Handbook

Module designation	**Entrepreneurship in Biotechnology**
Semester(s) in which the module is taught	The 2nd semester (Even semester)
Person responsible for the module	**Prof. Tri Agus Siswoyo, SP.,M.Agr.,Ph.D**
Language	Indonesian
Relation to curriculum	Elective Course
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 136 hours Contact hours: 16 × 1.67 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2 hours Private study including examination preparation, specified in hours: 14 × 2.80 hours
Credit points	3 Credits or 4.53 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. Able to internalize an attitude of piety to God Almighty and love their country 2. Able to develop the biotechnological principles and other relevant sciences 3. Able to manage biotechnology research comprehensively with a multidisciplinary approach to solve problems in agroindustrial sectors.
Content	1. General study and principles in Entrepreneur in the field of Biotechnology 2. Guest lecture 3. Visits of UKKM Companies in the field of Biotechnology 4. Planning an entrepreneur as a result of a research in the field of biotechnology
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module
Reading list	1. Craig Shimasaki (2014) Biotechnology Entrepreneurship: Starting, Managing, and Leading Biotech Companies, Academic Press doi: https://doi.org/10.1016/C2012-0-02297-1

	2. Introduction to Biotech Entrepreneurship: From Idea to Business A European Perspective. Springer Cham. Doi: https://doi.org/10.1007/978-3-030-22141-6

Module Handbook

Module designation	**Dissemination of Research**
Semester(s) in which the module is taught	The 3rd semester (Odd semester)
Person responsible for the module	**Prof. Tri Agus Siswoyo, SP.,M.Agr.,Ph.D**
Language	Indonesian
Relation to curriculum	Elective Course
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 45.33 hours Contact hours: 16 × 0.82 hours Structured Learning: 14 × 2 hours Independent Study: 14 × 2 hours Private study including examination preparation, specified in hours: 14 × 2.80 hours
Credit points	1 Credit or 1.51 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	Able to demonstrate the ability to collaborate and to communicate well in verbal and in writing national and/or internationally
Content	1. Various activities for the dissemination of research results 2. Requirements and procedures for registration of research results dissemination activities 3. Presentation of research results orally
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module
Reading list	Surat Direktur Jenderal Pendidikan Tinggi Nomor 638/E.E4/KP/2020 tentang Pedoman Operasional Tentang Penilaian Angka Kredit Kenaikan Jabatan Fungsional/Pangkat Dosen

Module Handbook

Module designation	**Thesis**
Semester(s) in which the module is taught	The 4th semester (Even semester)
Person responsible for the module	**Prof. Tri Agus Siswoyo, SP.,M.Agr.,Ph.D**
Language	Indonesian
Relation to curriculum	Elective Course
Teaching methods	Lecture, Lesson, Discussion, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 272 hours Private study including examination preparation, specified in hours: 16 × 5 hours
Credit points	6 Credit or 9.51 ECTS
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. Able to demonstrate the ability to collaborate and to communicate well in verbal and in writing national and/or internationally 2. Able to demonstrate the ability to collaborate and to communicate well in verbal and in writing national and/or internationally
Content	1. Proposal Seminar 2. Results Seminar 3. Thesis Exam
Examination forms	Oral presentation, Essay, Quis
Study and examination requirements	Requirements for successfully passing the module
Reading list	1. Drafting Team. 2016. Guidelines for Writing Scientific Papers at the University of Jember. Jember University Press. 2. Standard Operating Procedures (POB) Commission for Master's Thesis Guidance on Biotechnology 3. UNEJ Team. 2021. Guidelines for the Implementation of Education at the University of Jember 4. Regulation No. 17 of 2021. Regarding the Implementation of Education at the University of Jember