FACULTY OF AGRICULTURE

DEPARTMENT OF ANIMAL SCIENCE

UNDERGRADUATE PROGRAM **MODULE HANDBOOK**

Module designation	Genetics
Semester(s) in which themodule is taught	1nd Semester
Person responsible for the module	Dr. Mohd. Agus Nashri Abdullah, S.Pt., M.Si.
Language	Indonesia/English
Relation to curriculum	Compulsory module
Teaching methods	Discussion, use of audio visuals, questions and answers, group assignments, individual assignments
Workload	✓ 100 minutes of lecture and discussion per week ✓ 100 minutes of structured tasks per week ✓ 150 minutes of independent activity per week
Credit points	2 credits point (lesson = 2) = 3.2 ECTS
Required and recommended prerequisites for joining the Module	-
Module objectives/intended learning outcomes	• Have knowledge, understanding and be able to explain the development of classical genetics to modern genetics, the benefits of genetics and breeding in the field of animal husbandry. • Have knowledge, understanding and be able to explain cell biology (anatomy, function and cell reproduction; mitosis in the context of cell multiplication in growth). • Have knowledge, understanding and be able to explain gametogenesis (meiosis and mitosis; spermatogenesis; and oogenesis). • Able to explain molecular genetics (DNA and RNA; protein synthesis; nuclear and mitochondrial gene expression). • Able to explain chromosome structure and abnormalities (crossing over and chromosome mutations and DNA mutations). • Able to explain gene expression, genetic characteristics, genotype and phenotype (non-additive gene performance; and dominant genes) • Able to explain the pattern of qualitative trait inheritance (monohybrid) (distribution of genes from one generation to the next; dominant recessive; deviation; and monohybrid). • Able to explain the pattern of qualitative (dihybrid) trait inheritance (crossing between pure seeds; test cross; codominance influence; and the influence of lethal genes).

Content	This course introduces the fundamental principles of genetics, covering the structure and function of genes, the mechanisms of inheritance, genetic variation, gene interaction, and molecular genetics. It also explores modern genetic technologies and their applications in biotechnology, agriculture, medicine, and environmental conservation. Students will gain both theoretical knowledge and practical skills in genetic analysis, enabling them to interpret genetic data, solve biological problems, and evaluate the ethical, social, and environmental implications of genetic research.
Examination and assesment formats	Lecture, interactive discussion, and focus group discussion
Study and examination requirements	✓ 20% structured tasks/project cases ✓ 20% quiz ✓ 30% mid test ✓ 30% final test
Reading list	Griffiths, A. J. F., Wessler, S. R., Carroll, S. B., & Doebley, J. (2020). Introduction to genetic analysis (12th ed.). New York, NY: W. H. Freeman and Company. Klug, W. S., Cummings, M. R., Spencer, C. A., Palladino, M. A., & Killian, D. J. (2021). Concepts of genetics (12th ed.). Hoboken, NJ: Pearson Education. Liao, B. Y., et al. (2021). Advances in CRISPR–Cas genome editing technologies. Nature Reviews Genetics, 22(4), 259–277. https://doi.org/10.1038/s41576-020-00324-7 Liu, G., et al. (2020). Genome editing for crop improvement: Progress and prospects. Nature Genetics, 52(7), 653–661. https://doi.org/10.1038/s41588-020-0628-9 Sahu, S. K., et al. (2023). Single-cell multi-omics for understanding cellular heterogeneity. Nature Reviews Genetics, 24(3), 159–176. https://doi.org/10.1038/s41576-022-00525-2 Gupta, P. K., & Rustgi, S. (2021). Genetic diversity and its applications in crop improvement. Theoretical and Applied Genetics, 134(9), 2741–2762. https://doi.org/10.1007/s00122-021-03834-2