



# Biology Master Program

## PROFILE

2023

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DEPARTMENT OF BIOLOGY  
FACULTY OF MATHEMATICS AND NATURAL SCIENCES  
ANDALAS UNIVERSITY  
INDONESIA





## PROFILE

Biology Master Program

Department of Biology

**Andalas University**

### DRAFTING TEAM

**Chief : Dr. Putra Santoso**

**Secretary : Dr. M. Idris**

**Members:**

- **Dr. Wilson Novarino**

- **Prof. Dr. Indra J Zakaria**

- **Dr. Nurainas**



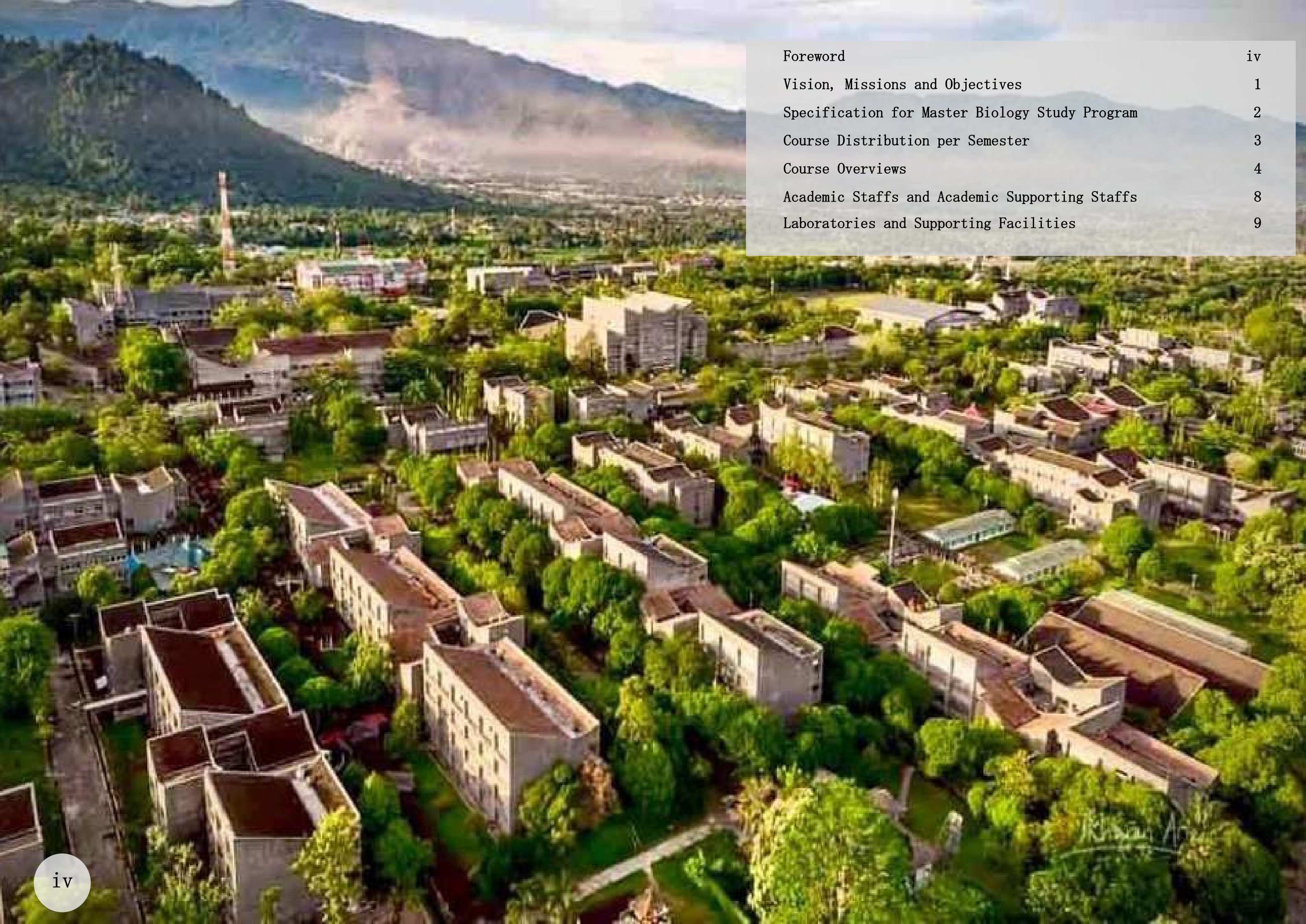
## Foreword

The Department of Biology has been 61 years old this 2023. This is one of four departments in Faculty of Mathematics and Natural Science, Andalas University. During the period it runs, it has built a robust academic tradition, which supported by facilities and infrastructures provisioned to assist the development of integrative and multi-party cooperation toward education, research and social service, as well as improving academic atmosphere and productivity, in which the students' life become more creative, innovative and competitive. It has vision "To be an excellent study program in studying, utilizing, and conserving the tropical biodiversity to generate competitive graduates at the international level in 2028 ."

Biology Master Programme was established in 1997 based on the Decree of the Director General of Higher Education Number 77/DIKTI/Kep/197, April 22th 1997. The naming refers to the current regulation (Decree of Minister of Research, Technology and Higher Education 57 Year 2019) regarding the Name of Study Program in University. The graduates from this program earn the degree of Magister Sains (M.Si), qualified with general competence in accordance with the Presidential Regulation of Republic of Indonesia No. 8 Year 2012 regarding Indonesian Qualification Framework (or KKNI). Since 2018, it has achieved the Grade A (highest level) of accreditation based on National Accreditation Agency for Higher Education Indonesia (BAN\_PT). Institutionally, the department has designed multiple methods for improving the capacity building through various trainings which relate to specific expertise. Its goal is not only to train the internal human resource (teaching staffs, students), but also goes further externally by involving many communities from surrounding municipalities and villages in West Sumatra and beyond. It serves as the implementation of community outreach by providing various training materials to society. Enhancements input and process have become focal attention to achieve the optimum quality of output and outcome. All of the agenda mentioned above, together with academic activities (improvement the quantity and quality of research, seminar, scientific articles, journal and book publishing) are expected to bring the Biology Master Programme of Andalas University gets closer to become the reputable graduate programme at international level in 2028.

Dr. Wilson Novarino  
(Head of Department)





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# Vision, Missions, and Objectives

## Vision:

To be an excellent study program reputable in studying, developing, and conserving tropical biodiversity and generating competitive graduates at international level in 2028.

## Missions:

1. To carry out qualified education in order to generate competitive graduate at the international level
2. To conduct researches on biodiversity and conservation towards reputable international publications and intellectual property rights.
3. To conduct community services based on the outcomes of biodiversity and conservation studies in order to improve community welfare.
4. To implement mutual collaboration with various stakeholders to achieve goals of educational, research, and community services.

## Objectives:

1. To nurture the qualified graduates with a recognizable specificity in studying, developing and conserving Sumatran biodiversity at national and international level.
2. To disseminate scientific publications in reputable international journals and obtain intellectual property rights in the field of biodiversity and conservation.
3. To elevate the implementations of research results in the field of biodiversity and conservation for community welfare and environmental sustainability.
4. To enhance the mutual benefits from collaborations with stakeholders in the fields of education, research, and community services.







## Specification for Biology Master Program

Program Name	Biology Master Program Department of Biology, Faculty of Mathematics and Natural Sciences, Andalas University
Year of Establishment	1997
Accreditation Level	A (Decree no. 3231/SK/BAN-PT/Akred/M/XII/2018)
Graduate Profiles	researchers at various public and private research institutions and universities, analysts of biology laboratories, environmental consultants and conservationists in non-governmental organizations (NGOs), environmental impact analysis companies and various companies that require environmental analysis and audits, biological curators at public and private research institutions.
Teaching and learning methods	Teaching and learning process are characterized by interactive, collaborative and student-centered learning
Assessment methods	Learning outcome assessments cover; 1) soft skills, attitudes and core values, 2) knowledge and 3) psychomotor. Assessment methods include observation, participation, writing test, practical exam, and interview. Learning process are assessed using rubrics, and learning outcomes are assessed using portfolios.
Total Credit Hours	41-43 (61.91 - 64.93 ECTS)
Duration of Study	4 semester

## Intended Learning Outcome (ILO)

- ILO1. Internalize academic honesty, open-mindedness, agility, and concern for saving biodiversity.
- ILO2. Having the capacity to work in a group and independently, communicate in written and oral, analytical thinking, creative and innovative.
- ILO3. Deepen theory and concept of molecular, physiology, biosystematics, ecology, and microbiology
- ILO4. Be able to apply principal and concepts of measurement by using hardware and software to analyze data of molecular, physiology, biosystematics, microbiology, and ecology
- ILO5. Be able to identify and solve problems related to tropical biodiversity through induction and deduction approach
- ILO6. Be able to disseminate research results of tropical biodiversity in scientific seminar and indexed journal



## Course Distribution Per Semester

Code	Course Name	Credit	ECTS*	Workload**	
				Hours in class	Hours Self-Study
<b>1<sup>st</sup> Semester</b>					
BIO81101	Molecular Biology	2	3.02	26.67	64
BIO81102	Ecology and Ecosystem Conservation	2	3.02	26.67	64
BIO81103	Physiology	2	3.02	26.67	64
BIO81104	Biosystematics and Evolution	2	3.02	26.67	64
BIO81105	Tropical Biodiversity	2	3.02	26.67	64
BIO81106	Biostatistics	2	3.02	26.67	64
<b>Sub-Total</b>		12	18.12	160.00	384
<b>2<sup>nd</sup> Semester</b>					
BIO8....	Compulsory subject I in concentration	2	3.02	26.67	64
BIO8....	Compulsory subject I in concentration	2	3.02	26.67	64
BIO82101	Research methodology	2	3.02	26.67	64
BIO8....	Elective 1	2	3.02	26.67	64
BIO8....	Elective 2	2	3.02	26.67	64
BIO8....	Elective 3	2	3.02	26.67	64
<b>Sub-Total</b>		12	18.12	160.00	384

3 <sup>rd</sup> Semester		Credit	ECTS*	Hours in class	Hours Self-Study
BIO8....	Elective 4	2	3.02	26.67	64
BIO81107	Scientific Writing	2	3.02	26.67	64
BIO80101	Research Proposal Seminar	1	1.51	13.33	32
<b>Sub-Total</b>		5	7.55	66.67	160
<b>4<sup>th</sup> Semester</b>					
BIO80103	Research Result Seminar	1	1.32	13.33	32
BIO80102	Thesis	6	9.06	80.00	192
BIO80105 / BIO80106	National Scientific Seminar / International Scientific Semi-	2 or 3	3.02 or 4.53	0	90.67 or 136
BIO80108 / BIO80109	Accredited national scientific Journal / Indexed International	3 or 4	4.53 or 6.04	0	136 or 181.33
<b>Sub-Total</b>		12 - 14	18.12 - 21.14	93.33	450.67 - 541.33
<b>Total</b>		41 - 43	61.91 - 64.93	480	1378.67 - 1369.33

\* 1 ECTS = 30 hours

\*\* 1 credit (SKS) = 170 minutes = 2,833 hour (50 minutes in class and 120 minutes self-study) for 16 meetings



# Course Overviews

## **Molecular Biology (Compulsory)**

This course covers the particular topics related with application of molecular biology in biosystematics, ecology and conservation, growth and development, and biotechnology; regulation in DNA synthesis, DNA repair and recombination, regulation in RNA synthesis, intracellular compartments and protein sorting, membrane transportation intracellular, cell signaling, cell interaction, state of the art in molecular biology

## **Ecology and Ecosystem Conservation (Compulsory)**

This subjects focused on ecology and natural ecosystem conservation of terrestrial and aquatic as well as man-made ecosystem including plantation, agriculture, fisheries; anthropogenic ecosystem, energy flow in ecosystem, alterations in ecosystems, ecosystem resilience, ecosystem services, ecosystem management, technologies in ecosystem restorations, state of the art ecology and ecosystem conservation

## **Biosystematics and Evolution (Compulsory)**

The course engage students to understand the concepts of categorization in biosystematics (siblings, ecospecies, ecotype etc.), species concepts in botany, zoology and microbe, speciation, nomenclature in botany, zoology and microbe, biosystematics characterizations, phenetic and phylogenic analysis, biosystematics and conservation relationship

## **Physiology (Compulsory)**

In this subject, students will deeply explore the certain topics including regulations of primary and secondary metabolism, action mechanism of foreign agents in the targeted organ, metabolic disorders, factors determining the physiology of growth. Developmental physiology, adaptive physiology, research application based on growth and development, stem cells, and state of the art in metabolic regulation





## **Community Ecology (Compulsory for Ecology and Ecosystem Conservation)**

This subject covers the following topics: definition and scope of community ecology, community properties, diversity (types, alpha, beta, gamma, global diversity), factors affecting biodiversity, interspecific interaction, predation modeling in simple community, factors affecting interspecies interaction, state of the art in community ecology.

## **Genomics and Proteomics (Compulsory for Genetics and Biomol. Concentration)**

Course topics cover the scope of genomics and proteomics, genomics in biological systems, proteomic in biological systems, protein degradation rate in cells, techniques in proteomic analysis, interaction of protein and ligands, genome editing, prospective of genomic and proteomic in the fields of health and agriculture, state of the art genomic, state of the art proteomics .

## **Advanced Physiology (Compulsory for Physiology Concentration)**

This course specifically covers the topics related with defense System in Plants (response, adaptation, and resistance), Defense system in animals (response, adaptation and resistance, homeostasis), Reproductive physiology (factors affecting reproduction, cycles and reproductive adaptation strategies, application of reproductive knowledge), Photoreceptors (phytochromes, cryptochromes, neuropeptides), temperature reception, and other factors (plants and animals), Bioregulators in plants, Bioregulators in animals, State of the art" in physiology.

## **Applied Physiology (Compulsory for Physiology Concentration)**

The content of the course covers the topics including Bioenergy (in plants and animals)., Probiotic feed production (utilization of natural enzymes), Metabolite production (induction/elicitation, mass production, and other related matters), Mechanisms of xenobiotic detoxification (in animals and plants), Bioconversion Applications, Nutraceuticals (functional foods, supplements, and medical foods), State of the art" in applied physiology.



## **Ecology Genetics (Compulsory for Genetics and Biomol. Concentration)**

The content of the course covers Gen Pool, genetic structure based on space and time, genetic fitness, genetic erosion, genetic differentiation and factors caused it, genetic divergence, introgression, epigenetics in molecular perspective, state of the art in ecology genetics.

## **Molecular Diagnostics (Elective)**

It covers topics about scope of molecular diagnostics, techniques in molecular diagnostics, detection and elucidation of pathogenic microorganisms, molecular diagnostics of inherited diseases, molecular diagnostic of cancer, DNA polymorphism for diagnostic markers, DNA fingerprint for diagnostics, state of the art in molecular diagnostics

## **Genetic Engineering (Elective)**

The course covers the specific topics related with genetic transmission in bacteria, DNA recombinant technology, restriction enzymes, vector cloning, knock out, knock in, knock down of the gene expression, genomic and cDNA library, gene amplifications, genome sequencing, and transposon mutagenesis.

## **Conservation Genetics (Elective)**

It covers certain topics including relationship of genetics and conservation, genetics and extinction, Evolutionary genetics of Natural Populations, Loss of genetic diversity in small populations, Inbreeding and Inbreeding depression, Population fragmentation, Resolving taxonomic uncertainties and defining management units, Genetics and the management of wild populations, captive populations and reintroduction, Molecular genetics in forensics and to understand species biology, Populations viability analysis (PVA), State of the art in conservation genetics





### Advanced Tissue Culture (Elective)

This course covers the topics such as Tissue culture for plant breeding (anther culture, endosperm culture, and other related matters, Tissue culture for the production of secondary metabolites (elicitation, precursor, transformation culture / hairy root culture), Tissue culture for genetic engineering (expression test), Cryopreservation (plant and animal), Concepts and methods of stem cell culture in animals, Concepts and methods of specific cell culture (cancer cells, adipocytes, osteoblasts, and other related matters), Concepts and methods of animal organoid culture.

### Bioregulation (Elective)

Students will engage with particular topics cover the Principle and mechanisms of bioregulation in plants, animals, and humans, Principle and mechanisms of bioregulation in sex determination in animals, Mechanism of bioregulation in development of insect and its application for pest control, Application of bioregulation mechanisms in food formulations and quality enhancement, Mechanism of bio stimulant and its role in regulating the plant growth and production enhancement, Mechanism of bioregulation in physiological stress of the plant, State of the art in the bioregulation

### Photoreceptor (Elective)

The topics the courses are including Introduction: the basic concept of photoreceptor, history about photoreceptor research development, types of photoreceptor in animal and plant, Non-visual photoreceptor in animal (phototaxis; rhodopsin dan the pineal gland)., visual photoreceptor in animal., the photoreceptor of red light in plant (phytochrome, PHY)., photoreceptor of blue light and UV-A in plant (cryptochrome, CHY; phototropin, PHOT and Zeitlupe, ZTL), photoreceptor of UV-B in plant (UV-Resistant Locus 8, UVR8)., photoreceptor crosstalk; synergistic and antagonistic.

### Nutrition and Biopesticides Development (Elective)

This course focused on principles in nutrition and biopesticides development, physiological concepts in nutrition and biopesticide formulation, identification and exploration of nutrition and biopesticides, toxicology and efficacy of nutrition and biopesticides, Eco physiological aspect of nutrition and biopesticides, regulations in commercialization of nutrition and biopesticides products, state of the art in nutrition and biopesticides development.

### Cell Signaling (Elective)

The topics of the course are types of signaling and receptors in signal transduction systems, pathways in signal transduction, reception mechanism of targeted cells in responding the signals, signal transduction in gene expression regulation, signal transduction in microbe defense system, signal transduction in plant cell defense system, signal transduction in animal cell defense system, State of the art in cell signaling .



## Academic and Supporting Staffs



### Academic Staffs

- Aadrean, Dr.
- Anthoni Agustien, Dr.
- Chairul, Prof. Dr.
- Dahelmi, Prof. Dr.
- Dewi Imelda Roesma, Prof. Dr.
- Djong Hon Tjong, Dr.
- Efrizal, Prof. Dr.
- Erizal Mukhtar, Prof. Dr.
- Feskaharny Alamsjah, Dr.
- Fuji Astuti Febria, Dr.
- Henny Herwina, Dr.
- Indra Junaidi Zakaria, Dr.
- Jabang Nurdin, Dr.
- M. Idris, Dr.
- Mairawita, Dr.
- Mansyurdin, Prof. Dr.
- Mildawati, Dr.
- Nofrita, Dr.
- Nurainas, Dr.
- Nurmiati, Dr.
- Periadnadi, Dr.
- Putra Santoso, Dr.
- Resti Rahayu, Dr.
- Rita Maliza, Dr.
- Rizaldi, Dr.
- Solfiyeni, Dr.
- Syaifullah, Dr.
- Syamsuardi, Prof. Dr.
- Tesri Maideliza, Dr.
- Wilson Novarino, Dr.
- Zozy Aneloi Noli, Dr.

### Academic Supporting Staffs

- Mayarni, SE.
- Ernawati Lutan
- Nurhaida, S. Pt.
- Zainal, SP.
- Lismaryanti, A. Md.
- Irmizon
- Roni Kurniawan
- Doddy Putra, A. Md.
- Anugrah Viona Agesi, M. Si.
- Nelma Eka Putri



# Laboratories and Supporting Facilities

## Laboratories

- **Plant Taxonomy**
- **Animal Taxonomy**
- **Plant Ecology**
- **Animal Ecology**
- **Genetics & Cell Biology**
- **Microbiology**
- **Teaching Laboratories**
- **Plant Physiology**
- **Animal Physiology**
- **Plant Structures and Functions**
- **Animal Structures & Functions**
- **Herbarium Andalas (ANDA)**
- **Museum of Zoology**

## Academic Supporting Facilities

- **Reading room and Library**
- **Greenhouse**
- **The Biological Educational and Research Forest (HPPB)**
- **Arboretum Andalas**

## Student Supporting Facilities

**Mosque, University Hospital, Student Dormitory, Cafeteria, Polyclinic, Sport Facilities, Convention Center, Language Center, Guest House, etc**

