MODULE HANDBOOK
BACHELOR IN BIOLOGY

Biology Department
Faculty of Mathematics and Sciences
Jember University
2023

Table of content

Fundamental Biology

Module designation	: **Fundamental Biology**
Semester(s) in which the module is taught	: odd/I
Person responsible for the module	:1. Dr.rer.nat. Kartika Senjarini, M.Si 2. Dr.rer.nat. Fuad Bahrul Ulum, S,Si. M.Sc
Language	: Indonesian and English
Relation to curriculum	: Compulsory /~~ elective ~~/ ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation, Practical course
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 181.32hr a. lecture-Discussion: 40hr b. Practical course: 45.3 hr c. Project: 28.8hr d. Presentation: 19.2hr e. Private study: 48hr
Credit points	: 4 credits or 6.04 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in group (LO6)
Content	This course describes concepts of fundamental biology: Describe the principal concept of cell structure and function, metabolite, DNA and mutation, genetic, evolution, Virus and Organism (structure and development), and Ecology. There are also implementation scientific methods for fundamental biology research through a **case-based Method** by analyzing the research data presentation from Campbell book and paper publication of some lecturer in Biology d
Examination forms	a. Essay test (25%) b. Per chapter quiz (35%) c. Project report (15%) d. Practical course (25%) e. : passing grade 70%
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Cole, L.A., 2016. Biology of life: biochemistry, physiology and philosophy. Academic Press. 2. Keeton and Gould. 1993. Study Guide Biological Science, Fifth Edition. W.W. Norton & Company, Inc. New York 3. Reece, Jane B. & Meyers, Noel. & Urry, Lisa A. & Cain, Michael L. & Wasserman, Steven A. & Minorsky, Peter V. & Jackson, Robert B. & Cooke, Bernard J. & Campbell, Neil A. (2017). Campbell biology Eleventh Edition. Frenchs Forest, NSWPearson 4. Starr, C. 1994. BiologyConcept and Applications. Wadsworth. California 5. Wallace, R.A., G.P Sanders and R.J Ferl. 1997. BiologyThe Science of Life. Harper Collins College Publishers. New York. 6. Solomon, E.P, L.R. Berg and D.W Martin. 2008. Biology Eighth Edition. Thomson Brooks/Cole. Canada

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Calculus

Module designation	: **Calculus**
Semester(s) in which the module is taught	: odd/I
Person responsible for the module	: Dr. Firdaus Ubaidiilah, M.Si. and team
Language	: Indonesian and English
Relation to curriculum	: Compulsory /~~ elective ~~/ ~~specialisation~~
Teaching methods	: Lecture- Discussion, Project, Presentation, Practical course
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 181.32hr a. Lecture-Discussion: 45.32 hr b. Laboratory work68 hr c. Case-method68 hr
Credit points	: 4 credits or 6.04 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO 2) **Skills:** Able to implement calculus concepts in laboratory work and/or field studies independently and/or in group (LO6)
Content	This course **describes concepts** of calculus: including basic concepts of the real number system, absolute values, inequalities, functions and graphs, introduction special functions (absolute functions, signum functions, and largest integer functions), limit functions, function continuity, derivatives (definitions, rules derivative search, composition function derivative, higher order derivative, implicit function derivative), derivative use (maximum and problems) minimum, maximum and relative minimum, draw advanced graphs, Mean Value Theorem), and define integrals. There are also implementation scientific methods for calculus research through **a case-based Method** by analyzing the research data presentation from updated references.
Examination forms	1. Essay test (30%) 2. Pre-test (5%) 3. Final practical test (15%) 4. Activity observation (10%) 5. Equipment software/observation (5%) 6. Progress report (10%) 7. Final Report (15%) 8. Report Presentation (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Varberg, D., Purcell, E., and Rigdon, S., 2015, Calculus, 9th, Wiley Publishing 2. Stewart, J., 2016, Calculus: Early Transcendentals, 8th, Belmont: Thomson Higher Education 3. Firdaus Ubaidillah, Ika Hesti Agustin, 2019, Kalkulus Fungsi Satu Peubah, Jember: UPT Percetakan dan Penerbitan Universitas Jember 4. Book of Practical Guide

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

General Physics

Module designation	: **General Physics**
Semester(s) in which the module is taught	: odd/I
Person responsible for the module	: Physics department lecturers
Language	: Indonesian and English
Relation to curriculum	: Compulsory /~~ elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation, Practical course
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 181.32hr a. Lecture-Discussion: 45.32 hr b. Laboratory work68 hr c. Case-method68 hr
Credit points	: 4 credits or 6.04 ECTS
Required and prerequisites for joining the module	
Module objectives/intended learning outcomes	**Knowledge:** able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) **Skills:** Able to implement physics concepts in laboratory work and/or field studies independently and/or in group (LO6)
Content	This course **describes concepts** of general physics for the level of undergraduate stundes. The course topics are Quantities and unit of measurements, Kinematics, Dynamics, Work, Energy and Momentum, Fluids, Vibrations and Waves, Temperature and Heat, Thermodynamics, Optics, Electricity, Magnetism. The Practical course emphasis the skill of equipment handling, mesurement techniques and data analysis. There are also implementation scientific methods for general physics research through **a case-based Method** by analyzing the research data presentation from updated references.
Examination forms	a. Essay test (25%) b. Per chapter quiz (35%) c. Project report (15%) d. Practical course (25%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Bauer, W. dan Westfall, G. D. (2011). University Physics with Modern Physics. New York (US): McGraw -Hill Companies, Inc. 2. Bloomfield, L. A. (2013). How Things Work, The Physics of Everyday Life; 5th Edition. New Jersey (US): John Wiley & Sons, Inc. 3. Cutnell, J. D. & Johnson. K. W. (2012). Physics; 9th Edition. New Jersey (US): John Wiley & Sons, Inc. 4. Giancoli, D. H. (2014). Physics Principles with Applications; 7th Edition. Boston: Pearson Education, Inc. 5. Giambattista, A., Richardson, B. M., dan Richardson, R. C. (2010). Physics. New York: McGraw -Hill. 6. Glencoe Science. (2005). Physics; Principles and Problems. Columbus: Glencoe/McGraw -Hill. 7. Serway, R. A. & Vuille, C. (2017). College Physics; 12th Edition. Boston: Cengage Learning. 8. Sudarti & Singgih Bektiarso, 2020, Fisika Radiasi, Jember University Press. 9. Walker, J., Halliday, D., dan Resnick, R. (2014). Fundamentals of Physics; 10th Edition. New York: John Wiley & Sons Inc. 10. Book of Practical Guide

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Basic Chemistry

Module designation	: **Basic Chemistry**
Semester(s) in which the module is taught	: odd/I
Person responsible for the module	: Chemistry lecturer
Language	: Indonesian and English
Relation to curriculum	: Compulsory /~~ elective ~~/ ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation, Practical course
Workload (incl. contact hours, self-study hours)	Estimated) Total workload: 181.32hr a. lecture-Discussion: 40hr b. Practical course: 45.3 hr c. Project: 28.8hr d. Presentation: 19.2hr e. Private study: 48hr
Credit points	: 4 credits or 6.04 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	: **Knowledge:** Able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in group (LO6)
Content	This course **describes concepts** of fundamental chemistry: including the principal concept of material and energy, stoikiometry, atom structure and mollecule, form of substance, chemistry kinetics, chemical equilibrium, solution chemistry, electrochemistry, nuclear chemistry and radioactivity, and environmental chemistry. The Practical course emphasis the skill of equipment handling, mesurement techniques, preparation and identification of alkane compounds, identification of carboxylic functional groups, carbonyl groups in aldehydes and ketones, reactions of alcohols, acids, bases and salts. There are also implementation scientific methods for basic chemistry research through **a case-based Method** by analyzing the research data presentation from updated references.
Examination forms	a. Essay test (25%) b. Per chapter quiz (35%) c. Project report (15%) d. Practical course (25%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Haryono, H.E., 2019. Kimia Dasar. Deepublish 2. Brady, J.E. 2014. Chemistry 7th Edition. New York: Wiley and Sons 3. Chang, R. 2015. General Chemistry 12th Edition. New York: Mc Graw Hill 4. Silberbeg M. 2012. Principles of General Chemistry. New York (US): McGraw-Hill Education 5. Book of Practical Guide

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Religion Education:

Islamic

Module designation	: **Islamic education**

Semester(s) in which the module is taught	: even/I
Person responsible for the module	: Team Teaching General Courses
Language	: Indonesian
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr lecture-Discussion: 56.66hr Presentation: 34.00hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: -
Module objectives/intended learning outcomes	● : **Knowledge:** ● able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) ● implementing the basic concepts of islamic principal (the pillars of islam and the pillar of faith) in oral and writing (CLO2a) ● **Competence:** ● able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1) ● showing an honest attitude and final practical testability individually and in society (CLO1a)
Content	To improve the students' skills and competences in Islamic education, this course covers the principal of Islamic pillars and the principal of faith pillars. This course encourages the students to internalize the Islamic principle for their faith and their daily activities as students and as part of society. The course also explains the history of Islam and the application of Islamic religion in society manners.
Examination forms	a. Mid test (25%) b. Final test (25%) c. Observation evaluation (30%) d. Presentation evaluation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Qurah, Husein Sulaiman, 1977, al-Ushûl al-Tarbawiyah fi Binâ al-Manâhij, Cairo: Dar al-Maarif 2. Sabiq, Sayid. (1990), Akidah Islam, (terjemahan), Bandung: Diponegoro. Cetakan kesepuluh. 3. Sabiq, Sayid,2006, Fiqh al-Sunnah, Beirut: Dar al-fikr, juz III 4. Al-Nahlawi, Abdurrahman. (1989). Prinsip-prinsip dan Metoda Pendidikan Islam.terjemahan Herry Noer Ali. Bandung: CV Diponegoro. 5. Ohan Sudjana, (1994) , Fenomena Akidah Islam Berdasarkan Qur'an dan sunnah, Jakarta: Meida Dakwah 6. Ansari, Ali, (2003). Tasawuf dalam Sorotan Sains Modern, Bandung: Pustaka Hidayah. 7. Din Syamsudin, (2002), Etika Agama dalam Membangun Masyarakat Madani, Logos, Jakarta. 8. Husien, Machsun. (1985). Pendidikan Islam dalam Lintasan Sejarah. Yogyakarta: Nur Cahya.

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Catholic

Module designation	: **Catholic Religion**

Semester(s) in which the module is taught	: even/I
Person responsible for the module	: Team Teaching General Courses
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialization~~
Teaching methods	: lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr a. lecture-Discussion: 56.66hr Presentation: 34.00hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: -
Module objectives/intended learning outcomes	**Knowledge:** able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) **Competence:** able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1)
Content	In order to improve understanding of the basic concepts of Catholic religion and students' competences in building cooperation with people of the others religions, this course covers: the definition and terminology Catholic religion, basic human problems and human as God' image, human dignity, religious pluralism and inter-religious harmony, the Bible: A source for knowing the life and work of Jesus Christ, overview of the universal Church and Indonesian Church (local)
Examination forms	a. Mid test (25%) b. Final test (25%) c. Observation evaluation (30%) Presentation evaluation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Crossway Bibles. 2011.The Holy Bible, English Standard Version.Crossway Publisher. 2. Dixon, Thomas M. 2009.Science and Religion: A very short Introduction.Oxford University Press: International Society for Science and Religion. 3. Wayne Grudem. 2014.Bible Doctrine: Essensial Teaching of the Christian Faith.Zondervan Publisher. 4. John. F.A. Sawyer.2006. The Bible and Culture. Wiley-Blackwell Publisher 5. Alfra Siauwarjaya, Th. Huber SJ. Mengena Iman Katolik. Jakarta, Obor, 1987 Franz Magnis Suseno, SJ. Gereja Katolik Indonesia Menjelang Tahun 2000. Tantangan dan Harapan, dalam Spektrum XXVIII: 2 (2000)

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Christian

Module designation	: **Christianity**
Semester(s) in which the module is taught	: even/I
Person responsible for the module	: Team Teaching General Cources
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr lecture-Discussion: 56.66hr Presentation: 34.00hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: -
Module objectives/intended learning outcomes	: **Knowledge:** ● able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) implementing the basic concepts of the Christian faith in the behaviour of life (CLO2a) **Competence:** ● able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1) ● showing an honest attitude and final practical testability in caring behaviour for others as Christians (CLO1a) working individually or in team works (CLO1b)
Content	In order to improve understanding of the basic concepts of Christian faith and students competences in caring for the others, this course covers: teaching the Bible about God (God's existence Trinity of God, God's Providence), Christ's work of salvation in life (Man as a created person, the fall into sin, Christ's saving work, application in life), biblical self-image (factors supporting self-image, criteria and causes of self-image unhealthy, healthy and biblical self-image), proper Christian ethics on various moral issues (definition of Christian ethics, ethical decision making, Christian moral attitudes towards various moral issues), the relationship between Christian faith and science and technology, culture, politics, and law (Relation of Christian faith with science and technology, relationship of Christian faith with culture, politics, and law), religious harmony in society (factors driving pluralism, three models of theological views of religions, religious pluralism according to the Bible), and attitudes and actions as Christians who are involved in the community (service to the community)
Examination forms	a. Mid test (25%) b. Final test (25%) c. Observation evaluation (30%) Presentation evaluation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Wayne Grudem. 2014.Bible Doctrine: Essensial Teaching of the Christian Faith.Zondervan Publisher 2. William Lande Craig. 2008. Reasonable Faith: Christian Truth and Apologetics. Crossway Books Publisher.

	3. Philip Graham Ryken & James Montgomery Boice. 1973. Is Jesus the Only Way?. Crossway Publisher 4. James Montgomery Boice. 1993. Amazing GraceThe Meaning of God's Grace — And How It Can Change Your Life. Tyndale House Pub Publisher. 5. Lase, Jason (ed.). Pendidikan Agama Kristen. Bandung: Bina Media Informasi, 2005.. Hadiwijono, Harun. 1973. Iman Kristen. JakartaBPK Gunung Mulia.

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Hinduism

Module designation	: **Hinduism education**
Semester(s) in which the module is taught	: even/I
Person responsible for the module	: Team Teaching General Courses
Language	: Indonesian
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr a. lecture-Discussion: 56.66hr b. Presentation: 34.00hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: -
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) ● Implementing the basic concepts of Hinduism principal (the pillars of Hindu and the pillar of faith) in oral and writing (CLO2a) **Competence:** ● able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1) ● showing an honest attitude and final practical testability individually and in society (CLO1a)
Content	The Hindu Religious Education course discusses and explores materials with the substance of human relations with Hyang Widhi (God who is God). Maha Esa) for increasing faith and piety (Sraddha and bhakti); human relations with fellow humans in building a civilization that humanist; as well as human relations with their environment in realizing prosperity (jagadhita), so as to be able to form Hindu and spiritual people Indonesian human beings who are independent, final practical testble and caring.
Examination forms	a. Mid test (25%) b. Final test (25%) c. Observation evaluation (30%) d. Presentation evaluation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Reading list	1. Singer, Wayan, 2012. Tattwa (Ajaran Ketuhanan Agama Hindu, Surabaya, Paramita 2. Tim Penyusun, 1997, Pendidikan Agama Hindu Untuk Perguruan Tinggi, Hanuman Sakti 3. Wiana, 1994, Bagaimana Hindu Menghayati Tuhan, Manik Geni . 4. Wiana, 1982, Niti Sastra, Ditjen Hindu dan Budha. 5. Titib, 1996, Veda Sabda Suci Pedoman Praktis Kehidupan, Paramita. 6. Pudja, 1997, Teologi Hindu, Mayasari

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Buddhism

Module designation	: **Buddhism education**
Semester(s) in which the module is taught	: even/I
Person responsible for the module	: Team Teaching General Courses
Language	: Indonesian
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr a. lecture-Discussion: 56.66hr b. Presentation: 34.00hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: -
Module objectives/intended learning outcomes	: **Knowledge:** ● able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) ● implementing the basic concepts of Buddhism principal (the pillars of Buddha and the pillar of faith) in oral and writing (CLO2a) **Competence:** ● able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1) ● showing an honest attitude and final practical testability individually and in society (CLO1a)
Content	Buddhist education is an effort to produce Indonesian people who are able to understand, live, and practice/apply the Dharma in accordance with the Teachings The Buddha contained in the Tipitaka/Tripitaka Scriptures so that he becomes a human who is final practical testble (according to Dharma principles) in daily life.
Examination forms	a. Mid test (25%) b. Final test (25%) c. Observation evaluation (30%) d. Presentation evaluation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Pokok-Pokok Dasar Agama Buddha Mulyadi Wahyono,SH. Jakarta Tahun 2002. 2. Tim Penyusun. 2003. Materi Kuliah Sejarah Perkembangan Agama Buddha CV.Dewi Kayana Abadi Jakarta. 3. Abhidhammattha Sangaha ,Penyusun Pandit Jinaratana Kaharudin. Cetakan Pertama Tahun 2005. 4. Dhammapada Sabda-Sabda Buddha Gotama, Kemenag Bimas Buddha Jabar Tahun 2011 5. Dhammapada Atthakatha, Pustaka Narada Jakarta 2007 3. Itivuttaka, Kitab Suci Agama Buddha, diterbitkan oleh Lembaga Anagarini Indonesia Tahun 2007 6. Riwayat Buddha Gotama, Penerbit Lembaga Pengkajian Dan Pengembangan Keagamaan Buddha Indonesia, Tahun 2010 7. Kapita selekta Agama Buddha, Tim Penyusun Penerbit CV.Dewi Kayana Abadi Jakarta 2003 8. Agama Buddha dan Ilmu Pengetahuan, DR.Buddhadasa P. Kirthisinghe, Tahun 2004

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

English

Module designation	: **English**
Semester(s) in which the module is taught	: odd/I
Person responsible for the module	: Team Teaching General Courses
Language	: Indonesian
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr a. lecture-Discussion: 56.66hr b. Presentation: 34.00hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: -
Module objectives/intended learning outcomes	: **Knowledge:** ● able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) ● implementing the basic concepts of English communication in oral and writing (CLO2a) **Competence:** ● able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1) ● showing an honest attitude and final practical testability in English communication (CLO1a) ● working individually or in team works (CLO1b)
Content	This course covers the ability to write and communicate scientifically, especially about biology using English. There are four basic English skills that are included, namely reading, listening, speaking, and writing. The materials are include to understand the meaning of speech, to deliver ideas/ideas, to speak, to distinguish nouns, verbs, adjectives, and adverbs, to use basic grammar, to recognize various kinds of paragraphs in English, and to write paragraphs in English with good grammar. The grammar covers conceptual knowledge of present and past tense, progressive and perfect; future tenses; passive voice; reading comprehensions; adjective clauses; noun closes; gerunds and infinitives; quoted and direct speeches.
Examination forms	a. Mid test (30%) b. Final test (40%) c. Observation evaluation (30%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Yuliani, Marta. 2008. Let's Study Passive and Active Sentences. Bandung: Pakar Raya 2. Dwi, Elan W. 2009. Modern English Grammar. Yogyakarta: Pustaka Pelajar 3. Hartono, John Surjadi. 2008. Tata Bahasa Bahasa Inggris (English Grammar). Surabaya: Penerbit Indah 4. Aziz, E. Aminudin. 2003. Cultured Based English For College Students. Grasindo: Jakarta 5. Ann Cook. 2000. American Accent Training: A Guide to Speaking and Pronouncing Colloquial American English, Barrons. 6. Harry Collins. 1987. 101 American English Idioms: Understanding and Speaking English Like an American , Passport Books.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Indonesian

Module designation	: **Indonesian**
Semester(s) in which the module is taught	: odd/II
Person responsible for the module	: Team Teaching General Cources
Language	: Indonesian
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr a. lecture-Discussion: 56.66hr b. Presentation: 34.00hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: -
Module objectives/intended learning outcomes	: **Knowledge:** ● able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) ● implementing the basic concepts of Indonesian communication in oral and writing (CLO2a) **Competence:** ● able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1) ● showing an honest attitude and final practical testability in Indonesian communication (CLO1a) ● working individually or in team works (CLO1b)
Content	In order to improve the students' skills and competences in Indonesian scientific written and oral communication, this course covers a variety of standard written communication based on standard Indonesian grammar and Indonesian spelling. It includes understanding the position and function of the Indonesian language; words and word formation, sentence concept, paragraph formation, characteristics of academic texts and non-academic texts so students are able to build academic texts independently; and book review text. This course encourages the students to apply direct quotations and indirect quotations in writing scientific papers, writing a bibliography from various references, understanding types of scientific work and systematics of scientific work, writing research reports based on observations, and editing language errors in writing scientific papers. Each theory and applying the Indonesian language material in an integrated manner, so that it has a positive impact on the formation of attitudes and behavior as an educated society; writing various standard written communications, especially in writing scientific papers.
Examination forms	Mid test (25%) Final test (25%) Observation evaluation (30%) Presentation evaluation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Reading list	1. Alwasilah C. dan Yahya, S. 2015. Dasar-dasar Teori Linguistik. Bandung: CV Tunas Putra Bandung. 2. Badan Pengembangan Bahasa Indonesia. 2015. Pedoman Umum Ejaan Bahasa Indonesia. Jakarta: Badan Pengembangan dan Pembinaan Bahasa. 3. Chaer, Abdul. 2012. Seputar Tata Bahasa Baku Bahasa Indonesia. Jakarta: Rineka Cipta. 4. Chaer, Abdul. 2012. Linguistik Umum. Jakarta: Rineka Cipta. 5. Chaer, Abdul. 2013. Pembinaan Bahasa Indonesia. Jakarta: Rineka Cipta. 6. Chaer, Abdul. 2013. Pengantar Semantik Bahasa Indonesia. Jakarta: Rineka Cipta. 7. Chaer, Abdul. 2015. Filsafat Bahasa. Jakarta: Rineka Cipta. 8. Badan Pengembangan dan Pembinaan Bahasa kementerian Pendidikan dan Kebudayaan. 2016. Pedoman Umum Ejaan Bahasa Indonesia (PUEBI). Jakarta: Badan Pengembangan dan Pembinaan. 78pp 9. Junaiyah H. Matangi & E. Zaenal Arifin. 2014. Analisis Kesalahan Berbahasa Indonesia. Tangerang: Pustaka Mandiri. 10. Nurwardani P, dkk. 2016. Bahasa Indonesia untuk Perguruan Tinggi. Jakarta: Direktorat Jenderal Pembelajaran dan Kemahasiswaan Kementerian Riset Teknologi dan Pendidikan Tinggi.

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Civic Education

Module designation	: **Civic Education**
Semester(s) in which the module is taught	: even/II
Person responsible for the module	: Team Teaching General Cources
Language	: Indonesian
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr a. lecture-Discussion: 56.66hr b. Presentation: 34.00hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: -
Module objectives/intended learning outcomes	: **Knowledge:** ● able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) ● implementing the basic concepts of civic education for sustainability resources (CLO2a) **Competence:** ● able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1) ● showing an honest attitude and final practical testability as the practice of Pancasila (CLO1a)
Content	This course discusses some of the mandatory basic materials regarding the concepts in citizenship education and is able to identify problems that are developing, and can work together as an effort to change behavior in accordance with the personality of the Indonesian nation and norms in accordance with the 1945 Constitution and Pancasila, and show it directly in everyday life
Examination forms	a. Mid test (25%) b. Final test (25%) c. Observation evaluation (30%) d. Presentation evaluation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Reading list	1. UUD 1945 pasca amandemen 2. Ismatullah (2012). Pendidikan Pancasila dan Kewarganegaraan. Bandung. CV. Pustaka Setia 3. Kaelan dan Zubaidi (2010), Pendidikan Kewarganegaan, Yogyakarta: Paradigma 4. Winarno (2013), Paradigma Baru Pendidikan Kewarganegaraan, Jakarta: PT. Bumi Aksara 5. Tim Nasional Dosen Pendidikan Kewarganegaraan (2010). Pendidikan Kewarganegaraan Paradigma Baru untuk Mahasiswa, Bandung: Alfabeta 6. Sholihudin dkk, Merevitalisasi Pendidikan Pancasila Sebagai Pemandu Reformasi, Surabaya: IAIN Sunan Ampel Press 7. Syahri (2013), Paradigma Kewarganegaraan, Malang: UMM Press 8. Ridwantono (2007), Pendidikan Kewarganegaraan Republik Indonesia, Malang: Bayumedia 9. Rozak dan Ubaedillah (2013), Pancasila, Demokrasi, HAM dan Masyarakat Madani, Jakarta: ICCE UIN 10. 10.Bakry (2010), Pendidikan Pancasila, Yogyakarta: Pustaka Pelajar

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Microbiology

Module designation	: **Microbiology**
Semester(s) in which the module is taught	: Odd/II
Person responsible for the module	1. Dr. Esti Utarti, S.P., M.Si., 2. Dr. Drs. Sutoyo, MSi., 3. Drs. Rudju Winarsa, M.Kes.
Language	: Indonesian and English
Relation to curriculum	: Compulsory/~~elective~~/~~specialization~~
Teaching methods	: lecture- Discussion, Practice-lab works, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 136 hr a. lecture-Discussion: 68 hr b. Practical-course (case method): 45.33 hr c. Presentation: 22.67 hr
Credit points	: 3 credits or 4.53 ECTS
Required and recommended prerequisites for joining the module	: Fundamental Biology
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells, and organisms (LO3) **Skills:** a. Able to implement biological concepts in laboratory work and/or field studies independently and/or in group (LO6) b. Competencies: able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1)
Content	This course covers the basic knowledge of the biological concept of microbes, i.e. cell structure, metabolism and growth, genetics, and controlling of microorganisms. Laboratory skills in microbiology are aseptic technique, microbial culture, characterization of bacteria colony, simple staining of bacteria, and microscopic observation of molds and yeast.
Examination forms	a. Essay test (30%) b. Assignment or quiz (10%) c. Scientific Article of the project including data analysis (software application) (20%) d. Practical work (30%) e. Presentation (10%)
Study and examination requirements	: passing grade 70% (Requirements for successfully passing the module
Reading list	1. Cappuccino, J.G. and Welsh, C. 2020. Microbiology: A Laboratory Manual. Pearson. 2. Kim, B.H and G.M. Gadd. 2008. Bacterial Physiology and Metabolism. Cambridge University Press. Cambridge 3. Madigan, M.T, J.M Martinko and J. Parker. 2019. Biology of Microorganisms. Prentice-Hall. 4. Brenner, D.J., N. R. Krieg and J.T. Staley. Bergey's Manual of Systematic Bacteriology 2nd edition part A. Springer. 5. Brenner, D.J., N. R. Krieg and J.T. Staley. Bergey's Manual of Systematic Bacteriology 2nd edition part B. Springer.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Plant Structure

Module designation	: **Plant Structure**
Semester(s) in which the module is taught	: odd/II
Person responsible for the module	1. Dra. Dwi Setyati, MSi., 2. M. Su'udi, PhD. 3. Dr.rer.nat. Fuad Bahrul Ulum, S,Si. M.Sc
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation, Practical course
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload:181.32hr a. lecture-Discussion: 40hr b. Practical course: 45.3 hr c. Project (Booklet): 28.8hr d. Presentation: 19.2hr Private study:48hr
Credit points	: 4 credits or 6.04 ECTS
Required and recommended prerequisites for joining the module	: Fundamental of Biology
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular, cells and organism (LO3) - Able describing the principles of plant structure concepts (LO3a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) a. able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation(LO6a) b. Using software and/or basic instruments to analyze the plant structures (LO6b)
Content	This course describes concepts of Plant Structure: 1. Plant morphology: vegetative organs (root, stem, leaf) and generative organs (flower, fruit and seed). 2. Plant anatomy: Cytology, Histology, Organology of non-vascular and vascular plants: Vegetative organology (root, stem and leaf), and Generative organology (flower, fruit and seed). 3.Secondary growth and stem annual ring There are also implementation scientific methods for Plant structure through a **Project-based Method** by observing the morphological characteristics of plants around campus then the result will be made as booklet. Laboratory works cover: equipment handling for examining the vegetative and generative organs, plant collection technique for morphological examination, making plant semi-permanent microscope slides, observing and examining the anatomical structure Using optilab and Microsoft excel for to measure the distribution and density of stomata per unit area
Examination forms	a. Essay test (25%) b. Quiz (15%) c. Project report (35%) Practical course (25%)
Study and examination requirements	*: passing grade 70%*

	Requirements for successfully passing the module
Reading list	1. Bell, D.A. and A. Bryan.1991. Plant Form An Illustrated Guide to Flowering Plant Morfology. Oxford University Press. New York. 2. Bendre, A., and A. Kumar. 1980. A. Textbook of Practical Botany-volume Two. Rastogi Publication 3. Clegg, C.J and G. Cox.1978. Anatomy and Activities of Plants. A Guide to the Study of Flowering Plants. 4. ickison, W.G. 2000. Integrative Plant Anatomy. Academic Press. London 5. Fahn,A. 1992. Anatomi Tumbuhan (Terjemahan) Gadjah Mada University Press. Yogyakarta. 6. Pandey, B.P. 1982. Plant Anatomy. Third Edition. S. Chand dan Co. Ltd. London. Tjitrosoepomo, G. 1994. Morfologi Tumbuhan. Gadjah Mada University Press. Jogyakarta.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Animal Structure

Module designation	: **Animal Structure**
Semester(s) in which the module is taught	: even/II
Person responsible for the module	1. Dra. Mahriani, MSi. 2. Dra. Susantin Fajariyah,M.Si 3. Eva Tyas Utami, S,Si. M.Si 4. Husnatun Nihayah, S.Si, M.Biomed
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Practical course, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 181.4 hr a. lecture-discussion: 93.5hr b. Laboratory work: 45.3 hr c. Case Study: 42.5hr
Credit points	: 4 credits or 6.04 ECTS
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells, organisms, and biological resources management (LO 3): - Describing the principles of Animal Structure (CLO 3a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO 06): a. able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation(CLO 6a) b. using optilab software applications for structure observation (CLO 6b)
Content	This course **describes principal concepts** of animal structure: animal cell structure and basic tissue (epithelium, connective, muscle, nerve), digestive system (digestive tract and glands), reproductive system, endocrine system, respiratory system, circulation system, integumentary system, urinary system, muscular and skeletal system, and nervous system. There are also **practicing** laboratory of basic tissues (epithelial, loose and dense connective, blood, bone, cartilage, blood, muscle), digestion system histology and anatomy, circulatory system histology and anatomy, integumentary system histology and anatomy, urogenital system histology and anatomy, respiratory anatomy, muscular system anatomy, skeletal system anatomy, and endocrine system histology and **using optilab software** applications for respiratory system structure observation
Examination forms	a. Essay test (40%) b. Quiz (10%) c. Presentation base on Case Study: (25%) d. Laboratory work:(25%) e. Pre-test (5%) f. laboratory work Observation (equipment and activities) (5%) g. laboratory work report (5%) h. final practical test (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Eroschenko, V. P. 2008. diFiore's Atlas of Histology With Functional Correlations. 11th ed. Lipincott William & Wilkin, Philadelphia.

	2. Hickman CP, Roberts LS, Keen SL.,Larson A. 2008. Integrated Principles of Zoology. 14th edition. The Mc. Graw Hill education. New York 3. Hildebrand, M. 1988. Analysis of Vertebrate Structure. John Wiley and Sons. Inc. 4. Kardong K. 2008. Vertebrates: Comparative Anatomy, Function, Evolution. Mc. Graw Hill Science/Engineering/Math. 5. Kent, G.C. 1983. Comparative Anatomy of Vertebrates. The. C.V. Fosby Company. 6. Kuehnel, W. 2003. Color Atlas of Cytology, Histology and MicroscopicAnatomy. 4th edition. Georg Thieme Verlag. Germany. 7. Linzey,D.W. 2012. Vertebrate Biology. 2nd edition. The John Hopkins University Press. Baltimore. 8. Mescher A.L. 2016. Junquiera's Basic Histology.14th edition. Mc. Graw Hill ed. Lange. New york 9. Treuting, P. M., S.M. Dintzis dan K.S. Montine. 2012. Comparative Anatomy and Histology Mouse, Rat and Human Atlas. 2nd ed. Amerika: Academic Press.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Cell Biology

Module designation	: **Cell Biology**
Semester(s) in which the module is taught	: Even/II
Person responsible for the module	1. : Dr. Esti Utarti, S.P., M.Si., 2. Dra. Mahriani, M.Si., 3. Syubbanul Wathon, S.Si., M.Si., 4. Dr. Drs. Sutoyo, M.Si.
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90,67 hr a. lecture-Discussion: 45,33 hr b. Practical-course (case method): 45.33 hr
Credit points	: 2 credits or 3,02 ECTS
Required and recommended prerequisites for joining the module	: Fundamental Biology
Module objectives/intended learning outcomes	**Knowledge:** able to analyze the principles of molecular biology, cells and organisms (LO3) **Competence:** able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1)
Content	**This course describes** the structure of prokaryotic cells and eukaryotic cells and the characteristics of the organelles that make up the cell which include structure and function of cell membrane, cytoskeleton, ribosome, endoplasmic reticulum. golgi apparatus, lysosome, peroxisome, mitochondria, chloroplast and nucleus, cell cycle and cell division, and cell communication There is also **presentation** of structure and function of the cell organelles, in groups or teamwork
Examination forms	a. Essay test (30%) b. Assignment or quiz (20%) c. Presentation (50%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Albert, B., A. Johnson, J. Lewis, M. Raff, K. Roberts and P. Walter. 2008. Molecular Biology of The Cell. Fifth Edition. Garland Science. New York. 2. Cooper, G.M. 2019. The Cell, A Molecular Approach. Eighth Edition. Sinauer Associates. New York. 3. Campbel, N.A, J.B Reece And L.G Mitchell. 1999. Biology Fifth Edition,.An Imprint of Addison Wesley Longman Inc. California. 4. Fitzpatrick, B. 2011. Cell, the Building Block of Life. Yurchak Printing. Lansville. 5. Pollard, T.D, W.C. Earnshaw, J.L. Schwartz, and G.T. Johnson. 2017. Cell Biology. third edition. Elsevier. Philadelphia

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Biochemistry

Module designation	: **Biochemistry**
Semester(s) in which the module is taught	: Even/II
Person responsible for the module	1. Prof. Dr. Ir. Bambang Sugiharto, DagrSc., M.Agr. 2. Dr. Kahar Muzakhar, S.Si., 3. Dr. Sattya Arimurti, S.P., M.Si., 4. Dr. Esti Utarti, S.P., M.Si.
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Practice-lab works
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 136 hr a. lecture-Discussion: 90.67 hr b. Practical-course (case method): 45.33 hr
Credit points	: 3 credits or 4.53 ECTS
Required and recommended prerequisites for joining the module	: Basic Chemistry and Fundamental Biology
Module objectives/intended learning outcomes	**Knowledge:** able to analyze the principles of molecular biology, cells and organisms (LO3) **Skills:** able to implement biological concepts in laboratory work and/or field studies independently and/or in group (LO6)
Content	**This course is describe** water and its interactions in solution and the biological environment of organisms; structure and functions of carbohydrates, amino acids, peptides, protein, vitamins and nucleotides; enzymes and their kinetics, bioenergetics and types of biochemical reactions, glycolysis, gluconeogenesis, and the pentose phosphate pathway, citric acid cycle, oxidative phosphorylation and photophosphorylation, the flow of genetic information within biological system (genetic dogma), genetic expression and its regulation, basic principles of DNA recombination. This course is also supported by practical activities in the Biotechnology laboratory There is also implementation of biological concepts in laboratory work and/or field studies independently and/or in groups through **practical works laboratories**. It assigned in **individual or teamwork** covering 1) glucose assay using dinitrosalicylic colorimetric method, 2) sucrose assay using resorcinol method, 3) lipid total assay using Bligh-Dyer Method, 4) Protein assay using Bradford method, 5) protein separation and analysis using SDS-PAGE, 6) invertase and nitrate reductase assay, 7) DNA quantification using spectrophotometry method, 8) DNA electrophoresis analysis, **Data analysis using Microsoft Excel and Primer Software** for examination concentration of glucose, sucrose, protein, lipid , and enzyme activity, 8) Results and Discussion of practical laboratory activities.
Examination forms	a. Essay test (40%) b. Assignment or quiz (10%) c. Scientific Article of the project including data analysis (software application) (20%) d. Practical work (30%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Ahern K. 2019. Biochemistry and Molecular Biology. The Great Courses. USA.

	2. Berg, J.M., J. L. Tymoczko, & L. Stryer. 2002. Biochemistry 5td ed. W.H Freeman & Company. 3. Nelson, D.L. & M.M., Cox. 2017. Lehninger Principles of Biochemistry. 7th ed. W.H Freeman & Co. New York 4. Snyder, L., J.E. Peters, T.M. Henkin, & W. Champness. 2013. Molecular Genetics of Bacteria 4th edition. ASM Press. Washington DC. 5. Watson, J.D., A. Gann, T.A. Baker, M. Levine, S. P. Bell, and R. Losick. 2013. Molecular Biology of The Gene. Pearson. London.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Pancasila Education

Module designation	: **Pancasila Education**
Semester(s) in which the module is taught	: odd/II
Person responsible for the module	: Team Teaching General Courses
Language	: Indonesian
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture-Discussion: 56,66 hr b. Presentation: 19.2hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: -
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) - implementing the basic concepts of Indonesian communication in oral and writing **Competence:** Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1) a. showing an honest attitude and final practical testability as the practice of Indo (CLO1a) b. working individually or in team works (CLO1b)
Content	This course **describes concepts** of Pancasila in the perspective of the History of the Indonesian Nation; Pancasila as the State Foundation of the Republic of Indonesia; Pancasila as the Ideology of the Republic of Indonesia; Pancasila as a system of ethics, and Pancasila as the basis for the development of science. This course applies the Pancasila knowledge in an integrated manner, so that it has a positive impact on the formation of attitudes and behavior as an educated society.
Examination forms	a. Mid test (25%) b. Final test (25%) c. Observation evaluation (30%) d. Presentation evaluation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Armaidy Armawi, Geostrategi Indonesia, Jakarta, Direktorat jenderal Pendidikan Tinggi, 2006 2. Azyumardi Azra, paradigma Baru Pendidikan Nasional dan Rekonstruksi dan Demokratisasi, Penerbit Kompas, Jakarta, 2002 3. Bahar, Dr. Saefudin, Konteks Kenegaraan, Hak Asasi Manusia, Pustaka Sinar Harapan, Jakarta, 2000. 4. Ir. Sukarno, editor H Amin Arjoso, SH Tjamkan Pancasila Dasar Falsafah Negara", Jakarta, Penerbit Panitia Nasional Peringatan Lahirnya Pancasila 1 Juni 1945 – 1 Juni 1964

	5. Slamet Soemiarno, Geopolitik Indonesia, Jakarta, Direktorat Jenderal Pendidikan Tinggi, 2006 6. Magnis-Suseno, Etika Politik: Prinsip-prinsip Moral Dasar Kenegaraan Modern, Jakarta, Penerbit Gramedia Pustaka Utama

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Introduction to Environmental Science

Module designation	Introduction to Environmental Science
Semester(s) in which the module is taught	odd/III/V
Person responsible for the module	1. Dra. Hari Sulistiyowati, M.Sc, Ph.D 2. Dr. Dra. Retno Wimbaningrum, M.Si. 3. Rendy Setiawan, S.Si, M.Si. 4. Arif Mohammad Siddiq, S.Si., M.Si.
Language	Indonesian and English
Relation to curriculum	Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	lecture - Discussion, Case-Based Methods, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture- Discussion: 34 hr b. Case study Report (video and article review): 22.67 hr c. Presentation: 34 hr
Credit points	2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) - Analyzing the basic concepts of environmental science (CLO2a) **Competence:** Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1) a. working in team work on environmental concepts discussion (CLO1b) b. able to implement the logic of critical thinking on biosafety and environmental issues related to the field of biology with a scientific and bioethical approach (LO5) c. Implementing the logic of critical thinking on environmental problems with bioethics approach for better environmental awareness (CLO5a) d. Using the logic of critical thinking on environmental sustainability related to the field of biology with a scientific and bioethics approach (CLO5b)
Content	This course discusses the components of Environmental Introduction including abiotic, biotic, and social factors, the type of environmental health, water, air, soil, sanitation, food processing industries, principal of environmental ethics, environmental changes by time, growth population of human and consumption Lifestyle. This course also implementation scientific methods for the introduction of environmental sciences through **Case-Based Method** by reviewing the article and video of global environmental problem, a regional environmental problem, the pressure on natural sciences, and pollution which related to World attention to environmental problems, Environmental Management, and MDgs-SDGs
Examination forms	a. Essay test (40%) b. Case study Report (video and article review) (40%)

	c. report Presentation (20%)
Study and examination requirements	Passing grade 70% Requirements for successfully passing the module
Reading list	1. Cunningham, W.P. 1999. Environmental science: a global concern. Fifth Ed. The McGraw-Hill Companie, Inc. California. 2. Johnsen I, Jorgensen SE. 1989. Principles of Environmental and Science Tecshnology. Amsterdam (ND): Elsevier Science 3. Miller, G.T.J. 1998. Living in the environment, principles, connections, and solutions. Tenth Ed. Wadsworth Publishing Company. New York. 4. Zulkifli, A. 2014. Dasar-dasar ilmu lingkungan. Salemba Teknika. Jakarta. 5. Government Regulation on the Environment and other supporting sources

Credits to ECTS conversion formula 2 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 90.67 Hours. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Microbial Physiology

Module designation	: **Microbial Physiology**
Semester(s) in which the module is taught	: Odd/III
Person responsible for the module	1. Dr. Esti Utarti, S.P., M.Si., 2. Dr. Drs. Sutoyo, MSi., 3. Drs. Rudju Winarsa, M.Kes.
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture Discussion, Practical laboratory works, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 136 hr a. lecture-Discussion: 68 hr b. Laboratory Work: Case Study: 45.33 hr Presentation: 22.67 hr
Credit points	: 3 credits or 4.53 ECTS
Required and recommended prerequisites for joining the module	: Microbiology
Module objectives/intended learning outcomes	***Knowledge:*** *Able to analyze the principles of molecular biology, cells and organisms (LO3)* ***Skills:*** *Able to implement biological concepts in laboratory work and/or field studies independently and/or in group (LO6)* ***Competences*:** *Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1)*
Content	This course cover development of microbiology science; microbial nutrition; media and sterilization methods, and diversity of microorganism (eubacteria, archaea and eukarya) and virus. Laboratory skills in microbiology are aseptic technique, microbial culture, observation macroscopic and microscopic bacteria and molds, microscopic of algae and protozoa, and bacteriophage plaque.
Examination forms	a. Essay test (30%) b. Assignment or quiz (10%) c. Scientific Article of the project including data analysis (software application) (20%) d. Practical work (30%) e. Presentation (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Cappuccino, J.G. and Welsh, C. 2020. Microbiology: A Laboratory Manual. Pearson. 2. Kim, B.H and G.M. Gadd. 2008. Bacterial Physiology and Metabolism. Cambridge University Press. Cambridge 3. Madigan, M.T, J.M Martinko and J. Parker. 2019. Biology of Microorganisms. Prentice Hall. 4. Moat,A.G, J.W. Foster and M.P. Spector. 2002. Microbial Physiology. John Wiley & Sons. Canada. 5. Neidhardt, F.C, J.L. Ingraham and M. Schaechter. Physiology of Bacterial Cells. Sinauer Associates Inc. 6. Brenner, D.J., N. R. Krieg and J.T. Staley. Bergey's Manual of Systematic Bacteriology 2nd edition part A. Springer.

	7. Brenner, D.J., N. R. Krieg and J.T. Staley. Bergey's Manual of Systematic Bacteriology 2nd edition part B. Springer.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Plant Development

Module designation	: **Plant Development**
Semester(s) in which the module is taught	: odd/III
Person responsible for the module	1. : Dra. Dwi Setyati, MSi., 2. M. Su'udi, PhD. 3. Dr.rer.nat. Fuad Bahrul Ulum, S.Si. M.Sc
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation, Practical course
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload:136hr a. lecture-Discussion: 58.7 hr b. Practical course: 45.3 hr c. Project: 19.2hr d. Presentation: 12.8hr
Credit points	: 3credits or 4.53ECTS
Required and recommended prerequisites for joining the module	: Plant Structure
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular, cells and organism (LO3) - able to describing the principles of plant development concepts (LO 3a) **Skills:** Able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (LO6a)
Content	This course **describes concepts** of Plant development: Describe the principal concept of plant development among group of Bryophytes, Pteridophytes, Gymnospermae, and Angiospermae and mechanism of asexual reproduction via seed (Apomixis). There are also implementation scientific methods for Plant development through **a Project-based Method** by examining the germination of various seeds and the primary growth of the sprouts. The project result then will be presented. Second task is the publication paper analysis on embryo-sac development and the resume will be presented visually.
Examination forms	a. Essay test (25%) b. Quiz(15%) c. Project report (35%) d. Practical course (25%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Beck, C.B., 2010. An introduction to plant structure and development: plant anatomy for the twenty-first century. Cambridge University Press. 2. Fosket, D.E. 1994. Plant Growth and Development A Molecular Approach. Academic Press A Division of Harcourt Brace and Company. San Diego. California. 3. Leyser, O., & Day, S. 2009. Mechanisms in plant development. John Wiley & Sons. 4. Pandey, B.P. 1995. Embryology of Angiosperms (for Degree, Honors and Posgraduate Student). S.Chand& Company LTD: New Delhi.

	5. Srivastava, K.C., B.S. Dattatreya, A.B. Raizada. 1977. Vikas Handbook of Botany. Vikas Publishing House PVI LTD, New Delhi. 6. Vashista, B.R. 1976. BRYOPHYTA. Fourth Edition. S.Chand& Company Ltd. Ram Nagar, New Delhi.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Animal Development

Module designation	: **Animal Development**
Semester(s) in which the module is taught	: odd/III
Person responsible for the module	: 1. Dra. Mahriani, MSi. 2. Dra. Susantin Fajariyah,M.Si 3. Eva Tyas Utami, S,Si. M.Si 4. Husnatun Nihayah, S.Si,M.Biomed
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Practical course, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90,6hr a. Lecture-Discussion: 42.5hr b. Laboratory work: 45.3 hr c. Case Study: 2,8hr
Credit points	: 3 credits or 4.53 ECTS
Required and recommended prerequisites for joining the module	: Animal Structure
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells, organisms, and biological resources management (LO 3): ● able to **describe** and analyze the principles of animal development concepts (LO 3a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO 06): - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO 6a)
Content	This course **describes concepts** and analyze animal development concepts: gametogenesis (oogenesis and spermatogenesis), fertilization (internal and external fertilization), cleavage (factors, types and processes of division in amphioxus, sea urchins, amphibians, Aves and mammals), basculation in amphioxus, sea urchins, amphibians, Aves and mammal, gastrulation (morphogenetics movement, type of gastrulation, fate map, gastrulation process of sea urchins, amphibians, Aves and mammals), extraembryonic membranes and placentation (composition of extra embryos and types of placenta, regeneration and metamorphosis, organogenesis (factors that play a role in the process of organogenesis and organ derivatives from three layers of institutions), ectoderm derivatives (process of forming the nervous system and eye), mesoderm derivatives (process of formation of limb, urinary system and genital system), endoderm derivatives (the process of forming the digestive system and respiratory system).There are also **practicing** laboratory of animal development in groups cover: observation of oogenesis and spermatogenesis, frog embryo development, observation of wholemount development of frog eggs to tail development complete metamorphosis), frog embryo development histologic observation of frog blastula to late neurula stage), chicken embryo development (observation of wholemount development of chicken eggs before incubation until 96 hours of incubation), chicken embryo development (histological observation of the development of chicken eggs aged 33-72 hours). and planarian regeneration.

Examination forms	Essay test (40%) a. Assignment (video resume) (15%) b. Quiz (5%) c. Presentation base on Case Study: (15%) d. Laboratory work: (25%) e. Pre-test (5%) f. laboratory work Observation (activities) (5%) g. laboratory work report (5%) h. final practical test (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Balinsky,B.I. 1981. An Introduction to Embryology. 5thEd. Holt-SaundersInternasional. Philadelphia 2. Carlson, B.M. 1988. Pattern's Foundations Embryology. 5thEd. Mc Graw-Hill Co. New York. 3. Gilbert, S.F. 2016. Developmental Biology. 11Ed. Sanauer Assosiates Inc. Publishers Sunderland. Masachusetts. 4. Sadler, T.W. 2015. Langman's Medical Embryology. 13 Ed. Wolters Kluwer Health, Tokyo 5. Slack, J.M.W. 2006. Essensial Developmental Biology. 2 ¬Ed. Blackweel Publishing, Oxford, UK

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Terrestrial Ecology

Module designation	: Terrestrial Ecology
Semester(s) in which the module is taught	: odd/III
Person responsible for the module	1. Dra. Hari Sulistiyowati, MSc., PhD. 2. Dr. Dra. Retno Wimbaningrum, MSi 3. Rendy Setiawan, SSi., MSi. 4. Arif Mohammad Siddiq, SSi., MSi.
Language	: Indonesian and English
Relation to curriculum	: Compulsory /~~ elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project/Laboratory/Field Work, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 136 hr a. lecture- Discussion: 56.67 hr b. Laboratory/Field Works: 45.33 hr c. Presentation: 34 hr
Credit points	: 3 credits or 4.53 ECTS
Required and recommended prerequisites for joining the module	: Fundamental Biology
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells and organisms - Describing the principles of ecological hierarchies including individual, population, community, and ecosystem concept (CLO3a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) a. - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO6a) b. Using software applications and/or basic instruments for sampling and analysis in terrestrial ecology (CLO6b) **Competence:** Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO 1) - Showing an honest attitude and final practical testability during course and practical (CLO1a)
Content	This course covers **observation** an honest attitude and final practical testability during the terrestrial ecology discussion, practical and reporting practical work. It also describes the principles of ecological hierarchies including individual, population, community, and ecosystem concept. **Laboratory works** cover:: Equipment's handling of terrestrial ecology, Adaptation of organisms, Distribution Patterns of Plant and Animals, Sampling technique and ecological data analysis of animals (invertebrates and vertebrates), Sampling technique and ecological data analysis of plants (herbs, shrubs, and trees) by **Using Geographic Information System (GIS), Microsoft Excel, and Primer Software** for ecological analysis related to plant and animal ecology , and **Field work** to Baluran National Park

	(Savannah, Tropical Rainforest, Seasonal Forest, Tropical Dry Forest)
Examination forms	a. Observation (20%) b. Essay test (20%) c. Laboratory Work 30%), d. Skill in using software (20%) e. Field Work report presentation (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Archibold, O.W. 1995. Ecology of World Vegetation. London: Chapman & Hall. 2. Barbour, MG., Burk, SH, and Pitt, WD. 1987. Terrestrial Plant Ecology. Menlo Park: The Benyamin Cummings Publishing Company, Inc. 3. Fachrul, M.F. 2007. Metode sampling Bioekologi. Jakarta: Bumi Aksara. 4. Hunter, M.L. 1990. Wildlife, Forests and Forestry. New Jersey: Regents/Prentice Hall. 5. Krebs, C.J. 1978. Ecology The Experimental Analysis of Distribution and Abundance. Harper Collins Publisher. London. 6. Magguran, A. 1998. Ecological Diversity and its Measurement. rinceton, NJ: Princeton University Press. 7. Odum, E.P. 1983. Basic Ecology. Philadelpia: Holt-Saunders International Edition. 8. Odum, E.P. 1998. Dasar-dasar Ekologi. Cetaka Ketiga. 9. Kumar, P. and U. Mina. 2021 Fundamentals of Ecology and Environment 3rd Edition. India: PATHFINDER PUBLICATION, 107pp. ISBN: 9788193465509 10. Related Scientific Article Journals or Webscience

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Biostatistics

Module designation	: **Bostatistic**
Semester(s) in which the module is taught	: odd/III/V
Person responsible for the module	1. Dr. Esti Utarti, S.P., M.Si 2. Dr.rer.nat. Fuad Bahrul Ulum, S,Si. M.Sc
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation, Practical course
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.7 hr a. lecture-Discussion: 13.3 hr b. Practical course: 45.3 hr c. Project: 9.6hr d. Presentation: 6.4 hr e. Private study: 16hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Calculus
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) - able to analyzing the basic concepts of statistical analysis for Biology(2.a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (L06) - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (6.a)
Content	This course **describes concepts** of statistical analysis for data in Biology field: Describe the principal concept of descriptive statistic, parametric and non-parametric data analysis, linear regression analysis, and cluster analysis. There are also implementation scientific methods for analysis some descriptive data from paper publications in the area of biology research through **case-based Method. The** second task is analyzing the biology data of the research output from students or lecturers in Biology department.
Examination forms	a. Essay test (25%) b. Individual project (15%) c. Group project report (35%) d. Practical course (25%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Crawley, M.J., 2012. The R book. John Wiley & Sons. 2. Faraway, J.J., 2004. Linear models with R. Chapman and Hall/CRC. 3. McCullagh, P. and Nelder, J.A., 2019. Generalized linear models. Routledge. 4. Wickham, H. and Grolemund, G., 2016. R for data science: import, tidy, transform,

	visualize, and model data. " O'Reilly Media, Inc." online version: https://r4ds.had.co.nz 5. Zar, J.H. 1996. Biostatistical analysis. Third Ed. Prentice-Hall International, Inc., New Jersey

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Genetics

Module designation	: **Genetics**
Semester(s) in which the module is taught	: Odd/III
Person responsible for the module	1. Dr.Rike Oktarianti, MSi. 2. Dr. rer. nat. Kartika Senjarini, M.Si 3. Syubbanul Wathon, S.Si, M.Si
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project-lab works, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 181.4 hr a. lecture-discussion: 93.5hr b. Practical course: 45.3 hr c. Presentation: 42.5hr
Credit points	: 4 credits or 6.04 ECTS
Required and recommended prerequisites for joining the module	: Fundamental Biology
Module objectives/intended learning outcomes	**Knowledge:** Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1) a. **Working** in team works on the discussion of Genetics concept and application (CLO1b) b. able to analyze the principles of molecular biology, cells and organisms (LO3) c. **Describing** the principles of genetics concept (CLO3a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) a. able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO6a) b. **Using** software applications and/or basic instruments to analysis in principles of genetics (CLO6b)
Content	This **course** discusses the basic principles of Mendel's laws I and II, gene interactions and modification of the 9:3:3:1 phenotypic ratio, probability theory, sex determination, sex linked, linkage and crossing over, multiple alleles, multiple gene inheritance, inbreeding. and genetics population (prnciple of Hardy-Weiberg), inherited metabolism disorders, molecular basic of genetics, chromosomal structure and function, epigenetics, gene mutations (point muttation) and chromosome mutation (changes in the number and structure of chromosomes). **Laboratory work** cover observation of normal and mutant morphology, sex differentiation of Drosophila melanogaster as animal model in genetics, monohybrid and dihybrid mating experiments, sex linkage and non-disjunction experiments as well as linkage and crossing over using Drosophila melanogaster, genetic equilibrium testing of Hardy-Weinberg and DNA extraction
Examination forms	a. Essay test (30%) b. Quiz (20%) c. Presentation (25%) d. Practical course (25%).
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Snustad DP and MJ. Simmons, 2012. Principles of Genetics. 6th edition. John Wiley and Sons, New York.

	2. Benjamin AP, 2020. GeneticsConceptual Approach 7th edition. Macmillan Learning. USA. 3. Griffiths AJF, SR, Wessler, SB, Carrol, J, Doebley, 2015. An Introduction to Genetic Analysis. 11 edition. WH Freeman & Co Ltd 4. R. Brooker. 2021. GeneticsAnalysis and Principle. Mc-Graw Hill eBook. 5. Hartl DL and AG, Clark. 2007. Principle of Populaton Genetics. Sinauer Associates. 6. Rasmus N and M, Slatkin. 2013. An Introduction to Population Genetics: Theory and Applications. Sinauer Associates 7. Jack J. Pasternak, 2005. An Introduction to Human Molecular Genetics: Mechanisms of Inherited Diseases, Second Edition. John Wiley & Sons, Inc 7. Suryo. Genetika Strata 1.2013. Gadjah Mada University Press, Yogyakarta. 8. Suryo. Genetika Manuisa. .2016. Gadjah Mada University Press, Yogyakarta. 9. Anders, M. DNA, Genes and Chromosomes. 2018. Capstone Global Libary Limited.

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Bioethics

Module designation	: **Bioethics**
Semester(s) in which the module is taught	: Odd/III
Person responsible for the module	1. Dr. Rike Oktarianti, M.Si., 2. Purwatiningsih, S.Si, M.Si, Ph.D
Language	: Indonesian and English
Relation to curriculum	: Compulsory/~~elective~~/~~specialization~~
Teaching methods	: lecture- Discussion, case methods, presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90,6 hr a. Lecture-Discussion: 39,66 hr b. Case methods: 28,33 hr c. Presentation22.61 hr
Credit points	: 2 credits or 3,02 ECTS
Required and recommended prerequisites for joining the module	: Fundamental Biology
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells, and organisms (LO3) - Analyzing biological principles that are relevant to bioethics problem (3b) **Skills** Able to implement the logic of critical thinking on biosafety and environmental issues related to the field of biology with a scientific and bioethical approach (LO5) - implementing the logic of critical thinking on biosafety related to the field of biology with a bioethical approach for better environmental awareness (5b)
Content	This course discusses the principles of bioethics and the development of bioethics in Indonesia and in the world, ethics in the writing of scientific papers, discusses the ethics of using animals and humans in biological research, including biomedical and biotechnology fields, discusses ethics in genetic manipulation and the use of genetically engineered products in the food, agriculture, health as well as discussing environmental ethics, ethics in the use of Stored Biological Materials (BBT).
Examination forms	Essay test (25%) Quiz (20%) Assignment based on cased methods (30%) Presentation (25%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Beauchamp, T.L. 1994. Principle of Biomedical Ethics. 2. Bryant et al. 2002. Bioethics for Scientists. John Wiley and Sons. England. 3. Keraf, A. S. 2006. Etika Lingkungan. Penerbit. Kompas. 4. Hau, J & Hoosier Jr., G.L. (2003) Handbook of Laboratory Animal Science Second Edition. Boca Raton: CRC Press. 5. Ridwan, E. 2013. Etika Pemanfaatan Hewan Percobaan dalam penelitian kesehatan. www. Indonesia.digitaljournals.org/index.php/idnmed/article

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Occupational Safety and Health

Module designation	: **Occupational Safety and Health**
Semester(s) in which the module is taught	: even/IV
Person responsible for the module	: 1. Dra. Hari Sulistiyowati, MSc., PhD. 2. Dr. Drs. Sutoyo, MSi.
Language	: Indonesian and English
Relation to curriculum	: Compulsory /~~ elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, ~~Laboratory/Field Work~~, Case study
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66 hr a. lecture- Discussion: 34.00hr b. Case study: 28.33 hr c. Presentation: 28.33 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Fundamental biology, basic chemistry, general physic
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO2) ● analyzing the principles that are relevant to the occupational safety and health principles (CLO2a) Skills: **Competence:** ● able to internalize norms and ethics based on Pancasila in working independently or in groups (LO1) ● working individually or in team work during the discussion of occupational safety and health principles (CLO1b) ● able to implement the logic of critical thinking on biosafety and environmental issues related to the field of biology with a scientific and bioethical approach (LO5) ● Using the logic of critical thinking on environmental sustainability related to the occupational safety and health with a scientific and bioethics approach (CLO5b)
Content	This course describe and analyze principles of occupational safety and health (OSH) including: Scope of OSH (OSH and OHS Management System, OHS Audit, Accident, Hazard, Risk Management, Ergonomics); Environmental Conditions and Pollution Limits; Hazardous Materials; Personal Protective Equipment and Clothing; Occupational health and disease; Fires, emergency conditions and their mitigation; Estimation of the dangers of the condition of a building; Safety of Equipment Operations and Installations
Examination forms	a. Observation evaluation of teamwork (25%) b. Essay test (25%) c. Case study report (30%) d. Presentation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Redjeki. S. 2016. Kesehatan dan Keselamatan Kerja. Jakarta: Pusdik SDM Kesehatan. 235pp 2. Friend, M. A. and J. P. Kohn. 2007. Fundamentals of occupational safety and health 4th ed. Maryland: Government Institutes. 506pp 3. Schneid, Thomas D. and L. Collins. 2001.Disaster management and preparedness. USA: CRC Press LLC. 264pp ISBN-13: 978-0-86587-171-7

	4. Roughton,J. and N. Crutchfield. 2016. Job Hazard Analysis A Guide For Voluntary Compliance and Beyond. USA: Elsevier Inc. 480pp 5. Arezes, P. M. ,M. P. Barroso, P. Cordeiro, R. B. Melo, J. S. Baptista, P. Carneiro, N. Costa, A. S. Miguel, and G. Perestrelo (Editors). 2019. Occupational and Environmental Safety and Health. Switzerland: Springer Nature. 765pp 6. Related Scientific Article Journals or Webscience

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Animal Systematic

Module designation	: **Animal Systematic**
Semester(s) in which the module is taught	: even/IV
Person responsible for the module	1. Purwatiningsih,Ph.D. 2. Dra. Susantin Fajariyah,M.Si 3. Dr. Asmoro Lelono,M.Si 4. Eva Tyas Utami, S,Si. M.Si
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Practical course, Field Trip, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 181,3 hr a. Lecture-discussion: 85hr b. Case study: 51hr c. Laboratory work:36,83 hr d. Field work: 8,5hr
Credit points	: 4 credits or 6.04 ECTS
Required and recommended prerequisites for joining the module	: Animal Structure
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells, organisms and biological resources management (LO 3): - able to **describing** and analyze the principles of animal systematic concepts (LO 3a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO 06): - a. able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO 6a) **Competence:** Able to internalize norms and ethics based on Pancasila in working independently or in groups - **Showing** an honest attitude and final practical testability during course and practical (CLO 1a)
Content	This course **describing** and analyze the principles of animal systematic concepts: Basic Principles of Taxonomy and Basic Concepts of Classification, Phylum Porifera, Phylum Cnidaria, Phylum Platyhelminthes, Nematodes, Phylum Annelida, Phylum Mollusca, Phylum Arthropoda, Phylum Echinodermata, Phylum Chordata, Superclass Pisces, Amphibious Class, Reptile Class, Aves Class, and Mammal Class. There are also **practicing** laboratory of Phylum Porifera, Cnidaria, Platyhelminthes, Nematodes, Annelida, Mollusca, Arthropoda, Echinodermata, Chordata, Superclass Pisces, Amphibian Class, Reptile Class, Aves Class, and Mammal Class. There is also **showing** an honest attitude and final practical testability during laboratory and fieldwork as the implementation animal taxonomic principles in the animals systematic course
Examination forms	a. Essay test (40%) b. Quiz (10%) c. Presentation base on Case Study: (25%) d. Laboratory work: (25%) e. Pre-test (5%) f. laboratory work Observation (equipment and activities) (5%)

	g. laboratory work report (5%) h. final practical test (10%) i. Field work (15%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Britannica Illustrated Science Library. 2008. Invertebrates.Encyclopedia Britannica, Inc. Chicago. 2. Brusca,R.C and Brusca G.J. 2003. Invertebrates,2nd. Sinauer Associates.Inc. Publishers.Sunderland. 3. Jan Pechenik. 2009. Biology of the Invertebrates. 6th edition.McGraw-Hill Science/Engineering/Math. 4. Janet Moore. 2006. An Introduction to the Invertebrates. Cambridge University Press. 5. Jr. Cleveland Hickman, Susan Keen, Allan Larson, David Eisenhour. 2011. Integrated Principles of Zoology. McGraw-Hill Science/Engineering/Math. 6. Kardong,K.V. 2009. Vertebrates, Comparative Anatomy, Function and Evolution.6th edition.McGraw Hill Company. New York. 7. Linzey, 2003.Vertebrate Biology.The McGraw-Hill.Company. New York.

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Aquatic Ecology

Module designation	: **Aquatic Ecology**
Semester(s) in which the module is taught	: odd/IV
Person responsible for the module	1. Dr. Dra. Retno Wimbaningrum, MSi 2. Rendy Setiawan, SSi., MSi. 3. Arif Mohammad Siddiq, SSi., MSi.
Language	: Indonesian and English
Relation to curriculum	: Compulsory /~~ elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project/Laboratory/Field Work, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 136hr a. lecture- Discussion: 56.67 hr b. Laboratory/Field Works: 45.33 hr c. Presentation: 34 hr
Credit points	: 3 credits or 4.53 ECTS
Required and recommended prerequisites for joining the module	: Fundamental Biology
Module objectives/intended learning outcomes	**Knowledge:** Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO 1) a. Showing an honest attitude and final practical testability during course and practical (CLO1a) b. able to analyze the principles of molecular biology, cells and organisms c. Describing the principles of freshwater ecosystem (lotic and lentic) concept, estuarine ecosystem concept, and marine ecosystem (intertidal, subtidal, and deep sea) concept (CLO3a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) a. able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO6a) b. Using software applications and/or basic instruments for sampling and analysis in aquatic ecology (CLO6b)
Content	This course covers **observation, an honest** attitude and final practical testability during the aquatic ecology discussion, practical and reporting practical work. It also describes the principles of freshwater ecosystem (lotic and lentic) concept, estuarine ecosystem concept, and marine ecosystem (intertidal, subtidal, and deep sea) concept. **Laboratory works** cover: Equipment handling of aquatic ecology, Sampling technique and ecological data analysis of physics, chemical, and biological characteristics by **Using Microsoft Excel and Primer Software** for ecological analysis related to plant and animal ecology , and **Field work** to Bedadung River (lotic ecosystem), RanuKlakah Lake (lentic ecosystem), and Baluran National Park (Intertidal ecosystem)
Examination forms	a. Essay test (30%) b. Laboratory Work (40%), c. Skill in using software (15%) d. Field Work (15%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Reading list	1. Allan, J.D. & Castillo, M.M. 2007. Stream ecology: structure and function of running water. 2nd Ed. Springer. Netherlands. 2. Barnes, R.S.K. and Mann, K.H. 1991. Fundamental of aquatic ecology. Blackwell Scientific Publications. London. 3. Brönmark, C. And Hansson, L-A. 2005. The biology of lakes and ponds. 2nd Ed. Oxford University Press. Oxford. 4. Clesceri, L. S., Greenberg, A. E. & Eaton, A.D. 1998. Standard methods for the examination of water and wastewater. 20th Ed. American Public Health Association, American Water Works Association, and Water Environment Federation. Washington. 5. Closs, G., Downes, B., and Boulton, A. 2004. A scientific introduction to freshwater ecology. Blackwell Scientific Ltd. Oxford. 6. Edmondson, W.T. 1959. Freshwater biology. Second Ed. John Wiley and Sons Inc. New York. 7. Goldsmith, F.B. and Duffey, E. 1997. Conservation management of freshwater habitats. Chapman & Hall. London. 8. Hauer, F.R. & Lamberti, G.A. 1996. Methods in stream ecology. Academic Press. California. 9. Hemminga and Duarte, C.M. 2000. Seagrass ecology. Cambridge University Press. Cambridge. 10. Odum, T.E. 1993. Fundamental ecology. Gadjah Mada University Press. Yogyakarta. 11. Related Scientific Article Journals or Webscience

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Molecular Biology

Module designation	: **Molecular Biology**
Semester(s) in which the module is taught	: Even/IV
Person responsible for the module	1. Prof. Bambang Sugiharto 2. Dr. rer. nat. Kartika Senjarini, M.Si
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion-assignment, Project-lab work
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 181.4 hr 1. lecture-discussion-assignment: 136 hr 2. Practical course: 45.3 hr
Credit points	: 4 credits or 6.04 ECTS
Required and recommended prerequisites for joining the module	: Fundamental Biology
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells and organisms (LO3) - **Describing** the principles of Molecular Biology concept (CLO3a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) a. able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO6a) b. **Using** software applications and/or basic instruments to analysis in Molecular Biology (CLO6b)
Content	**This course** discusses the basic molecular basis of inheritance related to genetic material, namely DNA and genes, their universality in all cells that allows for inter-organismal engineering, gene expression and regulation, biosynthesis of these materials, and molecular repair mechanisms that affect the slow rate of evolution of living things. This concept is then continued with its application to modern biotechnology based on genetic engineering and molecular engineering as well as its basic methods which will be explained at the end of the lecture. **Laboratory work** cover Introduction to molecular analysis-based laboratory techniques, Sample preparation for working with molecular techniques, Isolation of DNA from various living samples Quantitative and qualitative DNA analysis, Plasmid isolation and transformation, DNA cloning and restriction, In vitro DNA amplification (Polymerase Chain Reaction) and Recombinant protein production and analysis
Examination forms	a. Essay test (35%) b. Quiz (20%) c. Assignment (individual/team work observation) (15%) d. Practical work (30%).
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Snustad DP and MJ. Simmons, 2012. Principles of Genetics. 6th edition. John Wiley and Sons, New York. 2. Benjamin AP, 2020. GeneticsConceptual Approach 7th edition. Macmillan Learning. USA.

	3. Griffiths AJF, SR, Wessler, SB, Carrol, J, Doebley, 2015. An Introduction to Genetic Analysis. 11 edition. WH Freeman & Co Ltd 4. R. Brooker. 2021. GeneticsAnalysis and Principle. Mc-Graw Hill eBook. 5. Hartl DL and AG, Clark. 2007. Principle of Populaton Genetics. Sinauer Associates. 6. Rasmus N and M, Slatkin. 2013. An Introduction to Population Genetics: Theory and Applications. Sinauer Associates 7. Jack J. Pasternak, 2005. An Introduction to Human Molecular Genetics: Mechanisms of Inherited Diseases, Second Edition. John Wiley & Sons, Inc 7. Suryo. Genetika Strata 1.2013. Gadjah Mada University Press, Yogyakarta. 8. Suryo. Genetika Manuisa. .2016. Gadjah Mada University Press, Yogyakarta. 9. Anders, M. DNA, Genes and Chromosomes. 2018. Capstone Global Libary Limited.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Animal Physiology

Module designation	: **Animal Physiology**
Semester(s) in which the module is taught	: even/IV
Person responsible for the module	1. Dr. Hidayat Teguh W, M.Pd 2. Dr. Asmoro Lelono, M.Si 3. Dra. Susantin Fajariyah,M.Si 4. Eva Tyas Utami, S,Si. M.Si
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Practical course, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 181,3 hr a. Lecture-discussion: 85.0hr b. Case study: 51,0 hr c. Laboratory work: 34,0 hr d. skill lab: 11,3 hr
Credit points	: 4 credits or 6,04 ECTS
Required and recommended prerequisites for joining the module	: Animal Structure
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO 2): - **correlating** the basic concepts of physics with the principles of circulatory system dynamic (CLO 2.b) Able to describing the principles of animal physiology concepts (LO 3): - **describing** the principles of animal physiology (CLO 3.a) **Skills:** Able to practice laboratory work in groups to demonstrate the principles of animal physiology concepts (LO 6): a. able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO 6.a) b. **Using** basic instruments for analysis in animal physiology (CLO 6.b) **Competence**: Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO 1): - **working independently and teamwork** during the courses (CLO 1.b)
Content	This course **correlating** the basic concepts of physics with the principles of circulatory system dynamic, **describes concepts** of animal development in groups basic concepts of animal physiology (membrane, channel, transport molecule), homeostasis, thermoregulation, nervous system, defense, and locomotion. There are also **practicing** laboratory of animal physiology cover: osmotic tolerance of poikilothermic and homoiothermic animals to various levels of medium concentration, effect of temperature and chemicals on the heart work of poikilothermic and homoiothermic animals, neurological integrative action, sense organs, behavior orientation of crickets, skeletal muscle contraction, blood flow in a closed circulatory system, adaptation of poikilothermic animals to environmental oxygen, adaptation of poikilothermic animals to environmental oxygen, and human blood pressure, **using basic instruments** for counting erythrocytes and leukocytes of poikilothermic and

	homoiothermic animals, determining hemoglobin (Hb) levels. and insect respiration measurement.
Examination forms	a. Essay test (35%) b. Quiz (5%) c. Presentation base on Case Study: (25%) d. Laboratory work: (35%) e. Pre-test (5%) f. laboratory equipment observation (10%) g. Laboratory activity observation (5%) h. laboratory work report (5%) i. final practical test (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Ghai C.L, 2013. A Textbook of Practical Physiology. Eight Edition. Jaype Brothers Medical Publisher: New Delhi 2. Hill R.W, Wyse A.G, Anderson, M. 2012. Animal Physiology. MassachusettsSinauer Associates, Inc. Publishers 3. Mayes, C.D & Schulte, P.M. 2006. Principles of Animal Physiology. San Fransisco: Pearson Education,Inc 4. Roger, E. Randall, D & Augustine, G. 1996. Animal Physiology Mechanism and Adaptation, Third Edition, New York: Wh Freeman and Co. 5. Sherwood, L., H, Klandorf., P, H, Yancey. 2013. Animal Physiology From Genes To Organisms. second Edition. USA: Brooks/Cole, Cengage Learning 6. Rastogie. S.C. 2007. Essential of Animal Physiology. Forth Edition. New Age International Publisher: New Delhi

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Evolution

Module designation	: **Evolution**
Semester(s) in which the module is taught	: Odd/IV
Person responsible for the module	1. Dr. Rike Oktarianti, M.Si 2. Syubbanul Wathon, S.Si, M.Si
Language	: Indonesian and English
Relation to curriculum	: Compulsory/~~elective~~/~~specialization~~
Teaching methods	: lecture- Discussion-assignment, Practice-field study
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 136 hr a. lecture-Discussion-assignment: 110,5 hr b. Practical-field study: 25,5 hr
Credit points	: 3 credits or 4.53 ECTS
Required and recommended prerequisites for joining the module	: Genetics
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells and organisms (LO3) - **Describing** the principles of evolution concept (CLO3a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO6a)
Content	This course discusses the concepts, theories, and mechanisms of evolution. The topics are the history and evolutionary development, genetics as the basis of evolution, the origin of genetic variation, population genetics, evidence of evolution, the mechanism of evolution in nature, natural selection, isolation, evolutionary direction, the origin of life and its phylogenetic of prokaryotes, protists, invertebrate, vertebrates, and primates (humans). Field studies were carried out at the UNESCO World Heritage archaeological site in Sangiran, Central Java. Observing the geomorphology of the soil layer where fossils were found and observing the fossils of plants, animals, primates and early humans
Examination forms	a. Essay test (35%) b. Quiz (15%) c. Assignment (individual & teamwork observaton (20%) d. Filed study (30%).
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Scheiner SM, DP. Mindell . 2020.The Theory of Evolution: Principles, Concepts, and Assumptions. University of Chicago Press 2. Futuyma, D.J. 1997. Evolutionary Biology. Sinauer Associates Inc 3. Pontarotti P, 2019. Evolution, Origin of Life, Concepts and Methods. Springer Nature Switzerland. 4. Murray J. 1972. Genetics Diversity and Natural selection. Oliver and Boyd, Edinburgh. 5. Fleagle, J. 20213. Primate Adaptation and Evolution. Elsevier. 6. Foley RA, 2004. Principle of Human Evolution. 7. Djoko T Iskandar. Penuntun Kuliah Evolusi. ITB Bandung

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Bioinformatics

Module designation	: **Bioinformatics**
Semester(s) in which the module is taught	: even/IV
Person responsible for the module	1. Dr. Kahar Muzakhar, S.Si 2. Syubbanul Wathon, S.Si., M.Si.
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Project, Presentation, Practical course
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.7 hr a. Lecture-Discussion: 29.3 hr b. Practical course: 45.3 hr c. Project: 9.6hr d. Presentation: 6.4 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Calculus, Biochemistry
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO 2) - able to analyze the basic concepts of bioinformatics for biological data analysis (CLO 2.a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO 6) - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO 6.b)
Content	This course **describes concepts** of bioinformatics for data processing and analysis in the Biology field: examining websites provided bioinformatics, using selected software for bioinformatic analysis, running DNA sequence data in data processing, primer designing, phylogenetic tree development, protein structure analysis, identifying secondary metabolite data and the metabolic pathway.
Examination forms	a. Individual/ teamwork observation (20%) b. Fill in the blank (20%) c. Essay (20%) d. Equipment/ essay observation (40%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Polanski A. & Kimmel M. 1998. Bioinformatic. Springer Berlin Hiedelberg, New York. 2. Baxevanis A.D. & Ouellette B. F. F. 2001. BioinformaticA practical Guide to Analysis of Gene and Proteins, Second Edition. Wiley-Interscience, New York. 3. Baldi, P and Brunak, S.. 2001. Bioinformatics: The Machine Learning Approach 2nd ed., MIT Press. 4. Xiong, J. 2006. Essensial Bioinformatics. Cambridge University Press. Cambridge. 5. Aluru, Srinivas, ed. 2006. Handbook of Computational Molecular Biology. Chapman & Hall/Crc. 6. Pan Y. & Hu X. 2007. Knowledge discovery in bioinformatic: technique, methods, and applications. Wiley-Interscience, New York. 7. Barnes M.R. 2007. Bioinformatics for Geneticista bioinformatics primer for analysis of genetic data. Second edition. John Wiley &Sons, Ltd

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Microtechnique

Module designation	: **Microtechnique**
Semester(s) in which the module is taught	: even/IV
Person responsible for the module	1. Dra. Mahriani, Msi 2. Eva Tyas Utami, S,Si. M.Si 3. Dr.rer.nat. Fuad Bahrul Ulum, S.Si, M.Sc
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Practical course, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.6hr a. lecture-discussion: 45.3 hr b. Laboratory work (case study): 45.3 hr c. Presentation: 11.3 hr
Credit points	: 2 credits or 3,02 ECTS
Required and recommended prerequisites for joining the module	: Fundamental Biology
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells, organisms and biological resources management (LO 3): - **analyzing** biological principles that are relevant to the problem of animal and plant preparation methods (CLO 3.b) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO 06): ● able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO 6.a)
Content	This course **describing and analysis:** scope of preparation (sampling techniques for preparation of preparations, Introduction to biosafety in the laboratory),whole mount preparation method, smear preparation method, spread preparation method,slice preparation method (types of sliced preparations (frozen, paraffin), types of microtomes), fixation method (concept of fixation, fixative type), tissue dehydration process, the concept of dehydration (type of dehydration solution, tissue dehydration method), clearing, infiltration and embedding process, sectioning, affixing and staining processes, dyes and staining methods (concept of dye stuff, classification of dyes, general staining methods for plant (safranin) and animal (HE, MAF, PAS) preparations), immunohistochemical method. There are also **practicing** using **case methods** through laboratory works to produce 7 specimen materials: identify sample material for microtechnique, propose objective and background, propose method, (including: a. spread preparation method, b. smear preparation method, c. mosquito larvae wholemount preparations, d. pollen wholemount preparations, non-embedding plant preparations, f. plant paraffin-embedding preparation, g. animal paraffin-embedding preparations), 4. Result and Discussion,5. Presentation of the result. **This** course support the enterpreneurship skill related to microtechnique.
Examination forms	a. Essay test (35%) b. Quiz (5%)

	c. Laboratory work: (60%) d. Postest (5%) e. Activity laboratory (5%) f. Progress report (10%) g. Report (10%) h. Final practical test (10%) i. Presentation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Berly G.P dan Miksche J.P., 1976. Botanical Microtechnic and Cytochemistry. IOWA. St. Univ. Press. 2. Humason G.L. 1966. Animal Tissue Technic. WH. Freeman and Company. San Fransisco 3. Handari,S.S. 1983. Metode Pewarnaan. Bharata Karya Aksara Jakarta 4. Kiernan.J.A. 1990. Histological and Histochemical Methods. Theory and Practice. 2nd edition. Pergamon Press. Oxford. 5. Yeung,E.C.T, Stasolla C, Sumner M.J. , dan Huang B.Q.2015. Plant Microtechniques and Protocols.Springer International Publishing Switzerland. 6. Sanderson. JB. 1994. Biological Microtechnique. Royal Microscopical Society Microscopy Handbooks 28. Bios Scientific Publisher.

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Introduction to Entrepreneurship

Module designation	: **Introduction to Entrepreneurship**
Semester(s) in which the module is taught	: odd/IV
Person responsible for the module	1. Dr. Hidayat Teguh Wiyono, M.Pd. 2. Dr. Esti Utarti, M.Si.
Language	: Indonesian
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr a. lecture-Discussion: 56.66hr b. Presentation: 34.00hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: -
Module objectives/intended learning outcomes	**Competence:** Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO 1) - showing an honest attitude and final practical testability as the practice of Introduction to Entrepreneurship (CLO 1.a) able **to implement** scientific methods for the management of biological resources in the tropics (LO 4) - integrate scientific methods for improvement of commercial products from the tropical natural resources (CLO 4.b)
Content	This course studies and discusses Entrepreneurship and Entrepreneurship, Building Dreams and Pursuing Dreams, Motivating Yourself, Identifying and Selecting New Business Opportunities, Business Communication, Creativity and Innovation, Establishing Superior Products and Innovation Management, Personal Finance Management, Business Finance Management, Performance Evaluation, Measuring Potential Entrepreneurship, New Business Plan.
Examination forms	a. Mid test (25%) b. Final test (25%) c. Observation evaluation (30%) d. Presentation evaluation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Dedy Takdir, Mahmudin AS, Sudirman Zaid, 2015, Penerbit Wijana Mahasi Karya Yogyakarta 2. Rusdiana, 2018. Kewirausahaan, Teori dan Praktek. CV Pustaka Setia. Bandung

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Plant Physiology

Module designation	: **Plant Physiology**
Semester(s) in which the module is taught	: odd/V
Person responsible for the module	1. Prof. Bambang Sugiharto, D.AgrSc 2. Dra. Dwi Setyati,M.Si 3. Mukhamad Su'udi, Ph.D 4. Dr.rer.nat. Fuad Bahrul Ulum, S.Si, M.Sc
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Practical course, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 181,3 hr a. Lecture-Discussion: 102hr b. Laboratory work and project (28,33+17)hr: c. Lab work28,33 hr d. Project: 12hr e. Case-based method: 17 hr f. Project Report Presentation: 17 hr
Credit points	: 4 credits or 6,04 ECTS
Required and recommended prerequisites for joining the module	: Plant Structure, Biochemistry
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO 2): - **correlating** the basic concept of science (physics, chemistry, mathematics) with the principles of plant physiology (CLO 2.b) Able to describing the principles of plant physiology concepts (LO 3): - **describing** the principles of plant physiology concept (CLO 3.a) **Skills:** Able to practicing laboratory work in groups to demonstrate the principles of plant physiology concepts (LO 6): a. able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO 6.a) b. **using** software applications and/or basic instruments to analysis in principles of plant physiology (CLO 6.b) **Competence:** Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO 1): - **Working independently and teamwork** on principle of plant physiology concepts during course and practical (CLO 1.b)
Content	This course **correlating** biophysics with plant physiological process of: Water in plant cells and their transport, Transport of nutrients. Correlating biochemistry with physiological process of: Secondary metabolites and plant defense. **Describing concepts of** plant physiology and its role , water in plant cells and their transport , secondary metabolites and plant defense, plant nutrition and their transport, assimilation of mineral elements, photosynthesis, secondary metabolites and plant defense, response and adaptation to abiotic stress, growth, development and morphogenesis, plant hormones (Phytohormones), and flowering control. In this course, the students also **practicing laboratory work** for

	plant physiology that cover: water potential measurement, evaporation, transpiration and evapotranspiration, nutrient transport, effect of temperature on aerobic respiration, photosynthesis, plant sigmoid curve, nitrate reductase activity, location of growing area, and the effect of the hormone kinetin on the sprout growth. Student also carry out **Project-based** approach for several topics such as: plant nutrition, sprout growth in dark and light, seed dormancy and phototropism (individually or teamwork). This course use basic instruments for Excel &R -statistic for data analysis in Plant physiology Project/laboratory work (e.g. counting chlorophyll content).
Examination forms	a. Attitude (5%) b. Essay test (25%) c. Fill in the blank(10%) d. Laboratory work: e. Pre test (4%) f. Activity observation (6%) g. Equipment/software (5%) h. Report (8%) i. Final practical test (7%) j. Case study k. report (5%) l. presentation (%) m. Project based n. Activity observation (5%) o. Progress report (5%) p. Final report (5%) q. Presentation (5%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Taiz L, Zeiger E. 2010. Plant Physiology. fifth edition.Massachussets: Sinauer Associates. 2. Davies, P.J. 1995. Plant Hormones, Physiology, Biochemistry and Molecular Biology. Kluwer Academic Publishers The Netherlands. 3. Fosket, D.E. 1994. Plant Growth and Development A Molecular Approach. AcademicPress A Division of Harcourt Brace and Company. San Diego, California. 4. Hopkins, W.G. 1995. Introduction To Plant Physiology. John Wiley & Sons, Inc., Canada. 5. Salisbury, F.B., C.W. Ross. 1992. Plant Physiology. Wadsworth Publ.Co.Inc. Belmont, C.A 6. Srivastava, L.M. 2002. Plant Growth and Development, Hormones and Environment. Academic Press Elsevier Science, USA.

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Environmental Science

Module designation	: **Environmental Science**
Semester(s) in which the module is taught	: odd/III
Person responsible for the module	1. Dra. Hari Sulistiyowati, MSc., PhD. 2. Rendy Setiawan, SSi., MSi. 3. Arif Mohammad Siddiq, SSi., MSi.
Language	: Indonesian and English
Relation to curriculum	: Compulsory /~~ elective~~ /~~ specialisation~~
Teaching methods	: Lecture- Discussion, Laboratory/Field Work, Case study
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. Lecture- Discussion: 28.33 hr b. Laboratory/Field Works: 45.33 hr c. Case study: 17 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Introduction of Environmental Science
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of biology, mathematics, and other relevant natural sciences (LO 2) - analyzing the principles that are relevant to the environmental pollution issues in the tropics (CLO 2.a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO 6) - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO 6.a) **Competence:** Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO 1) - working individually or in teamwork during the discussion of environmental concepts (CLO 1.b) Able to implement the logic of critical thinking on biosafety and environmental issues related to the field of biology with a scientific and bioethical approach (LO 5) - using the logic of critical thinking on environmental issues for sustainability management with a scientific and bioethics approach (CLO 5.b)
Content	This course describe and analyze principles that are relevant to the environmental pollution issues in tropics: the definition, terminology, and scope of environmental science, environmental quality standards (EQS), pollutants and contaminants (physical chemistry, and biology), toxic hazardous materials, sources and impacts of contamination, air pollution (including smells and sounds), water, and land; It also initiate **the logic of critical thinking** on **case study** analysis of environmental quality in physics, chemistry, and biology; and bioscience implementation in the management of Air, Water, Land, Food/beverage, and Cosmetics/medicine pollution. It also employs **Laboratory works** for quality control including: Equipment's handling for environmental parameters sampling, Water Sampling Technique, Biological Oxygen Demands (BOD) Test and Water Quality Analysis, Chemical Oxygen Demand (COD) Analysis, Total Solids Analysis, Examination of Suspended Materials (Mud Content), Simple Measurement of Air and Gas Particle Content, Noise Intensity Level Measurement,

	Utilization of biological waste (2 R), such as recycled paper production using double printing frame technique; Reused Paper and Plastic Waste products, the use of bioindicator for Environment Quality Control, analysis of population oxygen demand, tree biomass calculation to estimate carbon dioxide sequestration, and discussion of Laboratory Work Report. There will be an **observation evaluation** during the lecture-discussion and laboratory work.
Examination forms	a. Teamwork Observation (10%) b. Essay test (30%) Laboratory/field Work: a. Pre-testt (5%) b. final practical test (5%) c. activity observation (10%) d. equipment handling observation (10%) e. report presentation (10%) f. Case study report presentation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Archibold, O.W. 1995. Ecology of World Vegetation. London: Chapman & Hall. 2. Barbour, MG., Burk, SH, and Pitt, WD. 1987. Terrestrial Plant Ecology. Menlo Park: The Benjamin Cummings Publishing Company, Inc. 3. Fachrul, M.F. 2007. Metode sampling Bioekologi. Jakarta: Bumi Aksara. 4. Hunter, M.L. 1990. Wildlife, Forests and Forestry. New Jersey: Regents/Prentice Hall. 5. Krebs, C.J. 1978. Ecology The Experimental Analysis of Distribution and Abundance. Harper Collins Publisher. London. 6. Magguran, A. 1998. Ecological Diversity and its Measurement. Princeton, NJ: Princeton University Press. 7. Odum, E.P. 1983. Basic Ecology. Philadelphia: Holt-Saunders International Edition. 8. Odum, E.P. 1998. Dasar-dasar Ekologi. Cetakan Ketiga. 9. Kumar, P. and U. Mina. 2021 Fundamentals of Ecology and Environment 3rd Edition. India: PATHFINDER PUBLICATION, 107pp. ISBN: 9788193465509 10.

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Tissue Culture

Module designation	: **Tissue Culture**
Semester(s) in which the module is taught	: odd/V
Person responsible for the module	1. Dra. Mahriani, MSi 2. Mukhamad Su'udi, PhD
Language	: Indonesian and English
Relation to curriculum	: Compulsory /~~ elective~~ / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project/Laboratory/Field Work, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. Lecture- Discussion: 28.33 hr b. Laboratory/Field Works: 45.33 hr c. Presentation: 17 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Basic Chemistry, Cell Biology
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of molecular biology, cells, organisms and biological resources management (LO 3) ● **analyzing** biological principles that are relevant to the tissue culture concepts in the tropics (CLO 3.b) **Skills:** ● able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO 6) ● **practicing** laboratory works related to tissue culture using plant/ animal (CLO 6.a) ● Competence: able to internalize norms and ethics based on Pancasila in working independently or in groups (LO 1) ● w**orking in team works** on the discussion of tissue culture concept and application (CLO 1.b) ● able to employ bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO 7) ● **integrating** bioscience in problems solving related to the tissue culture processing steps and management (in team work) (CLO 7.a)
Content	This course **Describe and analysis** scope of Tissue culture: definition, terminology, sterilization and culture media used for tissue culture, cellular totipotency and protoplas fusion, the important of plant tissue culture for genetic engineering, cytotoxicity, viability and cell counting, and cell culture development for animal. It **integrating** bioscience for proposing/ or giving the recommendation as a solution (**Case-based Method**) of the problems found during tissue culture processing steps and management (in **team work**). This course also provides spesific skill for each student through **pacticing laboratory works** for the basic technich in tissue culture (**project-based**) including: sterilization, media preparation, explant selection, and the determination of cytotoxycity, viability and cell counting. **This** course support the enterpreneurship skill related to the utilization of plant tissu culture

	This course support the enterpreneurship skill related to the ethnobotany utilization..
Examination forms	a. Observation attitude (15%) b. Essay test (20%) c. Laboratory Work (25%) d. Project Report (40%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Bhojwani & Dantu. 2013. Plant Tissue Culture: An Introductory Text. Springer. 2. Smith. 2013. Plant Tissue Culture: Techniques and Experiments. Elsevier. 3. Freshney. 2010. Culture of Animal Cells. Wiley-Blackwel 4. Harrison & Rae. 1997. General Techniques of Cell Culture (Handbooks in Practical Animal Cell Biology). Cambridge University Press. 5. Stacey. 2012. Current Development in Cell Culture Technology. Landes Bioscience & Springer. 6. Verma et al. 2020. Animal Tissue Culture Principles and Applications. Elsevier. 7. Related Scientific Article Journals or Webscience

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Plant Systematic

Module designation	: **Plant Systematic**
Semester(s) in which the module is taught	: odd/IV
Person responsible for the module	1. Dra. Dwi Setyati, MSi., 2. M. Su'udi, PhD. 3. Dr.rer.nat. Fuad Bahrul Ulum, S,Si. M.Sc
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Project, Presentation, Practical course
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload:181.32hr Lecture-Discussion: 102hr Laboratory work and Field work a. Laboratory work:28,2hr b. Field work: 17 hr c. Project (herbarium): 17 hr d. Presentation: 17 hr
Credit points	: 4 credits or 6.04 ECTS
Required and recommended prerequisites for joining the module	: Plant Structure
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principle of molecular biology, cells, and organism (LO 3) - able to describing the principles of plant systematics concepts (LO 3.a) **Skills:** Able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO 6) - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (LO 6.a)
Content	This course **describes concepts** of Plant systematic: Describe the principal concept of plant taxonomy, herbarium and its curation, evolution and phylogeny. There are also implementation scientific methods for Plant systematic through **a Project-based Method** by observing the plant collection of botanical garden then the result will be presented as book report. The second task is submitting a complete and correct specimen of herbarium.
Examination forms	a. Essay test (25%) b. Fill in the blank (10%) c. Project based method: d. Progress report (5%) e. Final report (10%) Laboratory work and Field Work (25%+25%): a. Laboratory: b. Post test(4%) c. Final practical test (9%) d. Activity observation (5%) e. Report (7%) f. Field work g. Attitude (5%) h. Progress report (5%) i. Final report (5%) j. Report presentation (5%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Reading list	1. Cronquist, Arthur. 1981. An Integrated System of Classification of Flowering Plants. Columbia University Press. New York. 2. Simpson, M.G., 2019. Plant systematics. Academic press. 3. Stuessy, T.F., 2009. Plant taxonomy: the systematic evaluation of comparative data. Columbia University Press. 4. Holttum, R. E. 1967. A Revised Flora of Malaya Volume II. Ferns of Malaya. Government Printing Office. Singapore. 5. Levetin & McMahon. 2008. Plants and Society, Fifth Edition Introduction to Plant Life: Botanical Principles Plant Systematics and Evolution. The Mc Graw Hill Companies 6. de Winter, W. P. and V. B. Amoroso. 2003. Plant Resources of South-East Asia Cryptogams: Fern and Fern Allies. Bogor: Prosea Foundation.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Biology Conservation

Module designation	**Biology Conservation**
Semester(s) in which the module is taught	odd/V
Person responsible for the module	1. Dra. Hari Sulistiyowati, M.Sc., Ph.D. 2. Rendy Setiawan, S.Si., M.Si. 3. Arif Mohammad Siddiq, S.Si., M.Si.
Language	Indonesian and English
Relation to curriculum	Compulsory /~~elective~~ / ~~specialisation~~
Teaching methods	Lecture - Discussion, field work, case study
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. Lecture- Discussion: 56.67 hr b. Field work11.33 hr c. Case Study: 22.67 hr
Credit points	2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	Terrestrial Ecology and Aquatic Ecology E.g. existing competences in
Module objectives/intended learning outcomes	**Knowledge:** Able to **analyze** the principles of molecular biology, cells, organisms and biological resources management (LO 3) - **Analyzing** biological principles that are relevant to manage the biology conservation in the tropics (CLO 3.b) **Skill:** Able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (CLO 6) - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO 6.a) **Competence:** Able to **internalize** norms and ethics based on Pancasila in working independently or in groups (LO 1) a. **working** in team works on the discussion of Biology conservation concept and application (CLO 1.b) **b.** *integration of knowledge, skills and social and methodological capacities in working or learning situations* able **to implement** scientific methods for the management of biological resources in the tropics (LO 4) - **integrate** scientific methods for the biology conservation in the tropics (CLO 4.a)
Content	This course describe and analyze definition and terminology of SDH Conservation, history and concept of SDH conservation; SDH value; characteristics of geoparks or Earth Parks as conservation objects and High Conservation Value Areas; SDH threats; SDH conservation strategy and management through formal student activities, namely articles, discussions, seminars, and field studies activities. **Case-based method** on biological resources threats in tropics. It is assigned in teamwork Biological resources threats; Biological resources conservation strategy and management through formal student activities, namely articles, discussions, seminars, and field studies activities. Observation Biological resources conservation management in Protected Area of Meru Betiri national Park by individual or group.
Examination forms	a. Attitude Observation (5%) b. Essay test (40%) c. Activity observation of Field work (15%)

	d. Progress report of Case Method (10%) e. Report presentation of Case Method based on field work (10%) f. Final report of Case method (20%)
Study and examination requirements	Passing grade 70% Requirements for successfully passing the module
Reading list	1. Fornaro A., Fernandes A.M. 2018. Geoparks: from conception to the teaching of Geosciences. Terræ Didatica, 14(3):330- 338. URL: http://www.ige.unicamp.br/ terraedidatica/. 2. Consortium for the Revision of the HCV Toolkit Indonesia. 2009. Guidelines for the identification of High Conservation Values in Indonesia (HCV Toolkit Indonesia). Wageningen. **ISBN:** 978-979-18366-7-8 3. Primack, RB., Jatna S., M. Indrawan, dan P. Kramadibrata. 1997. Biologi Konservasi. Jakarta: Yayasan Obor Indonesia. 4. Sodhi, N.S.and Ehlrich, P.R. 2011. Conservation Biology for All. Oxford: Oxford University Press. 5. Štrba,L., J. Kolaˇckovská, D. Kudelas , B. Kršák and C. Sidor. 2020. Geoheritage and Geotourism Contribution to Tourism Development in Protected Areas of Slovakia—Theoretical Considerations. Sustainability 2020, 12, 2979; doi:10.3390/su12072979 6. Strategi Pengelolaan Keanekaragaman Hayati Indonesia (IBSAP). IBSAP kurun waktu tahun 2003 – 2020 7. Rawat and Agarwal, 2015. Biodiversity-concept, threats and conservation. Environment Conservation Journal 16(3): 19-28. 8. Indonesia Regulation related to biology conservation 9. Related Scientific Article Journals or Webscience

Credits to ECTS conversion formula 2 SKS TM = 2 (50min T+60min TS+60min M (170 minutes) x 16 weeks) = 90.67 Hours. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Research Methodology

Module designation:	**Research Methodology**
Semester(s) in which the module is taught	even/odd/VI/VII
Person responsible for the module:	1. Dr. Retno Wimbaningrum, M.Si. 2. Dr. Hidayat Teguh Wiyono, M.Pd. 3. Dr. Rike Oktarianti, M.Si. 4. Mukhamad Su'udi, S.Si., Ph.D 5. Dr. Sutoyo, M.Si.
Language	Indonesian and English
Relation to curriculum	Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	Lecture - Discussion, Case-Based Method
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr *a.* Lecture- Discussion: 39,67 hr *b.* Case study Report (research proposal draft): 51hr
Credit points:	2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	Biostatistics
Module objectives/intended learning outcomes	**Skills:** Able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO 6) - **using** software applications and/or basic instruments for sampling and analysis in biology and environmental fields (CLO 6.b) **Competence:** able **to implement** scientific methods for the management of biological resources in the tropics (LO 4) - able to integrate scientific methods for the management of biological resources in the tropics (CLO 4.a) Able to **employ** bioscience in solving problems related to biological resources in the tropics and to **communicate** the results (LO 7) a. **integrating** bioscience in problems solving related to the management of biological resources in the tropics (CLO 7.a) b. **presenting** the results of problems solving related to the management of biological resources in the tropics (CLO 7.b)
Content	This course **discusses** fundamentals of research, research proposal preparation techniques, research methods, preparation of research report, thesis and scientific articles, scientific paper publication and presentation techniques, research ethics, plagiarism and impact of research. This course also guides students in making research proposals with a scope of microbiology, zoology, botany, ecology, and biotechnology with **Case-Based Method** (scientific method), through namely literature survey and documentation, formulation of research problems, thought frameworks and hypothesis, variables, and research parameters, research object, data collection resources and techniques, research design, data analysis, and Interpretation.

Examination forms:	a. Essay test (30%) b. Case study Report (research proposal draft) (50%) c. Research proposal draft presentation (presentation video) (20%)
Study and examination requirements:	: Passing grade 70% Requirements for successfully passing the module
Reading list	1. Pandey, P. & M. M. Pandey. 2015. Research Methodology: Tools and Techniques. Bridge Center. Romania 2. Mishra, S.B. & S. Alok. 2017. Handbook of Research Methodology. Education Publishing. New Delhi 3. Suharjito, D. 2014. Metodologi penelitian. IPB Press. Bogor. 4. Suryana. 2010. Metodologi penelitian. Model praktis penelitian kuantitatif dan kualitatif. UPI. Bandung

Credits to ECTS conversion formula 2 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks =90.67 Hours. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Community Services Training

Module designation	: **Community Service Training**
Semester(s) in which the module is taught	: odd/VI-VII
Person responsible for the module	Dr. Esti Utarti, S.P., M.Si
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Project/ ~~Laboratory/~~Field Work, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 136 hr a. Honesty: 25.5 hr b. Work plan preparation: 17 hr c. Realisation of activities: 45.33 hr d. Discipline: 11.33 hr e. Attitude: 25.5 hr f. Article: 11.33 hr
Credit points	: 3 credits or 4.53 ECTS
Required and recommended prerequisites for joining the module	: Total credit has taken ≥ 110
Module objectives/intended learning outcomes	**Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO 6) - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO 6.a) **Competence:** Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO 1) a. show an honest attitude and final practical testability as the practice of Pancasila (CLO 1.a) b. work individually or in team works (CLO 1.b) ● able to implement scientific methods for the management of biological resources in the tropics (LO 4) - Integrate scientific methods for development of commercial products from the tropical natural resources (CLO 4.b) Able to employ bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO 7) a. integrating bioscience in problems solving related to the management of biological resources in the tropics (CLO 7.a) b. present the results of problems solving related to the management of biological resources in the tropics (CLO 7.b)
Content	This course offers students to determine their own program to be carried out with a choice of thematic options for the Community Service Program as follows: 1. Covid-19 Prevention Humanitarian Program; 2.Community Entrepreneurial Empowerment Program/MSMEs Affected by Covid-19; 3. Technology/Information Innovation Activity Program in Handling Covid-19; 4. BUMDES/Village Government Empowerment Program in Strengthening Village Social Safety Networks During the Covid-19 Pandemic; and

	5. Learning Innovation Programs, Especially Elementary and Middle School Children Affected by Covid-19. This course offers a scientific method that covers discussion of a problem or topic that is presented systematically and comprehensively equipped with a literature study, and contains elements of analysis and synthesis under the guidance of Advisor. It continues to gather data collection for research or internships; work on data analysis, processing, and interpretation; analyze the result and make a report and give a seminar; and then write a draft final report and defend the report in the final exam. At the end of the course, the student has to make a final report and scientific article to be published.
Examination forms	a. Program planning (25%) b. Field activities (30%) c. Report (30%) d. Presentation (15%) e. Proposal document and seminar: 30% f. Result Report and Seminar: 20% g. Draft Final Report and Oral Exam: 50%
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Back To Village KKN Guidelines 2. Covid-19 Volunteer Community Service Guidelines

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Final Project

Module designation	: **Final Project**
Semester(s) in which the module is taught	: odd or even/VII-VIII
Person responsible for the module	: Commission of final project
Language	: Indonesian and English
Relation to curriculum	: Compulsory / ~~elective~~ / ~~specialisation~~
Teaching methods	: Discussion, Project/Laboratory/Field Work, Presentation Seminar~~,~~
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 272hr a. Discussion: 45.33 hr b. proposal draft and seminar; 28.33 hr c. Data Collection; 107.67 hr d. Data Analysis, report and seminar: 45.33 hr e. Draft Final report and seminar article: 45.33 hr
Credit points	: 6 credits or 9.06 ECTS
Required and recommended prerequisites for joining the module	: Total credit has taken ≥ 120, GPA ≥2
Module objectives/intended learning outcomes	**Knowledge:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) a. practising laboratory and/or field works independently and in groups (CLO 6.a) b. using software applications and/or basic instruments for sampling and analysis in biology and environmental fields (CLO 6.b) **Competence:** Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO 1) - **showing** an honest, final practical testble, tough, and disciplined attitude as a reflection of the attitude of piety to God Almighty (CLO 1.a) **Skills:** ● able to implement scientific methods for the management of biological resources in the tropics (LO 4) - implementing scientific methods for the management of biological resources in the tropics (CLO 4.a) Able to employ bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO 7) a. integrating bioscience in problems solving related to the biological resources topic of final project in the tropics (CLO 7.a) b. presenting the results of problems solving related to to the biological resources topic of final project in the tropics (CLO 7.b)
Content	This course offers a scientific method that covers discussion of a problem or topic that is presented systematically and comprehensively equipped with a literature study, and contains elements of analysis and synthesis under the guidance of Advisor. It continues to gather data collection for research or internships; work on data analysis, processing, and interpretation; analyze the result and make a report and give a seminar; and then write a draft final report and defend the report in the final exam. At the end of the course, the student has to make a final report and scientific article to be published.

	The final project can be taken through regular semester or internship, research project, thematic community service, independent study activities of MBKM program as long as to fulfill the requirements
Examination forms	a. Proposal document and seminar: 30% b. Result Report and Seminar: 20% c. Draft Final Report and Oral Exam: 50%
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Food Microbiology

Module designation	: **Food Microbiology**
Semester(s) in which the module is taught	: odd/V/VII
The Person responsible for the module	1. Dr. Sattya Arimurti, SP.,M.Si 2. Drs. Siswanto, M.Si
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture- Discussion, laboratory work, Project method
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. b. Lecture- Discussion: 34 hr c. Laboratory Work: 28.33 hr d. Project Method28.33 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Physiology Microbe
Module objectives/intended learning outcomes	**Knowledge:** Able to **analyze** the principles of molecular biology, cells, organisms and biological resources management (LO 3) - Describing microbiology principles that are relevant to the problem of the food industry in the tropics (CLO3a) **Competence:** Able to **implement** the logic of critical thinking on biosafety and environmental issues related to the field of biology with a scientific and bioethical approach(LO5) - using the logic of critical thinking on food safety issues related to microbe pathogen with a scientific and bioethical approach (CLO5a) **Skills:** Able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) ● able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLP6a)
Content	This course **describes concepts of Food Microbiology**: terminology and development of food microbiology, pathogenic and nonpathogenic microbes, beneficial microbes on food, using indicator microbes to determine total microbes on food, and growth characterization of microbes on the food. This course discusses food safety related to **projects and writing HACCP documents**. These are also implementing scientific methods for Food microbiology through **Project-Based Methods** including identification of microbiology problems in the food industry, data sampling of food, calculating of the total microbe and analysis abundance of pathogenic microbe results discussion, writing project report as **a scientific article draft**, and **presentation** in class.

Examination forms	Lecture Discussion Evaluation ● Essay test (30%) Laboratory Work Evaluation a. Activity Observation (10%) b. Equipment/Software Observation (5%) c. Report (10%) d. Project Method Evaluation e. Progress Report (10%) f. Article (15%) g. Report Presentation (5%) h. Topic Presentation (15%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Doyle, M.P. and R.L. Buchanan. 2013. Food Microbiology: Fundamental and Frontiers. 4th Edition. ASM Press 2. Senan, S., R.K. Malik, and S. Vij. 2019. Food and Industrial Microbiology. ICAR. 3. Madigan, M.T, J.M Martinko and J. Parker. 2019. Biology of Microorganisms. Prentice Hall 4. Cappucino, Emeritus, J.G and C. Weish. 2020. Microbiology a Manual Laboratory. Pearson. 5. R. L. Buchanan W. Anderson L. Anelich J.-L. Cordier R. Dewanti-Hariyadi T. Ross (Eds). 2018. Microorganisms in Foods 7 Microbiological Testing in Food Safety Management. Second Edition. Springer. 6.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Health Microbiology

Module designation	: **Health Microbiology**
Semester(s) in which the module is taught	: odd/V/VII
Person responsible for the module	1. Dr. Sutoyo, MSi. 2. Drs. Rudju Winarsa, M.Kes.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~/elective / ~~specialization~~
Teaching methods	: Lecture-Discussion, Project-Laboratory/Field Works, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr Lecture-Discussion: 34 hr Project-Laboratory/Field Works: 45.33 hr Presentation: 11.33 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Microbial Physiology
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells, organisms and biological resources management (LO 3) - **Describing** the principles of Health Microbiology (CLO 3.a) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in group (LO 6) a. able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO 6.a) b. **Using** software applications and/or basic instruments for sampling and data analysis in health microbiology (CLO 6.b) **Competence:** able to implement scientific methods for the management of biological resources in the tropics (LO 4) - **Integrate** scientific methods in Health Microbiology for antimicrobial agent exploration (CLO 4.a) Presenting the results of problems solving related to the development of health microbiology in the tropics (LO 7) - **Presenting** the results of exploring antibacterial compounds from natural ingredients in the tropics (CLO 7.b)
Content	This course **describe concepts** of Health Microbiology: general aspects of health microbiology and history of infectious diseases, infectious microbes, pathogenicity, bacteria as human pathogens, fungi as human pathogens, virus as human pathogens, basic principles of antibiotic therapy, laboratory diagnosis of pathogenic bacteria, laboratory diagnosis of pathogenic fungi, taxonomies and an overview of human pathogen microbes, exploration, and development of chemotherapy agents; there is also implementation **Case method based** on the management of the incidence of antibiotic resistance in pathogenic bacteria that cause disease caused by bacteria by exploring antibacterial compounds from natural ingredients in the tropics. It assigned in teamwork: Testing of Antibiotic

	Sensitivity with Agar Diffusion Methods and Radiant Dilution Methods, Interpretation of Test Results of Determination of Minimum Resistance Concentration, Antimicrobial Agent Exploration Techniques, through formal student activities, namely articles, discussions, seminars, and laboratory studies activities proposing the objectives of the project topic, implementation suitable method, data analysis (**Using** Excel, R Program, T-Test, Duncan, or ANOVA **applications** for data analysis in small research of Health Microbiology), in results discussion, writing project report as **a scientific article draft** and **presentation** in class. This project is done through the laboratory.
Examination forms	a. Essay test (8%) b. Fill the blank (2%) c. Topic presentation d. case report (10%) e. report presentation (10% Case method in practical laboratory a. case report (10%) b. draft article (10%) c. report presentation (10%) d. Observation of data analysis (10%) e. Case method in the scope of health in groups on the diagnosis of diseases in humans (practical laboratory) with journal review f. report presentation (10%) g. draft article (10%) h. case presentation (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Baron, S. 1996. Medical Microbiology, 4th edition. University of Texas Medical Branch at Galveston, Galveston, Texas 2. Brogden, K.A. and J.M. Guthmiller. 2002. Polymicrobial diseases. ASM Press.Washington3. Brook, G.F., K.C. Carroll, and J.S. Butel. 2013. Mikrobiologi Kedokteran. EGC Emergence 3. Kayser, F.H., Bienz, K.A., Eckert, J. and , Zinkernagel, R.M. 2005. Medical Microbiology. Thieme, Stuttguart, New York 4. Riedel, S., Hobden, J.A., Miller, S., Morse, S.A., Mietzner, T.A., Detrick, B., Mitchell, T.G., . Sakanari,, J.A., Hotez, and P., Mejia, R., 2019., Medical Microbiology. 38th edition. Mc Graw Hill. Toronto.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks =45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Enzymology

Module designation	: **Enzymology**
Semester(s) in which the module is taught	: Odd/V or VII
Person responsible for the module	1. Dr. Kahar Muzakhar, S.Si., 2. Dr. Esti Utarti, S.P., M.Si.,
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective-/ ~~specialisation~~
Teaching methods	: Lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. Lecture-Discussion: 68 hr b. Presentation: 22.67 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Microbial physiology
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells, organisms and biological resources management (LO 3) **Competences:** Able to internalize norms and ethics based on Pancasila in working independently or in groups (LO 1) able to implement scientific methods for the management of biological resources in the tropics (LO 4)
Content	**This course is describe** the historical perspective of enzymes, general properties and nomenclature of enzymes, enzyme structures, thermodynamic aspects and enzyme catalysis mechanisms, enzyme reaction mechanisms, enzyme kinetics: Michaelis-Menten mechanism and analysis, enzyme kinetics: reversible reactions and enzyme reaction process, repression and inhibition of enzyme, production and mechanism of enzyme secretion by microbes, purification and immobilization of enzymes, application of enzymes in food, health, agriculture, and environmental fields There is also **implementation of scientific methods** through the use of microbial enzymatic activity in the management of biological resources in the tropics **independently and/or in groups** through **Case Method** on natural resources in tropics, writing case method report and **presentation** in class

Examination forms	a. Essay test (30%) b. Assignment or quiz (20%) c. Case method report (30%) d. Presentation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Cappuccino, J.G. and Welsh, C. 2020. Microbiology: A Laboratory Manual. Pearson. 2. Copeland, R.A. 2000. Enzymes: A Practical Introduction to Structure, Mechanism, and Data Analysis. 2nd. Wiley-VCH. New York. 3. Dalbey, R.E., C.M. Koehler & F. Tamanoi. 2007. The Enzymes: Molecular Machines Involved in Protein Transport Across CellularMembranes. Academic Press. Elsevier. San Diego 4. Guisan, J.M. 2006. Immobilisation of Enzymes and Cells. 2nd ed. Humana Press. New jersey 5. Madigan, M.T, J.M Martinko and J. Parker. 2019. Biology of Microorganisms. Prentice Hall. 6. Nelson, D.L. & M.M., Cox. 2017. Lehninger Priciples of Biochemistry. 7th ed. W.H Freeman & Co. New York 7. Traut, T. 2008. Regulatory Allosteric Enzymes. Springer. North Carolina

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Industrial Microbiology

Module designation	: **Industrial Microbiology**
Semester(s) in which the module is taught	: even/VI
Person responsible for the module	1. Dr. Esti Utarti, S.P., M.Si. 2. Dr. Drs. Sutoyo, MSi.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Practice-lab works, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90,66 hr a. Lecture-Discussion: 34 hr b. Practical-course (case method): 45.33 hr c. Presentation: 11.33 hr
Credit points	: 2 credits or 3,02 ECTS
Required and recommended prerequisites for joining the module	: Microbial Physiology
Module objectives/intended learning outcomes	**Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO 6) **Competences:** able to implement scientific methods for the management of biological resources in the tropics (LO 4) Able to implement the logic of critical thinking on biosafety and environmental issues related to the field of biology with a scientific and bioethical approach (LO 5)

Content	**This course is demonstration** scientific methods for development of microbial commercial products from the tropical natural resources through characterization of microbes, media and nutrition in industry, potential screening and inoculum preparation of tropical environments microbe, metabolic pathways for biosynthesis of primary and secondary metabolites of tropical environment microbes, overproduction of metabolites in industry, culture collection of tropical environments microbe, fermentation techniques and fermentation kinetics, upstream and downstream processes in industrial microbiology, production of intracellular and extracellular enzymes, production of single cell proteins of yeast, production of antibiotics and probiotics, production of insecticides and biofertilizers. There is also i**mplementation of the logic of critical thinking** on biosafety related for applying microbes by using waste in environmentally friendly industries in laboratory work and/or field studies independently and/or in groups through **project-based methods** on natural resources in the tropics through **practical works**. It assigned in **individual or teamwork** covering 1) Isolation of microbes (bacteria, yeast and fungi), 2) Purification of microbes, 3) Inoculum preparation, 4) Raw material preparation, 5) Submerged and solid state fermentation, 6) Extracellular enzymes production, 7) Ethanol and biofuel production, 8) Short chain fatty acid production, 9) Explore microbe as biofertilizer agent, 10) Explore microbe as antimicrobial agent, 11) Culture collection, 12) Results and Discussion of Project, and 13) writing project report as **an scientific article draft** and **presentation** in class. **This** course support the enterpreneurship skill related to the industrial microbiology for fermented food and beverage.
Examination forms	a. Essay test (20%) b. Assignment or quiz (10%) c. Scientific Article of the project including data analysis (software application) (30%) d. Practical work (20%) e. Presentation (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Reading list	1. Cappuccino, J.G. and Welsh, C. 2020. Microbiology: A Laboratory Manual. Pearson. 2. Baltz, R.H. et al. 2010. Manual of Industrial Microbiology and Biotechnology. 3th ed. ASM Press 3. Desai, M.A. 2000. Downstream Processing of Proteins: Methods and Protocols. Humana Press. Jersey 4. Madigan, M.T, J.M Martinko and J. Parker. 2019. Biology of Microorganisms. Prentice Hall. 5. Okafor, N. 2007. Modern Industrial Microbiology and Biotechnology. Science Publisher. USA 6. Steinkraus. K.H. 2004. Industrialization of Indigenous Fermented Food. 7. Marcel Dekker IncKim, B.H and G.M. Gadd. 2008. Bacterial Physiology and Metabolism. Cambridge University Press. Cambridge 8. Moat,A.G, J.W. Foster and M.P. Spector. 2002. Microbial Physiology. John Wiley & Sons. Canada.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Virology

Module designation	: **Virology**
Semester(s) in which the module is taught	: even/VI/VIII
Person final practical testable for the module	1. Drs. Rudju Winarsa, M.Kes 2. Dr. Sattya Arimurti, SP.,M.Si
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture- Discussion, laboratory work, topic Presentation, case study, field work
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85hr a. Lecture- Discussion: 39.67 hr b. Laboratory Work11.33 hr c. Field work22.67 hr d. Case study11.33 hr e. Topic presentation5.67 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Microbiology
Module objectives/intended learning outcomes	**Knowledge:** Able to **analyze** the principles of molecular biology, cells, and organisms (LO 3) - analyzing the nature of viruses, recombinant viruses, and virus interactions with the whole organism (CLO 3.a) **Skills:** Able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO 6) - able to implement virology concepts in laboratory work and/or field studies independently and/or in a group (CLO 6.a) **Competence:** Able to **employ** bioscience in solving problems related to biological resources in the tropics and to **communicate** the results (LO 7) - presenting the results of case method project related to characteristics of virus in the tropics gently and in groups (CLO 7.b)

Content	This course **describes** the nature of viruses (structure, replication, and classification of viruses), recombinant viruses, and virus interactions with the whole organism, These are also implementing scientific methods for virology through **Case-Based Methods** through **practical works** in the lab and field**.** It is assigned an **individual or teamwork** including observation of infection and detection of viruses on the bacteria, plant, animal, and human by **project report** and **presentation** in class.
Examination forms	Lecture-Discussion Evalution a. Fill the blank (10%) b. Essay test (20%) Laboratory Work Evaluation a. Equipment/Software Observation (10%) b. Report (10%) c. Field work d. Final report (10%) e. Report presentation (10%) f. Case Method Evaluation g. Progress Report (10%) h. Final Report (10%) i. Topic Presentation (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Acheson, N.H. 2011. Fundamentals of Molecular Virology. John Wiley & Sons, Inc. 2. Dimmock, N.J., A.J. Easton, and K.N. Leppard. 2016. Introduction to Modern Virology. Seventh Edition. Wiley Blackwell. 3. John Carter and Venetia Saunders. 2013. Virology: Principles and Applications. 2nd Edition. Wiley. 4. Korsman S.N.S., Gert U. van Zyl, L. Nutt, M.I. Anderson, and W. Preiser. 2012. Virology: An Illustrated Colour Text. Churchill Livingstone 5. Flint, S.J. , L.W. Enquist, V.R. Racaniello, A.M. Skalka. 2009. Principles of Virology. Third Edition. ASM Press. 6. Wagner E.K., I.M.J. Hewlett, D.C. Bloom, and D. Camerini. 2008. Basic Virology. Third Edition. Blackwell Publishing.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Microbiological Analysis Techniques

Module designation	: **Microbiological Analysis Technique**
Semester(s) in which the module is taught	: even/V
Person responsible for the module	1. Dr. Esti Utarti, S.P., M.Si., 2. Dr. Sattya Arimurti, S.P., MSi., 3. Drs. Siswanto, M.Si.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Practice-lab works, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture-Discussion: 39.67 hr b. Practical-course (case method): 45.33 hr c. Presentation: 5.67 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Microbial physiology
Module objectives/intended learning outcomes	**Skills:** ● able to implement biological concepts in laboratory work and/or field studies independently and/or in group (LO 6) **Competences:** ● able to internalize norms and ethics based on Pancasila in working independently or in groups (LO 1)
Content	**This course** studies independently and/or in groups through **Case Method** on natural resources based on laboratory works for microbial activity and identification by using laboratory techniques through **practical works**. It is assigned in **individual or teamwork** covering 1) Sterilisation and aseptic techniques, 2) Buffer and growth media of microbes preparation, 3) Microbial isolation and purification techniques, 4) Centrifuge techniques for protein extraction, 5) Spectrophotometry technique for protein and glucose analysis, 6) Dialysis and Chromatography technique for protein separation, 7) Molecular identification of microbe, **Data analysis using Microsoft Excel and Primer Software** for analyzing of glucose, protein, and enzyme activity assay; using **MEGA program** to molecular identification of microbes, 8) Results and Discussion of molecular microbes identification , and 9) writing practical work report and **presentation** in class

Examination forms	a. Essay test (20%) b. Assignment or quiz (10%) c. Data analysis (software application) (20%) d. Practical work (25%) e. Presentation (25%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Cappuccino, J.G. and Welsh, C. 2020. Microbiology: A Laboratory Manual. Pearson. 2. Hollas, J.M. 2004. Modern Spectroscopy. 4th ed. John Wiley & Sons. San Francisco. 3. Leung, W. 2007. Centrifugal Separations in Biotechnology. Academic Press. United Kingdom. 4. Lucatorto, L., A. C. Parr and K. Baldwin. 2014. Spectrophotometry: accurate measurement of optical properties of material. Academic Press. Amsterdam. 5. Lundanes, E., L. Reubsaet , and T. Greibrokk. Chromatography. basic Principles, sample preparations and related methods. Wiley=VCH. singapore. 6. Madigan, M.T, J.M Martinko and J. Parker. 2019. Biology of Microorganisms. Prentice Hall.

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Bioconversion

Module designation	: **Bioconversion**
Semester(s) in which the module is taught	: odd/V or VII
Person responsible for the module	1. Dr. Kahar Muzakhar, S.Si. 2. Drs. Rudju Winarsa, M.Kes.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective-/ ~~specialisation~~
Teaching methods	: Lecture- Discussion, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. Lecture-Discussion: 79.33 hr b. Presentation: 11.33 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Microbial Physiology
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells, organisms and biological resources management (LO 3) **Competences:** able **to implement** scientific methods for the management of biological resources in the tropics (LO 4) Able to employ bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO 7)

Content	**This course is describing** the principles of microbial activity that cover dehydrogenation, amination, isomerization, hydroxylation and condensation process There is also **implementation of scientific methods** through the use of microbial physiology activity in the management of biological resources in the tropics that cover 1) Bioconversion of non-edible cellulose to edible cellulose and 2) Bioconversion of raw material resources in the tropics **independently and/or in groups** through **Case Method.** This course also **integrates** microbial bioconversion activity in problems solving related to the management of biological resources in the tropics that cover: 1) Bioconversion of primary organic waste into ruminant feed, 2) Bioconversion organic waste into biogas, 3) Bioconversion of palm oil waste into biofuel, 4) Bioconversion of molasses becomes bioplastic, 5)Bioconversion of carbonaceous waste into organic acids, 6) Waste bioconversion as a single cell protein production medium, and 7) Writing a report and **presentation** in class the results of problems solving related to the management of biological resources independently and in groups through microbial bioconversion activity
Examination forms	a. Essay test (20%) b. Assignment or quiz (20%) c. Report case (30%) d. Presentation (30%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Reading list	1. Babu V., A. Thapliyal, and G.K. Patel. 2014. Biofuels Production. Wiley 2. Cappuccino, J.G. and Welsh, C. 2020. Microbiology: A Laboratory Manual. Pearson. 3. Fang, Z., R. L. Smith, and X. Qi. 2014. Production of Biofuels and Chemicals with Ionic Liquid. Springer. New York. 4. Gupta, R.b. and A. Demirbas. 2010. Gasoline, Diesel, and Ethanol Biofuels from Grasses and Plants. Cambridge University Press. 5. Luque, R., J. Campelo, and J. Clark. 2011. Handbook of Biofuels Production. Woodhead Publishing. 6. Lee, S. and Y.T. Shah. 2013. Bioenergy Processes and Technologies. CRC Press 7. Madigan, M.T, J.M Martinko and J. Parker. 2019. Biology of Microorganisms. Prentice Hall.

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Mycology

Module designation	: **Mycology**
Semester(s) in which the module is taught	: odd/VI
Person responsible for the module	1. Dr. Drs.Sutoyo, MSi., 2. Drs. Siswanto, M.Si.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Project, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr a. Lecture-Discussion: 45.33 hr b. Project: 45.33 hr c. Presentation: 5.67 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Microbiology
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of fungal molecular biology, cells and organisms (LO 3.a) **Skills:** Able to implement scientific methods in mycology for identification and improvement of commercial products from the tropical natural resources (LO 4.b) ● able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (LO 6.a) **Competence:** Able to present the results of the exploration and identification of proteolytic fungi as a candidate agent for hydrolyzing protein compounds from natural ingredients of the biological resources in the tropics (LO 7.b)
Content	This course **describes concepts** of fungal biology: development, diversity, structure, nutrition, metabolism, differentiation and development, genetics, physiology, biochemistry and molecular, control of fungal growth, interaction with other organisms, role in agriculture, environment, health and industry. Laboratory work: techniques of exploration of potential fungi: isolation and purification, morphological identification (macroscopic and microscopic) mushroom

	and mycorrhizal, screening of amylolytic, lipolytic and cellulolytic fungi, effect of preservatives on the growth of fungi, and analysis of ethanol production by yeast. There is also implementation of scientific methods with **Case Methods** to demonstrate the activity of protease produced by wild-type fungi as a candidate of an insoluble protein hydrolyzing agent in generating valuable protein product that originated from biological resources in the tropics (the topic of the project), proposing the objectives of the project topic, implementation suitable method, data analysis (Using excel data analysis), results discussion, writing project report as **a scientific report** and **presentation** in class.
Examination forms	a. Essay test (25%) b. Scientific Article of the project (60%), c. Presentation (15%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. DeLucia E. H., J. S. Coleman, T. E. Dawson, and R. B. Jackson. 2001. Plant physiological ecology: linking the organism to scales above and below. New Phytologist 149:12-16. 2. Daubermine,R.F. 1974. Plants and Environment. A. textbook of Plant Autecology. Third Edition. John wiley &Sons, New York. 3. Fitter, A.H. dan R.K.M. Hay. 1994. Fisiology Lingkungan Tanaman Gadjah mada University Press. Yogyakarta. 4. Larcher, W. 1995. Physiological Plant Physiology third Edition. Berlin: Springer 5. Lambers H, Chapin III, F. S., Pons, T. L. 2008. Plant Physiological Ecology Second Edition. Springer ScienceþBusiness Media, LLC, 233 Spring Street, New York 6. Salisbury, F.B. and Ross, C.W. 1999. Plant Physiology 7. Related Article journals or webscience

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Ethnobotany

Module designation	: **Ethnobotany**
Semester(s) in which the module is taught	: odd/VI
Person responsible for the module	: 1. Dra. Dwi Setyati, M.Si 2. Mukhamad Suudi, Ph.D 3. Dr.rer.nat. Fuad Bahrul Ulum, M.Sc
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Project, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr a. Lecture-Discussion: 28,33 hr b. Laboratory work & Project (45,33 hr): c. Laboratory work: 28,33 hr d. Project: 17 hr e. Case-based project: 11,33 hr f. Presentation: 5,67 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Plant Systematic
Module objectives/intended learning outcomes	**Knowledge:** Able to analyzing the basic concepts of biology and mathematics for ethnobotany (LO 2) - **analyzing** the basic concept of chemistry and mathematics for principles of ethnobotany (CLO 2.a) Able to analyze the principles of molecular biology, cells, organisms and biological resources management (LO 3) - Analyzing biological principles that are relevant to ethnobotany (CLO 3.b) **Skills:** Able **to implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO 6) - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO 6.a) **Competences:** Able to **integrate knowledge, skills and social and methodological capacities in working or learning**

	situation for the management of biological resources in the tropics (LO 4) - integrate scientific methods for improvement of commercial products from the tropical natural resources (CLO 4.b)
Content	This course **describes, and analyses: the** introduction of ethnobotany, methods of research and techniques, utilization of plants for traditional ceremonies/rituals, food, clothing, boards, medicine, cosmetics, preservatives, dyes and crafts and their conservation efforts. **Project Case Method** on biological resources threats in the tropics through **practical/field works**. It is assigned in individual or teamwork covering: 1) Interview & questionnaire for data collection, 2) Plant utilization for traditional ceremonies, 3) Plant utilization for medicine/herbs, 4) Plant utilization for crafts, 5) Plant utilization for food colouring, 6) Plant utilization for clothing dyes/Eco print. The Project is reported as **presented** in class. **This** course supports entrepreneurship skills related to ethnobotany product utilization.
Examination forms	a. Essay test (30%) Laboratory work and Project: a. Lab work: b. Post test (5%) c. Report (8%) d. Final practical test (7%) e. Activity observation (5%) f. Project: g. Activity observation (5%) h. Progress report (5%) i. Final report (10%) j. Report presentation (10%) k. Case study: l. Case report (5%) m. Presentation (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Martin, G J. 1995, Ethnobotany: A methods manual. Chapman and Hall, London 2. Kim J. Young. 2007. Ethnobotany.Chelsea House Publisher.

	3. Ulysses Paulino Albuquerque Marcelo Alves Ramos Washington Soares Ferreira Júnior Patrícia Muniz de Medeiros. 2017. Ethnobotany for Beginners. Springer International Publishing 4. Gary. J. Martin. 1995. Ethnobotany: A Methods Manual. Springer US Publisher. 5. Luchman Hakim. 2014. Etnobotani dan Manajemen Kebun-Pekarangan Rumah: Ketahanan Pangan, Kesehatan dan Agrowisata. Penerbit Selaras 6. Tri Atmoko, Wawan Gunawan, Fransisca Emilia, Mukhlisi, Angga Prayana, Zainal Arifin 2016. Budaya Masyarakat Dayak Benuaq dan Potensi Flora Hutan Lembonah. Baliytek KSDA Publisher. 7. Iis Nur Asyaih dan Sulifah A. Hariani. 2014. Bahan Ajar Etnobotani (Kajian Khusus Masyarakat Osing).

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Ornamental Plant

Module designation	*: **Ornamental Plant***
Semester(s) in which the module is taught	*: odd/V/VII*
Person responsible for the module	1. Dra. Dwi Setyati, MSi., 2. M.Suudi, Ph.D.
Language	: *Indonesian and English*
Relation to curriculum	: ~~*Compulsory*~~ */ elective /* ~~*specialisation*~~
Teaching methods	*: lecture- Discussion, Presentation, practical course*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload:* 90.66r a. lecture-Discussion: 28,33 hr Laboratory work & Field work (45,33 hr): a. Laboratory work: 28,33 hr b. Field work: 17 hr c. Project: 17 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Plant Systematic
Module objectives/intended learning outcomes	**Knowledge:** Able to analyzing the basic concepts of biology and mathematics for Ornamental plant (LO 2) - **analyzing** the basic concepts of mathematics and biology for Ornamental plant (LO2a) **Skill:** Able to analyze the principles of molecular biology, cells and organism (LO3) - Analyzing biological principles that are relevant to ornamental plant (LO3b) Able to **implement** scientific methods for the management of biological resources in the tropics (LO4) - **Demonstrating** scientific methods for improvement of commercial products from ornamental plant (LO4b) Able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) - **Practicing** laboratory and field works related to Ornamental Plant (LO6a)
Content	This course **describe concepts** of Ornamental Plant: introduction of ornamental plant(terminology and scope of ornamental plants), types of ornamental plant (indoor,

	outdoor, leaf, stem, flower and vegetable ornamental plant, cut flower, propagation and cultivation; propagation and cultivation of ornamental plant, ornamental plant agribusiness /bioentrepreneur ornamental plant. There is also implementation of scientific methods for Plant ornamental through **Project based Method** for improvement of commercial products ornamental plants by promotion product, competitive price, and packaging, results discussion, writing project reports as **presentation** in class Laboratory Works cover: exploring types of ornamental plants around our campus, indoor plant, outdoor plant, leaf, stems, flower ornamental plant, cut flower, repotting, terrarium, vegetative and generative plant propagation and ornamental plant cultivation. This laboratory works is also completed with filed work to nurseries related to ornamental plant agribusiness. **This** course support the enterpreneurship skill related to the utilization of ornamental plant.
Examination forms	a. Essay test (30%) Laboratory work and Field work: a. Lab work: b. Post test (5%) c. Report (10%) d. Final practical test (10%) e. Activity observation (5%) f. Field work g. Progress report (5%) h. Final report (10%) i. Presentation (5%) j. Project: k. Activity observation (5%) l. Progress report (5%) m. Final report (5%) n. Report presentation (5%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Michael A. Dirr, 1998. Manual of Woody Landscape Plants, Their Identification, Ornamental Characteristics, Culture, Propagation, and Uses., Stipes, Publishing L. L. C., Champaign, Illinois. The Royal Horticultural Society, Encyclopedia of Gardening. Christopher Brickell, 1992, Dorling Kindersley.

	2. Center for Internaional Economics. 1996. The Cut Flower Industry: R&D Issues. ACIAR Technical Reports No. 39, 80p. 3. W. Arthur Whistler. 2000.Tropical Ornamentals: A Giude. Timber Press, Incorporated. 4. Succulent circle. 2020. Indoor Succulent Care: A Beginner's Guide on How Succulent Plants Can Keep You Out of Trouble and Make You a Better Person. Amazon **5.** Rebecca De La Paz. 2021. Houseplants for Beginners: A Practical Guide to Choosing, Growing, and Helping Your Plants Thrive. Rockridge Press. 6. T. Widyastuti. 2018. Teknologi Budidaya Tanaman Hias Agribisnis.

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Natural Medicine

Module designation	: **NATURAL MEDICINE**
Semester(s) in which the module is taught	: odd/V/VII
Person responsible for the module	1. Mukhamad Su'udi, PhD. 2. Dr.rer.nat.Fuad Bahrul Ulum, M.Sc
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload:90.67 hr a. lecture- Discussion: 28.33 hr b. Project: 45.33 hr c. Presentation: 17 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Biochemistry, Plant Systematics
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells and organisms (LO3) - **Analyzing** biological principles that are relevant to the issues of natural resources used for natural medicine and their efficacy (CLO3b) **Competence:** Able **to employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7) - **integrating** bioscience in problems solving related to the ingredients and processing used for natural medicine products (in team work) (CLO7a) - **communicating** the results of project based solving related to the natural medicine product and management (LO7b)

Content	This course **Describes and analyses** scope of Natural medicine: definition and terminology, medicinal plant (in Indonesia) as the source for natural medicine, classification of natural medicine as standardized by government regulation (BPOM), and the updated amount of product for each level. It **integrates** bioscience for proposing/ or giving recommendations as a solution (**Case-based Method**) to the problems found in society regarding the ingredients used and processing applied for natural medicine production. The course also provides specific skills for each student to practice the basic steps for producing natural medicine in the form of simplicia (or jamu) through **Project-based** activity starting from selecting the ingredients until product packaging, as well as the prototype name, excellency and recommended pricing, then **presenting** the results in front of the class.
Examination forms	a. Essay test (25%) b. Case-based report (25%) c. Report Progress of Project (35%) d. Presentation (15%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Heinrich et al. 2012. Fundamentals of Pharmacognosy andPhytotherapy. 2nd edition. Elsevier. 2. Mitra et al. 2007. Medicinal plants of Indonesia. APBN Vol. 11 No.11. 3. Elfahmi et al. 2014. Jamu: Indonesian traditional herbal medicinetowards rational phytopharmacological use. Journal of Herbalmedicine. 4. PedomanFitofarmaka. 1992. MenteriKesehatanRepublikIndonesia.

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Bryology

Module designation	: **Bryology**
Semester(s) in which the module is taught	: odd/V/VII
Person responsible for the module	1. Dra. Dwi Setyati, MSi., 2. Dr.rer.nat. Fuad Bahrul Ulum, S,Si. M.Sc
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation, Practical course
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload:90.7 hr a. lecture-Discussion: 29.3 hr b. Practical course: 45.3 hr c. Project: 9.6hr d. Presentation: 6.4 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Plant Systematic
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of biology, mathematics, and other relevant natural sciences(LO2) - Able to analyzing the basic concepts of Bryophytes diversity and ecology in the tropics (2.a) Able to analyze the principles of molecular biology, cells and organisms (LO3) - able to analyzing the problem of bryophytes conservation management in the tropics (3.b) **Skills:** Able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (L06) - able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (6.a) **Competence:** Able to employ bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7) a. able to integrating bioscience in problems solving of bryophytes conservation management in the tropics (7.a)

	b. able to presenting the results of problems solving related to the management of bryophytes conservation management in the tropics (7.b)
Content	This course **describes concepts** of Bryology: Describe the principal concept of Bryophytes diversity, herbarium and its curation, systematic, and conservation. There are also implementation scientific methods for bryophyte identification through **a Project-based Method** by examining the structural diversity and identification of specimens collected in the natural forests through east java. The second task is analyzing the problem of bryophyte conservation in the tropics based on a literature study.
Examination forms	a. Essay test (25%) b. Per chapter quiz (15%) c. Project report (35%) d. Practical course (25%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Eddy, A. 1998. A Handbook of Malesian Mosses Volume 1,2,3. London: British Museum (Natural History). 2. Gradstein, Churchill and S. Allen. 2001. Guide to Bryophytes of Tropical America. 3. Goffinet, B., dan Shaw, A. J. 2009. Bryophyte Biology. Cambridge: Cambridge University Press. 4. Gradstein, S. R. 2011. Guide to the Liverworts and Hornworts of Java. Bogor: SEAMEO-BIOTROP 5. Vanderpoorten, A. and Goffinet, B., 2009. Introduction to bryophytes. Cambridge University Press. 6. Tuba, Z., Slack, N.G. and Stark, L.R. eds., 2011. Bryophyte ecology and climate change. Cambridge University Press.

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Phytohormone

Module designation	: **Phytohormone**
Semester(s) in which the module is taught	: even/VI
Person responsible for the module	1. Prof. Bambang Sugiharto, M.Sc., Ph.D. 2. Dra. Dwi Setyati, MSi.,
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr lecture-Discussion: 34 hr Laboratory work :22.66hr Project: 22.66hr Presentation: 11.33 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Plant Physiology
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells and organisms (LO 3) - **Describing** the principles of phytohormone concept (LO3a) **Skills:** Able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) ● able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (LO6a) **Competence:** Able to employ bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7) ● Able to integrate bioscience in problems solving of resource management in the tropics (LO7a) ● Able to present the results of phytohormone-individual project (LO7b)
Content	This course **describes concepts** of Phytohormone: Describe the principle concept of plant phytohormones, auxin, gibberellins, cytokinin, ethylene, abscisic acid, and another plant hormones concept (Brassinosteroide,

	Jasmonic acid, steroid) and application of phytohormone in the field of biology and agriculture. Laboratory work cover: parthenocarpy, apical dominance, effect of auxin on root elongation, dormancy breaking (seed germination), cut flower preservation, triple response, fruit ripening There are also implementation scientific methods for Phytohormone through **Project Case Method** by the topic of parthenocarpy for seedless production and presenting them in class
Examination forms	a. Essay test (30%) b. Laboratory works (25%) c. Project (30%) d. Oral Presentation (15%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Davies, P.J. 2004. Plant Hormones Biosyntesis, Signal Transduction, Action. Kluwer Academic Publishers, Dordrecht/Boston/London. 2. Hopkins, W.G. 1999. Introduction to Plant Physiology. Second Edition. John Wiley &Sons, Inc..New York. 3. Krishnamoorthy, H.N. 1981. Plant Growth Substances Including Application in Agriculture. Tata McGraw-Hill Publishing Company Limited. New Delhi. 4. Srivastava, L.M.2002. Plant Growth and Development,Hormones and Environment Academic Press Elsevier Science, USA. 5. G.A. Wattimena.1988.Zat Pengatur Tumbuh Tanaman. Second University Development Project IBRD LOAN No. 2547-IND.PAU Institut Petanian Bogor Bekerjasama dengan Lembaga Sumberdaya Informasi-IPB 6. F. Eyidogan, K.T. Oz, M. Yucel, H.A. Oktem (auth), Nafees A Khan, Rahat Nazar, Noushina Iqbal, Naser A. Anjum. 2012. Phytohormones and Abiotic Stress Tolerance in Plants. Springer-Verlag Berlin Heidelberg

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Plant Ecophysiology

Module designation	: **Plant Ecophysiology**
Semester(s) in which the module is taught	: odd/V/VII
Person responsible for the module	1. Dra. Dwi Setyati, MSi., 2. Dr.rer.nat. FuadBahrul ulum, S.Si, M.Sc
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project-Laboratory/Field Works, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr a. lecture-Discussion: 34 hr b. Laboratory Works: 22.67 hr c. Project: 22.67 hr d. Topic Presentation: 11.33 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Terrestrial Ecology and Plant Physiology
Module objectives/intended learning outcomes	**Knowledge:** Able to analyze the principles of molecular biology, cells, organisms, and biological resource management (LO 3) • Describing the principles of plant ecophysiology (CLO3a) **Skills:** • **implement** scientific methods for the management of biological resources in the tropics (LO4) • Implementing scientific methods for Plant Ecophysiology in the tropics (CLO4a) • Able to implement biological concepts in laboratory work and/or field studies independently and/or in group (LO6) • able to do laboratory work and/or in the field independently and/or in groups for biological concepts implementation (CLO6a) • Using software applications (Excel, SPSS, T-Test, Duncan, or ANOVA) and/or basic instruments for sampling and analysis in Plant Ecophysiology (CLO6b) **Competence:**

	Presenting the results of problems solving related to the development of plant ecophysiology in the tropics (LO7) - Presenting the results of the Plant Ecophysiology individual project (CLO7b)
Content	This course **describes concepts** of Plant Ecophysiology, the response of plants to the abiotic factors (light, water and temperature, salinity, minerals and nutrients), biotics (herbivory, carnivory, pollinator, disseminator, parasite, symbiotic N fixation, allelopathy), Carbon utilization and biomass production (C3, C4 and CAM plants), hormone on plant growth and development, There is also implementation **Project Based Method** of plant stress on growth and development. The student conducted research in stress treatment, measurement, data analysis and evaluation. The output of the project is a scientific report.
Examination forms	a. Essay test (25%) b. Laboratory work (20%) c. Software application (10%) d. project report and draft article (30%): e. progress report (10%) f. final report (10%) g. draft article (10%) h. Topic Presentation (15%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. DeLucia E. H., J. S. Coleman, T. E. Dawson, and R. B. Jackson. 2001. Plant physiological ecology: linking the organism to scales above and below. New Phytologist 149:12-16. 2. Daubermine,R.F. 1974. Plants and Environment. A. textbook of Plant Autecology. Third Edition. John wiley &Sons, New York. 3. Fitter, A.H. dan R.K.M. Hay. 1994. Fisiology Lingkungan Tanaman Gadjah mada University Press. Yogyakarta. 4. Larcher, W. 1995. Physiological Plant Physiology third Edition. Berlin: Springer 5. Lambers H, Chapin III, F. S., Pons, T. L. 2008. Plant Physiological Ecology Second Edition. Springer ScienceþBusiness Media, LLC, 233 Spring Street, New York 6. Salisbury, F.B. and Ross, C.W. 1999. Plant Physiology 7. Related Article journals or webscience

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Orchidology

Module designation	: ORCHIDOLOGY
Semester(s) in which the module is taught	: even/VI/VIII
Person responsible for the module	: 1. Mukhamad Su'udi, PhD. 2. Dra.Dwi Setyati, M.Si 3. Dr.rer.nat Fuad Bahrul Ulum, M.Sc
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload:90.67 hr lecture- Discussion: 28.33 hr Project: 45.33 hr Presentation: 17 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Plant Systematics
Module objectives/intended learning outcomes	Knowledge: able to analyze the principles of molecular biology, cells and organisms (LO3) **Analyzing** biological principles that are relevant to the problem of orchid propagation, conservation and management in the tropics (CLO3b) Competence: able **to employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7) **integrating** bioscience in problems solving related to orchid propagation, conservation and management (in team work) (CLO7a) **communicating** the results of project-based solving related to the orchid cultivation, conservation and management(in team work) (LO7b)

Content	This course **Describe and analysis** scope of Orchidology: morphology, systematics, the use of orchids as ornament and others (food, medicine, aphrodisiac, cosmetics), propagation/ cultivation, and product management for agribusiness commodity. It **integrating** bioscience for proposing/ or giving the recommendation as a solution (**Case-based Method**)of the problems found in orchid cultivation area in order to meet predetermined standards for orchid management and conservation issues. The course also provides spesific skill for each student to learn orchid propagation/ cultivation through **Project-based** activity starting from selecting the parental line, crossing, until the emergence of fruit obtained from crossing, then **presenting** the results in front of class or as a paper/ manuscript.
Examination forms	Essay test (25%) Case-based report (25%) Report Progress of Project (35%) Presentation (15%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. E. S. Teoh, Medicinal orchids of Asia. Singapore: SpringerNature, 2016. 2. S. Bottom, Orchid Plant Parts and Why They Matter. St.Augustine Orchid Society. (www.staugerchidsociety.org). 3. E. S. Teoh, Orchids as aphrodisiac, medicine or food.Singapore: Springer Nature, 2019. 4. Assagaf MH. 1001 SpesiesAnggrek yang DapatBerbunga diIndonesia. Jakarta: Kataelha. 2012. 5. International Code OfBotanicaNomenclatureonlinewebsite (https://www.iapttaxon.org/icbn/main.htm). 6. M. M. Hossain, R. Kant, P. T. Van, B. Winarto, S. Zeng, and J.A. Teixeira da Silva, The Application of Biotechnology toOrchids, Critical Reviews in Plant Sciences, vol. 32, no. 2. pp.69–139. 2013. 7. Shao SC, Burgess KS, Cruse-Sanders JM, Liu Q, Fan XL,Huang H, Gao JY. Using in situ symbiotic seed germination to restore over-collected medicinal orchids in Southwest China.Frontiers in plant science. 2017. 8. Lee YI. In vitro culture and germination of terrestrial Asianorchidseeds. InPlant Embryo Culture. 2011.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Animal Reproduction

Module designation	: **Animal Reproduction**
Semester(s) in which the module is taught	: odd
Person responsible for the module	1. Dra. Mahriani, M.Si 2. Dra. Susantin Fajariyah,M.Si
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Practical course, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload:90.67 hr lecture-discussion: 17.00 hr Case Study28.33 hr Laboratory work45.33 hr
Credit points	: 2 credits or 3.023007669 ECTS
Required and recommended prerequisites for joining the module	: Animal development
Module objectives/intended learning outcomes	**Knowledge:** ● able to **describe** the principles of molecular biology, cells, organisms and biological resources management (LO 3) ● Describing the principles of animal reproduction concepts (3a) **Skills:** ● able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) ● Practising laboratory in independently and groups to demonstrate principles of animal reproduction (CLO6a) **Competence:** ● **implementing** the logic of critical thinking on biosafety related to the field of biology with a bioethical approach for better environmental awareness (LO 5) ● **implementing** the logic of critical thinking on animal reproduction related to handling animal testing with a scientific and bioethics approach (LO5b)

Content	This course **describes** the principles of animal reproduction in group basic concepts of animal reproduction: Principles of animal reproduction, Oogenesis, hormones that play a role, and folliculogenesis, Spermatogenesis, a hormone that participates in the seminiferous tubular cycle, Puberty, hormones that play a role as well as factors that influence puberty, Reproductive Cycle (ovary cycle and uterine cycle), Ovulation and gamete transport (spermatozoa maturation), Fertilization (capacitation and acrosome reaction), Implantation and hormones that play a role, Parturition and hormones that play a role, Lactation and hormones that play a role, Introduction to reproductive biotechnology, Insemination, Cryopreservation, In Vitro Fertilization, Embryo Transfer, Embryo Clone. There are also **practising** laboratories of animal reproduction covering Handling of animal testing, Practical techniques for animal testing, Fertility tests, Insemination, Ovariectomy, Vasectomy, and **implementing** the logic of critical thinking on animal reproduction related to handling animal testing with a scientific and bioethics approach
Examination forms	a. Essay test (35%) b. Assigment/Quis (10 %) c. Presentation base on Case Study: (25%) d. Laboratory work: (30%) e. Pre-test (5%) f. laboratory work Observation (activities) (5%) g. laboratory work report (10%) h. final practical test (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Hafest, E.S.E., & B. Hafest. 2000. Reproduction in Farm animal. Seventh Edition. Lippincott Williams & WilkinsUSA 2. Johnson,M. & B.Everitt .2007. Essential Reproduction.Third edition. Blackwell Scientific Publication, London 3. Liu. E. & J. Fan. 2018. Fundamentals of Laboratory Animal Science. CRC Press: London 4. Neill, J. D. (Ed). 2006. Knobil and Neill's Physiology of Reproduction.Academic Press, USA 5. Schatten, H., & G. M. Constantinescu. 2007. Comparative Reproductive Biology. Blackwell Publishing Ltd: Australia

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Parasitology

Module designation	: **Parasitology**
Semester(s) in which the module is taught	: Odd
Person responsible for the module	1. Purwatiningsih, S.Si., M.Si., Ph.D. 2. Dr. Drs. Hidayat Teguh Wiyono, M.Pd. 3. Husnatun Nihayah, S.Si., M.Biomed.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~ shared with bachelor in biology of University of Malang
Teaching methods	: Lecture- Discussion, Laboratory work, Case methods
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90,67 hr a. Lecture-Discussion: 45,33 hr b. Laboratory work: 25,5 hr c. Case-based methods: 19,83 hr
Credit points	: 2 credits or 3,02 ECTS
Required and recommended prerequisites for joining the module	: Animal Systematic
Module objectives/intended learning outcomes	**Knowledge:** ● able to **analyze** the principles of molecular biology, cells, organisms, and biological resources management (LO 3) ● Describing the principles of parasitology concepts (LO 3a) ● Analyzing biological principles that are relevant to the parasitological problem (3b) **Skills:** ● able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO 6) ● Practicing laboratory work both independently and in groups to demonstrate the principles of parasitology concepts (LO 6a)
Content	This course **describes concepts** of parasitology about the definition, terms, and scope of parasitology; knowledge of morphology, life cycle, pathology, infective stage, epidemiology, diagnosis, and prevention efforts in animals that are parasitic from the group of protozoa, helminths, and insects. There is also **a description and analysis of the**

	article on the development of the transmission ability of Plasmodium from host to vector. **Laboratory works** cover: the morphology of parasitic agents from protozoa (Ciliophora, Mastigophora, Sporozoa), helminth (Nematoda, Cestoda, Trematoda), and Arthropoda (Arachnida, Insecta) There are also implementation scientific methods for parasitology through **a Case-based Method** by vector collection of larval and adult-stage diseases of the Diptera group. The project result then will be shown by the case report and case progress.
Examination forms	a. Essay test (35%) b. Paper review (25%) Laboratory work: a. pre-test (5%) b. laboratory work report (5%) c. final practical test (10%) d. case-based method: e. activity observation (5%) f. case progress (5%) g. report (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	a. Levin, N. D. 1995. Protozoologi veteriner. Gajah Mada University Press. Yogyakarta b. Marvin C Meyer and O.Wilford Olsen, 1976. Essential of Parasitology, 2nd Ed, Dubuque, IOWA: WMC Brown Company Publisher c. Raymond M. Cable,1965 an illustrated laboratory manual of Parasitology. Minneapolis, Burgess: Publishing Company d. Sutanto I, Ismid I S, Sjarifuddin P, Sungkar S. 2008. Parasitologi Kedokteran, edisi ke 4. Fakultas Kedokteran Universitas Indonesia. Jakarta e. Pusarawati S, Ideham B, Kusmartisnawati, Tantular I, Basuki S. 2009. Atlas Parasitologi Kedokteran. Penerbit Buku Kedokteran EGC. Jakarta. f. Balai Besar Penelitian dan Pengembangan Vektor dan Reservoir Penyakit, Badan Penelitian dan Pengembangan Kesehatan. 2017. Pedoman Pengumpulan Data Vektor (Nyamuk) di Lapangan. Kementerian Kesehatan RI. Jakarta

	g. Diez-Fernandesz, Puenten J, Gangoso L, Lopez P, Sorigues R, Martin J, Figueralo J. 2020. Mosquitoes are attracted by the outdoor of Plasmodium-infected birds. International Journal for Parasitology Volume 50, Issue 8, July 2020, hal. 569-575

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Animal Behaviour

Module designation	: **Animal Behaviour**
Semester(s) in which the module is taught	: even/II
The Person responsible for the module	1. Dr. Asmoro Lelono M.Si 2. Husnatun Nihayah, S.Si,M.Biomed
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ /elective /~~specialisation~~ shared with a bachelor in Chemistry of University of Jember and bachelor in the Biology of University of Malang
Teaching methods	: Lecture-Discussion, Project base study, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90,67 hr a. lecture-discussion: 56,67 hr b. project base method: 11,33 hr c. presentation: 22,67 hr
Credit points	: 2 credits or 3,02 ECTS
Required and recommended prerequisites for joining the module	: Animal Systematic
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of molecular biology, cells, organisms and biological resources management (LO 3): ● **Describing** the principles of Animal Behaviour (CLO 3a) **Competence:** ● able to **employ** bioscience in solving problems related to biological resources in the tropics and to **communicate** the results (LO 7) ● **presenting** the results of problems solving related to certain major issues in animal behaviour (CLO 7b
Content	This course **describes concepts** of behaviour, the mechanisms that underlie the emergence of behaviour, physiological-ecological relationships and behaviour, individual behaviour: innate and learned behaviour, migration and navigation, behaviour in groups: competition for resources, mating and child care systems, and the role of understanding animal behaviour for human interests There is also implementation of scientific methods for animal behaviour through **a Project-based Method** by

	problems solving related to certain major issues in animal behaviour (reproductive, parenting, social behaviour). The project result then will be shown by the project report and **presentation**.
Examination forms	a. Essay test (40%) b. project report c. activity observation (10%) d. project report (20%) e. Presentation (30%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Alcock, J., 2009. Animal behavior: An evolutionary approach. Sinauer associates. 2. Hogan, J.A., 2017. The study of behavior: organization, methods, and principles. Cambridge University Press. 3. BOLHUIS, J.J., The Behavior of Animals: Mechanisms, Function and Evolution Oxford: Blackwell Publishing, 2005, 536 pages (ISBN 0-631-23125-0, US $69.95 Paperback).

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Entomology

Module designation	: **Entomology**
Semester(s) in which the module is taught	: Odd
Person responsible for the module	1. Purwatiningsih, S.Si., M.Si., Ph.D. 2. Husnatun Nihayah, S.Si., M.Biomed.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture-Discussion, Laboratory work, Case-based methods
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90,67 hr a. Lecture-Discussion: 45,33 hr b. Laboratory work: 25,50 hr c. Case-based method: 19,83 hr
Credit points	: 2 credits or 3,02 ECTS
Required and recommended prerequisites for joining the module	: Animal Systematic
Module objectives/intended learning outcomes	**Knowledge:** ● able to **analyze** the principles of molecular biology, cells, organisms, and biological resources management (LO 3) ● Describing the principles of entomology concepts (3a) ● Analyzing biological principles that are relevant to the entomological problem (3b) **Skills:** ● able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO 6) ● Practicing laboratory work both independently and in groups to demonstrate and observe the principles of entomology concepts (6a) **Competence:** ● able to integrate knowledge, skills and social and methodological capacities in working or learning situation for the management of biological resources in the tropics (LO 4) ● integrate the scientific method for producing an insectarium (4b)

Content	This course **describes** concepts of entomology about concepts of insect biology, evolution and coevolution, insect morphology, digestive system, circulatory system, respiratory system, muscular system, and movement. Excretory system, nervous system, endocrine system, reproductive system, development and metamorphosis, behavior and ecology, social insects, useful insects, nuisance insects, and IPM. There are also **descriptions and analyses of the article on** insect and plant interaction; entomophagous insects. **Laboratory works** cover: observing the anatomy and morphology of insects. There are also implementation scientific methods for entomology through **a Case-based Method** by insect collection and preservation. The case result then will be shown by the case progress and insectarium product.
Examination forms	a. Essay test (35%) b. Paper review (25%) Laboratory work: a. Pre-test (5%) b. laboratory work report (5%) c. final practical test (10%) d. case-based method: e. activity observation (5%) f. case progress (5%) g. case method product (insectarium) (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Gullan, P.J. & Cranston, P.S. (2000). The insects: an outline of entomology (second edition). Blackwell Science, Oxforf, UK. 2. Romoser, W. S. (1981). The Science of Entomology. Maxmillan Publishing, New York. 3. McGavin, G.C (2000). Essential Entomology: An order-by-order Introduction. Oxford University Press, Oxford, England, UK. 4. Elzinga, RJ. 1978. Fundamentals of Entomology. New Jersey: Prentice Hall Inc. 5. Untung K. 1996. Pengantar Hama Terpadu, Yogyakarta: Gadjah Mada University Press.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Endocrinology

Module designation	: **Endocrinology**
Semester(s) in which the module is taught	: even/II
The Person responsible for the module	1. Dr. Asmoro Lelono M.Si 2. Husnatun Nihayah, S.Si,M.Biomed
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ /elective /~~specialisation~~
Teaching methods	: Lecture-Discussion, Case study, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90,67 hr a. lecture-discussion: 45,33 hr b. Case base method: 11,33 hr c. Presentation: 34 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Animals Physiology
Module objectives/intended learning outcomes	**Knowledge:** ● able to **analyze** the principles of biology, mathematics, and other relevant natural sciences (LO 2) ● **Correlating** the basic concepts of science (chemistry) with the principles of endocrin (CLO 2b) ● able to **analyze** the principles of molecular biology, cells, organisms and biological resources management (LO 3) ● **Describing** the principles of endocrinology (CLO 3a) **Competence:** ● able to **employ** bioscience in solving problems related to biological resources in the tropics and to **communicate** the results (LO 7) ● **Presenting** the results of problems solving related to certain major issues in endocrinology (CLO 7b)
Content	This course **describes concepts** the scope of endocrinology; understanding and classifying hormones, especially chemical structures, biological activities of the glands and hormone products synthesized by the thyroid gland, gastrointestinal hormones which include pancreatic hormones and gastrointestinal hormones, reproductive hormones, hormone receptors in the membrane and cytoplasm also discuss communication between cells, hormonal disorders.

	There are also implementation scientific methods for endocrinology through **a Case-based Method** by problems solving related to **thyroid gland** and its synthesized hormone products, **reproductive hormones** by type and function in each sex, **gastrointestinal hormone** along with the types of enzymes and their functions, **adrenal glands** and their synthesized hormone products. The project result then will be shown by the **case report** and **presentation**.
Examination forms	a. Essay test (40%) case report a. activity observation (5%) b. progress report (5%) c. case report (20%) d. Presentation (30%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Gardner, D.G. and Shoback, D.M., 2017. Greenspan's basic and clinical endocrinology. McGraw-Hill Education. 2. Larry, J.J., 2013. Harrison's endocrinology. 3. Badiu, C., 2019. Williams textbook of endocrinology. Acta Endocrinologica (Bucharest), 15(3), p.416.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Immunology

Module designation	: **Immunology**
Semester(s) in which the module is taught	: Even/VI
Person responsible for the module	1. Dr. Rike Oktarianti, M.Si 2. Syubbanul Wathon, S.Si, M.Si
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture- Discussion-assignment, Practical course
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90,6 hr a. Lecture-Discussion: 45,3 hr b. Assignment/presentation 8,5 hr c. Practical course: 36,83 hr
Credit points	: 2 credits or 3,02 ECTS
Required and recommended prerequisites for joining the module	: Fundamental Biology
Module objectives/intended learning outcomes	**Knowledge**: ● able to **analyze** the principles of molecular biology, cells, organisms, and biological resources management (LO 3) ● Describing the principles of immunology concepts (3a) ● Analyzing biological principles that are relevant to immunological problem (3b) **Skills:** ● able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) ● **Practicing** laboratory in independently and groups to demonstrate principles of immunology concept (CLO6a) ● **Using** software applications and/or basic instruments to analysis in principles of immunology (CLO6b)
Content	This course **describes** the history of immunology, basic principles of immunology, cells in the immune system, non-specific and specific immune responses, antigens, immunoglobulins, immune system mechanisms in eliminating infectious agents (bacteria, viruses, tumors), hypersensitivity reactions, autoimmune diseases., antibody production techniques (monoclonal and polyclonal), as well as vaccine development and application. Review. **Laboratory works** cover: testing of

	antigen-antibody reactions by rhesus testing, determination of the number of leukocytes, isolation, and extraction of mosquito salivary gland proteins, qualitative analysis of the human immune response by dot blot and western blot analysis, and quantification analysis of human immune responses by Elisa analysis.
Examination forms	a. Essay test (35%) b. Quiz (15%) c. Assignment (individual/team work observation(20%) d. Practical course (30%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Abbas A.K., Lichtman A.H., 2005, Cellular and Molecular Immunology, 5th Ed., WB Saunders Co., Philadelphia 2. Baratawidjaja K. G., 2002, Imunologi Dasar, Edisi V, Balai penerbit FKUI, Jakarta 3. Brown F., Dougan, Hocy E.M., Martin S.J., Rima, B.K., and Trudgett A., 1993, Vaccine Design, John Wiley & Son,West Sussex 4. Burgess G. W, 1995, Teknology Elisa Dalam Diagnosis dan Penelitian, Cetakan Pertama, Gadjah Mada University Press, Yogyakarta

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Human Physiology

Module designation	: **Human Physiology**
Semester(s) in which the module is taught	: Even
Person final practical testble for the module	1. Dr. Teguh Hidayat Wiyono, M.Pd 2. Dra. Susantin Fajariyah, M.Si 3. Husnatun Nihayah, S.Si, M.Biomed
Language	: Bilingual
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Practical course, presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. Lecture-Discussion: 14.17 hr b. Case Study: 31.17 hr c. Practical course: 45.33 hr
Credit points	: 2 credits or 3,02 ECTS
Required and recommended prerequisites for joining the module	: Animal Physiology
Module objectives/intended learning outcomes	**Knowledge:** ● able to describing the principles of molecular biology, cells, organisms and biological resources management (LO 3) ● Describing the principles of animal physiology concepts (3a) **Skills:** ● able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) ● Practicing laboratory in independently and group to demonstrate principles of animal physiology (CLO6a)
Content	This course describes the principles of human physiology in groups. The basic principles of human physiology, Homeostasis, Stimulus (eyes, skin, ears, nose, tongue), Nerve response, Endocrine glands, The process of blood formation (Hematopoiesis), Blood pressure (systolic and diastolic), Reproductive system, Regulation of breathing, Mechanism of urine formation, Digestion and absorption of nutrients, and gastrointestinal regulation. There are also practicing laboratories of human physiology that cover The Effect of Stimulant Substances on Nerve Response Speed, the Effect of Highland Activities on

	Blood Pressure, Heart Rate and Hemoglobin Levels., Sense System, Digestive Enzyme Analysis, Measurement of glucose, cholesterol and uric acid levels, Urine Examination.
Examination forms	Essay test (35%) Quiz (5 %) Presentation base on video review: (30%) Laboratory work: (30%) Pre-test (5%) laboratory work Observation (activities) (5%)) laboratory work report (10%) final practical test (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Barret, K., Brooks, H., Boitano, S., & Barman.2010. Ganong's Review of Medical Physiology. 23 Ed. Mc.Graw-Hill Companies, Inc. New York. 2. Sherwood. 2010. Human physiology from cell to system. 7 Ed. Brooks/Cole, Cengage Learning, US 3. Stanfied, C.L. 2013. Principal of Human Physiology. 5Ed. Pearson Education. USA 4. Tortora, G.J & Nielsen, M.T. 2017. Principal of Human Anatomy. 14 Ed. Jonh Wiley and Sons, Inc. USA.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Ecotourism

Module designation	: **ECOTOURISM**
Semester(s) in which the module is taught	: odd/V/VII
Person responsible for the module	: 1. Dra. Hari Sulistiyowati, MSc., PhD. 2. Rendy Setiawan, SSi., MSi. 3. Arif Mohammad Siddiq, SSi., MSi.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture- Discussion: 22.67 hr b. Project: 68hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Terrestrial Ecology and Aquatic Ecology
Module objectives/intended learning outcomes	**Knowledge:** ● able to **analyze** the principles of molecular biology, cells, organisms, and biological resources management (LO 3) ● **Analyzing** biology principles that are relevant to the ecotourism issues in the tropics (CLO3b) **Skills:** ● able **to implement** scientific methods for the management of biological resources in the tropics (LO4) ● **demonstrating** scientific methods for improvement of a potential specific area of the tropics as an ecotourism destination (CLO4b) **Competence:** ● able **to employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results ● **integrating** bioscience in problems solving related to the development of ecotourism in the tropics (LO7a) ● **presenting** the results of problems solving related to **demonstrating** scientific methods to develop potential specific area of tropics as ecotourism destination (LO7b)

Content	This course **analyzes concepts** of Ecotourism: Definition, Types, and Policy Potential Tourism Destination in the tropics, **Project Method** (scientific methods) for ecotourism development (4A-Attraction, Accessibility, Amenity, Ancillary) by conducting a comprehensive analysis of areas to be developed into ecotourism destinations. The integration of the four components (4A) needs to be planned and analyzed by considering all aspects of funding, human resources, infrastructure, organization, and policies, including involvement at the community level, village government, sub-district, district, and province as scientific article; the final project is communicated through **presentation** in class covering Promotion (7 P-Product, Positioning, Price, Promotion, Place, Packaging, Partnership) **This** course supports the entrepreneurship skill related to the utilization of ecotourism.
Examination forms	a. Essay test (20%) b. Report Progress of Project (30%) c. Final Project Report (20%), d. Project Report Presentation (30%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Drumm A & A Moore. 2002. An Introduction to Ecotourism Planning Vol 1.The Nature Conservancy, Arlington, Virginia, USA 2. Fennell, D.A. and Dowling, R.K. 2003. Ecoturism Policy and Planning. CABI Publishing. UK 3. Weaver DB. 2001. The Encyclopedy of Ecotourism. CAB International 4. Wood, ME. 2002. Ecotourism. Principles, Practices and Policy for Susitainability. UNEP 5. Indonesia Regulation related to Ecotourism

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Valuation of Natural Resources

Module designation	: **Valuation of Biological Resources**
Semester(s) in which the module is taught	: even/VI
Person responsible for the module	1. 1. Dra. Hari Sulistiyowati, MSc., PhD. 2. Rendy Setiawan, SSi., MSi. 3. 3. Arif Mohammad Siddiq, SSi., MSi.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, laboratory work, field work, project study
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture- Discussion: 22.67 hr b. laboratory works: 17 hr c. Field work22.67 hr d. Project study: 28.33 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Terrestrial Ecology and Aquatic Ecology
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of molecular biology, cells, organisms and biological resources management (LO 3) ● Analyzing biology principles that are relevant to the natural resources valuation in the tropics (CLO3b) **Skills:** ● able **to implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) ● **Practicing** laboratory and field works related to natural resources valuation in the tropics (CLO6a) ● **Using** software applications and/or basic instruments for sampling and analysis natural resources values (CLO6b) **Competence:** ● able **to employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7) ● **presenting** the results of problems solving related to the valuation of natural resources in the tropics (CLO7b)

Content	This course **Describes and analyzes:** Health Ecosystem, Structure or Goods Functions or Services, Biological resources (Plant, wildlife, and aquatic fauna) Valuation Application, and Forest Ecosystem Valuation and Ecosystem Degradation. **Project Based Method** on biological resource threats in the tropics through **practical and field works**. It assigned in individual or teamwork covering 1) determination of title of independent research - biological resources Valuation (Determination of Tangible and intangible value Plants, wildlife or aquatic fauna in tropic), 2) Preparation of independent research background, 3) The method of collecting data on the structure and function (tangible and intangible values), 4) Analysis of Plants, wildlife or aquatic fauna structure data in tropic, 5) Analysis of Plants, wildlife or aquatic fauna function data in tropic, 6) Data analysis (Using Microsoft Excel and Primer Software) of Total Ecological Value of Plants, wildlife or aquatic fauna in tropic, 7) Results and Discussion of Project. The Project is reported as **a scientific article draft** and **presented** in class.
Examination forms	a. Essay test (20%) b. Equipment/software observation (laboratory work) (10%) c. Activity observation (field work) (20%) d. Progress Report (Project) (15%) e. Scientific article (Project) (25%) f. Report presentation (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Reading list	1. Brauman, K. D. (2007). The Nature and Value of EcosystemServices: An Overview Highlighting Hydrologic Services. Annu. Rev. Environ. Resour. 32 (2007) , 67–98. 2. Cardinale, B.J., Duffy, M., Gonzalez, A., Hooper, D.U., Perrings, C., Venail, P., Narwani , A., Mace, G.M., Tilman, D., Wardle, D.A., Kinzig, A.P., Daily, G.C., Loreau, M.C., Grace, J.B., Larigauderie, A., Srivastava, D., and Naeem, S. Review: Biodiversity loss and its impact on humanity. Nature 486 (2012): 59-67 CBD, 2009, Forest 3. Resilience,Biodiversity,and Climate Change: A Synthesis of the Biodiversity/Resilience/Stability Relationship in Forest EcosystemsTechnical No. 43 the Convention of Biodiversity (CBD). 4. Sulistiyowati, H. and Buot, I.E. 2016. Ecological Valuation Tools To Appraise Biomass, Necromass And Soil Organic Matter In A Natural Forest Ecosystem. J. Wetlands Biodiversity 6: 97-108 5. Costanza, R. d. (Vol 38 (1997)). The value of the world's ecosystem services and natural capital. Nature 38. Nature . 6. Costanza, R., 2000. Social goals and the valuation of ecosystem services. Ecosystems 3: 4–10. 7. B, Kautsky N, Levin S, Lubchenco J, Mäler KG, Simpson D, Starrett D, Tilman D, Walker B.2000. Ecology. The value of nature and the nature of value. Science 289(5478):395-6. 8. Straton, A. 2006. A complex systems approach to the value of ecological resources. Ecological Economics 56 (3): 402–411 9. Related Scientific Article Journals or Webscience

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Environmental Biomonitoring

Module designation	: **ENVIRONMENTAL BIOMONITORING**
Semester(s) in which the module is taught	: odd/V/VII
Person responsible for the module	: 1. Dr. Dra. Retno Wimbaningrum, M.Si. 2. Rendy Setiawan, SSi., MSi.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture- Discussion, Laboratory work, Project study, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture- Discussion: 22.67 hr b. Laboratory work: 22.67 hr c. Project Study: 22.67 hr d. Presentation 22.67 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Environmental Sciences

Module objectives/intended learning outcomes	**Knowledge:** ● able to **analyze** the principles of biology, mathematics, and ● other relevant natural sciences (LO2) ● **correlating** the basic concepts that are relevant to the biological environmental quality assessment (CLO2b) **Skills:** ● able to **implement** biological concepts in laboratory work ● and/or field studies independently and/or in groups (LO6) ● **Practicing** laboratory and field works related to biological environmental quality monitoring in the tropics (CLO6b) **Competence:** ● able to **implement** the logic of critical thinking on biosafety and environmental issues related to the field of biology with a scientific and bioethical approach (LO5) ● **Using** the logic of critical thinking on the implementation of biosciences for the biological environmental quality assessment with a scientific and bioethical approach (CLO5b) ● able to **employ** bioscience in solving problems related to ● biological resources in the tropics and to **communicate** the ● results (LO7) ● **Presenting** the results of problems solving related to the biological environmental quality assessment in the tropics (CLO7b)
Content	This course describes and correlates the basic concepts that are relevant to environmental biomonitoring. It implements **scientific methods (Project Based Method)** for biological environmental quality assessment by analyzing: river water, lake water, air and intertidal zone quality through practical, **problem-solving** in environmental quality assessment in the tropics through **presentation** and paper draft
Examination forms	● Essay test (20%) ● Presentation (20%) ● Activity observation (Laboratory work) (20%) ● Activity observation (Project) (10%) ● Scientific article (Project) (20%) ● Report Presentation (Project) (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Reading list	1. Borja, A., Franco, J., and Perez, V. 2000. A marine biotic index to establish the ecological quality of soft-bottom benthos within the European estuarine and coastal environment. Marine Pollution Bulletin. 40 (12): 1100-1114. 2. Mandaville SM. 2002. Benthic macroinvertebrates in freshwaters-taxa tolerance values, metrics, and protocols.Project H-1, Soil & WaterConservation Society of Metro Halifax.California (US). 3. Merritt, R.W. & Cummins, K.W. 1996. An introduction to the aquatic insects of North America. 3rd Ed. Kendall/Hunt Publishing Company. Iowa. 4. Neher, D.A. 2001. Role of nematodes in soil health and their use as indicators. Journal of Nematology, 33(4):161–168. 5. Pulak D. S. Joshi, J.Rout & D. K. Upreti. 2013. Lichen Diversity For Environmental Stress Study: Application Of Index Of Atmospheric Purity (IAP) And Mapping Around A Paper Mill In Barak Valley, Assam, Northeast India. Tropical Ecology 54(3): 355-364. 6. Rosenberg, D.M. & Resh, V. H. 1993. Freshwater biomonitoring and benthic macroinvertebrates. Chapman and Hall. New York. 7. Soto, R.L. 2012. Nematodes as soil quality indicators in coffee systems. Thesis. Wageningen University. Wageningen. 8.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Biogeography

Module designation	: **Biogeography**
Semester(s) in which the module is taught	: Odd/V or VII
Person responsible for the module	1. Dra. Hari Sulistiyowati, MSc., PhD 2. Dra.Rike Oktarianti, MSi., PhD. 3. Arif Mohammad Siddiq, SSi., MSi.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project-lab works, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.66hr a. lecture-Discussion: 45.33 hr b. Laboratory work: 22.67 hr c. Project-Based Method: 22.67 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Fundamental Biology
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of molecular biology, cells and organisms (LO3) ● Analyzing biological principles that are relevant to the problem of Biogeography of tropical species (CLO3b) **Skills:** ● able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) ● Practicing Laboratory works related to biology conservation in the tropics (CLO6a) ● Using software applications and/or basic instruments for research-based projects of flora and fauna geography (CLO6b) **Competence:** ● able to employ bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7). ● Presenting the results of a project based on Flora or Fauna geography through laboratory works covering: specific flora-fauna selected with fossil record, construction of flora-fauna selected phylogenetic (CLO7b)

Content	This course describes **and analyzes** the scope of Biogeography of tropical species: Definition and Importance of Biogeography, History of Biogeography, Ecological Biogeography, Paleoecology Evolution and Speciation, Island Biogeography (Evolution, Immigration, Extinction), Plate Tectonics (Impacts on Flora and Fauna), Phytogeography (Provincialism and Floristic Kingdom) Concept of Zoogeography, Major biogeographic regions (Paleartic, Neartic, Paleotropical, Neotropic, Oriental, Australian, and Oceanic), Animal Distribution Patterns, Environmental Changes to biogeography, Rarity and Extinction, Hotspots and coldspots fragmentation of the ecosystem, Distribution pattern (Disjunction, Continuous, Cosmopolitan, Endemic) and influencing factors distribution (Long distance and Land bridges), and refugia/ glaciation of tectonic plates. It also implements teamwork **project-based research** on Flora or Fauna geography through laboratory works covering: specific flora-fauna selected with fossil records, construction of flora-fauna selected phylogenetic by using gene banks and the **Mega 11 application**, description of the flora-fauna gene-bank tracking through the Mega 11 application, implementation of **Bioedit application**, fossils Mapping by **using the Ocean Drilling Stratigraphic Network (ODSN) application**, writing a draft article and **presenting** the result of a project on flora and fauna biogeography.
Examination forms	a. Essay test (35%) b. Pre-test (Laboratory work) (5%) c. Final practical test (Laboratory work) (10%) d. Activity observation (Laboratory work) (10%) e. Equipment Software/Observation (Laboratory work) (10%) f. Article (Project) (20%) g. Report Presentation (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Reading list	1. Cox CB, Moore PD, and Ladle R. 2016. Biogeography: An Ecological and Evolutionary Approach Ninth Edition. London (UK): John Wiley & Sons . 509pp. ISBN 9781118968581 2. Ebach, M. C. 2015. Origins of Biogeography The role of biological classification in early plant and animal geography. Netherlands: Springer. 185pp 3. Strahler, A. 2013. Introducing Physical Geography. USA: John Wiley & Sons. Inc. 661pp 4. Losos, J. B. and Ricklefs, R.E.2010. The theory of island biogeography revisited.New Jersey: Princeton University Press. 495pp 5. Whittaker RJ, Palacios JMF. 2007. Island Biogeography: Ecology, evolution, and conservation Second Edition. New York (US): Oxford University Press. 6. Renema W (Eds). 2007. Biogeography, Time, and Place: Distributions, Barriers, and Islands. Netherlands: Springer 7. Huggett, R. J. 2004. Historical Biogeography: An Introduction. London (UK): Harvard University Press. 456pp 8. Related Scientific articles Journals or web science

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Wildlife Management

Module designation	: **Wildlife Management**
Semester(s) in which the module is taught	: even/VI
Person responsible for the module	1. Dra. Hari Sulistiyowati, M.Sc., Ph.D. 2. Arif Mohammad Siddiq, S.Si., M.Si.
Language	Indonesian and English
Relation to curriculum	~~Compulsory~~ / elective / ~~specialisation~~ Chemistry UNEJ
Teaching methods	lecture - Discussion, Case-based Methods, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture- Discussion: 34 hr b. Case-based Method (Project): 56.67 hr
Credit points	2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	Terrestrial Ecology
Module objectives/intended learning outcomes	**Knowledge:** ● able to **analyze** the principles of molecular biology, cells and organisms (LO3) ● **Analyzing** biological principles that are relevant to manage the wildlife in the tropics area (CLO3b) **Skill:** ● able **to implement** scientific methods for the management of biological resources in the tropics (LO4) ● **Implementing** scientific methods for the wildlife management in the tropics (CLO4a) ● able to **implement** biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) ● **Using software** applications and/or basic instruments for sampling and analysis in biology and environmental fields (CLO6b) **Competence:** ● able to **employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7). ● **Presenting** the results of prototype design related to the wildlife management (CLO7b)

Content	This course describes and analyzes the concepts of wildlife management: wildlife ecology, habitat management, and population management. This course also implemented scientific methods for Wildlife Management through the **Case-Based Method** by identifying degradation habitat or decreasing population of wildlife, Proposing the objective, selecting the suitable method for wildlife Population or habitat management, Analyzing and discussing results, and then finally writing a project report as **a scientific review article draft** and **presentation** in class.
Examination forms	a. Essay test (35%) b. Progress report (Case) (15%) c. Report presentation (Case) (25%) d. Draft article (25%)
Study and examination requirements	Passing grade 70% Requirements for successfully passing the module
Reading list	1. Alikodra, H. 1990. Pengelolaan Satwa Liar [Indonesian]. Bogor (ID): IPB Press. 2. Alikodra, H. 2010. Teknik Pengelolaan Satwa Liar dalam Rangka Mempertahankan Keanekaragaman Hayati Indonesia [Indonesian]. Bogor (ID): IPB Press. 3. Harrison C, Greensmith A. 1993. Birds of The World. New York (US): Dorling Kindersley Handbooks 4. McComb BC. 2007. Wildlife Habitat Management Concepts and Applications in Forestry. New York (US): CRC Press. 5. Mills LS. 2013. Conservation of Wildlife Populations Demography, Genetics, and Management. Oxford (UK): Wiley Blackwell. 6. McComb BC. 2016. Wildlife Habitat Management Concepts and Applications in Forestry 2nd Edition. New York (US): CRC Press. 7. Morrison ML, Mathewson HA. 2015. Wildlife Habitat Conservation Concepts, Challenges, and Solutions. Maryland (US): John Hopkins University Press. 8. Sinclair ARE, Frycell JM, Caughley G. 2006. Wildlife Ecology, Conservation and Management, 2nd Edition. Oxford (UK): Blackwell Publishing 9. Wilson DE. 2015. Wildlife of the world. New York (US): DK Smithsonian. 10. Indonesia Regulation related to Wildlife Management 11. Related Scientific Article Journals or Webscience

Credits to ECTS conversion formula 2 SKS TM = 2 (50min T+60min TS+60min M (170 minutes) x 16 weeks) = 90.67 Hours. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Bio-invasion Ecology

Module designation	: **Bio-Invasive Ecology**
Semester(s) in which the module is taught	: odd/V/VII
Person responsible for the module	1. Dra. Hari Sulistiyowati, MSc., PhD. 2. Rendy Setiawan, SSi., MSi. 3. Arif Mohammad Siddiq, SSi., MSi.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture- Discussion: 45.33 hr b. Project: 45.33 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Terrestrial Ecology and Aquatic Ecology
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of molecular biology, cells and organisms (LO3) ● **Analyzing** biological principles that are relevant to the problem of Bio-invasion Ecology in the tropics (CLO3b) **Skills:** ● able **to implement** scientific methods for the management of biological resources in the tropics (LO4) ● **Implementing** scientific methods for ecology invasive species management in the tropics (CLO4a) ● Competence: able **to employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7) ● **integrating** bioscience in problems solving related to the management of bio-invasive ecology (CLO7a) ● **Communicating** the results of Case-based solving related to the management of bio-invasive ecology in the tropics (in teamwork) (LO7b)
Content	This course **Describes and analyzes the** scope of Bio-invasion Ecology: Terminology and Development of Bio Invasive, Invasion pathway of invasive species, Impact of bioinvasion (abundance of invasive species, biodiversity of endemic species, biogeochemical cycles), Distribution, geographic and evolution of invasive species, and invasive species management. It implements **scientific methods (Case-based Method)** for ecology invasive species management by analyzing: the problem in the tropics related to the characteristics and value of invasive species, the historical invasive species colonization, the impact of invasive species colonization (adaptation, abundance, and distribution); the course also covers **problems solving** in bio invasive management in the tropics through **presentation** and paper draft

Examination forms	a. Essay test (30%) b. Paper review (10%) c. Case Study: d. Progress report (20%) e. Article draft (30%) f. report presentation (10%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Liebhold, AM., Brockerhoff EG., et all, 2017 Biological Invasifons in Forest Ecosystems, Biol Invasions vol 19: 3437-3458 2. Gobster, P. H. 2005. Invasifve Species as Ecological Threat: Is Restoration an Alternative to Fear-based Resource Management? Ecological Restoration 23 (4): 261-270 3. Beisel J-N (2001) The elusive model of a biological invasifon process: time to take differences among aquatic and terrestrial ecosystems into account? Ethology Ecology & Evolution 13: 193–195 4. Richardson, DM (Ed). 2011. Fifty Years Of Invasion Ecology The Legacy Of Charles Elton. UK. Blackwell Publishing Ltd Lockwood, J.L., Hoopes, M. F., and Marchetti M. P. 5. 2013. Invasion Ecology.Second Edition. UK. Wiley-Blackwell. Gallien, L. and Carboni,M. 2017. The community ecology of invasive species: where are we and what's next? Ecography 40: 335–352, 2017 6. Inderjit (Ed). 2005 Invasive Plants: Ecological and Agricultural Aspects. Berlin. Birkhäuser Verlag 7.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Phytoremediation

Module designation	: **Phytoremediation**
Semester(s) in which the module is taught	: even/VI/VIII
Person responsible for the module	: Dr. Dra. Retno Wimbaningrum, M.Si.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~ Biology UNSOED, Biology UN Gorontalo
Teaching methods	: Lecture- Discussion, Project, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. Lecture- Discussion: 22.67 hr b. Presentation: 22.67 hr c. Practical: 45.33 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Environmental Science
Module objectives/intended learning outcomes	**Knowledge:** ● able to **analyze** the principles of biology, mathematics, and ● other relevant natural sciences (LO2) ● **correlating** the basic concepts that are relevant to the phytoremediation (CLO2b) **Skills:** ● able to **implement** biological concepts in laboratory work ● and/or field studies independently and/or in groups (LO6) ● **Practicing** laboratory and field works related to wastewater management using phytoremediation in the tropics (CLO6b) ● Competence: ● able to **implement** the logic of critical thinking on biosafety and environmental issues related to the field of biology with a scientific and bioethical approach (LO5) ● **Using** the logic of critical thinking on the implementation of biosciences for wastewater management using phytoremediation with a scientific and bioethical approach(CLO5b) ● able to **employ** bioscience in solving problems related to ● biological resources in the tropics and to **communicate** the ● results (LO7) ● **presenting** the results of problem-solving related to wastewater industrial management in the tropics (CLO7b)

Content	This course describes, and correlate the basic concept that are relevant to phytoremediation, It implements **scientific methods (Case-Based Method)** for wastewater management by analyzing: the effectiveness of artificial wetland in phytoremediation of industrial wastewater through practical, implementation of phytoremediation in artificial wetland as **problem-solving solving** in industrial wastewater management in the tropics through **presentation** and paper draft
Examination forms	a. Essay test (25%) b. Report Progress of Project (40%) c. Case-based paper draft (20%), d. Presentation (15%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Brisson, J. & Chazarenc, F. 2009. Maximizing pollutant removal in constructed wetlands should we pay more attention to macrophyte species selection? Science of The Total Environment. 407: 3923-3933 2. Chandra, R., N.K. Dubey, and V. Kumar. 2018. Phytoremediation of environmental pollutants. CRC Press. 3. EPA. 1999. Manual constructed wetlands treatment of municipal wastewaters. EPA/625/R-99/010. National Risk Management Research Laboratory Office of Research and Development U.S. Environmental Protection Agency Cincinnati. Ohio. 4. EPA. 2000. Introduction to phytoremediation. EPA/600/R-99/007. National Risk Management Research Laboratory Office of Research and Development U.S. Environmental Protection Agency Cincinnati. Ohio. 5. McCutcheon, S. and J.L. Schnoor. 2003. Phytoremediation transforms and controls contaminants. John Wiley & Sons Inc. New Jersey. 6. Terry, N. 2020. Phytoremediation contaminated soil and water. 1st edition. CRC Press. 7.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Coastal Area Management

Module designation	: **Coastal Area Management**
Semester(s) in which the module is taught	: odd/VI/VIII
Person responsible for the module	1. Dr. Dra. Retno Wimbaningrum, MSi. 2. Rendy Setiawan, SSi., MSi.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, case method
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture- Discussion: 45.33 hr b. Case Method: 45.33 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Terrestrial Ecology and Aquatic Ecology
Module objectives/intended learning outcomes	**Knowledge:** ● able **to analyze** the principles of molecular biology, cells and organisms (LO3) ● able **to Analyze** the biology principles that are relevant to the problem of Coastal Area Management (LO3b) **Skills:** ● able **to implement** scientific methods for the management of biological resources in the tropics (LO4) ● Implementing scientific methods for coastal area management in the tropics (LO4a) **Competence:** ● able **to employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7) ● Integrating bioscience in problems solving related to the Coastal Area Management in the tropics (LO7a) ● presenting the results of problems solving related to the Coastal Area Management in the tropics (LO7b)

Content	This course **Describe and analyze** scope of Coastal Area Management such as Coastal boundaries and general characteristics of the coastal area in Indonesia also Importance, use, and problems of coastal resources. It implements **scientific methods (Case-based Method)** for Coastal Area Management based on biota economy and ecological value; the course also covers **problems solving** in Coastal Area management in the tropics through **presentation** and paper draft
Examination forms	a. Essay test (40%) b. Progress Report (Case Method) (30%) c. Final Report (10%) d. Report Presentation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Clark, J.R. 1998. Coastal seas. The conservation challenge. Oxford: Blackwell Science Ltd. 2. Hemmings, M.A. & Duarte, C.M. 2000. Seagrass ecology. Cambridge: Cambridge University Press. 3. MPP-EAS. 1999. Total economic valuation: coastal and marine resources in the straits of Malacca. Quezon City: GEF/UNDPIMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas. 4. Nordstrom, K.F. & Roman, C.T. 1996. Estuarine shores: evolution, environment, and human alteration. Chichester: John Wiley & Sons, Inc. 5. Nybakken, J.W. 1982. Marine biology: an ecological approach. Diterjemahkan oleh: Eidman, M., Koesoebiono, Bengen, D.G., Hutomo, M. Sukardjo, S.). Jakarta: P.T. Gramedia Pustaka Umum. 6. Purnomo A.H., Suryawati, S.H., Radjawane, I.M. Sembiring, K.O. 2015. Perubahan iklim di wilayah pesisir. Konsepsi dan aplikasi strategi adaptasi. Penerbit ITB. Bandung. 7. Supriharyono, M.S. 2000. Pelestarian dan pengelolaan sumber daya alam di wilayah pesisir tropis. Jakarta: P.T. Gramedia Pustaka Utama.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Mangrove Ecology

Module designation	: **Mangrove Ecology**
Semester(s) in which the module is taught	odd/V/VII
Person responsible for the module	1. Dr. Dra. Retno Wimbaningrum, M.Si. 2. Rendy Setiawan, S,Si., M.Si.
Language	Indonesian and English
Relation to curriculum	~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	lecture - Discussion, Case-Based Methods, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture- Discussion: 45.33 hr b. Case-based Method (Project): 11.33 hr c. Presentation: 34 hr
Credit points	2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	Terrestrial Ecology and Aquatic Ecology
Module objectives/intended learning outcomes	**Knowledge:** ● able **to analyze** the principles of molecular biology, cells and organisms (LO3) ● **Analyzing** biological principles that are relevant to the problem of mangrove ecology (CLO3b) **Competence:** ● able to **internalize** norms and ethics based on Pancasila in working independently or in groups (LO1) ● **Working** in team works on the discussion of the mangrove ecology concept and application (LO1b) ● able to **employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7) ● **Presenting** the results of problems solving related to the problems of mangrove ecology (LO7b)

Content	This course discusses the meaning and limitations of mangrove ecosystem areas, types of mangrove plants (morphology, adaptation, reproduction, and taxonomy), factors limiting the existence of mangrove forests, plant zoning patterns of mangroves, the distribution of mangrove forests in the world and Indonesia, diversity of mangrove forest fauna, energy flow, material cycle and mangrove forest productivity, methods ecological research in mangrove forests, ecological benefits and economics of the mangrove ecosystem, the condition of the mangrove forest in Indonesia and its conservation efforts. This course also implements scientific methods for mangrove Ecology through Case-Based Method by conservation strategy and management of mangroves, writing paper reports, and presenting in class.
Examination forms	a. Essay test (30%) b. Article and Video Review (15%) c. Paper Reports (25%), d. Presentation (30%)
Study and examination requirements	Passing grade 70% Requirements for successfully passing the module
Reading list	1. Aksornkoae, S. 1993. **Ecology and Management of Mangroves**. Bangkok: UCN Chapman, V. J. 1976. **Mangrove Vegetation**. Vaduz: J. Cramer. 2. Hutchings, P and P. Saenger. 1987. **Ecology of Mangroves**. London: University of Queensland Press. 3. Inoue, Y., O. Hadiyati, H. M. A. Affendi, K. R. Sudarma, dan I. N. Budiana. 1999. **Sustainable Management Models for Mangrove Forests**. Denpasar: Ministry of forestry and Estate Crops and JICA 4. Kitamura, S., Chairil Anwar, Amalyos Chaniago, Shigeyuki Baba. 1997. **Handbook of Mangroves in Indonesia. Bali & Lombok**. Denpasar: ISME. 5. Noor, Y. R., M. Khazali dan I. N. N. Suryadiputra. 1999. **Panduan Mengenal Mangrove di Indonesia**. Bogor: Wetlands International Indonesia Programme. 6. Tam, N. F. and Y. Wong. 1999. **Hong Kong Mangroves**. Kowloon: City University of Hong Kong Press. 7. Tomlinson, P. B. 1986. **The Botany of Mangroves**. Cambridge: Cambridge University Press.

Credits to ECTS conversion formula 2 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 90.67 Hours. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Tropical Forest Ecology

Module designation	: **Tropical Forest Ecology**
Semester(s) in which the module is taught	odd/V/VII
Person responsible for the module	1. Dra. Hari Sulistiyowati, M.Sc., Ph.D. 2. Arif Mohammad Siddiq, S.Si., M.Si.
Language	Indonesian and English
Relation to curriculum	~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	lecture - Discussion, Case-Based Methods, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture- Discussion: 34 hr b. Field Work: 11.33 hr c. Case-based Method: 45.33 hr d. Presentation: 34 hr
Credit points	2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	Terestrial Ecology
Module objectives/intended learning outcomes	**Knowledge:** ● able to **analyze** the principles of molecular biology, cells and organisms (LO3) ● **Analyzing** biological principles that are relevant to the problem of tropical forests ecology (CLO3b) **Competence:** ● able to **internalize** norms and ethics based on Pancasila in working independently or in groups (LO1) ● **Working** in team works on the discussion of tropical rainforest ecology concept and application (CLO1b) ● able to **employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7). ● **Presenting** the results of problems solving related to the problems of tropical forest ecology (CLO7b)
Content	This course discusses the structure and function of tropical forests, the composition and character of tropical forests, disturbance dynamics, tropical biodiversity, frugivores, seed dispersal, Tree Recruitment, predation, and trophic cascades. This course also implements scientific methods for Tropical Forest Ecology through the **Case-Based Method** by identifying factors causing the deforestation of tropical forests and conservation strategies, writing paper reports, and **presenting** in class.

Examination forms	a. Essay test (40%) b. Attitude observation (Field Work) (10%) c. Attitude observation (Case-based Method) (10%) d. Final report (Case-based Method) (20%) e. Report presentation (Case-based Method) (20%)
Study and examination requirements	Passing grade 70% Requirements for successfully passing the module
Reading list	1. Allaby M, Garratt R. 2006. Tropical Forests. New York (US): Chelsea House. 2. Corlett RT, Primack RB. 2011. Tropical Rain Forests: An Ecological and Biogeographical Comparison, Second edition. New Jersey (US): Wiley Blackwell. 3. Goldsmith FB. 1998. Tropical Rain Forest: A Wider Perspective. Dordrecht (ND): Springer Netherlands 4. Sudarshana P, Nageswara-Rao M, Soneji JR. 2012. Tropical Forests, InTech Chapters: ISBN 978-953-51-0255-7. 5. Montagnini F, Jordan CF. 2005. Tropical Forest Ecology. New York (US): Springer. 6. Qayim I. 2008. Ekologi Hutan Tropis [indonesia]. Jakarta (ID): Universitas Terbuka Press. 7. Indriyanto. 2006. Ekologi Hutan [indonesia]. Jakarta (ID): Bumi Aksara. 8. Turner IM. 2001. The Ecology of Trees in the Tropical Rain Forest. Cambridge (UK): Cambridge University Press. 9. Zang X, Wang M, Liang X, Valk AGVd. 2009. Forest ecology: recent advances in plant ecology. Dordrecht (ND): Springer Netherlands

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Forensic Biology

Module designation	: **Forensic Biology**
Semester(s) in which the module is taught	: odd/V/VII
Person responsible for the module	Mukhamad Su'udi, PhD. Syubbanul Wathon, M.Si.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation,

Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr lecture-discussion: 28.33 hr Project: 45.33 hr Presentation: 17 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Biochemistry
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of molecular biology, cells and organisms (LO3) ● **Analyzing** biological principles that are relevant to forensic investigation (CLO3b) **Competence:** ● able **to employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7) ● **Integrating** bioscience in problems solving related to the forensic investigation process (in team work) (CLO7a)
Content	This course **describes and analyzes the** scope of Forensic Biology: terminology, other major/disciplines required for supporting & developing forensic biology, type of evidence that arises in the crime scene, and investigation steps applied in forensic analysis. It **integrates** bioscience for proposing/ or giving recommendations as a solution (**Case-based method**) of the problems found in crime scenes during the forensic investigation that occurs in recent/ unsolved cases and reporting as a paper/ manuscript.
Examination forms	a. Essay test (35%) b. Case-based progress report (25%) c. Article progress (40%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Gunn A. 2009. Essential Forensic Biology, 2nd edition. Oxford: Wiley-Blackwell. 2. Coyle HM. 2005. Forensic Botany, Principles and Applications to Criminal Casework. Archibold, O.W. 1995. Ecology of World Vegetation. Boca Raton: CRC Press. 3. Li R. 2011. Forensic Biology. Boca Raton: CRC Press.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Industrial Biotechnology

Module designation	: **Industrial Biotechnology**
Semester(s) in which the module is taught	: odd/V
Person responsible for the module	1. Dr. Rike Oktarianti 2. Syubbanul Wathon, M.Si.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture-Discussion, Case-based Methods, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture-discussion: 45.3 hr b. Case-based methods: 34 hr c. Presentation: 11.3 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Molecular Biology
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of molecular biology, cells and organisms (LO3) ● **analyzing** biological principles that are relevant to the problem of industrial biotechnology in the tropics (CLO3b) **Competence:** ● able **to employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7) ● **integrating** bioscience in problems solving related to industrial biotechnology in the tropics (CLO7a)

Content	This course discusses the basic concept and scope of industrial biotechnology, genetics in the study of industrial biotechnology, industrial biotechnology ethics, biomass as a substrate for industrial biotechnology, bioprocess engineering technology, industrial biotechnology, and environmental studies. There are also **integrating** bioscience in problem-solving related to the application of industrial biotechnology in aquatic and marine, application of industrial biotechnology in agriculture, application of industrial biotechnology in animal husbandry, application of industrial biotechnology in food and beverage, application of industrial biotechnology in food additive and supplement, application of industrial biotechnology in pharmacy and medicine, application of industrial biotechnology in renewable energy resources, and regulation of genetic modified organism and safety.
Examination forms	a. Essay test (30%) b. Quiz (20%) c. Cased methods (30%) d. Presentation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Galzer A.N. & Nikaido H. 2007. Microbial Biotechnology. Cambridge University Press, New York. 2. Mosier N.S. & Ladisch M.R. 2009. Modern Biotechnology. Wiley-Interscience, New York. 3. Persley J. & MacIntyre. 2002. Agriculture Biotechnology. CAB publishing, Washington. 4. Smith J.E. 2004. Biotechnology, fourth edition. Cambridge University Press, New York.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Plant Biotechnology

Module designation	: **PLANT BIOTECHNOLOGY**
Semester(s) in which the module is taught	: even/VI/VIII
Person responsible for the module	1. Prof. Bambang Sugiharto, D.Agr.Sc 2. Mukhamad Su'udi, PhD
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project/Laboratory/Field Work, Presentation.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 136hr a. lecture- Discussion: 56.67 hr b. Laboratory/Field Works: 45.33 hr c. Presentation: 34 hr
Credit points	: 3 credits or 4.53 ECTS
Required and recommended prerequisites for joining the module	: Biochemistry, Plant Physiology
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of molecular biology, cells and organisms (LO3) ● **Analyzing** biological principles that are relevant to the issue of plant biotechnology in the tropics (CLO3b) **Skills:** ● able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) ● **Practicing** laboratory works of plant biotechnology independently and in groups (CLO6a) **Competence:** ● able **to implement** the logic of critical thinking on biosafety and environmental issues related to plant biotechnology and its product with a scientific and bioethical approach (LO5) ● **Implementing** the logic of critical thinking on biosafety related to plant biotechnology and its product with a bioethical approach for better environmental awareness (CLO5a)

Content	This course **describes and analyzes** Plant Biotechnology: definition, terminology, and relatedness between plant tissue culture techniques for plant biotechnology application, the steps for selecting target genes, vector construction and cloning, and the steps for producing transgenic plants and its analysis. It **implements** the logic of critical thinking (**Case-based Method**) on the biosafety issue and regulation related to genetically modified products, and the prospect of plant biotechnology application. To facilitate students' special skills, this course provides **laboratory works** such as explant preparation, genetic transformation, detection and confirmation of putative transformants, and transgenic plantlets maintenance.
Examination forms	a. Essay test (40%) b. Laboratory Work (25%) c. Report (20%) d. Presentation (15%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Prasad, B. D., Sahni, S., Kumar, P., & Siddiqui, M. W. (Eds.). 2017. Plant Biotechnology, Volume 1: Principles, Techniques, and Applications. CRC Press. 2. Stewart Jr, C. N. (Ed.). 2016. Plant biotechnology and genetics: principles, techniques, and applications. John Wiley & Sons.

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Health Biotechnology

Module designation	: **Health Biotechnology**
Semester(s) in which the module is taught	: even/VI
Person responsible for the module	1. Dr. rer. nat. Kartika Senjarini 2. Dr. Rike Oktarianti 3. Syubbanul Wathon, M.Si.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Project, Presentation,
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. lecture-discussion: 76.33 hr b. presentation: 11hr c. Laboratory practice: 45hr
Credit points	: 3 credits or 4.5 ECTS
Required and recommended prerequisites for joining the module	: Molecular Biology
Module objectives/intended learning outcomes	**Knowledge:** ● able to analyze the principles of molecular biology, cells and organisms (LO3) ● **Analyzing** biological principles that are relevant to health biotechnology (CLO3b) **Skills:** ● able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) ● **Practicing** laboratory works related to health biotechnology (CLO6a)
Content	This course **describes and analyzes** the terminology, scope, and development of health biotechnology, Molecular biology base in health biotechnology, molecular epidemiology & diagnostics, gene therapy, stem cell technology, recombinant DNA technology, biosimilar, biomarker, vaccine development, immunotherapy, ethics and regulation of animal models in health biotechnology research. There are also **practicing** laboratories of DNA plasmid isolation, DNA restriction, DNA ligase, DNA electrophoresis, cell competence & DNA transformation, recombinant protein

	extraction, SDS-PAGE, Western blotting, and DNA fingerprint
Examination forms	a. Essay test (35%) b. Presentation (20%) c. Quiz and assignment (15%) d. Laboratory practice (30%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Glick BR & Pasternak JJ. 2002. Molecular Biotechnology: Principles and aplication of recombinant DNA. ASM Press 2. Albert S. 2005. Medical Biotechnology.United Nations University Press 3. Lewins B. 2013. Genes X. Publisher: Jones & Bartlett. 9th edition 4. Godbey WT. 2014. An introduction to biotechnology. Academic Press. 5. Firdos AK. 2014. Biotechnology in Medical Sciences. CRC Press 6. Bernard RG, Terry LD, Chyeril LP. 2014. Medical Biotechnology. ASM Press. 7. Alberts B, Johnson A, Walter P, Lewis J. 2015. Molecular Biology of the Cell. 6th Edition. Publisher Taylor & Francis

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Molecular Genetics

Module designation	: **Molecular Genetic**
Semester(s) in which the module is taught	: even/VI
Person responsible for the module	: 1. Dr. rer. nat. Kartika Senjarini 2. Syubbanul Wathon, M.Si.
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: lecture- Discussion, Case-based Methods, Presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 90.67 hr a. Lecture-discussion: 45,3 hr b. Case-based method: 34 hr c. Presentation: 11.3 hr
Credit points	: 2 credits or 3.02 ECTS
Required and recommended prerequisites for joining the module	: Molecular Biology
Module objectives/intended learning outcomes	**Knowledge:** ● able to **analyze** the principles of molecular biology, cells, organisms and biological resources management (LO 3) ● **Describing** the principles of molecular genetics concepts (3a) **Competence:** ● able **to employ** bioscience in solving problems related to biological resources in the tropics and to communicate the results (LO7) ● **integrating bioscience in problems solving related to molecular genetics in the tropics (CLO7a)**
Content	The course discusses the basic concepts and scope of molecular genetics, genetic material and genomic structure, chromosomal structure, DNA replication, transcription and post transcription, translation and post translation, materials cytoplasmic genetics, gene mutation, gene recombination, regulation of protein synthesis, regulation of gene expression in prokaryotes, regulation of gene expression in eukaryotes.
Examination forms	a. Essay test (30%) b. Quiz (20%) c. Cased methods (30%) d. Presentation (20%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module

Reading list	1. Lewin B. 1999. Gene VI. Oxford University Press, New York 2. Klug, WS & Cummings, MR. 1998. Concepts of Genetic. Macmillan Publishing Company, New York. 3. Howe, C. 2007. Gene Cloning and Manipulation. Cambridge University Press, New York. 4. Jusuf, M. 1999. Genetika 1. Struktur dan Ekspresi Gen. Sagung Seto, Jakarta 5. Yowono, T. 2005. Biologi Molekular. Erlangga, Jakarta.

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Population Genetics

Module designation	: **Population Genetics**
Semester(s) in which the module is taught	: Even/VI
Person responsible for the module	1. Dr. Rike Oktarianti, M.Si 2. Dr. Hidayat Teguh Wiyono, M.Pd 3. Syubbanul Wathon, S.Si, M.Si
Language	: Indonesian and English
Relation to curriculum	: ~~Compulsory~~ / elective / ~~specialisation~~
Teaching methods	: Lecture- Discussion, paper review, Case-based methods
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 91 hr a. Lecture-Discussion: 57 hr b. Presentation paper review 17 hr c. Case-based method: 17 hr
Credit points	: 2 credits or 3,02 ECTS
Required and recommended prerequisites for joining the module	: Genetics
Module objectives/intended learning outcomes	**Knowledge:** ● able to **analyze** the principles of molecular biology, cells, organisms and biological resources management (LO 3) ● Describing the principles of population genetics concepts (3a) **Skills:** ● able to implement biological concepts in laboratory work and/or field studies independently and/or in groups (LO6) ● **Using** software applications and/or basic instruments to analysis in principles of popuation genetics (CLO6b)
Content	This course discusses the basic concepts and scope of population genetics, the techniques used in population genetic analysis, and the application of population genetics in various fields. The study includes basic statistics in population genetics, Hardy Weinberg's law of genetic equilibrium and its application, genetic polymorphisms, factors driving the occurrence of genetic equilibrium

	deviations in populations, mating systems of living things in nature, benefits and impacts, quantitative inheritance in a population and estimation of heritability values.
Examination forms	a. Essay test (30%) b. Quiz (20%) c. Presentation/paper review (15%) d. Case methods (35%)
Study and examination requirements	: passing grade 70% Requirements for successfully passing the module
Reading list	1. Gillespie J.H. 2004. Population Genetics; A Concise Guide, 2nd edition. Johns Hopkins University Press. 2. Hartl D.L., Clark A.G. (2007) Principles of Population Genetics, 4th edition. Sinauer Associates. 3. Halliburton R. 2004. Introduction to Population Genetics. Pearson Prentice Hall. 4. Weir. B.S, 1990. Genetic Data Analysis. Methods for Discrete Population Genetic Data. Sinauer Associates, Inc, Publisher. 5. John, J. Chen. 2010. Hardy-Weinberg Principle and Its Application in Modern Population Genetics.Frontiers in Biology, vol 5, issue 4, pp 348-353

Credits to ECTS conversion formula 1 SKS TM = 50min T+60min TS+60min M (170 minutes) x 16 weeks = 45.33 Hours 1 SKS Practice = 170 min. 1 ECTS = 29.99 hours 1 Credit = 1.51 ECTS

Module Revition history

Version 1: Published in 2022

Version 2: Published in April 2023

Revision: Course description Physics, Chemistry, Microbiology, and Microbial Physiology

Version 3: Published in November 2023

Revision: Course description in Microbiology, Microbial Physiology, Plant Ecophysiology, Bryology