Faculty of Mathematics and Natural Sciences
Universitas Tanjungpura

ACADEMIC HANDBOOK
for The Undergraduate Program
Academic Year of 2021–2022

PREFACE

Assalaamu'alaikum Wr. Wb. Salam sejahtera bagi kita semua.

All praise and gratitude are directed to Allah SWT, the Almighty God, for the publication of the Academic Handbook of the Faculty of Mathematics and Natural Sciences, Universitas Tanjungpura, for the Academic Year 2021/2022. This handbook serves as a guide containing various regulations related to the academic administration at FMIPA, intended for the entire FMIPA academic community, including educators (lecturers), students, and administrative staff.

This academic handbook is a revision of the 2020/2021 edition, undertaken as an effort to ensure improved academic services so that they may be implemented more effectively while preserving its high quality. The contents of this handbook have been adjusted in accordance with the latest government policies, including the Indonesian National Qualification Framework (KKNI), the National Standards for Higher Education (SNPT), and the "Merdeka Belajar Kampus Merdeka (MBKM)" program.

We extend sincere appreciation to the team members who have worked diligently to compile this academic handbook. May this book be of great benefit to us all. We welcome constructive criticism and suggestions from all parties in our ongoing efforts to enhance this academic guide in the future.

Thank you for your full attention and cooperation.

Wassalaamu'alaikum Wr. Wb.

Pontianak, August 2021
Dean,

Dr. Gusrizal, M.Si
NIP. 197108022000031001

Faculty Management Leader

Dean

Dr. Gusrizal, M.Si.

Vise Dean for Academic Affairs

Yudha Arman, D.Sc.

Vice Dean for General Affairs and Finance

Dr. Evi Noviani, M.Si.

Vice Dean for Student Affairs and Alumni

Drs. Cucu Suhery, M.A.

Head of Departments/Head Of Study Programs
at Faculty of Mathematics and Natural Sciences Universitas Tanjungpura

Head of Mathematics Department

Dr. Yundari, M.Sc.

Head of Physics Department

Nurhasanah, S.Si., M.Si.

Head of Chemstry Department

Dr. Andi Hairil Alimuddin, M.Si.

Head of Biology Department/ Study Programme

Dr. Kustiati, S.Si., M.Si.

Head of Computer Systems Engineering Department/ Study Programme

Ikhwan Ruslianto, S.Kom, M.Cs.

Head of Information System Department/ Study Programme

Ilhamsyah, S.Si., M.Cs.

Head of Marine Science Department/ Study Programme

Arie Antasari Kushadiwijayanto, M.Si.

Head of Mathematics Study Programme

Mariatul Kiftiah, M.Sc.

Head of Statistics Study Programme

Naomi Nessyana Debataraja, M.Si.

Head of Physics Study Programme	Head of Geophysics Study Programme	Head of Chemistry Study Programme
		
Dr. Azrul Azwar, M.Si.	**Dr. Yoga Satria Putra, M.Si.**	**Imelda H. Silalahi, Ph.D.**

Administrative Officer of Faculty Of Mathematics and Natural Sciences, Universitas Tanjungpura

Administrative Coordinator

Hamka, S.Sos, M.M.

Sub Coordinator for
Academic and Student Affairs

Bambang Sugeng, S.Sos.

Sub Coordinator for
General and Finance

Fara Jusmania, S.E., M.M

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Introduction

I.1. Brief History of FMIPA UNTAN

The idea of establishing the Faculty of Mathematics and Natural Sciences (FMIPA) at Universitas Tanjungpura (UNTAN) was initiated by UNTAN's Rector of 1982–1991, **Prof. Dr. H. Hadari Nawawi**. This effort led to the formation of the UNTAN Mathematics and Natural Sciences ad hoc committee Management (*BPMIPA UNTAN*) in 1992, based on Rector's Decree No. 4669/PT29.H/E/1992 dated November 26, 1992.

Later, based on Rector's Decree No. 193a/J22/KP/1999 dated April 1, 1999, a new management team for BPMIPA was appointed, structured as follows:

- **Patron:** Rector
- **Person in Charge:** Vice Rector I & II
- **Advisors:**
    - Dean of the Faculty of Engineering
    - Dean of the Faculty of Agriculture
    - Dean of the Faculty of Teacher Training and Education
    - Drs. M. Bakau Darimin
    - Dr. Leo Sutrisno
- **Chair:** Dr. Thamrin Usman, DEA
- **Vice Chair I:** Dr. Ir. Mardan Adijaya, M.Sc.
- **Vice Chair II:** Drs. **Cucu** Suhery, M.A.
- **Vice Chair III:** Drs. Sugiatno, M.Pd.

Various coordinators were also assigned to oversee specific fields such as Biology, Mathematics, Chemistry, and Physics.

On **November 9, 2001**, the Director General of Higher Education, Ministry of National Education, issued a letter (No. 3494/D/T/2001) granting permission for FMIPA UNTAN to offer undergraduate programs in **Mathematics, Physics, Chemistry, and Biology** (Bachelor's Degree/S1).
Student admissions began in the **2002/2003 academic year**, welcoming **160 students**. Eventually, FMIPA UNTAN was officially established on **January 9, 2006**, through Rector's Decree No. 119/J22/OT/2006.

On **July 7, 2008**, FMIPA UNTAN expanded by adding a new department: **Computer Systems Engineering** (S1 Program), authorized under Ministerial Decree No. 2076/D/T/2008. By 2011, FMIPA UNTAN received approval to establish its first **graduate program (Master's in Chemistry/S2),** under the Department of Chemistry.

Further expansions followed in **2013**, with the introduction of programs in **Geophysics, Marine Science, and Statistics**, authorized by Ministerial Decree No. 630/E.E2/DT/2013. The **Geophysics** program was placed under the Department of Physics, **Statistics** under the Department of Mathematics, and **Marine Science** became an independent department.

By **2014**, FMIPA UNTAN added the **Information Systems** program, established through Ministerial Decree No. 442/E.E2/DT/2014. With this expansion, FMIPA UNTAN now houses **nine undergraduate programs (S1) and one graduate program (S2)** across **seven departments**.

I.2. Vision and Mission of FMIPA UNTAN

I.2.1. Vision

FMIPA UNTAN's vision is:

"To become an outstanding institution in the transformation, development, and dissemination of science and technology based on tropical environmental resources, with globally competitive outcomes."

This vision includes several key aspects:

- **Outstanding Institution** – A faculty that upholds a culture of quality in all its activities, ensuring that all programs strive toward achieving *Excellent Accreditation*.
- **Transformation** – The adaptation of science and technology to fit Indonesia's conditions, while maintaining local wisdom and cultural values.
- **Development** – A commitment to actively contributing to scientific knowledge (*the body of knowledge*).
- **Dissemination** – The process of spreading the results of *Tri Dharma* activities (education, research, and community service) to both academic and general audiences.

Educational outputs include graduates (*alumni*), textbooks, instructional media, policy recommendations, and other related resources. **Research outputs** include scientific publications, patents, intellectual property rights (*HAKI*), policy models, and popular science writing to educate the community.

Faculty of Mathematics and Natural Sciences (*MIPA*) aim to uncover the order of nature through theoretical formulation, model development, experimental verification, and practical applications for human welfare. As such, MIPA is globally relevant, but FMIPA UNTAN must retain a **distinct identity** by focusing on the **development and application of MIPA in tropical environments**. This means leveraging theories and principles to analyze phenomena, solve problems, and maximize natural resources in tropical regions.

The phrase **"based on tropical environmental resources"** also highlights FMIPA UNTAN's commitment to environmental awareness. **"Globally competitive outcomes"** refers to the high-quality graduates and research outputs that have a meaningful impact and are recognized in scientific communities, professional sectors, and society.

I.2.2 Mission

FMIPA UNTAN's mission aligns with UNTAN's broader vision and revolves around the three pillars of higher education (in Indonesian Language: *Tri Dharma Perguruan Tinggi*):

1. Conducting integrated higher education to produce quality graduates who are adaptive to scientific and technological developments while preserving national identity.

2. Conducting focused, continuous, and environmentally conscious research, oriented toward developing local potential in West Kalimantan.
3. Carrying out community service programs that enhance environmental quality and improve societal welfare.

I.3 Educational Objectives of FMIPA UNTAN

To align with its **vision and mission**, FMIPA UNTAN has set the following educational objectives:

1. **Providing a strong foundation** in basic and applied sciences through innovative and creative higher education and research.
2. **Developing and applying scientific knowledge** independently and collaboratively with related disciplines to enhance competitive value and human resource quality.
3. **Offering solutions to societal problems** related to the fields of mathematics and natural sciences (*MIPA*).

I.4 Organizational Structure

FMIPA UNTAN's organizational structure was first established through Rector's Decree No. 119/J22/OT/2006 and later updated via Rector's Decree No. 461/UN22/OT/2014. It consists of the following components:

- **Leadership:** Dean and Vice Deans
- **Faculty Senate**
- **Quality Assurance Unit**
- **Academic Executing Units:** Departments, Study Programs, Laboratories, and Faculty Groups
- **Administrative Units:** Faculty Administration Office

In **2021**, FMIPA UNTAN appointed new leadership for the **2021–2025 period**, based on Rector's Decree No. 2363/UN22/KP/2021:

- **Dean:** Dr. Gusrizal, M.Si
- **Vice Dean for Academic Affairs:** Yudha Arman, D.Sc
- **Vice Dean for Finance & General Affairs:** Dr. Evi Noviani, M.Si
- **Vice Dean for Student & Alumni Affairs:** Drs. Cucu Suhery, M.A

FMIPA UNTAN also supported by administrative staff, led by the **Head of Administration** and supported by **Sub-Coordinators for Academic Affairs and Finance**:

- **Head of Administration:** Hamka, S.Sos., M.M
- **Sub-Coordinator for Academic Affairs:** Bambang Sugeng, S.Sos
- **Sub-Coordinator for General Affairs & Finance:** Fara Jusmania, S.E., M.M

FMIPA UNTAN's departments and study programs are led by **Heads of Departments, Study Program Heads, and Laboratory Heads**, as outlined in various Rector's decrees.

I.5 Human Resources

As of the **2022/2023 academic year**, FMIPA UNTAN employs **112 lecturers**, all holding at least a **Master's degree (S2)**. These include:

- **101 Permanent Lecturers**
- **11 Contract Lecturers with NIDK status**

The faculty's **academic, administrative, laboratory, and library services** are supported by **45 staff members**, comprising:

- **14 civil servants (PNS)**
- **31 contract employees**

The educational qualifications of faculty members across different departments are summarized below:

Table 1.1: Educational Qualifications of FMIPA UNTAN Lecturers by Department

Qualification	Mathematics	Physics	Chemistry	Biology	Computer Systems	Information Systems	Marine Science
Master's (S2)	13	16	7	12	12	8	12
Doctorate (S3)	4	5	16	7	0	0	0
Total	**17**	**21**	**23**	**19**	**12**	**8**	**12**

I.6 Educational Facilities

To support academic and research activities, FMIPA UNTAN provides:

- Lecture halls
- Laboratories
- Reading rooms
- Faculty offices
- Lecturer rooms
- Administrative offices

I.6.1 Buildings

FMIPA UNTAN conducts **lectures** in **36 classrooms**, located both in the **FMIPA UNTAN building** and the **Shared Lecture Building** (*Gedung Kuliah Bersama UNTAN*). These classrooms are equipped with:

- **Whiteboards** and **LCD projectors**
- **Fans** (all rooms)
- **Air conditioning (AC)** (select rooms)

The faculty building also houses:

- **Dean and Vice Dean Offices**
- **Lecturer offices for various departments**
- **Laboratories for all departments**
- **Reading room**
- **Faculty administration office**
- **Academic administration office**
- **Faculty senate meeting room**
- **General and equipment department**
- **Student meeting rooms**, which also serve as faculty meeting rooms

I.6.2 Laboratories

As a faculty specializing in basic sciences, FMIPA UNTAN places high importance on **laboratory facilities** for both **student skill development** and **faculty research**. Below is a breakdown of FMIPA UNTAN's laboratories by department:

Table 1.2: Laboratories at FMIPA UNTAN

Department	Laboratory
Mathematics	Mathematics Lab, Statistics Lab
Physics	Basic Physics Lab, Advanced Physics Lab, Geophysics & GIS Lab
Chemistry	Basic Chemistry Lab A & B, Organic Chemistry Lab, Inorganic-Physical Chemistry Lab, Biotechnology Lab, Pigment Lab
Biology	Basic Biology Lab, Microbiology Lab, Zoology Lab, Tissue Culture Lab, Micro-technique Lab
Computer Systems	Digital Controller Lab, Control Engineering Lab
Information Systems	Information Systems Lab
Marine Science	Marine Science Lab

I.6.3 Reading Room

The FMIPA UNTAN **Reading Room** is located on the **first floor of Building H**, managed by an administrative staff member. It provides:

- **Internet access**
- **Textbooks on science subjects**
- **Collections of student theses and final projects**

I.6.4 Information System

FMIPA UNTAN prioritizes **technology integration** to support academic and administrative activities. The faculty has enhanced its **network infrastructure** with:

- **Wi-Fi hotspots and dedicated internet access**
- **A bandwidth allocation of 10 Mbps per student**, distributed across all departments
- **Ongoing infrastructure improvements** to ensure optimal academic services

The **FMIPA UNTAN IT Team** manages the faculty's digital systems under the **Vice Dean for Finance & General Affairs**.

I.6.5 Other Supporting Facilities

FMIPA UNTAN also offers various **extracurricular and support facilities**, including:

- **Musholla (prayer room)**
- **Smart study area**
- **Student organization offices** (for HMJ and BEM FMIPA UNTAN)
- **Faculty hall**
- **Cafeteria**
- **FMIPA UNTAN Cooperative**
- **Spacious parking area**
- **Sports facilities**

Additionally, FMIPA UNTAN students can access **UNTAN-managed facilities**, such as:

- **Al-Muhtadin Mosque**
- **UNTAN Sports Stadium**
- **UNTAN Hospital and Clinic**
- **MTQ Plaza**
- **UNTAN Central Library**
- **UNTAN Auditorium**
- **UNTAN Language Center** (including BCLC, American Corner, French Center, and Chinese Language Hub)
- **Student Activity Center**
- **UNTAN Tennis Courts**
- **UNTAN Gardens and Parks**
- **Counseling and Career Development Services** (provided by LP3M UNTAN)

Chapter II: Academic System

II.1 Academic Programs at FMIPA UNTAN

a. FMIPA UNTAN offers **undergraduate (S1) and postgraduate (S2) programs**, adopting a **Higher Education Curriculum (KPT)** that aligns with **Indonesia's National Qualification Framework (KKNI)**. The curriculum emphasizes **tropical environmental potential** and **West Kalimantan's strategic geographic location**.

b. The faculty consists of the following **departments and study programs**:

   1. **Department of Mathematics, consists of** Bachelor's in Mathematics and Bachelor's in Statistics
   2. **Department of Physics, consists of** Bachelor's in Physics, and Bachelor's in Geophysics
   3. **Department of Chemistry, consists of** Bachelor's in Chemistry, and Master's in Chemistry (S2)
   4. **Department of Biology, consist of** Bachelor's in Biology
   5. **Department of Computer Systems Engineering, consist of** Bachelor's in Computer Systems
   6. **Department of Marine Science, consist of** Bachelor's in Marine Science
   7. **Department of Information Systems, consists of** Bachelor's in Information Systems

c. Academic programs are divided into **two semesters per year**, in which **Odd Semester** (August – January), and **Even Semester (**February – July)

d. The **academic calendar** is officially determined by **UNTAN Rector's Decree** each year.

e. Courses are conducted in **Indonesian** and/or **English** as the primary languages of instruction.

II.2 Learning Methods

a. The learning process is carried out through compulsory curricular activities using effective teaching methods that align with the characteristics of each course to achieve the intended Learning Outcomes (ILOs).

b. The teaching methods for each course may involve one or a combination of the following: group discussions, simulations, case studies, collaborative learning, project-based learning, problem-based learning, or other effective approaches suited to achieving the specified ILOs.

c. Forms of learning activities may include: lectures; tutorials and response sessions; seminars, practicums, studio work, workshop practice, or fieldwork.

II.3 Credit System (SKS) and Semesters

a. A student's study load is measured in semester credit units (SKS).

b. A semester is defined as a period of 16 effective weeks of learning, including the Mid-Semester Examination (UTS) and Final Examination (UAS).

c. One (1) SKS for lectures, tutorials, or response sessions consists of 50 minutes of face-to-face instruction, 60 minutes of structured assignments, and 60 minutes of independent study per week per semester.

d. One (1) SKS for seminar-based learning consists of 100 minutes of face-to-face sessions and 70 minutes of independent study per week per semester.
e. One (1) SKS for practicums, fieldwork, studio practice, workshop practice, research, or community service consists of 170 minutes per week per semester.

II.4 Student Workload and Duration of Study

a. The maximum period of study for undergraduate students is 7 (seven) academic years with a minimum study load of 144 credit units (SKS).
b. The study load for students in their first academic year (semesters 1 and 2) is determined by the faculty.
c. Students with outstanding academic performance may take up to 24 credit units in the following semester after completing the first two semesters.
d. Students with outstanding academic performance are those who have a semester GPA greater than 3.00 and comply with academic ethics.

II.5 Curriculum

a. The curriculum is the comprehensive plan and arrangement concerning graduate learning outcomes (CPL), subject matter, learning processes, and assessments used as a guideline for implementing the study program.
b. The curriculum implemented at FMIPA UNTAN is a higher education curriculum (KPT) that refers to the Indonesian National Qualifications Framework (Government Regulation No. 8 of 2012) and the National Standards for Higher Education (SN Dikti, in accordance with Ministerial Regulation No. 3 of 2020), and adopts the Merdeka Belajar Kampus Merdeka (MBKM) program.
c. The curriculum may be reviewed at least every five years unless otherwise mandated by the disciplinary commission.
d. The curriculum becomes valid once it is ratified through the approval of the Faculty Senate.
e. The curriculum consists of learning outcomes, compulsory courses, and elective courses.
f. Compulsory courses are courses that students must take and cannot be substituted with other courses.
g. Elective courses are courses that may be taken by students to support their field of specialization.

II.6 Course Code System

a. To facilitate the implementation of academic administration, each course is assigned a code.
b. The course codes for each study program within FMIPA UNTAN are as follows:

Table II.6.1: Laboratories at FMIPA UNTAN

Table II.6.1: Course Code System at FMIPA UNTAN

Code	Course Category
MKWU	General Compulsory Courses
UMG	General Courses

Code	Course Category
MPU	Core Science Courses
MPM	Mathematics
MPF	Physics
MPK	Chemistry
MPB	Biology
SK	Computer Systems Engineering
MPS	Statistics
MPL	Marine Science
MPG	Geophysics
IKS	Information Systems

c. Following the letters that represent the course code prefix, each course is assigned a numerical code consisting of 3 to 4 digits.
d. The numerical course codes are further regulated by the respective department or study program.

II.7 Prerequisite Courses

Prerequisite courses include two meanings:
a. Courses that must be completed prior to enrolling in a specific course.
b. Courses for which a minimum credit or grade requirement has been set in order to register for a particular course.

II.8 Laboratoty Courses

Laboratory courses are structured academic activities that do not take the form of conventional lectures. They are conducted in laboratories, workshops, studios, or in the field. The credit value (SKS) for practicum courses is determined in accordance with section II.3 (e).

II.9 Academic Performance Assessment

II.9.1 Assessment Objectives

Students' academic performance in a course is assessed periodically through examinations, structured assignments, independent tasks, or equivalent activities by the lecturer/instructor. The purposes of administering assessments are to:
1. Evaluate students' understanding and mastery of the material presented in lectures.
2. Classify students into groups based on their academic performance.
3. Measure results against targeted learning outcomes.
4. Provide feedback to improve and enhance the quality of the teaching and learning process.

II.9.2 Examination Implementation

a. Examinations consist of the Mid-Semester Examination (UTS) and Final Examination (UAS).
b. UTS and UAS are conducted according to the academic calendar of the current academic year.

c. Make-up exams may be administered for acceptable reasons upon the recommendation of the department or faculty.
d. Examination results are announced after the final examination period ends.

II.9.3 Grading System

a. Exam scores for a course are expressed as raw scores ranging from 0 (zero) to 100 (one hundred).
b. A course grade is determined by:
   1. A combination of attendance/class participation, structured academic tasks, midterm exam, and final exam weighted accordingly, or
   2. A combination of attendance/class participation, structured academic tasks, and modular exams weighted accordingly.
c. The evaluation components are as follows:

Component	Weight (%)
Attendance / Participation	10% – 20%
Structured Assignments	10% – 30%
Midterm Exam	20% – 30%
Final Exam	30% – 40%
Total	100%

For certain study programs, the naming and percentage of evaluation components are further regulated in each department's respective section.

d. If all activities are completed, students are entitled to receive the maximum raw score.
e. According to the Dean's Decree of FMIPA UNTAN No. 819/UN22.8/DT/2016 on adjustments to student performance assessment, the grading standards are as follows:

Numerical Range	Letter Grade	Grade Point	Proficiency Category
80 ≤ score ≤ 100	A	4.0	Excellent
75 ≤ score < 80	B+	3.5	Between Excellent and Good
70 ≤ score < 75	B	3.0	Good
65 ≤ score < 70	C+	2.5	Between Good and Fair
60 ≤ score < 65	C	2.0	Fair
55 ≤ score < 60	D+	1.5	Between Fair and Poor
50 ≤ score < 55	D	1.0	Poor
0 ≤ score < 50	E	0.0	Fail

f. Grades of A, B+, B, C+, C, D+, and D are considered passing; a grade of E is considered failing.
g. Final grades must be submitted by the course instructor to the Sub-Coordinator of Academic and Student Affairs no later than two weeks after the course's final examination.
h. Students who have not completed required academic tasks will receive a provisional grade of TL.
i. TL grades must be completed or updated within two weeks after grades are announced.

j. Grade changes must be submitted by the lecturer to the Academic and Student Affairs Subdivision and forwarded to the Academic and Student Affairs Bureau (BAK).
k. If TL is not resolved within the specified time, it will automatically convert to an E (fail).
l. Grades submitted to the academic administration can only be changed by the relevant instructor with approval from the Vice Dean for Academic Affairs (WD I) of FMIPA UNTAN.

II.9.4 Exam Eligibility Conditions

A student may take an exam if they meet the following conditions:

a. **Registered for the current semester**, both administratively and academically.
b. **Not under academic sanctions** and within their study period limit.
c. **Attendance requirement:** A student must have attended **at least 75%** of the total class sessions to take the **Final Semester Exam (UAS)**.
d. **Practical courses:** A student must complete all required **lab modules** before taking related exams.
e. **Non-compliance with attendance rules (Point 3)** results in a **zero (0) score** for the final exam.

II.9.5 Exam Proctor Regulations

For **in-person exams**:

a. Proctors **must arrive 5 minutes before the exam** begins.
b. Exam papers **must be opened and distributed** in front of students in their sealed condition.
c. Proctors **give a signal when the exam begins**.
d. Proctors **should not read, chat, or disrupt the exam**.
e. If issues arise, the proctor must **consult the exam coordinator** for resolution.
f. Once the exam concludes, the proctor **collects all answer sheets** and reports absent students.
g. The invigilator must sign the Examination Report and the Invigilator Attendance Sheet. All exam-related documents must be submitted to the examination committee, including:
    1. All exam papers for the recently administered course.
    2. The completed Examination Report and the participant attendance list.
h. The examination coordinator shall submit the aforementioned documents to the chairperson or secretary of the examination committee along with a Handover Report.

These rules also apply to **online examinations**, adapted to the format in which the online exam is conducted.

II.9.6 Examination Rules for Students

For face-to-face (offline) examinations:

a. Participants must fulfill the eligibility requirements as stated in point II.8.3.
b. Participants must arrive in the examination room at least ten minutes before the exam begins.
c. Participants must sit in the seat and room assigned by the committee.

d. Participants are strictly prohibited from engaging in any form of cheating (copying, using books, notes, papers, or similar materials that may assist in answering the exam), unless permitted by the invigilator in accordance with the nature of the exam.
e. Participants must bring all writing tools themselves; borrowing from others during the exam is not allowed.
f. Students must bring their student ID card and sign the attendance sheet or examination logbook.
g. During the exam, participants are prohibited from:
    1. Disturbing the peace or order of the examination through behavior, noise, movements, etc.
    2. Cooperating, requesting, or offering assistance to others in any form intended to answer the exam.
    3. Leaving their seat or the room without the invigilator's permission.
    4. Activating communication devices.
h. Participants must maintain order and cleanliness of the room and surroundings. Eating, drinking, and smoking in the exam room are not allowed.
i. Participants must comply with all instructions from the exam committee regarding the administration of the exam.
j. To summon the invigilator, participants should simply raise a hand and must not speak or create any disturbance.
k. Participants must behave and dress appropriately and respectfully, in line with the academic code of conduct on campus.
l. Students wishing to leave the exam room before time must obtain permission from the invigilator. The answer sheet must be left face down on the desk or chair.
m. When the invigilator signals the end of the exam, participants must immediately stop writing and leave the room. The answer sheet must be left face down on the desk or chair.

These rules also apply to online examinations, with adjustments made according to the format of the online exam.

II.10 Assessment of Study Outcomes

a. Student academic achievement is assessed using the Academic Performance Index (IP).
b. The index reflecting a student's academic success within a single semester is called the Semester Performance Index (IPS).
c. The index representing the average of all academic performance indices from previous semesters is referred to as the Cumulative Performance Index (IPK).
d. The IPS and IPK are calculated using the following formula:

$\mathrm{IPS} = \frac{\sum K_S N}{\sum K_S}$ where K_s = The number of credit units (SKS) taken in a given semester

N = The grade weight of each course.

$\mathrm{IPK} = \frac{\sum K_k N}{\sum K_k}$ where Kk = Cumulative credit units (SKS) of courses taken

e. Student academic performance is recorded in the Study Results Sheet (LIHS), which is issued by the academic system at the end of each semester.
f. If there is an error in the completion of the LIHS, corrections may be made by the faculty through the academic affairs division, based on a request from the course instructor and in accordance with applicable regulations.

II.11 Study Load per Semester

A student's study load for the following semester is determined based on their Semester Performance Index (IPS) from the previous semester, following the guidelines below:

Previous Semester GPA (IPS)	Maximum Study Load (SKS)
3.00 – 4.00	24 SKS
2.50 – 2.99	21 SKS
2.00 – 2.49	18 SKS
1.50 – 1.99	15 SKS
< 1.50	12 SKS

II.12 Planning the Course of Study

a. Courses to be taken in a semester are listed in the Study Plan Form (LIRS).
b. The LIRS must be completed by students with approval from their Academic Advisor (PA) before the semester starts.

II.13 Changes to Study Plan

a. Changes can be made to add or drop courses, as long as it aligns with the maximum allowable credit load.
b. Course changes must be submitted using the Study Plan Change Form (LIPRS), approved by the PA, and submitted to the Academic and Student Affairs Sub-Coordinator before the deadline.
c. Changes to the study plan can be made within the first two weeks of the semester.
d. If no form is submitted, the approved LIRS remains valid without changes.

II.14 Course Cancellation

a. Students may cancel a course listed in the LIRS.
b. Cancellation must be done no later than the second week of the semester.
c. Cancelled courses may be replaced with others.
d. Courses already recorded in the Study Results Sheet (LIHS) cannot be cancelled.

II.15 Course Repetition

a. Students may improve their GPA by repeating courses either during the regular semester or through an inter-semester program.
b. Repeats should be completed within the academic year and before the thesis exam.
c. Students repeating a course must fully participate in all academic activities for the repeated course.

d. The highest grade obtained for a repeated course is used to calculate the GPA.

II.16 Evaluation of Academic Progress

a. Academic progress is evaluated based on a student's performance within a defined timeframe.
b. The goal is to determine the credit load for the next semester and whether the student may continue their studies at FMIPA UNTAN.
c. There are four evaluation stages: every semester, after four semesters, after eight semesters, and at the end of the academic program.
d. Evaluations are conducted by the Head of Department based on recommendations from the Program Chair and reported to the Dean.
e. Students whose academic performance falls below the minimum standard will receive an academic warning before evaluation.
f. If a student fails to meet the evaluation criteria and is deemed unfit to continue, the Dean may recommend termination of their student status to the Rector, who will issue a formal dropout decision.
g. If all evaluations are passed, graduation is formalized through a final academic assessment (yudisium) conducted by the Head of Department.
h. Semester evaluations are based on grades from all courses taken that semester.
i. Four-Semester Evaluation:
    1. Conducted after the completion of four semesters.
    2. Students may continue their studies if they have:
        i. Accumulated at least 45 SKS, and
        ii. Achieved a GPA ≥ 2.00
    3. If more than 45 credits are earned, the top 45 credits (by grade) are used for evaluation.
j. Eight-Semester Evaluation:
    1. Conducted after eight semesters.
    2. Students may continue if they have:
        i. Accumulated at least 90 SKS (including the first four semesters), and
        ii. Achieved a GPA ≥ 2.00
k. Final Graduation Evaluation. Graduation is granted if the student has:
    1. Accumulated a minimum of 144 SKS
    2. Achieved a GPA ≥ 2.00
    3. No grade of E
    4. No more than 5% of total credits graded D or D+
    5. Passed the thesis examination
    6. Earned at least a C in courses on Religion, Pancasila, Citizenship, and Bahasa Indonesia
    7. Fulfilled other requirements set by the faculty/department/study program

II.17 Internship Program (Kerja Praktek / KP)

II.17.1 Internship Requirements

To be eligible for an internship (KP), students must:

a. Have completed at least 90 credit units (SKS) with a GPA ≥ 2.00
b. Have completed prerequisite courses relevant to the internship field
c. Fill out the internship application form and submit it to the Academic and Student Affairs Office, with a copy sent to the Head of the Study Program

II.17.2 Internship Procedure

a. Internship Placement: The internship site must be relevant to the department's field of expertise and fulfill specific learning outcomes and departmental requirements
b. Internship Schedule: The schedule is determined by each study program
c. Internship Supervisor: Assigned by Dean's Decree based on department/program recommendations
d. Internship Sanctions:
    1. Students who fail to carry out their internship as scheduled by the study program and on-site supervisor will be declared unsuccessful in KP
    2. Students must report their field activities to their academic supervisor; failure to do so will result in verbal or written warnings
e. Internship Report: After completing KP, students must write a report, consult their supervisor, and submit a printed, bound version on A4 paper (specific report guidelines are provided separately)
f. Internship Seminar: Seminar requirements are regulated individually by each study program
g. Internship Assessment: Graded as A, B+, B, C+, C, D+, D, or E. Students receiving a D+, D, or E must retake the internship and course.

II.18 COMMUNITY SERVICE PROGRAM (Kuliah Kerja Mahasiswa / KKM)

II.18.1 KKM Requirements

To be eligible for KKM, students must:

a. Have completed at least 90 SKS with a GPA ≥ 2.00 (Specific requirements for Mathematics majors are regulated within their own curriculum structure)
b. Submit a KKM application form to the academic office, with a copy to their Program Head

II.18.2 KKM Procedure

a. KKM Location: Assigned by the faculty or the Institute for Research and Community Service (LPPKM) UNTAN.
b. KKM Duration: Conducted for one effective month according to the predetermined schedule
c. KKM Supervisor: Appointed by Dean's Decree
d. KKM Sanctions:
    1. Students who fail to complete their KKM as scheduled by the faculty, LPPKM, or field supervisor will be declared unsuccessful

2. Students must report their activities to the field supervisor; failure to do so will result in verbal or written warnings

e. KKM Report: After completing the KKM, students must prepare a report and consult their field supervisor. The report must be printed on A4 HVS paper and properly bound (with further formatting specified separately)
f. KKM Seminar: If required, seminars are conducted collectively with the field supervisor acting as the examiner
g. KKM Assessment: Graded as A, B+, B, C+, C, D+, D, or E. Students receiving a D+, D, or E must repeat the KKM

II.19 Final Project/ Thesis

II.19.1 Thesis/ Final Project Submission Requirements

Every FMIPA UNTAN student completing their studies is required to write a final project in the form of a thesis. To submit a thesis proposal, the student must meet the following requirements:

a. Be registered as an active FMIPA UNTAN student
b. Have completed at least 120 credit units (SKS)
c. Have a GPA of ≥ 2.00
d. Have sufficient time remaining, at least one semester before the end of their study period at FMIPA UNTAN

II.19.2 Thesis/Final Project Submission Process

a. The student consults their Academic Advisor (PA) to discuss the thesis preparation plan
b. The student completes and submits the following forms to their study program:
   1. Thesis proposal application form
   2. Most recent Study Results Sheet (LIHS)
   3. A proposed topic/title for the thesis
c. The department/study program recommends a thesis supervisor; the student then begins consultation with the assigned supervisor
d. The department submits the supervisor's name to the Dean, who issues an official Appointment Decree

II.19.3 Guidelines for Thesis Supervisors and Examiners

a. Supervisors consist of a Main Supervisor (First Advisor) and an Assistant Supervisor (Second Advisor), who provide guidance on content, methods, and scientific writing
b. Supervisors must have expertise relevant to the thesis topic
c. The Main Supervisor must be a permanent FMIPA UNTAN lecturer with a minimum academic rank of Assistant Professor (Asisten Ahli)
d. The Assistant Supervisor may be a lecturer with a minimum rank of Teaching Staff or contract status and may come from outside FMIPA UNTAN if they meet the qualifications

e. Examiners consist of a Chief Examiner (First Examiner) and Examiner Members, responsible for providing feedback and questions to assess the student's preparedness and understanding
f. Supervisors also serve as Examiner Members during the final defense
g. Supervisors and examiners are appointed by Dean's Decree upon recommendation by the department/study program
h. If a supervisor or examiner becomes unavailable for a period of time, the Head of Department/Program may propose a replacement via a new Dean's Decree

II.19.4 Thesis/Final Project Defense

a. The thesis defense may be conducted if the student:
    1. Has completed all required academic credits
    2. Has finalized the thesis and a manuscript for publication, both approved and signed by the First and Second Supervisors
    3. Has fulfilled all administrative requirements
    4. Has achieved a required English proficiency score (e.g., TOEFL), according to their cohort and education level, as stated by Rector's decree
b. The defense lasts a maximum of 2.5 hours and consists of three phases:
    1. Preliminary Briefing
        (i) A meeting between the exam chair and examiners before the defense begins
        (ii) The chair explains rules, procedures, and any additional notes to both examiners and the student
    2. Oral Examination
        (i) The student presents their work in 10–15 minutes
        (ii) Each examiner is given time to ask questions to assess the student's comprehension and mastery of the thesis topic and field
    3. Decision Announcement
        (i) The result of the thesis defense is delivered after the oral exam and final evaluation by the examiners
        (ii) The decision is officially announced by the exam chair

II.19.5 Thesis/ Final Project Submission

Students who have completed their final project defense are required to submit a bound copy of their thesis in accordance with regulations set by the Faculty and the University. The thesis submitted to FMIPA UNTAN must be the revised version, incorporating examiners' suggestions. Submission must include both a soft copy (CD) and hard copy, in quantities as needed. Students are also required to publish part or all of their research results in an ISSN-accredited scientific journal.

II.20 GRADUATION HONORS FOR UNDERGRADUATE PROGRAM

a. Each student who passes the final project examination receives a graduation designation through a bachelor's degree yudisium.

b. The graduation honors are determined based on the final GPA, including all courses and the final exam.
c. Graduation designations are awarded according to the following criteria:
    1. With honors (cum laude): GPA ≥ 3.51
    2. Very satisfactory: GPA 3.01–3.50
    3. Satisfactory: GPA 2.76–3.00
d. The “with honors” designation requires completion of studies within a maximum of 5 years.

II.21 ACADEMIC DEGREE AND AWARD REQUIREMENTS

II.21.1 Academic Degree

a. The academic degree is the scholarly title granted to FMIPA Untan graduates and is placed after their name.
b. The degrees awarded in the undergraduate programs at FMIPA UNTAN are:

Study Program	Academic Degree	Abbreviation
Mathematics	Bachelor of Mathematics	S.Mat.
Statistics	Bachelor of Statistics	S.Stat.
Physics	Bachelor of Science	S.Si.
Geophysics	Bachelor of Science	S.Si.
Chemistry	Bachelor of Science	S.Si.
Biology	Bachelor of Science	S.Si.
Computer Systems Eng.	Bachelor of Computer Science	S.Kom.
Information Systems	Bachelor of Computer Science	S.Kom.
Marine Science	Bachelor of Science	S.Si.

II.21.2 Requirements for Degree Conferment

An academic degree is conferred if:
a. The student has completed all academic requirements, including:
    1. Credit units (SKS) as specified in the curriculum
    2. GPA of at least 2.00.
    3. Completion and passing of a comprehensive thesis/final project exam.
    4. Official graduation from the study program
b. The student has fulfilled all administrative and financial obligations.

II.22 GRADUATION CEREMONY

a. Graduation ceremonies at Universitas Tanjungpura are held four times each academic year—in November, January, April, and July.
b. Students who have completed academic, administrative, and financial requirements may participate in the ceremony.

II.23 INTER-SEMESTER PROGRAM

Departments/programs, with approval from FMIPA Untan, may hold teaching and learning activities between the even and odd semesters under the following provisions:

1. Conducted for at least 8 weeks
2. Maximum student study load is 9 SKS
3. Must support achievement of the established learning outcomes (CP)
4. If delivered through lectures, a minimum of 16 sessions must be held, including midterm (UTS) and final (UAS) exams

II.24 ACADEMIC VIOLATIONS AND SANCTIONS

a. Violations during exams or falsification of grades include:
    1. Students caught cheating (e.g., copying/plagiarizing) during exams and recorded in the exam report will receive a grade of E (fail) for that course and have their SKS limit reduced in the following semester by the same SKS amount as the violated course.
    2. First-semester students who cheat will have their SKS limit reduced when planning their study program for semester 3.
    3. Unauthorized grade alterations result in course cancellation and suspension for up to two semesters, which are not considered academic leave.
    4. If violations involve threats, violence, or bribery, students may be suspended or expelled from FMIPA UNTAN upon Rector approval.

b. **Falsification of signatures** in documents such as LIRS or LIPRS, or other academic activities, results in cancellation of the academic activity and suspension, duration determined by the faculty.

c. **Violations in thesis writing:**
    1. Students committing fraud, including threats or coercion in thesis writing, may be suspended or expelled upon Rector approval.
    2. Graduates found guilty of plagiarism or fraud in their final project may have their degree revoked.

d. Students convicted of a crime by a court ruling, whether on or off campus, may be expelled from FMIPA UNTAN upon Rector approval.

e. Other academic violations and corresponding sanctions are governed by Universitas Tanjungpura's official procedures manual.

CHAPTER III
ACADEMIC ADMINISTRATION SYSTEM

III.1 Student Admission

New student admission to FMIPA UNTAN is based on:

1. Results of the National Selection for State University Admission (SNMPTN)
2. Results of the Joint Selection for State University Admission (SBMPTN)
3. Results of the Universitas Tanjungpura Written Entrance Exam (UTM UNTAN)

III.2 Administrative and Academic Registration

a. Administrative Registration

   To be officially recognized as a student at the beginning of each academic semester:

   1. Students must settle the tuition fee and other charges through the Single Tuition Fee (UKT) system
   2. Students must register at the start of each semester in accordance with the current academic calendar
   3. Registration requirements:
      (i) New students who have passed the selection process
      (ii) Returning students entering a new academic semester
      (iii) Not exceeding the maximum study period
      (iv) Not subject to administrative or academic sanctions by the university or faculty authorities
      (v) Have not forfeited academic rights by being unregistered for four consecutive semesters

b. Academic Registration

   1. The purpose of academic registration is to grant the right to participate in academic activities
   2. Academic registration is carried out at the beginning of each semester
   3. Academic registration may only proceed after administrative registration has been completed
   4. Academic registration procedures:
      (i) Prepare a study plan by selecting courses to be taken in that semester
      (ii) Prerequisite courses may only be chosen if the prerequisites have been fulfilled
      (iii) Students may not select two or more courses scheduled at the same time
   5. Selected courses must be listed in the Study Plan Form (LIRS) and input into the Academic System (SIAKAD)
   6. LIRS signed by the academic advisor must be submitted to the Academic Subdivision. Failure to submit will result in the student being unregistered for academic activities (e.g., not listed for classes or exams)

c. The schedule and procedures for both administrative and academic registration must follow the established academic calendar.

d. LIRS modifications are allowed within the specified timeframe for each semester, subject to existing regulations

III.3 Requirements to Participate in Courses

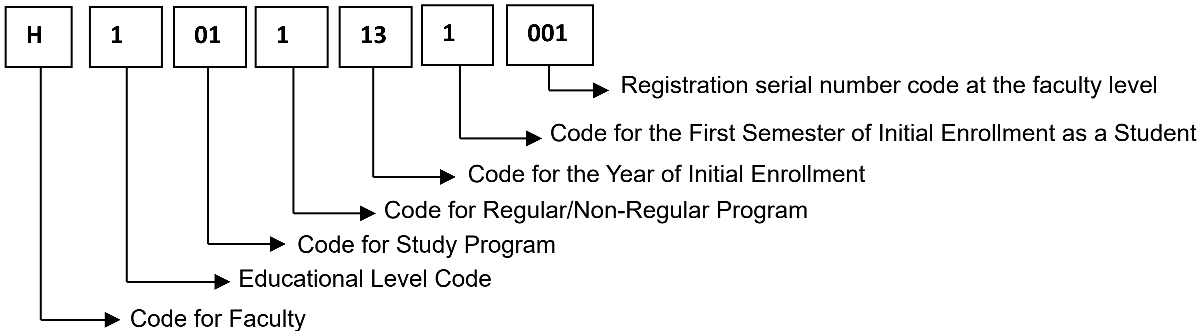
a. Tuition fee (UKT) payment has been completed
b. Student has received the Student ID Card (KTM) for the current semester
c. Student has completed academic registration, including:
    1. Preparing and submitting the study plan (LIRS) in consultation with their assigned Academic Advisor (PA)
    2. To modify the study plan, students must complete the Study Plan Change Form (LIPRS) and consult the advisor. After the modification period ends, changes are no longer permitted

III.4 Academic Administration Implementation

a. Academic administration follows the Semester Credit System (SKS)
b. It is managed centrally using the SIAKAD UNTAN computerized system
c. At the university level, academic administration is managed by the Bureau of Academic and Student Affairs (BAK), and at the faculty level by FMIPA's Sub-Coordinator for Academic and Student Affairs
d. Academic administrative tasks include:
    1. Managing student registration for course enrollment each semester
    2. Issuing Student ID Cards (KTM)
    3. Recording and processing academic grades
    4. Issuing academic transcripts
    5. Providing other academic administrative services
e. Final grades for each student are submitted by lecturers to BAK through the faculty's Academic and Student Affairs Sub-Coordinator
f. These grades are recorded on grade sheets provided specifically for this purpose

III.5 Student Identification Number (NIM)

a. Undergraduate students at FMIPA UNTAN receive a Student Identification Number (NIM), consisting of a letter code and nine digits, assigned as follows:
    1. First character: faculty code (letter)
    2. Second digit: level of education (0 = Diploma, 1 = Bachelor’s, 2 = Master’s, 3 = Doctoral)
    3. Third and fourth digits: department and study program code
    4. Fifth digit: regular or non-regular program
    5. Sixth and seventh digits: year of initial enrolment
    6. Eighth digit: semester of initial enrolment
    7. Ninth to eleventh digits: serial registration number within the faculty



b. The student identification number (NIM) is assigned by the Academic and Student Affairs Bureau (BAK) of Universitas Tanjungpura.

III.6 Academic Advising

a. Academic advising is provided to help students resolve academic challenges and support them in completing their studies as effectively and efficiently as possible, based on their individual conditions and potential.
b. Academic advising for each student is conducted by a lecturer appointed as the Academic Advisor (PA).
c. The faculty leadership assigns a unique identification code for each PA lecturer.
d. The duties and responsibilities of an Academic Advisor (PA) include:
   1. Providing guidance and advice on effective study strategies
   2. Explaining the study program and offering academic direction
   3. Assisting in selecting courses and developing the study plan for upcoming semesters
   4. Authorizing the Study Plan Form (LIRS) and/or its modification form (LIPRS)
   5. Encouraging consistent and continuous academic effort
   6. Instilling the importance of self-discipline and self-awareness
   7. Motivating students to strive for academic achievement
   8. Offering additional advice as needed
   9. Allocating sufficient time for student consultations
   10. Providing reports and recommendations about their advisees when necessary

III.7 Academic Leave and Re-enrollment

III.7.1 Academic Leave

a. Academic leave or temporary study withdrawal is granted by the Rector upon student request for legitimate and justifiable reasons, such as:

1. Pregnancy
2. Illness requiring rest as verified by a medical certificate
3. Other strong supporting reasons

b. Students must submit a written leave request to the Rector (attn: Head of Academic and Student Affairs Bureau - BAK), accompanied by a recommendation from the Dean.
c. Leave requests must be submitted no later than one month after the close of re-registration for that semester.
d. Leave may be granted for up to four consecutive semesters and only once during a student's study period.
e. Leave time is not counted toward the maximum 14-semester study period.
f. Students on approved leave are not required to re-register during their leave period.
g. Students may take academic leave only after completing at least two semesters of academic activities.
h. Students on leave are not permitted to participate in academic activities.
i. Leave is not granted to students who are about to be dropped or are currently under suspension.
j. Leave cannot be applied retroactively.

III.7.2 Re-Enrollment After Leave

Students wishing to resume their studies after academic leave must submit a reactivation request to the Rector (attn: Head of BAK), either before or after the leave period ends.

III.8 Students Not Registering

a. A student who fails to complete academic registration in a given semester is considered absent and the semester is still counted toward their study duration.
b. A student who fails to re-register for four consecutive semesters without written permission from the Rector is deemed to have withdrawn or is considered dropped out.

III.9 Program Transfer within Universitas Tanjungpura

a. Students at Universitas Tanjungpura may transfer study programs provided there is available capacity and they meet the academic requirements.
b. General requirements for a program transfer:
    1. The student is currently registered at the university
    2. The student has completed at least two semesters in their current faculty
    3. At least 25% of their completed courses are applicable to the target program
    4. The student is not subject to or in danger of academic dismissal from their original faculty

c. Specific requirements for program transfers:
   1. The student's request must have the originating faculty's approval before it is forwarded to the Rector
   2. The target faculty/program must accept the transfer request
d. Program transfer procedure:
   The student submits a formal request to the Rector, including:
   1. A letter from the current faculty stating the student is eligible to transfer
   2. A letter from the target faculty/program confirming they accept the student
e. Transfers may not take place after the first evaluation period (end of the 4th semester).
f. The duration of study in the new program will be reduced by the time already spent in the original program.

III.10 ADMISSION OF TRANSFER STUDENTS FROM OTHER UNIVERSITIES

a. Transfer students are allowed to change their academic program within Universitas Tanjungpura if the desired program has available capacity and the academic requirements are met.
b. General Requirements:
   1. Must come from a public or private university and from a similar study program.
   2. Transfer is due to the relocation of a parent/guardian/spouse.
   3. The student must have completed at least two semesters at their original institution with a GPA of at least 2.75 and a minimum of 40 credits, as reflected in the transcript.
   4. For students from private institutions, the original study program must be accredited at least equal to that of the receiving program.
   5. The original university must use the semester credit system (SKS).
c. Specific Requirements:
   1. The student or parent must submit a written request to the Rector stating the reason for the transfer and a willingness to fulfill all obligations set by Universitas Tanjungpura. A copy should be sent to the Dean of the intended faculty.
   2. The request must include:
      a. A transfer certificate from the original university, signed by the Rector or appointed official.
      b. A transcript signed by the Vice Rector I or authorized official.
   3. The student must not be subject to academic or administrative sanctions, proven by an official letter.
   4. A study break must not exceed two years at the time of re-registration.

5. Transfers are only accepted at the beginning of the academic year.

d. Admission Procedure:
   1. The student's/parent's request is submitted to the Rector, with a copy to the faculty Dean.
   2. The Head of BAK processes the application upon approval by the Rector and recommendation from the faculty.
   3. The Rector issues a response letter, either accepting or rejecting the transfer.
   4. If accepted, the letter will clearly state:
      a. Number of credits and courses recognized by the receiving faculty
      b. Number of credits required to complete the bachelor's program
      c. The allowed duration of study
   5. Transfer students are classified as new students.
   6. Enrollment Procedure:
      (i). Submit the acceptance letter and fulfill obligations as a new Universitas Tanjungpura student
      (ii). Once requirements are met, the Head of BAK issues a confirmation letter for the faculty
      (iii). The faculty registers the student, appoints an academic advisor (PA), and assists with the Study Plan Form (LIRS) based on recognized credits.

III.11 ADMISSION OF DIPLOMA 3 (D3) GRADUATES TO UNDERGRADUATE PROGRAMS

a. Admission of D3 graduates to the undergraduate level (S1) at FMIPA UNTAN is based on the following criteria:
   1. The original study program must be accredited at least equally to the intended program
   2. Must come from a similar field of study
   3. Must align with available program capacity
   4. Minimum GPA of 2.75
   5. At least 2 years of relevant work experience
   6. Must pass an academic aptitude test and interview
   7. Once accepted, the student must complete courses required by the curriculum
b. Graduates from academies or associate degree programs can also be admitted through a special agreement between Universitas Tanjungpura and a third party or the Ministry of Education as study-assignment students, through the same process.
c. Study-assignment students from third parties are subject to available capacity.
d. Admission Procedure:

1. Applicants submit a request to the Rector with copies to FMIPA UNTAN's Dean and Head of Department/Study Program, attaching:
    i. Certified copy of diploma
    ii. Academic transcript
    iii. Study assignment letter issued by an authorized official
2. The Head of BAK processes the request upon approval by the Rector and FMIPA Dean's recommendation
3. The Rector issues a response letter, either acceptance or rejection
4. If accepted, the decision letter specifies:
    i. Number of credits and courses recognized by FMIPA UNTAN
    ii. Number of credits required to complete the bachelor's degree
    iii. Study period limit for the student

e. Enrollment Procedure:
    1. Present the acceptance letter
    2. Complete a commitment form of agreeing to fulfill student obligations
    3. The Head of BAK issues confirmation of compliance, then forwards it to FMIPA UNTAN
    4. The department, through FMIPA, registers the student, appoints an academic advisor (PA), and prepares the Study Plan Form (LIRS) based on approved credits
f. Credit transfer for military academy graduates in relevant fields follows provisions set by Director General Decree No. 111/DIKTI/Kep/1993 on credit transfer for graduates of the Armed Forces Academy of the Republic of Indonesia (AKABRI).
g. Credit transfer for graduates from public academies or associate programs (other than military academies) is determined by the receiving faculty, considering:
    1. Courses with equivalent content and credit are recognized directly
    2. Courses with the same content but different credits are recognized proportionally, based on the total credits required in the receiving program
    3. The total recognized and remaining credits and courses to graduate are determined by the department/study program according to the applicable curriculum.

CHAPTER IV
ACADEMIC QUALITY ASSURANCE SYSTEM

In line with its core mandate in higher education, FMIPA UNTAN upholds the three pillars of Tri Dharma Perguruan Tinggi: (1) teaching, (2) research, and (3) community service. To maintain educational quality, both external and internal quality assurance mechanisms are implemented.

External quality assurance follows the guidelines of the National Accreditation Board for Higher Education (BAN-PT) and includes participation in national and international symposiums and scientific forums.
Internal quality assurance at FMIPA UNTAN is overseen by the Faculty Quality Assurance (PMF) unit, which reports to the Vice Dean for Academic Affairs and coordinates with UNTAN's Center for Learning Development and Quality Assurance (LPPPM).

PMF is responsible for initiating, facilitating, and evaluating FMIPA's implementation of quality assurance across all programs under its jurisdiction. Internal academic quality assurance at the faculty level is conducted to:

1. Ensure compliance with academic policies, standards, regulations, and quality manuals
2. Guarantee that graduates possess the competencies aligned with each program's learning outcomes
3. Assure that students gain educational experiences consistent with program specifications
4. Ensure educational and research programs are relevant to stakeholder needs

Organizational Structure of FMIPA Quality Assurance (Based on Dean's Decree No. 2420/UN22.8/JM.00/2022 dated March 29, 2022).

General Supervisor	:	Dr. Gusrizal, M.Si.
Technical Supervisors	:	Yudha Arman, D.Sc
		Dr. Evi Noviani, M.Si.
		Drs. Cucu Suhery, M.A.
Chairperson	:	Dr. Elvi Rusmiyanto P.W., S.Si., M.Si.
Vice Chairperson	:	Renny Puspitasari, M.T.
Secretary	:	Dr. Endah Sayekti, S.Si., M.Si.
Members	:	Hasanuddin, S.Si., M.Si., Ph.D
		Muhardi, S.Si., M.Sc.
		Sukal Minsas, S.Si., M.Si.
		Nurfitri Imro'ah, M.Si.
		Dr. Zulfa Zakiah, S.Si., M.Si.
		Yudhi, S.Si., M.Si.
		Irma Nirmala, M.T.
		Puji Ardiningsih, M.Si.
Secretariat	:	Hamka, S.Sos., M.M.
		Bambang Sugeng, S.Sos.
		Rachmat Jamaluddin, A.Md.
		Sakdiana

Toni
Wiwid Widyana, S.Si.
Budi Suryadarma

The quality assurance system focuses on the quality of student intake, curriculum, and the learning process in implementing the **Tri Dharma of Higher Education**. FMIPA UNTAN establishes academic standards, academic regulations, academic quality manuals, and procedural manuals, while also conducting academic quality monitoring and evaluation at the department/study program level.
Each study program defines its own specifications, graduate profile and competencies, learning plans, work instructions, standard quality procedures or **Standard Operating Procedures (SOPs)**, and relevant supporting documents, as well as conducts a self-evaluation based on **SWOT analysis**.
The goals for implementing the academic quality assurance system are outlined in:

- The **Strategic Plan (RENSTRA)** of FMIPA UNTAN
- The **Work and Budget Program Plan (RPKA)** for the medium term
- The **Annual Work and Budget Activity Plan (RPKAT)**, extending from the study program to faculty and university level

As a reference for implementing quality assurance at the faculty level, **FMIPA's Quality Assurance Unit (PMF)** prepares the following quality assurance documents:

1. **Academic Documents**: Academic Policy, Academic Procedure Manual, and Academic Standards
2. **Academic Quality Documents**: Academic Regulations and Academic Quality Guidelines

Each of these documents is developed by a faculty-appointed team involving all academic units and study programs under FMIPA UNTAN. Once finalized, PMF submits the documents to the faculty for deliberation and adoption in a faculty senate meeting.

At the start of each academic year, new students receive an **Academic Handbook** containing academic regulations essential to building a productive academic environment. For rules not yet covered in the handbook, the faculty provides updates via bulletin boards or, in special cases, through student meetings.

Internal quality assurance evaluates process indicators and learning outcomes, including:

1. **Student Input**
2. **Learning Process**, covering the curriculum, teaching materials, methods, references, attendance of lecturers and students, and the effectiveness of class time
3. **Learning Output**, such as study duration, thesis quality, assessment of final assignments, and graduate quality

Evaluations of input–process–output are conducted on a scheduled basis: annually, biennially, and every four years.

1. **Input evaluation** includes human resources, teaching facilities, and infrastructure
2. **Process evaluation** includes content, interaction quality, teaching methods, and instructional assessment

Monitoring & Surveys

Teaching and learning evaluation is conducted by PMF through student surveys to gather feedback on:

1. Learning experiences
2. Facilities and infrastructure
3. Academic and non-academic services

Quality assurance results are reported to the faculty leadership for follow-up measures.

Digital Integration: EDOM & ELOM

Lecture evaluation is now conducted digitally per semester via:

- **EDOM (Lecturer Evaluation by Students)** — assesses student satisfaction with instructors and learning quality, directly influencing faculty efforts to improve teaching
- **ELOM (Evaluation of Services by Students)** — gauges satisfaction with services provided by the institution

Both are accessed and filled out online via each student's SIAKAD (academic system) portal.

EDOM results are used by the faculty to evaluate lecturer performance and implement necessary policies.

Output Evaluation

This includes monitoring students who have completed coursework, thesis writing, scientific publication, and the overall study completion process. Results—based on standardized quality benchmarks—are discussed in faculty forums to develop appropriate solutions.

The outcomes are used to improve program management and inform **self-evaluation reports** in preparation for external reviews.

Chapter V: Mathematics Department

Mathematics, as one of the fundamental sciences, has a core structure aimed at developing mathematics itself as a discipline and as a tool for advancing other fields such as physics, biology, chemistry, engineering sciences, and others. As a fundamental science, mathematics is dominated by three key areas: Analysis, Algebra, and Geometry. Other branches such as Statistics, Applied Mathematics, and Computer Science emerge from the fusion of two or more of these disciplines.

The Mathematics Department at UNTAN's Faculty of Mathematics and Natural Sciences (FMIPA UNTAN) was established in 2001, initially offering only one program: the Mathematics Study Program. The department was founded because no institution in West Kalimantan was offering programs dedicated to pure mathematics, despite its critical role in other sciences.

With time, in 2013, the department expanded by introducing the Statistics Study Program, with the aim of fostering advancements in applied mathematics.

The department's activities are supported by lecturers with a minimum qualification of a master's degree (S2). Below is a list of permanent faculty members in the Mathematics Department:

Table 5.1: Permanent Faculty Members in the Mathematics Department

No	Lecturer's Name	Field of Expertise
1	Ir. Dadan Kusnandar, M.Sc., Ph.D.	Biometry
2	Drs. Helmi, M.Si.	Applied Mathematics
3	Dr. Bayu Prihandono, S.Si., M.Sc.	Applied Mathematics
4	Dr. Nilamsari Kusumastuti, S.Si., M.Sc.	Algebra, Representation Theory
5	Neva Satyahadewi, S.Si., M.Sc.	Actuarial Science
6	Dr. Evi Noviani, S.Si., M.Si.	Applied Mathematics
7	Dr. Yundari, S.Si., M.Sc.	Applied Statistics
8	Mariatul Kiftiah, S.Si., M.Sc.	Analysis
9	Shantika Martha, S.Si., M.Si.	Time Series Analysis
10	Evy Sulistianingsih, S.Si., M.Sc (S3 Universitas Gadjah Mada)	Financial Statistics
11	Naomi Nessyana Debataraja, S.Si., M.Si.	Applied Statistics
12	Setyo Wira Rizki, S.Si., M.Sc.	Actuarial Science
13	Fransiskus Fran, S.Si., M.Si.	Applied Algebra
14	Yudhi, S.Si., M.Si.	Analysis
15	Meliana Pasaribu, S.Pd., M.Sc.	Applied Mathematics
16	Hendra Perdana, S.Si., M.Sc.	Computational Statistics
17	Nurfitri Imro'ah, S.Si., M.Si.	Applied Statistics
18	Nur'ainul Miftahul Huda, S.Si, M.Si.	Applied Statistics

V.1 Mathematics Study Program

1. Introduction

The Mathematics Study Program (PS Matematika) at the Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Tanjungpura (UNTAN) serves as a leading institution in the development of fundamental sciences, aiming to produce graduates with high-quality academic skills who can compete in the global era.

The program was officially permitted to operate under Directorate General of Higher Education (DIKTI) Decree No. 3494/D/T/2001. Currently, PS Matematika UNTAN is accredited B based on the National Accreditation Board for Higher Education (BAN-PT) Decree No. 08179/SK/BAN-PT/Akred/S/III/2017.

Since its establishment in 2002, PS Matematika has adopted various curricula:

1. 2002 and 2005 Curricula (Content-Based Curriculum)
2. 2011 Curriculum (Competency-Based Curriculum / KBK, in accordance with Government Regulation No. 17/2010)
3. 2015 Curriculum (KBK refinement, aligned with KKNI and SN-Dikti standards)
4. 2020 Curriculum (refinement of the 2015 curriculum, embracing the Merdeka Belajar concept, allowing students to study beyond their main program, in accordance with Ministerial Regulation No. 3/2020, Article 18).

The 2020 Curriculum was implemented in the odd semester of the 2020/2021 academic year.

2. Vision and Mission

2.1. Vision

The vision of the Mathematics Study Program (PS Matematika) is: *"To become an outstanding study program in the development of mathematics and its interactions, with an environmental perspective, producing adaptive graduates".*

2.2. Mission

To realize this vision, PS Matematika has established three missions, which align with FMIPA UNTAN and UNTAN's overall mission:

1. Developing innovative and creative mathematics to support the advancement and application of science and technology (*IPTEK*).
2. Utilizing fundamental mathematical principles independently or in collaboration with other disciplines through learning, research, and community service, to enhance competitive value and societal welfare, particularly in West Kalimantan.
3. Establishing partnerships with various stakeholders to improve the relevance of education, research, and community engagement.

2.3. Objectives

In order to manage the Mathematics Study Program (PS Matematika) in alignment with its established vision and mission, the program has the following objectives:

1. To produce graduates with excellent academic abilities in the field of mathematics through effective learning processes.

2. To generate high-quality research and scientific publications that serve as references for the advancement of mathematics and other related disciplines.
3. To produce graduates who are skilled in mathematical analysis and geometry, algebra and combinatorics, applied mathematics, statistics, and computer science, and who are capable of developing and applying their knowledge independently or in collaboration with other fields.
4. To address societal challenges through the application of mathematics, implemented via relevant, solution-oriented, and innovative community service activities.

2.4. Curriculum

2.4.1. Graduate Profile and Learning Outcomes

The graduate profile of PS Matematika defines the career paths available to mathematics graduates. The key graduate profiles are:

1. Research Assistant – Graduates are scientists in pure or applied mathematics. With their expertise, they can support researchers holding master's or doctoral degrees in universities, research institutions, and private companies.
2. Academician – Many mathematics graduates work in academia, including as lecturers, teachers, and private tutors.
3. Consultant – The analytical and decision-making skills developed in mathematics enable graduates to work as consultants, assisting in problem modeling and mathematical analysis.
4. Practitioner – Graduates excel in structured problem analysis and interpretation, enabling them to work in banking, insurance, IT, and technology sectors.

The learning outcomes describe the competencies graduates will achieve upon completing their studies in PS Matematika. These outcomes are categorized into four aspects:

Learning Outcomes	
Attitudes and Values (S)	1. Have faith in God Almighty and demonstrate religious behavior. 2. Uphold humanitarian values, acting ethically and morally. 3. Contribute to improving society, nation, and civilization based on Pancasila principles. 4. Act as proud and responsible citizens with a sense of nationalism. 5. Respect cultural diversity, opinions, religions, and beliefs while recognizing original discoveries. 6. Collaborate effectively and be socially responsible toward communities and the environment. 7. Follow legal principles and maintain discipline in society. 8. Internalize academic integrity, norms, and ethics. 9. Show accountability and independence in their profession. 10. Demonstrate entrepreneurial spirit, perseverance, and self-reliance.
General Skills (KU)	1. Apply logical, critical, systematic, and innovative thinking in developing and implementing science and technology. 2. Demonstrate independent, high-quality, and measurable performance. 3. Analyze the implications of science, technology, and artistic development based on scientific ethics and methodologies. 4. Document research findings in scientific reports, such as a thesis or final project, and publish them on academic websites. 5. Make data-driven decisions to solve problems in their field. 6. Build and maintain professional networks with colleagues and mentors inside and outside academic institutions.

	7. Take responsibility for team achievements, supervising and evaluating assigned tasks. 8. Conduct self-evaluation of team performance and manage lifelong learning. 9. Ensure proper documentation, storage, and retrieval of data, preventing plagiarism.
Knowledge Mastery (PP)	1. Master basic science concepts (mathematics, physics, chemistry, biology, and IT). 2. Master theoretical mathematical concepts, including logic, discrete mathematics, algebra, analysis, geometry, probability, and statistics. 3. Understand mathematical modeling principles, including linear programming, differential equations, and numerical methods.
Specialized Skills (KK)	1. Develop mathematical reasoning, from computational procedures to logical exploration, abstraction, and proof formulation. 2. Identify and solve mathematical problems using mathematical approaches with or without software assistance. 3. Analyze and interpret mathematical phenomena, communicate findings clearly and accurately in written and oral form. 4. Apply alternative mathematical problem-solving techniques individually or collaboratively. 5. Adapt and grow within mathematics or other relevant fields, including professional careers.

2.4.2. Alignment Between Learning Outcomes and Courses

Every aspect of attitudes and values (S) and general skills (KU) must be embedded in all courses offered by the Mathematics Study Program. Meanwhile, knowledge mastery (PP) and specialized skills (KK) are specific learning outcomes, characterizing mathematical expertise.

Table 5.3: Alignment Between Learning Outcomes and Mathematics Courses

Learning Outcome	Related Courses
S, KU	Indonesian Language, English Language, Pancasila, Religion, Citizenship Studies
S, KU, KK1, PP2	Basic Physics, Contextual Chemistry, Contextual Biology, Introduction to Information Technology, Databases
S, KU, KK1, KK3, PP1, PP2	Introduction to Modern Mathematics, Calculus, Multivariable Calculus
S, KU, KK1, KK2, PP2	Geometry, Transformation Geometry, Discrete Mathematics, Elementary Linear Algebra, Introduction to Computational Mathematics
S, KU, KK1, KK2, PP2	Statistical Methods, Probability Theory, Regression Analysis, Experimental Design, Introduction to Stochastic Processes, Nonparametric Statistics
S, KU, KK2, KK3, KK4, KK5, PP3	Graph Theory, Linear Programming, Operations Research, Introduction to Actuarial and Financial Mathematics
S, KU, KK1, KK3, KK5, PP2	Linear Algebra, Introduction to Abstract Algebra, Set Theory, Real Analysis I & II, Complex Variable Functions, Metric Space, Topology, Functional Analysis, Semigroup Theory, Finite Group Theory, Vector Analysis
S, KU, KK2, KK3, KK4, PP1, PP3	Ordinary Differential Equations, Partial Differential Equations

Learning Outcome	Related Courses
S, KU, KK1, KK2, KK4, PP2	Number Theory, Mathematical Statistics
S, KU, KK1, KK2, KK3, KK4, KK5, PP3	Differential Equation Modelling, Dynamic Systems
S, KU, KK1, KK4, KK5, PP1, PP3	Algorithms and Programming
S, KU, KK1, KK4, KK5, PP2	Numerical Methods
S, KU, KK1, KK3, KK5, PP2, PP3	Fuzzy Logic, Linear Algebra Applications, Mathematical Methods
S, KU, KK2, KK3, KK4, KK5, PP2, PP3	Multivariate Analysis, Sampling Methods, Econometrics, Time Series Methods
S, KU, KK1, KK2, KK3, KK4, KK5, PP2, PP3	Mathematics in West Kalimantan, Selected Topics, Introduction to Optimization Theory
S, KU, KK1, KK2, KK3, KK4, PP2	Mathematical Rivalry
S, KU, KK2, KK4, KK5, PP2	Mathematical Research Methods
S, KU, KK3, KK4, KK5, PP1	Community Service Program / Internship, Independent Learning
S, KU, KK1, KK2, KK3, KK4, KK5, PP1, PP2, PP3	Special Tasks I & II, Seminar, Thesis

2.4.3. Curriculum Structure

To complete the Mathematics Study Program at FMIPA UNTAN, students must complete at least 144 SKS (credit units) within a minimum of 3.5 years and a maximum of 7 years.

Courses are categorized into mandatory courses (125 SKS) and elective courses (19 SKS or more), with students having the flexibility to take additional elective courses to enhance their interdisciplinary knowledge.

Table 5.4. Curses Distribution

Courses Type		Credit	Total
Mandatory Courses	University-Wide Mandatory Courses	9	(125 Credits)
	Faculty-Wide Mandatory Courses	12	
Compulsory Courses	Mathematics Study Program Courses	104	
Elective Courses			(≥19 SKS)
		Total	144

Mathematics Study Program Courses at FMIPA UNTAN consist of two groups:

1. **Compulsory Course Group**, which includes courses that every Mathematics Study Program student is required to take. This group carries a total of **125 credits (SKS)** and is divided into three categories:
    a. **University Compulsory Courses**, which are mandatory courses from Universitas Tanjungpura (UNTAN).

   b. **Faculty Courses**, which are required by FMIPA UNTAN. These courses aim to build character and scientific insight among FMIPA students and are therefore also referred to as **Kemipaan Courses** (Science and Mathematics-oriented courses).
   c. **Study Program Courses**, which are core competency courses specific to the Mathematics Study Program. These are designed to enhance mathematical knowledge and expertise for each Mathematics student.
2. **Elective Course Group**, which consists of supporting courses intended to meet the minimum graduation credit requirements (with a **minimum of 19 credits**). In line with the implementation of the *Merdeka Curriculum*—designed to broaden student horizons and improve academic capabilities—elective courses are not limited to those offered within the Mathematics Study Program. Students may also choose electives from other study programs within Universitas Tanjungpura or even from other universities. These electives are intended to provide students with interdisciplinary competencies as Mathematics graduates. Students are allowed to begin selecting elective courses outside the Mathematics Program starting in **Semester 4**.

2.4.4. Course Code System

Each course in the Mathematics Study Program is categorized based on its field of study. The course code follows this structure:
1. MP – Identifies the course as belonging to the Mathematics Study Program.
2. M – Identifies the specific Mathematics Study Program.
3. First digit – Represents the year in which the course is offered (on a four-year scale).
4. Second digit – Represents the semester in which the course is available:
   a. 0 → Flexible (can be taken in either semester)
   b. 1 → Available in the odd semester
   c. 2 → Available in the even semester
5. Third digit – Represents the branch of mathematics:
   a. 1 → Analysis & Geometry
   b. 2 → Algebra
   c. 3 → Applied Mathematics
   d. 4 → Statistics
   e. 5 → Computer Science
   f. 6 → Independent Research (Special Assignments, Community Service, Seminar, Thesis)
6. Fourth digit – Indicates the course order within its field.

Example:
- MPM-2112 →
  - MPM → Mathematics Study Program course
  - 2 → Offered in the second year
  - 1 → Available in the odd semester
  - 1 → Belongs to Analysis & Geometry
  - 2 → Second course in its category for that year

2.4.5. Course Distribution Per Semester

Table 5.5: Mandatory Courses in PS Matematika

Semester	Course Code	Course Name	Credits (SKS)	Prerequisites
1	MPM-1111	Calculus	4	-
	MPM-1121	Introduction to Modern Mathematics	3	-
	MPU-112	Physics	2	-

Semester	Course Code	Course Name	Credits (SKS)	Prerequisites
	MPU-105	Introduction to Information Technology	2	-
	MPU-107	Contextual Chemistry	2	-
	MPU-111	Contextual Biology	2	-
	UMG-105	English Language	3	-
	MKWU2	Pancasila	2	-
Total SKS/Credits for Semester I			20	
2	MPM-1211	Integral Calculus	4	-
	MPM-1221	Elementary Linear Algebra	4	-
	MPM-1222	Discrete Mathematics	4	-
	MPM-1241	Statistical Methods	3	-
	MKWU1	Religion	3	-
	MKWU4	Indonesian Language	2	-
Total SKS/Credits for Semester II			20	
3	MPM-2111	Multivariable Calculus	4	MPM-1211
	MPM-2112	Geometry	4	MPM-1111
	MPM-2121	Introduction to Abstract Algebra	4	MPM-1121, MPM-1221
	MPM-2122	Graph Theory	2	-
	MPM-2131	Linear Programming	2	MPM-1121
	MPM-2132	Probability Theory	3	-
Total SKS for Semester III			19	
4	MPM-2211	Ordinary Differential Equations	4	MPM-1111
	MPM-2221	Linear Algebra	4	MPM-2121
	MPM-2241	Mathematical Statistics	3	MPM-2132
	MPM-2261	Mathematical Research Methods	2	-
	MKWU3	Citizenship Studies	2	-
Total SKS for Semester IV			15	
5	MPM-3111	Introduction to Real Analysis I	4	MPM-1111
	MPM-3112	Partial Differential Equations	4	MPM-1211, MPM-2211
	MPM-3131	Operations Research	2	MPM-2131
	MPM-3132	Introduction to Actuarial & Financial Mathematics	3	-
	MPM-3151	Introduction to Computational Mathematics	2	MPM-1221, MPM-2211
	MPM-3152	Algorithms and Programming	3	MPM-1121
Total SKS for Semester V			18	
6	MPM-3211	Introduction to Real Analysis II	4	MPM-3111
	MPM-3212	Complex Variable Functions	4	MPM-3111
	MPM-3231	Differential Equation Modelling	3	MPM-2211
	MPM-3232	Numerical Methods	3	MPM-1111, MPM-3152
	MPM-3261	Special Tasks I	2	75 SKS completed
Total SKS for Semester VI			16	
7	MPM-4161	Mathematics in West Kalimantan	3	75 SKS from core courses (excluding MKWU)

Semester	Course Code	Course Name	Credits (SKS)	Prerequisites
	MPM-4162	Special Tasks II	2	75 SKS completed
	MPM-4061	Community Service Program / Internship	2	90 SKS completed
	MPM-4062	Seminar	4	120 SKS completed
Total SKS for Semester VII			11	
8	MPM-4063	Thesis	6	-
Total Mandatory/Compulsory SKS			125 SKS	

Table 5.6: Elective Courses in PS Matematika

Semester	Course Code	Elective Course Name	Credits (SKS)	Prerequisites
3	MPM-2123	Number Theory	2	-
	MPM-2124	Fuzzy Logic	3	MPM-1121
	MPM-2125	Set Theory	2	MPM-1121
	MPM-2141	Regression Analysis	3	MPM-1241
	MPM-2151	Databases	3	-
4	MPM-2222	Transformation Geometry	2	MPM-1221
	MPM-2223	Introduction to Semigroup Theory	2	MPM-2121
	MPM-2212	Vector Analysis	2	MPM-1111, MPM-1221
	MPM-2224	Finite Group Theory	2	MPM-2121
	MPM-2242	Sampling Methods	3	MPM-2141
	MPM-2243	Multivariate Analysis	4	MPM-2141
	MPM-2244	Nonparametric Statistics	2	MPM-1241
5	MPM-3121	Applications of Linear Algebra	2	MPM-1221
	MPM-3133	Dynamic Systems	3	MPM-2211
	MPM-3141	Experimental Design	3	MPM-1241
	MPM-3142	Introduction to Stochastic Processes	2	MPM-2132
	MPM-3143	Time Series Methods	3	MPM-2141
	MPM-3161	Mathematical Rivalry	2	MPM-1111
	MPM-3061	Merdeka Belajar Program	11	Completed 75 SKS, GPA > 3.00
6	MPM-3213	Introduction to Topology	2	MPM-3111
	MPM-3214	Metric Space	2	MPM-3111
	MPM-3233	Mathematical Methods	3	MPM-3112
	MPM-3234	Introduction to Optimization Theory	3	MPM-3232
7	MPM-4111	Introduction to Functional Analysis	3	MPM-3211
	MPM-4163	Selected Topics	2	Completed 50 SKS from core courses (excluding MKWU)
		Total Credits	71	

*) Prerequisite courses are courses that have previously been taken.

For elective courses outside of the Mathematics Study Program (whether within or outside Universitas Tanjungpura), selection should be based on the courses offered in the relevant semester. When choosing elective courses, students are expected to consult and consider the recommendations of their Academic Advisor (Dosen Pembimbing Akademik) and ensure they meet the requirements and prerequisites of the selected courses.

Tabel 5.7. Course Equivalence Between 2015 and 2020 Curriculum

Curriculum 2015					Curriculum 2020				
Code	Course Name	Smt	SKS	W/P	Code	Course Name	Smt	SKS	W/P
MPM-121	Introduction to Modern Mathematics	1	3	W	MPM-1121	Introduction to Modern Mathematics	1	3	W
MPU-101	Calculus	1	3	W	MPM-1111	Calculus	1	4	W
MPU-103	Basic Physics	1	3	W	MPU-103	Physics	1	2	W
MPU-105	Introduction to Information Technology	1	2	W	MPU-105	Introduction to Information Technology	1	2	W
MPU-107	Contextual Chemistry	1	2	W	MPU-107	Contextual Chemistry	1	2	W
MPU-111	Contextual Biology	1	2	W	MPU-111	Contextual Biology	1	2	W
UMG-105	English	1	3	W	UMG-105	English	1	3	W
MPM-111	Differential Calculus	2	4	W	MPM-2111	Multivariable Calculus	3	4	W
MPM-122	Elementary Linear Algebra	2	4	W	MPM-1221	Elementary Linear Algebra	2	4	W
MPM-123	Discrete Mathematics	2	4	W	MPM-1222	Discrete Mathematics	2	4	W
MPM-141	Statistical Methods I	2	2	W	MPM-1241	Statistical Methods	2	3	W
UMG-101	Religion	2	3	W	MKWU1	Religion	2	3	W
MPM-211	Integral Calculus	3	4	W	MPM-1211	Integral Calculus	2	4	W
MPM-212	Geometry	3	4	W	MPM-2112	Geometry	3	4	W
MPM-221	Introduction to Abstract Algebra I	3	4	W	MPM-2121	Introduction to Abstract Algebra	3	4	W
MPM-241	Statistical Methods II	3	4	W	MPM-2132	Probability Theory	3	3	W
MKWU4	Indonesian Language	3	2	W	MKWU4	Indonesian Language	3	2	W
MPM-215	Number Theory	3	2	P	MPM-2123	Number Theory	3	2	P
MPM-223	Fuzzy Logic	3	3	P	MPM-2124	Fuzzy Logic	3	3	P
MPM-224	Set Theory	3	2	P	MPM-2125	Set Theory	3	2	P
MPM-213	Functions of Complex Variables	4	4	W	MPM-3212	Functions of Complex Variables	6	4	W
MPM-214	Ordinary Differential Equations	4	4	W	MPM-2211	Ordinary Differential Equations	4	4	W

Curriculum 2015					Curriculum 2020				
Code	Course Name	Smt	SKS	W/P	Code	Course Name	Smt	SKS	W/P
MPM-222	Introduction to Abstract Algebra II	4	4	W	MPM-2221	Linear Algebra	4	4	W
MPM-242	Mathematical Statistics	4	4	W	MPM-2241	Mathematical Statistics	4	3	W
MPM-261	Research Methods	4	2	W	MPM-2261	Mathematical Research Methods	4	2	W
MPM-231	Mathematical Methods	4	3	P	MPM-3233	Mathematical Methods	6	3	P
MPM-243	Sampling Methods	4	3	P	MPM-2242	Sampling Methods	4	3	P
MPM-244	Multivariate Analysis	4	4	P	MPM-2243	Multivariate Analysis	4	4	P
MPM-245	Non-Parametric Statistics	4	2	P	MPM-2244	Non-Parametric Statistics	4	2	P
MPM-311	Introduction to Analysis I	5	4	W	MPM-3111	Introduction to Real Analysis I	5	4	W
MPM-312	Partial Differential Equations	5	4	W	MPM-3112	Partial Differential Equations	5	4	W
MPM-331	Operations Research	5	6	W	MPM-2131	Linear Programming	3	2	W
					MPM-2122	Graph Theory	3	2	W
					MPM-3131	Operations Research	5	2	W
MPM-341	Introduction to Actuarial and Financial Mathematics	5	3	W	MPM-3132	Introduction to Actuarial and Financial Mathematics	5	3	W
MPM-351	Introduction to Computational Mathematics	5	2	W	MPM-3151	Introduction to Computational Mathematics	5	2	W
MPM-315	Introduction to Topology	5	2	P	MPM-3213	Introduction to Topology	6	2	P
MPM-321	Advanced Linear Algebra	5	2	P	MPM-3121	Applications of Linear Algebra	5	2	P
MPM-343	Advanced Mathematical Statistics	5	4	P	Removed				
MPM-344	Time Series Methods	5	3	P	MPM-3143	Time Series Methods	5	3	P
MPM-313	Introduction to Analysis II	6	4	W	MPM-3211	Introduction to Real Analysis II	6	4	W
MPM-332	Differential Equation Modeling	6	3	W	MPM-3231	Differential Equation Modeling	6	3	W
MPM-314	Numerical Methods	6	3	W	MPM-3232	Numerical Methods	6	3	W
MPM-342	Regression Analysis	6	4	W	MPM-2141	Regression Analysis	3	3	P
MPM-361	Special Assignment I	6	2	W	MPM-3261	Special Assignment I	6	2	W
MPM-362	KKM/KP	6	2	W	MPM-4061	KKM/KP	7	2	W

Curriculum 2015					Curriculum 2020				
Code	Course Name	Smt	SKS	W/P	Code	Course Name	Smt	SKS	W/P
MPM-333	Dynamic Systems	6	3	P	MPM-3133	Dynamic Systems	5	3	P
MPM-334	Introduction to Optimization Theory	6	3	P	MPM-3234	Introduction to Optimization Theory	6	3	P
MPM-345	Time Series Methods II	6	3	P	Removed				
MKWU3	Citizenship	6	2	W	MKWU3	Citizenship	4	2	W
MPM-441	Experimental Design	7	4	W	MPM-3141	Experimental Design	5	3	P
MPM-451	Algorithms and Programming	7	6	W	MPM-3152	Algorithms and Programming	5	3	W
MPM-461	Special Assignment II	7	2	W	MPM-4162	Special Assignment II	7	2	W
MKWU2	Pancasila	7	2	W	MKWU2	Pancasila	1	2	W
MPM-411	Introduction to Abstract Analysis	7	2	P	MPM-3214	Introduction to Metric Space	6	2	P
MPM-442	Selected Topics in Statistics	7	2	P	MPM-4163	Selected Topics	7	2	P
MPM-412	Selected Topics in Mathematics	7	2	P					
MPM-444	Econometrics	7	3	P	Removed				
MPM-462	Seminar	8	4	W	MPM-4062	Seminar	7	4	W
MPM-463	Thesis	8	6	W	MPM-4063	Thesis	8	6	W
New Courses					MPM-2151	Database	3	3	P
					MPM-2222	Transformation Geometry	4	2	P
					MPM-2223	Introduction to Semigroup	4	2	P
					MPM-2212	Vector Analysis	4	2	P
					MPM-2224	Finite Group Theory	4	2	P
					MPM-3142	Introduction to Stochastic Processes	5	2	P
					MPM-3161	Mathematical Rivalry	5	2	P
					MPM-3061	Independent Learning	5	11	P

Transition Rules:

a. Starting from the 2020/2021 academic year, the 2020 Curriculum applies to all students, including those from 2019 and earlier.
b. Mandatory courses for students from 2019 and earlier consist of courses required under both the 2015 and 2020 curricula.
c. Students from 2019 or earlier may choose additional courses from the 2020 Curriculum (not included in the 2015 Curriculum) as elective courses.

2.4.7. Teaching Methods

The Mathematics Study Program emphasizes Student-Centered Learning (SCL) to enhance student engagement and active participation. The key methods applied in lectures include:

1. Collaborative Learning (CL) – Encouraging teamwork, discussion, and joint problem-solving.
2. Problem-Based Learning (PBL) – Focusing on practical applications and real-world problem-solving.
3. A Combination of CL and PBL – Integrating both methods for a more interactive and applied learning experience.

Each course follows a Semester Learning Plan (RPS) and Weekly Learning Plan (RPM) developed by subject specialists. RPS and RPM undergo evaluation every semester to ensure they align with academic objectives, revisions are made based on student feedback and evaluation results.

2.4.8. Assessment and Evaluation Methods

Mathematics courses at FMIPA UNTAN use a modular system, meaning, each course consists of several modules, delivered over a set number of class meetings, Module exams are conducted at the completion of each module, and Exams may be written tests, research papers, or presentations, depending on the course's RPS and RPM guidelines.

Grading Components and Weighting

The overall grading structure for Mathematics courses is as follows:

- Attendance: 10%
- Class Participation: 20%
- Structured Assignments: 30%
- Module Exams: 40%

The final course grade is calculated as:

Final Grade (NA) = (Attendance Score × 10%) + (Participation Score × 20%) + (Assignment Score × 30%) + (Module Exam Score × 40%)

Detailed Grading Formulas

- Attendance Score: (Total student attendance per module ÷ Total class meetings) × 100
- Participation Score: Sum of (Total class meetings per module × Participation score per module) ÷ Total class meetings
- Assignment Score: Sum of (Total class meetings per module × Assignment score per module) ÷ Total class meetings
- Exam Score: Sum of (Total class meetings per module × Exam score per module) ÷ Total class meetings

The grading scale for participation, assignments, and exams ranges from 0 to 100.

2.4.9. Course Syllabi for Mathematics Study Program

Table 5.8: Syllabus for General Compulsory Courses

No.	COURSE	Credits	Topics
1	Religion	3	
	Religion (Islam)		Islamic Religious Studies in Higher Education. Human Beings and God. Religion Ensuring Happiness. Integrating Faith, Islam, and Ihsan in Creating a Perfect Human. Building a Quranic Personality. Spreading Islam in Indonesia. Islam Promoting Unity in Diversity. Islam Facing Modernization Challenges. The Contribution of Islam in Civilization Development. The Role and Function of Campus Mosques in Developing Islamic Culture.
	Religion (Catholic)		Human Life's Calling According to the Scriptures. Human Relations with Self, Others, Environment, and God. Religion and Faith in Pluralism. Jesus Christ. Church and Social Faith.
	Religion (Protestant)		Religion and Its Function in Human Life. God in Christian Belief. Humanity in Christian Teachings. Ethics and Christian Character Formation. The Relationship Between Christian Faith and Science, Technology, and Art. Creating Interfaith Harmony. God's Creation and Caring for It. Proper Social Interaction.
	Religion (Hindu)		Purpose and Function of Hindu Religious Studies in Building a Humanistic Personality for Students. The Role of Hindu Historical Development in Providing Positive Learning. Brahmavidya (Theology) in Developing Students' Faith and Devotion. The Role of Vedic Studies in Enhancing Students' Understanding of the Vedas as Sacred Scriptures and Legal Sources. Hindu Human Concept in Developing Leadership, Law Compliance, Health, Creativity, and Adaptability. Hindu Ethics in Building Morality. The Role of Religious Art in Shaping an Aesthetic Personality. Building Harmony According to Hindu Teachings. Raising Awareness as Social Beings in Hinduism.
	Religion (Buddhist)		Framework and Content of the Tipitaka/Tripitaka Scriptures. Meaning and Purpose of Human Life Based on Buddhist Teachings. The Role of Universal Buddhist Laws in Daily Life. The Concept of the Supreme God in Buddhism. Moral Values (Sila) as the Basis and Pattern of Life. The Harmony of Science and Art in Life. Buddhist Society Concept and Constructing Interfaith Harmony. The Dynamics of Buddhist Culture and Politics in Indonesia's National Context. Bhavana in Forming a Pure, Character-Based Mind.
	Religion (Confucian)		Purpose and Function of Confucianism as a General Compulsory Course in Diploma and Bachelor Programs. Life's Purpose and the Afterlife. The Essence and Urgency of Integrating Faith, Belief,

No.	COURSE	Credits	Topics
			Loyalty, and Devotion in Forming Noble Individuals. The Concept of Confucianism Regarding Religious Diversity and Its Contribution to Civilization. The Essence and Importance of Confucian Religion and Spiritual Values. Sources and Implementation of Confucian Teachings in Modern Indonesia. Science, Politics, Socio-Culture, Economy, Environment, and Education from a Confucian Perspective. The Role and Function of Student Confucian Activities as a Center for Confucian Cultural Development.
2	Indonesian Language	2	Academic texts in macro genres. Book review texts. Proposal texts. Report texts. Scientific article texts.
3	Pancasila	2	Pancasila in the historical study of Indonesia. Pancasila as the Foundation of the Republic of Indonesia. Pancasila as the State Ideology. Pancasila as a Philosophical System. Pancasila as an Ethical System. Pancasila as the Basis for the Development of Scientific Values.
4	Citizenship	2	Citizenship in advancing national intelligence. National identity as a determinant of national development and character building. National integration as a parameter for national unity. Constitution in national and state life. The harmony of state and citizen rights and obligations. Democracy derived from Pancasila. Law enforcement based on justice. National insight. National resilience and national defense.

Tabel 5.9 Syllabus for FMIPA Courses

No	Course	Credits (SKS)	Main Topic	Subtopic
1	Calculus	4	See Table 5.10	-
2	Physics	2	Measurement	Quantities and units, vectors
			Kinematics	Displacement, average and instantaneous velocity, average and instantaneous acceleration, free-fall motion, projectile motion
			Dynamics	Newton's First, Second, and Third Laws, types of forces
			Work and Energy	Work, kinetic energy, potential energy, spring energy, mechanical energy, energy conservation, the relationship between work and energy, power
			Momentum and Collision	Linear momentum, conservation of linear momentum, impulse, collision
			Rotational Dynamics	Rotational kinematics, rotational dynamics, and equations of rotational motion
			Equilibrium and Centre of Mass	Translational equilibrium, rotational equilibrium, centre of mass, and motion of the centre of mass
			Elasticity	Stress, strain, pressure, Young's modulus, torsion modulus, Hooke's law
			Fluids	Static fluids, pressure, Pascal's principle, Archimedes' principle, dynamic fluids, Bernoulli's equation
			Gas Kinematics	Temperature, thermal expansion, phases of matter, kinetic theory of gases, Boyle's law, Boyle-Gay Lussac law, Van der Waals equation and phase diagram
			Thermodynamics	Heat capacity, specific heat, phase changes, heat transfer, thermal energy, thermodynamic laws
			Vibrations, Waves, and Sound	Harmonic vibration, GHS energy, pulse and wave velocity, harmonic waves, standing waves, wave quantities, wave equation, resonance, sound intensity levels, Doppler effect
3		2	Types of Devices	Background, development, device types

	Introduction to Information Technology		Information and Communication Technology	History of computer systems, development of computer systems, system components, functionality, data and information
			Office Applications	Writing techniques (table of contents, bibliography, equations, numbering system), formulas and calculations
			Internet Applications	Introduction to the Internet (cyber ethics, security), Email & Mailing Lists, E-learning, Cloud Storage, File Management, Blog creation and customization
4	Contextual Chemistry	2	Chemistry for the Future	Air quality, ozone protection, energy, chemistry in society, water sustainability, acid rain, nutrition
5	Contextual Biology	2	Origin of Living Organisms	Theories of life origins, natural selection, organism characteristics
			Cell	Definition of a cell, differences between plant and animal cells, organelles and functions, reproduction
			Structure and Function in Animals	Basic principles of animal form and function, behaviour
			Structure, Growth, and Development in Plants	Basic plant organs and different types of plant tissues
			Plant Responses	Responses to light and other stimuli
			Biosystematics and Biodiversity	Classification principles, organism diversity, taxonomic levels
			Microbiology	Introduction to microorganisms and fermentation
			Genetics	Basic genetics and Mendelian genetics
			Ecology	Population, community, ecosystem, conservation, pollution

Table 5.10: Syllabus of Compulsory Courses in the Mathematics Study Programme

Course	Module	Main Topic	Subtopic	Duration (100 minutes)	in-person learning Sessions
Introduction to Modern Mathematics (3 Credits)	1	Mathematical Logic	Fundamentals of logic	4	7
			Algebraic logic	–	–
			Quantification	2	–
			Proof techniques	3	–
			Inference methods	1.5	–
	2	Set Theory	Fundamentals of sets	3	7
			Multiset	1.5	–
			Family of sets	2	–
			Ordered sets	2	–
			Equivalence relations	2	–
	Total			21	14
	References:				
	Devlin, K., 1992. *Sets, Functions, and Logic*, 2nd edition, New York: Chapman and Hall.				
	Soehakso, RMJT., 1993. *Introduction to Modern Mathematics*, Teaching Material, Yogyakarta: Department of Mathematics, FMIPA UGM.				
	Kusumastuti, N., 2005. *Mathematical Logic*, Teaching Material, FMIPA UNTAN.				
	Kusumastuti, N., 2005. *Set Theory*, Teaching Material, FMIPA UNTAN.				
Calculus (4 Credits)	1	Real Number System and Functions	Introduction	1	9
			Properties, inequalities, absolute values	2	–
			Coordinate system	1	–
			Definition of relations and functions	3	–
			Function graphs	2	–
	2	Limits and Continuity	Definition of limits, properties, and methods	3	5
			Definition of continuity and continuous functions	2	–
	3	Derivatives and Applications	Derivative formulas, Chain rule	2	9
			Parametric derivatives	1	–

			Implicit derivatives	1	–
			Higher-order derivatives	1	–
			Applications of derivatives	4	–
	4	Related Rates, Differentiation, and Approximation	Related rates	1	5
			Definition of differentials, Taylor series	2	–
			Function value approximation using differentials	2	–
	Total			28	28
	References:				
	Purcell, E. J. & Varberg, D., 1994. *Calculus and Analytical Geometry*, 4th edition. Translated by I Nyoman Susila, Bana Kartasasmita, Rawuh. Jakarta: Erlangga.				
	Stewart, J., 2001. *Calculus*, 4th edition. Translated by I Nyoman Susila & Hendra Gunawan. Jakarta: Erlangga.				
	Varberg, Purcell, E. Purcell & S. Rigdon, 2006. *Calculus*, 9th edition. Boston: Prentice Hall.				
Integral Calculus (4 Credits)	1	Indefinite Integral	Introduction	2	9
			Definition and properties of integrals	–	–
			Substitution method	1	–
			Integration by parts	1	–
			Rational integration	3	–
			Trigonometric integration	2	–
	2	Definite Integral	Introduction to integral areas	2	9
			TDK I and TDK II, and substitution	4	–
			Integrals of odd and even functions	1	–
			Improper integrals	2	–
	3	Applications of Integration	Area calculation under a graph	2	10
			Volume calculation of solids of revolution	4	–
			Arc length calculation	2	–
			Centre of mass and Pappus's theorem	2	–
	Total			28	28
	References:				
	Purcell, E. J. & Varberg, D., 1994. *Calculus and Analytical Geometry*, 4th ed. Translated by I Nyoman Susila, Bana Kartasasmita, Rawuh. Jakarta: Erlangga.				

	Stewart, J., 2001. *Calculus*, 4th ed. Translated by I Nyoman Susila & Hendra Gunawan. Jakarta: Erlangga.				
	Varberg, Purcell, E. Purcell & S. Rigdon, 2006. *Calculus*, 9th ed. Boston: Prentice Hall.				
Elementary Linear Algebra (4 Credits)	1	Linear Systems (SPL) and Matrices	Introduction and overview of SPL	1	9
			Definition and operations of matrices	1	–
			Types of matrices and their properties	2	–
			Elementary row operations (ERO) and matrix inverses	2	–
			Methods for solving SPL (elimination, substitution, Gauss–Jordan)	3	–
	2	Determinants	Definition	2	10
			Sarrus's method and cofactor expansion	–	–
			Properties of determinants	1	–
			Finding determinants using ERO	2	–
			Relationship between SPL, inverses, and determinants	3	–
			Eigenvalues and eigenvectors	1	–
			Cayley–Hamilton theorem	1	–
	3	Euclidean Vector Analysis	Introduction to vectors and geometric representation	1	9
			Vector arithmetic and properties	1	–
			Definition of norms and dot product	1	–
			Properties of norms and dot product	1	–
			Cross product and its properties	2	–
			Relationships among dot product, cross product, and norms	1	–
			Vector projection, distance between points and lines, planes	2	–
	Total			28	28
	References:				
	Anton, H. & Rorres, C., 2004. *Elementary Linear Algebra: Applications Version*. Jakarta: Erlangga.				
	Ayres, F., 1984. *Theory and Problems of Matrices*. Jakarta: Erlangga.				
	Leon, S., 2001. *Linear Algebra and Its Applications*. Jakarta: Erlangga.				

	Kusumastuti, N., Yundari, Fran, F., Pasaribu, M., 2020. *Elementary Linear Algebra*, Teaching Material. FMIPA UNTAN.				
Discrete Mathematics (4 Credits)	1	Proof Principles	Mathematical Induction	3	8
			Inclusion–Exclusion Principle	2	–
			Pigeonhole Principle	3	–
	2	Binomial Coefficients	Combinatorics	6	10
			Binomial Coefficient Calculation	4	–
	3	Discrete Numerical Functions	Numeric Functions	2	10
			Generating Functions	4	–
			Recurrence Relations	4	–
	Total			28	28
	References:				
	Liu, C.L., 1995. *Fundamentals of Discrete Mathematics*, 2nd edition. Jakarta: PT Gramedia Pustaka Utama.				
	Munir, Rinaldi, 2005. *Discrete Mathematics*, 3rd edition. Bandung: Informatika Publisher.				
	Kusumastuti, N., 2005. *Combinatorics Theory and Binomial Coefficients*, Teaching Material. FMIPA UNTAN.				
Statistical Methods (3 Credits)	1	Statistics, Data, and Probability	History and Role of Statistics	0.5	7
			Descriptive Statistics	1	–
			Measures of Central Tendency and Dispersion	1.5	–
			Data Transformation	1.5	–
			Classical Probability	1.5	–
			Random Variables (Discrete & Continuous)	2	–
			Probability Distributions (Discrete & Continuous)	2.5	–
	2	Sampling Distributions, Estimation, and Hypothesis Testing	Random Sampling, Sampling Distribution for Mean, Difference in Mean, Proportion, and t-distribution	4	7
			Confidence Intervals for Population Mean, Proportion, and Variance	3	–
			Hypothesis Testing: Mean, Proportion, Variance, Difference in Means, and Paired Data	3.5	–
	Total			21	14
	References:				

	Kusnandar, D., 2004. *Statistical Methods and Applications with Minitab and Excel*. Madyan Press, Yogyakarta.				
	Ott, Lyman & Michael, L., 1984. *An Introduction to Statistical Methods and Data Analysis*, 2nd edition. Boston: Duxbury Press.				
	Harinaldi, 2005. *Principles of Statistics for Engineering and Science*. Jakarta: Erlangga Publisher.				
	Nugroho, S., 2012. *Fundamentals of Statistical Methods*, 2nd edition. Jakarta: Drasindo Publisher.				
Multivariable Calculus (4 Credits)	1	Sequences and Series	Sequences	2	11
			Number Series	1	–
			Non-negative Series and Convergence Tests	4	–
			Alternating Series	2	–
			Power Series	2	–
	2	Multivariable Functions and Derivatives	Definition of Multivariable Functions	0.5	11
			Curve Visualization	1	–
			Vector-Valued Functions	2	–
			Limits and Continuity	1.5	–
			Partial Derivatives, Gradient, Implicit Differentiation, and Chain Rule	3	–
			Applications of Derivatives	3	–
	3	Multiple Integrals	Line Integrals and Their Relationship with Multiple Integrals	3	6
			Green’s Theorem	1	–
			Divergence Theorem	1	–
			Stokes’ Theorem	1	–
	Total			28	28
	References:				
	Purcell, E. J. & Varberg, D., 1994. *Calculus and Analytical Geometry, Volume 2*, 5th edition. Translated by I Nyoman Susila, Bana Kartasasmita, Rawuh. Jakarta: Erlangga.				
	Handali, Pamuntjak, 1982. *Multivariable Calculus*, 2nd edition. ITB Bandung.				
	Soemartojo Noenik, 1987. *Advanced Calculus*. Jakarta: UI Publisher.				

	Nyoman Susila I, 1995. *Calculus and Analytical Geometry, Volume 2*, 5th edition. Jakarta: Erlangga.				
	Spiegel, Murray R., 1994. *Theory and Problems in Vector Analysis*, 4th edition. Jakarta: Erlangga (translated by Hans J. Wospakrik, ITB Bandung).				
Geometry (4 Credits)	1	Introduction to Geometry	Incidence geometry	2	8
			Linear functions, equations of straight lines, gradients, tangent equations	4	–
			Introduction to GeoGebra	2	–
	2	Analytic Geometry in the Plane	Circle	4	10
			Ellipse	2	–
			Hyperbola	2	–
			Parabola	2	–
	3	Analytic Geometry in Space	Points and vectors in space	2	10
			Equations of straight lines in $\mathbb{R}^3$	2	–
			Sphere equation	2	–
			Surface of revolution	2	–
			Second-degree surfaces	2	–
	Total			28	28
	References:				
	Purcell, E. J. & Varberg, D., 1994. *Calculus and Analytical Geometry*, 4th edition. Translated by I Nyoman Susila, Bana Kartasasmita, Rawuh. Jakarta: Erlangga.				
	Hadiwidjojo, M., 1974. *Analytical Geometry*, Yogyakarta: FPMIPA-IKIP.				
Introduction to Abstract Algebra (4 Credits)	1	Group Theory	Binary operations and algebraic systems	1	15
			Group axioms	2	–
			Cayley table	1	–
			Permutation groups, cyclic groups	3	–
			Properties of groups	2	–
			Subgroups and normal subgroups	2	–
			Factor groups	2	–
			Group homomorphisms	2	–
	2	Ring Theory	Ring axioms	2	13

			Properties and characteristics of rings	1	–
			Types of rings	3	–
			Subrings and ideals	3	–
			Factor rings	2	–
			Ring homomorphisms	2	–
	Total			28	28
	References:				
	Malik, D.S., Mordeson, J.N., & Sen, M.K., 2007. *Introduction to Abstract Algebra*. Nebraska: Creighton University.				
	Fraleigh, J.B., 1994. *A First Course in Abstract Algebra*, 5th edition. New York: Addison-Wesley.				
	Hungerford, T.W., 1974. *Algebra*. New York: Springer-Verlag.				
Graph Theory (2 Credits)	1	Introduction to Graph Theory	Introduction to graphs	1	8
			Graph connectivity	2	–
			Eulerian and Hamiltonian graphs	1	–
			Trees	3	–
			Directed graphs	1	–
	2	Graph Applications	Graph coloring	2	6
			Graph labeling	2	–
			Graph domination	2	–
	Total			14	14
	References:				
	Fould, L.R., 1992. *Graph Theory Applications*. Springer, Varleg.				
	Mahmudi, A., 2003. *Graph Theory*. FMIPA UNY.				
	Munir, R., 2001. *Computer Science Textbook: Discrete Mathematics*. Informatika Bandung.				
Linear Programming (2 Credits)	1	Graphical Method	Introduction to linear programming models	1	6
			Solutions using graphical methods and special cases	3	–
			Sensitivity analysis in graphical method	2	–
	2	Simplex Method	Primal simplex method	4	8
			Dual simplex method	2	–
			Integer linear programming	2	–

<table>
<tr><td rowspan="5"></td><td colspan="3">Total</td><td>14</td><td>14</td></tr>
<tr><td colspan="5">References:</td></tr>
<tr><td colspan="5">Hillier, F.S. & Lieberman, G., 1990. Introduction to Operations Research. New York: McGraw Hill.</td></tr>
<tr><td colspan="5">Susanta, B., 1997. Linear Programming. Yogyakarta: UGM.</td></tr>
<tr><td colspan="5">Taha, H., 1989. Operations Research: An Introduction. Collier MacMillan International Edition.</td></tr>
<tr><td rowspan="12">Probability Theory (3 Credits)</td><td rowspan="3">1</td><td rowspan="3">Probability</td><td>Axioms of probability</td><td>4.5</td><td>7</td></tr>
<tr><td>Conditional probability and independence</td><td>3</td><td>–</td></tr>
<tr><td>Random variables and their distributions</td><td>3</td><td>–</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Random Variables</td><td>Probability distributions, joint distributions, and expected values</td><td>2</td><td>7</td></tr>
<tr><td>Important types of random variables</td><td>3</td><td>–</td></tr>
<tr><td>Limit Theorems</td><td>2.5</td><td>–</td></tr>
<tr><td>Functions of Random Variables</td><td>3</td><td>–</td></tr>
<tr><td colspan="3">Total</td><td>21</td><td>14</td></tr>
<tr><td colspan="5">References:</td></tr>
<tr><td colspan="5">Walpole, R.E., Myers, R.H., Myers, S.L., and Ye, K., 2012. Probability & Statistics for Engineers & Scientists, 9th edition. Boston: Prentice Hall.</td></tr>
<tr><td colspan="5">Gravetter, F.J., and Wallnau, L.B., 2017. Statistics for the Behavioral Sciences, USA: Cengage Learning.</td></tr>
<tr><td rowspan="11">Ordinary Differential Equations (ODE) (4 Credits)</td><td rowspan="8">1</td><td rowspan="8">First-Order Ordinary Differential Equations</td><td>Introduction and basic concepts of ODE</td><td>1</td><td>11</td></tr>
<tr><td>Basic solution concepts</td><td>0.5</td><td>–</td></tr>
<tr><td>Solution using direct integration</td><td>0.5</td><td>–</td></tr>
<tr><td>Homogeneous solutions</td><td>0.5</td><td>–</td></tr>
<tr><td>Homogeneous ODE</td><td>1.5</td><td>–</td></tr>
<tr><td>Separation of variables</td><td>1</td><td>–</td></tr>
<tr><td>Exact and Non-exact ODE</td><td>3</td><td>–</td></tr>
<tr><td>Bernoulli’s Equation and Lagrange’s Method</td><td>3</td><td>–</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Second-Order and Higher-Order ODE</td><td>Basic concepts of second-order and higher-order ODE</td><td>1</td><td>10</td></tr>
<tr><td>Method of undetermined coefficients</td><td>2</td><td>–</td></tr>
<tr><td>Method of variation of parameters</td><td>1</td><td>–</td></tr>
</table>

			Differential operator method	4	–
			Euler-Cauchy ODE	2	–
	3	Laplace Transform	Laplace transform and its inverse	5	7
			Applications of ODE	2	–
	Total			28	28
	References:				
	Ross L., Shepley., 1984. *Differential Equations*, 3rd edition. John Wiley & Sons, Singapore.				
	Ayres, Frank Jr., Ault J.C., 1992. *Theory and Problems of Differential Equations*, Schaum's Outline Series, 3rd printing. Jakarta: Erlangga.				
	Finizio, N., G. Ladas., 1988. *Ordinary Differential Equations with Modern Applications* (translated), 2nd edition. Jakarta: Erlangga.				
	Kreyzig, E., 1988. *Advanced Engineering Mathematics*, 6th edition. John Wiley & Sons. New York, Chichester, Brisbane, Toronto, Singapore.				
Linear Algebra (4 Credits)	1	Vector Space Theory	Vector spaces	3	10
			Subspaces	–	–
			Linear independence and spanning sets	5	–
			Basis and dimension	–	–
			Row space, column space, rank, and nullity	2	–
	2	Linear Transformations & Matrices	Linear transformations	4	9
			Matrix representation of linear transformations	5	–
	3	Inner Product Spaces	Inner products	3	9
			Orthogonal and orthonormal sets	1	–
			Orthonormal basis, projection, and Gram-Schmidt process	3	–
			QR decomposition	2	–
	Total			28	28
	References:				
	Anton, H. & Rorres, C., 2004. *Elementary Linear Algebra: Applications Version*. Jakarta: Erlangga.				
	Ayres, F., 1984. *Theory and Problems of Matrices*. Jakarta: Erlangga.				
	Leon, S., 2001. *Linear Algebra and Its Applications*. Jakarta: Erlangga.				

Mathematical Statistics (3 Credits)	1	Random Variables and Distributions	Discrete and continuous random variables	4	8
			Expectations and moment generating functions (MGF)	–	–
			Discrete and continuous probability distributions	6	–
			Joint distributions, independence, conditional distributions	2	–
	2	Properties and Functions of Random Variables	Random sampling	1	6
			Correlation and conditional expectation	2	–
			Cumulative distribution function (CDF), transformation methods, sum of random variables	4	–
			Order statistics	2	–
	Total			21	14
	References:				
	Walpole, R.E., Myers, R.H., Myers, S.L., and Ye, K., 2012. *Probability & Statistics for Engineers & Scientists*, 9th edition. Boston: Prentice Hall.				
	Hogg, R.V., and Craigh, A.T., 2014. *Introduction to Mathematical Statistics*, 7th edition. USA: Pearson.				
Mathematical Research Methods (2 Credits)	1	Research Process & Guidelines	Research steps and topic selection	7	7
			Problem identification, formulation, objectives, literature review	–	–
			Methodology, flowchart, theoretical foundation	–	–
			Data analysis and discussion	–	–
			Conclusion drawing	–	–
	2	Research Project	Writing and presenting scientific papers	7	7
	Total			14	14
Introduction to Real Analysis I (4 Credits)	1	Real Number System	Axioms of real numbers	3	10
			Order	1	–
			Absolute value	2	–
			Completeness of real numbers	4	–
	2	Sequences	Definition	1	8
			Convergence	4	–
			Cauchy’s criterion	2	–

			Divergent sequences	1	–
	3	Series	Definition	1	10
			Number series	2	–
			Non-negative series	2	–
			Convergence tests	2	–
			Alternating series	1	–
			Power series	2	–
	Total			28	28
	References:				
	Bartle, R.G. & Sherbert, D.R., 2000. *Introduction to Real Analysis*, 4th edition. USA: John Wiley & Sons.				
	Darmawijaya, S., 2006. *Introduction to Real Analysis*. Yogyakarta: Department of Mathematics, FMIPA UGM.				
Partial Differential Equations (PDE) (4 Credits)	1	First-Order PDE	Basic concepts of PDE	4	13
			Solution concepts and PDE formation	4	–
			Basic solution methods	5	–
	2	Second-Order PDE	PDE with constant coefficients	4	8
			PDE with variable coefficients	4	–
	3	Boundary & Initial Value Problems	Basic concepts and solutions	4	7
			Homogeneous and non-homogeneous PDE	–	–
			Parabolic PDE	1	–
			Elliptic PDE	1	–
			Hyperbolic PDE	1	–
	Total			28	28
	References:				
	Raji, A.Wahid & Mohamad, M. Nor, 2008. *Differential Equations for Engineering Students*. Comtech Marketing Sdn. Bhd, Malaysia.				
	Ross, S.L., 1984. *Differential Equations*, 3rd edition. John Wiley & Sons, New York.				
	Ayres, F., Ault J.C., 1992. *Theory and Problems of Differential Equations*, Schaum's Outline Series. Jakarta: Erlangga.				
	Folland, G.B., 1996. *Introduction to Partial Differential Equations*, 2nd edition. Princeton University Press.				

<table>
<tr><td rowspan="2"></td><td colspan="5">Kevorkian, J., 2000. Partial Differential Equations: Analytical Solution Techniques, 2nd edition. Springer-Verlag.</td></tr>
<tr><td colspan="5">Polyanin, A., Zaitsev, V., & Moussiaux, A., 2001. Handbook of First-Order Partial Differential Equations. New York: Gordon and Breach.</td></tr>
<tr><td rowspan="11">Operations Research (2 Credits)</td><td rowspan="2">1</td><td rowspan="2">Transportation</td><td>Basic transportation problems</td><td>2</td><td>7</td></tr>
<tr><td>Transshipment cases</td><td>5</td><td>–</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Networking</td><td>Assignment problems</td><td>2</td><td>7</td></tr>
<tr><td>Networking: Shortest path, tree diagram, PERT, and CPM</td><td>5</td><td>–</td></tr>
<tr><td colspan="3">Total</td><td>14</td><td>14</td></tr>
<tr><td colspan="5">References:</td></tr>
<tr><td colspan="5">Taha, H., 1997. Operations Research. Translated by Daniel Wirajaya. Jakarta: Binarupa Aksara.</td></tr>
<tr><td colspan="5">Supranto, J., 2006. Operations Research for Decision Making, Revised Edition. Jakarta: UI Press.</td></tr>
<tr><td colspan="5">Taylor III, B.W., 2002. Introduction to Management Science, 7th edition. Prentice Hall International, Inc.</td></tr>
<tr><td colspan="5">Siswanto, 2007. Operations Research. Jakarta: Erlangga.</td></tr>
<tr><td rowspan="13">Introduction to Actuarial and Financial Mathematics (3 Credits)</td><td rowspan="5">1</td><td rowspan="5">Insurance Theory & Interest</td><td>Types of insurance</td><td>1</td><td>6</td></tr>
<tr><td>Life tables</td><td>2</td><td>–</td></tr>
<tr><td>Survival functions</td><td>2</td><td>–</td></tr>
<tr><td>Simple interest</td><td>2</td><td>–</td></tr>
<tr><td>Compound interest</td><td>2</td><td>–</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Portfolio Theory</td><td>Annuities</td><td>4</td><td>8</td></tr>
<tr><td>Portfolio</td><td>3</td><td>–</td></tr>
<tr><td>Introduction to stochastic processes</td><td>5</td><td>–</td></tr>
<tr><td colspan="3">Total</td><td>21</td><td>14</td></tr>
<tr><td colspan="5">References:</td></tr>
<tr><td colspan="5">Bowers, Newton L., et al., 1997. Actuarial Mathematics, 2nd edition. Schaumburg, Illinois: The Society of Actuaries.</td></tr>
<tr><td colspan="5">Futami, Takashi., 1993. Life Insurance Mathematics, Volume 1. Translated by Gatot Herliyanto. Tokyo: OLICD Centre.</td></tr>
<tr><td colspan="5">Sidi, Pramono & Malau, R. Alam, 2006. Financial Mathematics. Jakarta: Universitas Terbuka.</td></tr>
</table>

	Sembiring, R.K., 1986. *Insurance I*. Jakarta: Karunika UT.				
Introduction to Computational Mathematics (2 Credits)	1	Introduction to Mathematical Software	Software for solving calculus problems	6	6
	2	Application of Mathematical Software	Solving linear algebra, ODE, and PDE problems using mathematical software	8	8
	Total			14	14
	References:				
	Abel, M.L. & Braselton, J.B., 2005. *Maple by Example*, 3rd edition. Elsevier Academic Press, USA.				
Algorithms and Programming (3 Credits)	1	Basic Programming Concepts	Programming basics and program structure	2	4
			Pseudocode	2	–
			Flowchart	2	–
	2	High-Level Programming Language	Introduction to software	0.5	5
			Structure, data types, variables, constants	1	–
			Operators and standard functions	1.5	–
			Conditional statements	4.5	–
	3	Advanced High-Level Programming	Loop structures	3	5
			Procedures and functions	4.5	–
	Total			21	14
	References:				
	Baudin, M., 2010. *Introduction to Scilab*. Scilab Consortium-Digiteo, France.				
	Campbell, S.L., Chancelier, J-P., & Nikoukhah, R., 2006. *Modeling and Simulation in Scilab/Scicos*. Springer, New York.				
	Sukamto, R.A., 2018. *Logic and Basic Programming*. Modula Publisher, Bandung.				
Introduction to Real Analysis II (4 Credits)	1	Limits and Continuity	Definition of limit functions	2	9
			Limit theorems	3	–
			Function continuity	2	–
			Uniform continuity	1	–

			Lipschitz functions	1	–
	2	Derivatives of Functions	Definition	2	9
			Mean value theorem	2	–
			L'Hôpital's rule	2	–
			Taylor’s theorem	3	–
	3	Riemann Integration	Riemann integral and its properties	5	10
			Fundamental theorem of calculus	5	–
	Total			28	28
	References:				
	Bartle, R.G. & Sherbert, D.R., 2000. *Introduction to Real Analysis*, 4th edition. USA: John Wiley & Sons.				
	Darmawijaya, S., 2006. *Introduction to Real Analysis*. Yogyakarta: Department of Mathematics, FMIPA UGM.				
Complex Variable Functions (4 Credits)	1	Complex Numbers	Complex number system	5	9
			Mapping of complex functions, elementary functions	4	–
	2	Limits, Continuity & Derivatives	Limits and continuity of complex functions	4	10
			Complex function derivatives	2	–
			Analytic functions	4	–
	3	Complex Integration	Complex integrals, Cauchy’s theorem, annulus	4	9
			Complex sequences and series	3	–
			Residue theorem	2	–
	Total			28	28
	References:				
	Brown, R.J & Churchill, R.V., 2009. *Complex Variables and Applications*, 8th edition. USA: McGraw-Hill.				
	Marsden, J.E., 1999. *Basic Complex Analysis*. California State University.				
	Volkovyskii, L.I., Lunts, G.L., & Aramanovich, I.G., translated by J.Berry, edited by T. Kovari, 1991. *A* Collection *of Problems on Complex Analysis*. New York: Dover Publications.				
Differential Equation Modelling (3 Credits)	1	Introduction	Introduction to mathematical modelling using differential equations (ODE/PDE)	1.5	8
			Differential equation modelling in physics	–	–

			Formation of mathematical models	1.5	–
			Mass-spring system and model validation	3	–
			Pendulum system	1.5	–
			Fluid mechanics	–	–
			Ideal fluid	1.5	–
			Potential flow	3	–
	2	Differential Equation Modelling in Biology, Social Sciences & Economics	Population growth models (Leslie matrix, interaction of two populations)	6	6
			Social-economic models	1.5	–
	3	Poster Session	Literature review or case study assignment on a differential equation model	1.5	–
	Total			21	14
	References:				
	Ansorge, R., 2003. *Mathematical Models of Fluid Dynamics: Modelling, Theory, and Basic Numerical Facts – An Introduction*. Wiley-VCH GmbH & Co. KGaA, Weinheim, Berlin.				
Numerical Methods (3 Credits)	1	Polynomial Taylor, Nonlinear Equation Roots, & Interpolation	Error analysis	3	7
			Closed-form methods	1.5	–
			Open-form methods	1.5	–
			Polynomial interpolation	1.5	–
			Lagrange interpolation	1.5	–
			Newton interpolation	1.5	–
	2	Numerical Differentiation, Integration & Differential Equations	Finite difference methods (forward, backward, central)	3	7
			Richardson extrapolation	1.5	–
			Trapezoidal rule	1.5	–
			Simpson's rule	1.5	–
			Euler's method	1.5	–
			Runge-Kutta method	1.5	–
	Total			21	14

	References:				
	Munir, R., 2003. *Numerical Methods*, 3rd edition. Informatika, Bandung.				
	Chapra, S.C., 2012. *Applied Numerical Methods with MATLAB for Engineers and Scientists*, 3rd edition. McGraw-Hill, New York.				
Special Assignment I (2 Credits)	1	Teaching Assistantship	Acting as a teaching assistant in the Mathematics Study Programme	70-85 hours per semester	
West Kalimantan in Mathematics (3 Credits)	1	Theme I	Case studies on mathematical theory applications in West Kalimantan	4.5	3
		Theme II	Case studies on mathematical theory applications in West Kalimantan	4.5	3
		Project and Poster Session	Literature review assignments for Theme I & II	1.5	1
	2	Theme III	Case studies on mathematical theory applications in West Kalimantan	4.5	3
		Theme IV	Case studies on mathematical theory applications in West Kalimantan	4.5	3
		Project and Poster Session	Literature review assignments for Theme III & IV	1.5	1
	Total			21	14
Special Assignment II (2 Credits)	1	Acting as a teaching assistant in the Mathematics Study Programme		70–85 hours per semester	
Community Service Programme (KKM) / Internship (KP) (2 Credits)	1	Students can choose between Community Service Programme (KKM) or Internship (KP)		30 working days	
Seminar (4 Credits)	1	Students present their thesis-related material, covering at least 80% of their research findings		5–8 advisory sessions per supervisor	
Thesis (6 Credits)	1	Students present their research findings in their thesis as an academic article		5–8 advisory sessions per supervisor	

Table 5.11: Syllabus of Elective Courses in the Mathematics Study Programme

<table>
<tr><th>Course</th><th>Module</th><th>Main Topic</th><th>Subtopic</th><th>Duration (100 minutes)</th><th>In-person Learning Sessions</th></tr>
<tr><td rowspan="13">Number Theory (2 Credits)</td><td rowspan="4">1</td><td rowspan="4">Divisibility</td><td>Equivalence relations</td><td>1</td><td>7</td></tr>
<tr><td>Divisibility relations</td><td>2</td><td>–</td></tr>
<tr><td>GCD and LCM</td><td>2</td><td>–</td></tr>
<tr><td>Prime numbers & unique factorization</td><td>2</td><td>–</td></tr>
<tr><td rowspan="5">2</td><td rowspan="5">Congruences</td><td>Definition and properties of congruence</td><td>1</td><td>7</td></tr>
<tr><td>Congruence applications</td><td>1</td><td>–</td></tr>
<tr><td>Linear congruences</td><td>1</td><td>–</td></tr>
<tr><td>Fermat & Wilson’s theorem</td><td>2</td><td>–</td></tr>
<tr><td>Congruence solutions</td><td>2</td><td>–</td></tr>
<tr><td colspan="3">Total</td><td>14</td><td>14</td></tr>
<tr><td colspan="5">References:</td></tr>
<tr><td colspan="5">Sukirman, 2004. Introduction to Number Theory, Volume 1. Yogyakarta: UNY.</td></tr>
<tr><td colspan="5">Weil, A., 1974. Basic Number Theory. Berlin: Springer Verlag.</td></tr>
<tr><td rowspan="9">Fuzzy Logic (3 Credits)</td><td rowspan="3">1</td><td rowspan="3">Fuzzy Sets</td><td>Fuzzy Sets</td><td>3</td><td>8</td></tr>
<tr><td>Membership Functions</td><td>4</td><td>–</td></tr>
<tr><td>Fuzzy Propositions</td><td>5</td><td>–</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Fuzzy Inference Systems</td><td>Tsukamoto Method</td><td>3</td><td>6</td></tr>
<tr><td>Mamdani Method</td><td>3</td><td>–</td></tr>
<tr><td>Sugeno Method</td><td>3</td><td>–</td></tr>
<tr><td colspan="3">Total</td><td>14</td><td>14</td></tr>
<tr><td colspan="5">References:</td></tr>
<tr><td colspan="5">Kusumadewi, S., Purnomo, H., 2010. Applications of Fuzzy Logic for Decision Support. Graha Ilmu, Yogyakarta.</td></tr>
<tr><td rowspan="4">Set Theory (2 Credits)</td><td rowspan="4">1</td><td rowspan="4">Infinite Sets</td><td>Bijective Functions</td><td>2</td><td>8</td></tr>
<tr><td>Equivalence of two sets (inductive & reflexive)</td><td>2</td><td>–</td></tr>
<tr><td>Denumerable and non-denumerable sets</td><td>2</td><td>–</td></tr>
<tr><td>Diagonal Method</td><td>1</td><td>–</td></tr>
</table>

			Bernstein-Schroder Theorem	1	–
	2	Cardinality of Infinite Sets	Cardinality	2	6
			Ordering relations of cardinal numbers	2	–
			Cantor's Theorem	2	–
	Total			14	14
	References:				
	Devlin, K., 2004. *Sets, Functions, and Logic: An Introduction to Abstract Mathematics*, 3rd edition. Chapman and Hall, London.				
	Stoll, R.R., 1963. *Set Theory and Logic*. Eurasia Publishing House (PUT) LTD, New Delhi.				
Regression Analysis (3 Credits)	1	Simple Linear, Correlation & Multiple Regression	Relationship between dependent and independent variables	9	6
			Simple Linear Regression Analysis	–	–
			Coefficient of Determination & Variance Sources	–	–
			Correlation Coefficient	–	–
			Multiple Regression: Model and Assumptions	–	–
	2	Best Model Selection & Dummy Variables	Backward & Forward Regression	12	8
			Step-Wise Regression	–	–
			Software Introduction	–	–
			Model Selection	–	–
			Dummy Variables	–	–
	Total			21	14
	References:				
	Kusnandar, D., 2004. *Statistical Methods and Applications with Minitab and Excel*. Madyan Press, Yogyakarta.				
	Kutner et al., 2005. *Applied Linear Statistical Models*, 5th edition. McGraw-Hill/Irwin, New York.				
	Hardy, M.A., 1993. *Regression with Dummy Variables*, Quantitative Applications in the Social Sciences Series. Sage Publications, Newbury Park.				
	Rosadi, D., 1991. *Econometrics and Time Series Analysis with EViews*. Penerbit Andi, Yogyakarta.				
	Sembiring, R.K., 2003. *Regression Analysis*, 2nd edition. ITB, Bandung.				
	Gujarati, D.N., 2004. *Basic Econometrics*, 4th edition. McGraw-Hill.				
	Walpole, R.E., 1992. *Introduction to Statistics*, 3rd edition. Translated by Ir. Bambang Sumantri. PT. Gramedia, Jakarta.				

Database Systems (3 Credits)	1	Fundamentals of Database Systems	Definition, database management, data independence, database architecture	10.5	7
	2	Data Security & Integrity	Data models, data security and integrity, distributed databases	10.5	7
	Total			21	14
	References:				
	Elmasri, R., & Navathe, S.B., 2011. *Fundamentals of Database Systems*, 6th ed. Addison-Wesley.				
	Klemens, B., 2009. *Modeling with Data: Tools and Techniques for Scientific Computing*. Princeton University Press.				
Transformational Geometry (2 Credits)	1	Isometry in $\mathbb{R}^2$	Introduction to metrics, transformations, composition, and inverse transformations	1	7
			Isometries: translation, rotation, reflection, glide reflection	2	–
			Symmetry groups	4	–
	2	Isometry in $\mathbb{R}^n$	Orthogonal matrices	1	7
			Transformation matrices for translation, rotation, and reflection	1	–
			QR decomposition using Householder reflections	2	–
			QR decomposition using Givens rotations	3	–
	Total			14	14
	References:				
	Susanta, B., 1990. *Transformational Geometry*. FMIPA Universitas Gadjah Mada, Yogyakarta.				
	Rawuh, 1992. *Transformational Geometry*. Department of Education, Bandung.				
	Eccles, F.M., 1971. *An Introduction to Transformational Geometry*. Addison Wesley Publishing Company, Inc.				
	Jurgensen, R.C., 1983. *Geometry, Teacher's Edition*. Houghton Mifflin Company.				
	Martin, G.E., 1982. *Transformational Geometry: An Introduction to Geometry*. Springer-Verlag, New York.				
Introduction to Semigroups (2 Credits)	1	Fundamentals of Semigroups	Definition of semigroups, monoids	2	7
			Subsemigroups	1	–
			Ordered semigroups	2	–
			Semigroup homomorphism and quotient semigroups	2	–

<table>
<tr><td rowspan="6"></td><td rowspan="3">2</td><td rowspan="3">Green’s Relations</td><td>Green’s equivalence</td><td>1</td><td>7</td></tr>
<tr><td>Types of elements in semigroups: regular, idempotent, inverse, generalized inverse</td><td>3</td><td>–</td></tr>
<tr><td>Regular semigroups, inverse semigroups, orthodox semigroups</td><td>3</td><td>–</td></tr>
<tr><td colspan="3">Total</td><td>14</td><td>14</td></tr>
<tr><td colspan="5">References:
Howie, J.M., 1995. Fundamentals of Semigroup Theory. Clarendon Press, Oxford.</td></tr>
<tr><td colspan="5">Lallement, G., 1979. Semigroups and Combinatorial Applications. John Wiley & Sons, New York.</td></tr>
<tr><td rowspan="12">Finite Group Theory (2 Credits)</td><td rowspan="3">1</td><td rowspan="3">Classes of Finite Groups</td><td>Introduction to groups, finite groups, subgroups, quotient groups, and group homomorphism</td><td>2</td><td>7</td></tr>
<tr><td>Normalizers, centralizers, and commutators</td><td>1</td><td>–</td></tr>
<tr><td>Permutation groups, alternating groups, dihedral groups</td><td>4</td><td>–</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Sylow Theorems</td><td>Jordan–Hölder Theorem</td><td>1</td><td>7</td></tr>
<tr><td>Group actions</td><td>2</td><td>–</td></tr>
<tr><td>Sylow subgroups and Sylow’s Theorems</td><td>2</td><td>–</td></tr>
<tr><td>Applications of Sylow’s Theorems</td><td>2</td><td>–</td></tr>
<tr><td colspan="3">Total</td><td>14</td><td>14</td></tr>
<tr><td colspan="5">References:</td></tr>
<tr><td colspan="5">Ledermann, W., 1984. Introduction to the Theory of Finite Groups. Interscience Publishers.</td></tr>
<tr><td colspan="5">Fraleigh, J.B., 1989. A First Course in Abstract Algebra, 4th edition. Addison-Wesley.</td></tr>
<tr><td colspan="5">Dummit, D.S., & Foote, R.M., 2004. Abstract Algebra, 3rd edition. John Wiley & Sons, New York.</td></tr>
<tr><td rowspan="9">Vector Analysis (2 Credits)</td><td rowspan="4">1</td><td rowspan="4">Fundamentals & Vector Differentiation</td><td>Vectors and scalars</td><td>1</td><td>8</td></tr>
<tr><td>Dot and cross products</td><td>1</td><td>–</td></tr>
<tr><td>Vector differentiation</td><td>3</td><td>–</td></tr>
<tr><td>Gradient, divergence, and curl</td><td>3</td><td>–</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Vector Integration</td><td>Vector integration</td><td>4</td><td>8</td></tr>
<tr><td>Divergence theorem, Stokes' theorem, and related integral theorems</td><td>4</td><td>–</td></tr>
<tr><td colspan="3">Total</td><td>16</td><td>16</td></tr>
<tr><td colspan="5">References:</td></tr>
<tr><td colspan="5">Spigel, M., 1994. Vector Analysis. Translated by Hans J. Wospakrik, Erlangga, Jakarta.</td></tr>
</table>

	O'Neil, P.V., 1987. *Advanced Engineering Mathematics*. Greg Hubit Bookworks, Belmont, California.				
Sampling Methods (3 Credits)	1	Random Sampling	Introduction	1	6
			Sampling types	3	–
			Simple random sampling	2.5	–
			Systematic random sampling	2.5	–
	2	Multistage Sampling	Stratified sampling	3	8
			Cluster sampling	3	–
			Multistage sampling methods	2	–
			Survey questionnaire	4	–
	Total			21	14
	References:				
	Scheaffer, R.L., 1986. *Elementary Survey Sampling*. PWS Publishers.				
Multivariate Analysis (4 Credits)	1	Principal Component Analysis	Terminology	1	10
			Review of matrices, eigenvalues, eigenvectors	1	–
			Data screening	2	–
			Validity and reliability testing	2	–
			Principal Component Analysis	4	–
	2	Factor Analysis	Factor Analysis	4	18
			Cluster Analysis	4	–
			Discriminant Analysis	4	–
			Multidimensional scaling analysis	4	–
			MANOVA	2	–
	Total			28	28
	References:				
	Latan, H., & Temalagi, S., *Multivariate Analysis: Techniques and Applications using IBM SPSS 20.0*. Alfabeta, Bandung.				
	Hardle, W. & Simar, L., 2003. *Applied Multivariate Statistical Analysis*. Method and Data Technologies.				
	Johnson, R.A., & Wichern, D.W., 2013. *Applied Multivariate Statistical Analysis*, 6th ed. Pearson Education.				
Nonparametric Statistics (2 Credits)	1	Comparative Hypothesis Testing	Research & parametric statistics	1	8
			Descriptive hypothesis testing (k samples)	1	–
			Comparative hypothesis testing for paired and independent samples	6	–

	2	Associative Hypothesis Testing	Associative hypothesis testing	6	6
	Total			14	14
	References:				
	Sugiyono, 2007. *Nonparametric Statistics for Research*. Alfabeta, Bandung.				
	Djarwanto, 1997. *Nonparametric Statistics*. BPFE, Yogyakarta.				
	Siegel, S., 1997. *Nonparametric Statistics for Social Sciences* (translated). Gramedia, Jakarta.				
Applications of Linear Algebra (2 Credits)	1	Matrix Diagonalization	Diagonalization	3	6
			Orthogonal diagonalization	3	–
	2	Applications of Linear Algebra	Applications in geometry	2	8
			Applications in physics	2	–
			Applications in economics	2	–
			Applications in biology and forestry	2	–
	Total			14	14
	References:				
	Anton, H., & Rorres, C., 2013. *Elementary Linear Algebra: Application Version*. Wiley, Canada.				
Dynamic Systems (3 Credits)	1	Differential Equation Systems	Introduction: Review of differential equations	1.5	6
			Types of linear systems	3	–
			Solutions of differential equation systems	3	–
			Linearization	1.5	–
	2	System Stability	Definition and theorem of system stability	2	8
			Routh-Hurwitz criterion	3	–
			Stability interval	3	–
			Phase portraits	4	–
	Total			21	14
	References:				
	Olsder, G.J., Maks, J.G., & Jeltsema, D., 2011. *Mathematical Systems Theory*, 4th edition, VSSD.				
	Chen, C.T., 2012. *Linear Systems Theory and Design*, 4th edition, Oxford University Press.				
Experimental Design (3 Credits)	1	Randomized Design	Completely randomized design	10.5	7
			Comparison of treatment means	–	–
			Randomized block design	–	–

	2	Continuous Stochastic Models	Factorial design	10.5	7
			Split plot design	–	–
			Practical experiments	–	–
	Total			21	14
	References:				
	Montgomery, D.C., 2005. *Design and Analysis of Experiments*, 6th edition. John Wiley & Sons, Inc.				
	Gasper, V., 1991. *Analytical Techniques in Experimental Research*. Tarsito Publisher, Bandung.				
Introduction to Stochastic Processes (2 Credits)	1	Discrete Stochastic Models	Introduction to stochastic processes	4	7
			Markov chains with discrete parameters	3	–
	2	Continuous Stochastic Models	Poisson process	3	7
			Markov chains with continuous parameters	2	–
			Renewal process	2	–
	Total			14	14
	References:				
	Ross, S.M., 2007. *Introduction to Probability Models*, 9th edition. Elsevier, USA.				
Time Series Methods (3 Credits)	1	Forecasting Problems & Exponential Smoothing	Definition, properties, and applications	1	7
			Decomposition method	2	–
			Exponential smoothing	3	–
			Exponential smoothing for seasonal data	4.5	–
	2	ARIMA Models	Stationary model	5.5	7
			Non-stationary model	5	–
	Total			21	14
	References:				
	Cryer, J.D., & Chan, K.S., 2008. *Time Series Analysis: With Applications in R*, 2nd edition. Springer Science & Business Media, USA.				
	Wei, W.W.S., 2006. *Time Series Analysis: Univariate and Multivariate Methods*, 2nd edition. Pearson Education, Boston.				

Mathematical Rivalry (2 Credits)	1	University Mathematics Competitions	Topics from mathematical competitions	14	14
Introduction to Topology (2 Credits)	1	Topological Spaces	Definition of topology and special topologies	3	7
			Subspaces	1	–
			Bases and sub-bases	1	–
			Point relations within a set	2	–
	2	Continuity & Separation Axioms	Continuity of functions & separation axioms	7	7
	Total			14	14
	References:				
	Lipshutz, S., 1965. *Schaum's Outline of Theory and Problems of General Topology*. McGraw-Hill, New York.				
	Munkres, J.R., 2000. *Topology*, 2nd edition. Prentice Hall, London.				
	Patty, C.W., 1993. *Foundations of Topology*. International Thomson Publishing, London.				
Introduction to Metric Spaces (2 Credits)	1	Basic Concepts of Metric Spaces	Definition of metric spaces	1	5
			Point positioning in a set	4	–
	2	Sequences	Definition	1	9
			Convergence	3	–
			Cauchy's criterion	2	–
			Compactness	3	–
	Total			14	14
	References:				
	Darmawijaya, S., 2006. *Introduction to Abstract Analysis*. Yogyakarta: Department of Mathematics, FMIPA UGM.				
	Kreyszig, E., 1978. *Introductory Functional Analysis with Applications*. John Wiley & Sons, New York.				
Mathematical Methods (3 Credits)	1	Fourier Series	Fourier series	3	9
			Double Fourier series	2	–
			Parseval's identity	2	–
			Harmonics	1	–
		Integral Transformations	Fourier integral	4	–
			Gamma and Beta functions	1.5	–

	2	Applications of Fourier Series	Heat propagation model in iron rods	1.5	5
			Heat propagation model in parallelograms	1.5	–
			Boundary and initial condition problems	4.5	–
	Total			21	14
	References:				
	Spiegel, R.M., & Imran, A., 1986. *Fourier Analysis: Schaum's Outline Series*. Erlangga, Jakarta.				
	Spiegel, R.M., Silaban, P., & Hana, W., 1985. *Laplace Transformations: Theory and Problems*. Schaum's Outline Series. Erlangga, Jakarta.				
	Moetiarsanto, M., 1983. *Problems and Solutions in Laplace Transformations*. Ananda, Yogyakarta.				
Introduction to Optimization Theory (3 Credits)	1	Euclidean Space	Introduction and NLP application cases	1.5	7
			Convex sets	3	–
			Convex functions	3	–
			Quadratic forms	3	–
	2	Function Extremes	Local and global extrema	1.5	7
			Unconstrained extrema	3	–
			Constrained extrema	6	–
	Total			21	14
	References:				
	Bazara, M.S., Sekrali, H.D., & Shetty, C.M., 1990. *Learning Theory and Algorithms*. John Wiley & Sons, New York.				
	Mital, K.V., *Optimal Methods in Operations Research and Analysis*. Wiley, New York.				
	Winston, W., 1994. *Operations Research: Applications and Algorithms*. Duxbury Press.				
	Taha, H.A., 1996. *Operations Research: An Introduction*, Vol. 2. Binarupa Aksara, Jakarta.				
Introduction to Functional Analysis (3 Credits)	1	Banach & Hilbert Spaces	Basic concepts of Banach space	4	8
			Hilbert space	3	–
			Orthonormal basis	3	–
			Orthogonal complement	2	–
	2	Continuous Linear Functions	Continuous linear function spaces	4	6
			Types of continuous linear functions	3	–
			Banach-Steinhaus theorem and reflexive spaces	2	–
	Total			21	14
	References:				

	Darmawijaya, S., 2006. *Introduction to Abstract Analysis*. Yogyakarta: Department of Mathematics, FMIPA UGM.				
	Kreyszig, E., 1978. *Introductory Functional Analysis with Applications*. John Wiley & Sons, New York.				
Selected Topics (2 Credits)	1	Recent Developments in Mathematics	Latest advancements in mathematical sciences and their applications	14	14

V.2 Statistics Study Program

1. Introduction

The Statistics Study Program (PS Statistika) at the Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Tanjungpura (UNTAN) was established in 2013 under the mandate of the Directorate General of Higher Education (DIKTI). The program was officially permitted to operate under DIKTI Decree No. 630/E.E2/DT/2013, issued on 10 July 2013.
Currently, PS Statistika UNTAN is accredited B based on the National Accreditation Board for Higher Education (BAN-PT) Decree No. 3340/SK/BAN-PT/Akred/S/XII/2018, issued on 19 December 2018.
Since its establishment, PS Statistika has implemented various curricula:

1. 2011 Curriculum – Competency-Based Curriculum (KBK), aligned with Government Regulation No. 17/2010.
2. 2015 Curriculum – A refinement of KBK, incorporating KKNI and SN-Dikti standards.
3. 2020 Curriculum – Further development of the 2015 curriculum, integrating the Merdeka Belajar (Independent Learning) framework as mandated by Ministerial Regulation No. 3/2020 on National Higher Education Standards, Article 18.

The 2020 Curriculum was officially implemented in the odd semester of the 2020/2021 academic year.

2. Vision and Mission

2.1. Vision
"To be a leading Statistics Study Program in Borneo, excelling in education and research in statistics and its applications, producing graduates who are competitive and innovative."

2.2. Mission
The Statistics Study Program aims to:

1. Provide creative and innovative education, ensuring graduates possess strong competencies in statistics and its applications.
2. Conduct research and community service that leverage statistical methods for local resource development.
3. Establish collaborations with national and international institutions to enhance education, research, and public engagement.

2.3. Objectives
The program's objectives are to:

1. Train graduates with expertise in statistics, computational techniques, and applied statistics for various industries.
2. Produce high-quality scientific publications that contribute to statistical advancements and societal benefits.
3. Implement professional governance for academic and administrative operations.
4. Strengthen partnerships with institutions that support the development of education, research, and community service in statistics and its applications.

3. Graduate Profiles

The Profile of the Statistics Study Program (PS Statistika) at UNTAN is Business and Industrial Statistics.
The areas of specialization offered in the program include:

- Business and Financial Statistics
- Social and Industrial Statistics
- Environmental and Disaster Statistics

Referring to the FORSTAT Document, graduate profiles from the Statistics Study Program are grouped into two major categories:

- **Academic Professionals** – individuals with higher education who work as lecturers or researchers at a university or higher education institution
- **Statistical Practitioners** – professionals who apply statistical methods in their work. Examples include data analysts, research consultants, actuaries, data managers, investment managers, and quality control managers

4. Learning Outcomes

Learning Outcomes of the Undergraduate Statistics Study Program (PS Statistika) are formulated by referring to the following regulations:

1. Regulation of the Minister of Education and Culture No. 3 of 2020 concerning National Standards for Higher Education
2. FORSTAT Document (2019) regarding the formulation of revised learning outcomes and curriculum structure for the Undergraduate Statistics Program

Based on these regulations, graduate competency standards have been established as the minimum criteria encompassing: attitudes, general skills, domain-specific knowledge, and specialized skills, all of which are expressed in the graduate learning outcomes. The learning outcomes of the Statistics Study Program are classified by FORSTAT and presented in Table 5.13. These competencies are grouped into four aspects:

a. Attitudes and Values

1. Devout to God Almighty and able to demonstrate religious conduct (S1)
2. Upholding human values in performing duties based on religion, morality, and ethics (S2)
3. Contributing to the improvement of societal quality, nation-building, and civilization based on Pancasila (S3)
4. Acting as a proud and patriotic citizen, with nationalistic spirit and responsibility to the nation and state (S4)
5. Respecting cultural diversity, perspectives, religions, and beliefs, as well as others' original opinions and findings (S5)
6. Collaborating and demonstrating social sensitivity and concern for society and the environment (S6)
7. Obeying laws and demonstrating discipline in community and national life (S7)
8. Internalizing academic values, norms, and ethics (S8)
9. Taking responsibility independently for work related to their area of expertise (S9)
10. Internalizing a spirit of independence, perseverance, and entrepreneurship (S10)

b. General Skills

1. Able to apply logical, critical, systematic, and innovative thinking in developing or implementing science and/or technology within their field of expertise
2. Able to demonstrate independent, high-quality, and measurable performance
3. Able to evaluate the implications of scientific, technological, or artistic development/implementation based on scientific principles and ethics, producing solutions, ideas, designs, or artistic critiques; and presenting scientific descriptions of the results in the form of a thesis or final report uploaded to the university portal
4. Capable of composing a scientific description of the research mentioned above as a thesis or final report and uploading it to the university website
5. Able to make appropriate decisions for solving problems in their field based on data and information analysis
6. Able to maintain and expand professional networks with advisors, colleagues, and peers both inside and outside their institution

7. Responsible for the achievement of group work outcomes and able to supervise and evaluate the completion of tasks delegated to subordinates
8. Able to conduct self-evaluation of group work under their supervision and manage independent learning

c. Domain-Specific Knowledge

1. Able to design and/or select efficient data generation/collection frameworks and apply them through surveys, experiments, or simulations
2. Capable of managing and analyzing data using statistical techniques with software assistance
3. Able to solve real-world problems statistically and present findings in both written and oral formats that are easy to understand
4. Mastering the foundational concepts of statistics and analytical methods applicable to various practical domains
5. Mastering the foundational concepts of statistics and analytical methods applicable to various practical domains *(repeated for emphasis in original text)*
6. Proficient in at least two statistical software packages, including open-source alternatives

d. Specialized Skills

1. Able to collaborate and communicate effectively in teams and take responsibility for their tasks
2. Demonstrating professional ethics in the application of statistics

The formulation of learning outcomes for the Undergraduate Statistics Program (PS S1 Statistika) is classified by FORSTAT and the Indonesian Mathematical Society (IndoMS) into four learning achievement parameters as described above.

Table 5.12. Learning Outcomes of Statistics Study Programme

Parameter	Learning Outcome Description	
Work-related Skills	KK1	Ability to design and select efficient data collection methods, including surveys, experiments, or simulations.
	KK2	Ability to manage and analyze data using statistical techniques and software tools.
	KK3	Competency in solving real-world statistical problems and effectively communicating findings, both written and orally.
Knowledge Proficiency	PP1	Mastery of core statistical concepts and methodologies, applicable to various fields.
	PP2	Proficiency in at least two statistical software tools, including open-source platforms.
Managerial Competence	KM1	Ability to work collaboratively in a team and take responsibility for assigned tasks.
	KM2	Ethical professionalism in applying statistical methods in various industries.

V. CURRICULUM

1. Course Code

Courses in the Statistics Study Program at the Faculty of Mathematics and Natural Sciences, Universitas Tanjungpura, are assigned identity codes as follows:

1. The first three letters (MPS) indicate the field of Statistics.
2. The first digit represents the semester in which the course is taken.
3. The second digit indicates whether the course is mandatory (0) or elective (1).
   - 0: Mandatory course

        - 1: Elective course
4. The third digit represents the course sequence within the semester.

Example: MPS – 302

- MPS indicates the field of Statistics.
- 3 means the course is in semester 3.
- 0 means the course is mandatory.
- 2 indicates this is the second course in that semester.

Table 5.14 presents the matrix linking learning outcomes with courses in the Statistics Study Program at FMIPA Untan.

2. Curriculum Structure

Students in the Statistics Study Program must complete at least 144 credits (SKS). The curriculum is designed to be completed within 8 semesters, but it is possible to complete it in less time.

The Statistics curriculum consists of two groups:

1. Mandatory Courses – These are courses that must be taken by every Statistics student, totaling 120 credits (SKS).
2. Elective Courses – These courses supplement the minimum credit requirements needed for graduation.
    - Elective courses include major electives (Statistics) and minor electives.
    - Statistics major electives can be selected from the list of available elective courses within the Statistics Study Program.
    - Each student must take 12–15 credits (SKS) of Statistics major electives.
    - Minor electives can be taken from courses outside the Statistics Study Program in accordance with the Merdeka Curriculum concept.
    - Students can choose 9–12 credits (SKS) of minor electives from other study programs.

The following table outlines how each learning outcome aligns with specific courses within the Statistics Study Program (PS Statistika).

Table 5.13: Correspondence Between Learning Outcomes and Specific Courses

Code	Course	Learning Outcomes																									
		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	KU1	KU2	KU3	KU4	KU5	KU6	KU7	KU8	KU9	KK1	KK2	KK3	PP1	PP2	KM1	KM2
MPU-105	Introduction to Information Technology									√		√	√	√						√				√		√	
MPS-101	Calculus 1									√	√	√	√											√			√
MKWU 3	Citizenship	√	√	√	√	√	√	√	√	√		√				√								√	√		
MPS-102	Algorithms and Statistical Software									√		√		√				√	√			√	√		√		
MKWU 4	Indonesian Language							√	√							√	√					√	√				
MPS-103	Matrix Algebra and Vectors									√								√				√			√		
UMG-105	English Language							√	√							√	√					√	√				
MPS-104	Exploratory Data Analysis									√		√	√	√					√	√	√	√		√			
MPS-201	Calculus 2									√	√	√	√									√			√		
MPS-202	Statistical Methods									√		√	√			√			√	√	√	√	√		√		
MPS-203	Statistical Databases									√		√	√	√	√		√			√	√	√	√	√	√		√
MPS-204	Entrepreneurship				√		√		√	√	√	√				√			√	√	√	√	√	√	√		
MKWU 1	Religion	√	√	√		√		√	√	√		√												√	√		
MPS-205	Linear Algebra for Statistics									√								√				√			√		

MPS-301	Advanced Calculus									√	√	√	√									√			√		
MPS-302	Introduction to Mathematical Statistics I									√	√	√	√									√			√		
MPS-303	Elementary Differential Equations									√	√	√	√								√		√			√	
MPS-304	Introduction to Linear Models									√		√	√			√			√	√	√	√	√	√	√		
MKWU 2	Pancasila	√	√	√	√	√	√	√	√	√		√				√						√	√				
MPS-305	Nonparametric Statistics									√		√	√			√				√	√	√	√	√	√		
MPS-306	Forecasting Methods									√		√	√			√			√	√	√	√	√		√		
MPS-401	Introduction to Mathematical Statistics II									√	√	√	√									√			√		
MPS-402	Survey Analysis and Design									√		√	√			√			√	√	√	√	√	√	√		
MPS-403	Introduction to Measure Theory and Probability									√	√	√	√									√			√		
MPS-404	Actuarial Mathematics I									√		√	√			√				√	√			√			
MPS-405	Experimental Design									√		√	√			√			√	√	√	√	√		√		
MPS-501	Multivariate Analysis									√		√	√			√			√	√	√	√	√	√	√		
MPS-502	Statistical Computation									√		√	√	√	√		√			√	√	√	√		√	√	√
MPS-503	Categorical Data Analysis									√		√	√			√				√	√	√	√	√	√		

MPS-504	Statistical Quality Control									√		√	√			√				√	√	√	√	√	√		
MPS-601	Special Assignment									√		√	√			√	√			√	√	√	√	√	√		
MPS-602	Communication Techniques				√				√						√					√			√	√			
MPS-603	Research Methodology									√	√	√	√									√		√	√		
MPS-604	Time Series Methods									√		√	√							√	√	√	√	√	√		
MPS-605	Internship	√	√	√	√	√	√		√	√					√	√	√		√	√	√	√	√	√			
MPS-606	West Kalimantan Data Studio									√		√	√			√				√	√	√	√	√	√	√	
MPS-607	Data Mining & Business Intelligence									√		√	√	√		√			√		√	√		√		√	
MPS-701	Seminar									√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
MPS-801	Final Project									√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
MPS-311	Numerical Methods									√		√	√			√				√	√	√	√	√		√	
MPS-411	Decision Theory									√		√	√			√				√		√				√	
MPS-412	Stochastic Processes									√	√	√	√							√	√	√	√	√	√	√	
MPS-413	Introduction to Linear Programming									√		√	√			√				√	√	√	√	√	√		
MPS-511	Survival Models									√		√	√							√	√	√	√	√		√	
MPS-512	Actuarial Mathematics II									√		√	√								√	√			√		

MPS-513	Introduction to Financial Statistics									√		√	√							√		√	√		√		
MPS-514	Official Statistics									√		√	√							√	√		√	√	√	√	
MPS-515	Operations Research									√		√	√								√	√			√		
MPS-611	Introduction to Spatial Data Analysis									√		√	√							√	√	√	√	√		√	
MPS-612	Introduction to Panel Data Analysis									√		√	√							√	√	√	√	√	√	√	
MPS-613	Queueing Theory									√		√	√							√	√	√	√			√	
MPS-614	Risk Theory									√		√	√			√				√	√	√	√			√	
MPS-615	Introduction to Financial Mathematics I									√		√	√							√		√	√		√		
MPS-616	Community Service Program (KKM)	√	√	√	√	√	√	√	√	√					√	√	√		√	√	√	√	√	√			
MPS-711	Geographic Information System									√		√	√							√		√		√		√	
MPS-712	Structural Equation Modelling									√		√	√							√	√	√	√	√	√	√	
MPS-713	Bayesian Theory									√		√	√							√	√	√	√	√		√	
MPS-714	Introduction to Financial Mathematics II									√		√	√								√	√			√		

The Forum for Higher Education in Statistics (FORSTAT) has formulated the core curriculum structure for the Bachelor's Degree in Statistics (PS S1). To align the curriculum with the vision and mission of the Statistics Study Program as an institution that develops statistical sciences and their applications, the curriculum structure has been designed to meet the core curriculum framework.
Table 5.15 presents the core curriculum structure for the Bachelor's Degree in Statistics (PS S1). The names of the courses are tentative.
The course "West Kalimantan Data Studio" is a distinctive course for the Statistics Study Program at FMIPA Universitas Tanjungpura (Untan). In this course, students study statistical techniques/methods/applications specific to West Kalimantan, such as:

- Financial and business systems in border regions.
- Statistical applications in conservation areas/tropical peatlands.
- Social and educational statistics in remote areas of West Kalimantan.

Students must have taken a minor elective course before enrolling in this subject. The topics covered may vary each year, depending on the interests of students and the faculty members teaching the course.

Table 5.14: Core Curriculum Structure for the Bachelor's Degree in Statistics

No	Core Course	Minimum Credits (SKS)
1	Calculus	6
2	Linear Algebra (Matrices)	3
3	Algorithms and Programming	3
4	Exploratory Data Analysis	9
5	Data Mining	–
6	Databases	–
7	Statistical Methods	8
8	Research Methodology	–
9	Experimental Design	–
10	Survey Analysis and Design	–
11	Introduction to Mathematical Statistics I (Probability)	22
12	Introduction to Mathematical Statistics II (Inference)	–
13	Statistical Quality Control	–
14	Nonparametric Statistics	–
15	Regression Analysis	–
16	Introduction to Linear Models	–
17	Categorical Data Analysis	–
18	Time Series Analysis	–
19	Multivariate Analysis	–
20	Statistical Computation	–

No	Core Course	Minimum Credits (SKS)
21	Internship	6
22	Final Project	–
Total		57

V.2.8 Mandatory Courses in PS Statistika

The Statistics Study Program consists of three types of mandatory courses:

1. General University Courses – Required for all UNTAN students.
2. Faculty-Wide Science Courses – Designed to build a strong scientific foundation.
3. Statistics Program Core Courses – Specialized courses that develop statistical expertise.

General university courses include:
1. Religion
2. Citizenship
3. Pancasila, and
4. Indonesian Language

Science Courses (Kemipaan Courses)
Science Courses (Mata Kuliah Kemipaan) are mandatory courses from FMIPA Untan that all FMIPA students must take. The Statistics Study Program (PS Statistika) offers Science Courses in Semester I, which are listed under the course code MPU. For Statistics students, the required Science Course is Introduction to Information Technology.

Statistics Study Program (PS) Courses
Study Program Courses (Mata Kuliah PS) are mandatory expertise courses taken by Statistics students. These courses aim to expand knowledge and enhance statistical skills for every Statistics student. Study Program Courses can be found under the course code MPS. Table 5.15 presents the list of mandatory courses that must be taken by Statistics students.

Table 5.15: Mandatory Courses in PS Statistika

Semester	Course Code	Course Name	Credits (SKS)	Prerequisites
1	MPU-105	Introduction to Information Technology	2	-
	MPS-101	Calculus I	3	-
	MKWU3	Citizenship Studies	2	-
	MPS-102	Algorithms and Statistical Software	3	-
	MKWU4	Indonesian Language	2	-
	MPS-103	Matrix Algebra and Vectors	3	-
	UMG-105	English Language	3	-
	MPS-104	Exploratory Data Analysis	3	-
Total SKS for Semester I			21	
2	MPS-201	Calculus II	3	-
	MPS-202	Statistical Methods	3	-
	MPS-203	Statistical Databases	3	-

Semester	Course Code	Course Name	Credits (SKS)	Prerequisites
	MPS-204	Entrepreneurship	3	-
	MKWU1	Religion	3	-
	MPS-205	Linear Algebra for Statistics	3	-
Total SKS for Semester II			18	
3	MPS-301	Advanced Calculus	2	MPS-101*, MPS-201*
	MPS-302	Introduction to Mathematical Statistics I	3	MPS-202*
	MPS-303	Elementary Differential Equations	3	MPS-101*
	MPS-304	Introduction to Linear Models	3	MPS-202*
	MKWU2	Pancasila Studies	2	-
	MPS-305	Nonparametric Statistics	2	MPS-202*
	MPS-306	Forecasting Methods	2	MPS-202*
Total SKS for Semester III			17	
4	MPS-401	Introduction to Mathematical Statistics II	3	MPS-302*
	MPS-402	Survey Design and Analysis	3	MPS-202*
	MPS-403	Introduction to Measure Theory and Probability	3	MPS-302*
	MPS-404	Actuarial Mathematics I	3	MPS-302*, MPS-201*
	MPS-405	Experimental Design	3	MPS-202*
Total SKS for Semester IV			15	
5	MPS-501	Multivariate Analysis	4	MPS-202*, MPS-205*
	MPS-502	Statistical Computing	3	-
	MPS-503	Categorical Data Analysis	3	MPS-202*
	MPS-504	Statistical Quality Control	3	MPS-202*
Total SKS for Semester V			13	
6	MPS-601	Special Topics	2	MPS-101**, MPS-102**, MPS-103**, MPS-104**, MPS-201**, MPS-202**, MPS-203 **, MPS-205**, MPS-302 **, MPS-303 **, MPS-304 **, even and odd semester
	MPS-602	Communication Techniques	2	-
	MPS-603	Research Methodology	2	-
	MPS-604	Time Series Methods	3	MPS-302*, MPS-306*
	MPS-605	Internship / Practical Work	2	Completion of 90 SKS

Semester	Course Code	Course Name	Credits (SKS)	Prerequisites
	MPS-606	Statistical Applications in West Kalimantan	3	Completion of minor electives
	MPS-607	Data Mining & Business Intelligence	3	MPS-203*
Total SKS for Semester VI			17	
7	MPS-701	Seminar	3	Completion of 120 SKS
8	MPS-801	Final Thesis	6	The Final Project consists of a Thesis (Skripsi) and a Scientific Journal (Jurnal Ilmiah). It is conducted in both odd and even semesters.
Total Mandatory SKS				107 SKS

Notes:
- (*) indicates that the course has already been taken.
- ()** indicates that the course has already been completed.

V.2.9 Elective Courses in PS Statistika

Students must take a minimum of 37 SKS (credits) in elective courses. These electives include: (1) Concentration Mandatory Courses, (2) Study Program Elective Courses, and (3) Minor Courses. The credit distribution for Concentration Mandatory Courses is as follows:
- Business and Finance: 12 SKS
- Social and Industry: 8 SKS
- Environment and Disaster Management: 9 SKS

The list of mandatory courses for each concentration is presented in Table 5.16.

Table 5.16: Elective Courses by Specialization in PS Statistika

Semester	Course Code	Course Name	SKS	Prerequisite
Business and Financial Statistics				
Odd	MPS-512	Actuarial Mathematics II	3	MPS-404
Odd	MPS-513	Introduction to Financial Statistics	3	MPS-202
Even	MPS-615	Introduction to Financial Mathematics I	3	-
Odd	MPS-714	Introduction to Financial Mathematics II	3	MPS-615
Social and Industrial Statistics				
Odd	MPS-515	Operations Research	3	MPS-413
Odd	MPS-712	Structural Equation Modeling	3	MPS-501
Even	MPS-413	Linear Programming	2	-

Semester	Course Code	Course Name	SKS	Prerequisite
Environmental and Disaster Statistics				
Even	MPS-611	Introduction to Spatial Data Analysis	3	MPS-302
Odd	MPS-711	Geographic Information Systems	3	-
Odd	MPS-712	Structural Equation Modeling	3	MPS-501

Students are generally free to choose elective courses available each semester. However, they should consider the academic discipline of each course to ensure they develop a cohesive set of skills. When selecting elective courses, students are encouraged to consult with their Academic Advisors, take their recommendations into account, and meet the requirements and prerequisites for the selected courses. Elective courses may shift from even semesters to odd semesters, or vice versa, and some courses may temporarily not be offered. Students who are pursuing a specific concentration are allowed to take mandatory courses from other concentrations as elective courses within the Statistics Study Program. The list of elective courses in the Statistics Study Program is presented in Table 5.17.

Table 5.17. List of Elective Courses in the Statistics Study Program

Semester	Code	Course	Credits (SKS)	Prerequisites
Odd	MPS-311	Numerical Methods	3	MPS-201 *
Even	MPS-411	Decision Theory	3	MPS-202 *
	MPS-412	Stochastic Processes	3	MPS-302 *
	MPS-413	Introduction to Linear Programming	2	-
Odd	MPS-511	Survival Model	3	MPS-302 *
	MPS-512	Actuarial Mathematics II	3	MPS-404 *
	MPS-513	Introduction to Financial Statistics	3	MPS-202 *
	MPS-515	Operations Research	3	MPS-413 *
Even	MPS-611	Introduction to Spatial Data Analysis	3	MPS-302 *
	MPS-612	Introduction to Panel Data Analysis	3	MPS-202 *
	MPS-613	Queueing Theory	3	MPS-302 *

Semester	Code	Course	Credits (SKS)	Prerequisites
	MPS-614	Risk Theory	3	MPS-302 *
	MPS-615	Introduction to Financial Mathematics I	3	-
Odd & Even	MPS-514	Official Statistics	3	-
	MPS-516	Merdeka Campus Program	3	-
	MPS-616	Community Service Program (KKM)	3	-
Odd	MPS-711	Geographic Information System	3	-
	MPS-712	Structural Equation Modelling	3	MPS-501 *
	MPS-713	Bayesian Theory	3	MPS-302 *
	MPS-714	Introduction to Financial Mathematics II	3	MPS-615 *

Notes: (*) indicates that the course has already been taken.
( )** indicates that the course has already been completed.

As part of the Merdeka Curriculum implementation, and to broaden students' perspectives while enhancing their competencies, students in the Statistics Study Program (PS Statistika) are also required to take Minor Courses. Minor Courses are courses that can be taken from other study programs within Universitas Tanjungpura, excluding Statistics. Statistics students can take between 9–12 credits (SKS) of Minor Courses during their studies. Table 5.18 presents the list of Minor Elective Courses available for Statistics students. These courses are grouped based on the area of interest chosen by each student. Students are encouraged to consult with academic advisors (PA) when selecting minor electives to ensure relevance to their career paths.

Table 5.18: Minor Elective Courses for PS Statistika

Semester	Course Code	Course Name	Credits	Faculty/Program
Field of Interest: Business and Financial				
5	PTE 501	Business Feasibility	3	Agriculture / Agribusiness
5	PTE 503	Consumer Behavior	3	
7	PPT 442	Project Analysis	3	Agriculture / Soil Science
7	PTPT 454	Economic Analysis of Livestock Enterprises	3	Agriculture / Animal Science
1	EKO 101	Introduction to Economics	4	Economics and Business / Development Economics

Semester	Course Code	Course Name	Credits	Faculty/Program
2	EKO 108	Digital Economics	2	
2	EKO 104	Microeconomics	4	
2	EKO 106	Macroeconomics	4	
1	EKO 101	Introduction to Economics	4	Economics and Business / Management
7	EKM 402	Business Feasibility Study	3	
5	EKM 307	Marketing Communication	3	
6	EKM 313	Consumer Behavior	3	
4	EKM 213	Banking and Financial Institutions	3	
2	EKM 102	Introduction to Business	3	Economics and Business / Islamic Economics
4	EKA 211	Portfolio and Investment Analysis	3	Economics and Business / Accounting
3	IKS 361	Customer Relationship Management	3	Mathematics & Natural Sciences / Information Systems
6	IKS 585	Accounting and Financial Information Systems	3	
5	IKS 564	E-Business	3	
3	—	Patient Safety and Occupational Health in Nursing	2	Medicine / Nursing
	SPM 302	Economic & Industrial Sociology	3	Social Sciences & Politics / Sociology
5	INF-55201-302	Web Programming	4	Engineering / Informatics Engineering
3	TIN-2240	Introduction to Management and Business	2	Engineering / Industrial Engineering
3	TIN-2260	Work System Design and Ergonomics	2	
5	TIN-3350	Information System Analysis and Design	3	
4	TIN-2241	Cost Analysis and Estimation	2	
	TIN-4472	Multi-Criteria Decision Analysis	3	
7	TKL 5441	Project Management	2	Engineering / Environmental Engineering
Field of Interest: Environment and Disaster Management				
7	KMA 706	Agribusiness Strategy and Policy	3	Agriculture / Agribusiness

Semester	Course Code	Course Name	Credits	Faculty/Program
7	KSE 707	Natural Resource and Environmental Economics	3	
7	PTT 441	Remote Sensing	3	Agriculture / Soil Science
2	KHU 111	Conservation of Biological Natural Resources	2	Forestry / Forestry
3	KHU 203	Land Measurement and Mapping	3	
3	KHU 207	Management of Wetland and Tropical Peat Forests	3	
5	KHU 303	Remote Sensing	3	
6	KHU 420	Conservation Area Management	–	
7	KHU 411	Forest and Land Fires	2	
Odd	MPB 2269	Environmental Impact Analysis (AMDAL)	2	Mathematics & Natural Sciences / Biology
Odd	SK 405	Image and Pattern Modeling	3	Mathematics & Natural Sciences / Computer Systems Engineering
3	MPL 225	Remote Sensing	3	Mathematics & Natural Sciences / Marine Science
6	MPL 314	Marine Geographic Information System (GIS)	3	
6	MPL 318	Marine and Coastal Conservation	3	
Odd	MPL 415	Marine Disaster Mitigation	2	
7	MPL 429	Coastal Area Management	2	
6	MPL 334	Ecotourism	2	
6	IKS 585	Accounting and Financial Information Systems	3	Mathematics & Natural Sciences / Information Systems
2	—	Epidemiology	2	Medicine / Nursing
3	—	Patient Safety and Occupational Health in Nursing	2	
3	—	Disaster Nursing	3	
5	SPA 325	Border Area Development	3	Social Sciences & Politics / Public Administration
6	SIP 303	Regional Problem & Potential Analysis	3	Social Sciences & Politics / Government Studies
3	SPS 302	Demographics and Regional Development	3	Social Sciences & Politics / Sociatry
1	TPB-106	Basic Geology	3	Engineering / Mining Engineering
1	TP2103	Environmental Geography	3	

Semester	Course Code	Course Name	Credits	Faculty/Program
3	TP3114	Watershed & River Management	3	Engineering / Urban and Regional Planning
5	INF-55201-302	Web Programming	4	Engineering / Informatics Engineering
5	TIN-3350	Information System Analysis and Design	3	Engineering / Industrial Engineering
4	TIN-2241	Cost Analysis and Estimation	2	
4	TIN-3354	Quality Control and Assurance	3	
6	TIN-3382	Supply Chain Management	3	
—	TIN-4472	Multi-Criteria Decision Analysis	3	
—	TIN-4473	Quality Engineering	3	
—	TIN-4443	Financial Management	3	
7	TKS-421	Water Resource Development	2	Engineering / Civil Engineering
1	TKL 1104	Introduction to Environmental Engineering	2	Engineering / Environmental Engineering
5	TKL 5424	Environmental Sociology	2	
5	TKL 5433	Environmental Health	2	
7	TKL 5431	AMDAL and Environmental Studies	2	
1	TKL 1135	Maritime Environmental Knowledge	3	Engineering / Marine Engineering
1	—	Basic Nursing 1	3	Medicine / Nursing
2	—	Health Education and Promotion	3	
2	—	Epidemiology	2	
3	—	Patient Safety and Occupational Health in Nursing	2	
—	—	Disaster Nursing	3	
Field of Interest: Social and Industry				
5	PTSP 157	Population Dynamics and Stock Estimation	3	Agriculture / Water Resource Management
3	KHU 107	Basic Climatology	3	Forestry / Forestry
1	EKO 101	Introduction to Economics	4	Economics and Business / Development Economics
4	EKO 208	Islamic Economics and Finance	3	

Semester	Course Code	Course Name	Credits	Faculty/Program
7	EKO 404	Economy of West Kalimantan and Border Areas	3	
5	EKO 312	Population Economics	3	
1	EKO 101	Introduction to Economics	4	Economics and Business / Management
4	EKM 211	Human Resource Management	3	
3	EKO 203	Industrial Economics	3	Economics and Business / Development Economics
3	SK 203	Data Communication	3	Mathematics & Natural Sciences / Computer Systems Engineering
Odd	SK 403	Modeling and Simulation	2	
Odd	SK 405	Image and Pattern Modeling	3	
Odd	SK 409	Decision Support Systems	2	
3	IKS 361	Customer Relationship Management	3	Mathematics & Natural Sciences / Information Systems
6	IKS 585	Accounting and Financial Information Systems	3	
7	IKS 777	E-Government	3	
1	—	Basic Nursing 1	3	Medicine / Nursing
2	—	Health Education and Promotion	3	
2	—	Epidemiology	2	
3	—	Patient Safety and Occupational Health in Nursing	2	
4	—	Sport and Art	3	
—	—	Disaster Nursing	3	
4	SPA 208	Public Policy	3	Social Sciences & Politics / Public Administration
6	SPA 327	Public Services	3	
4	SPO 211	Decision Making	3	
4	SPA 213	Public Relations	3	
4	SPA 214	Theory & Practice of Governance	3	
5	SPA 325	Border Area Development	3	
6	SPO 314	Philosophy of Science	3	Social Sciences & Politics / Political Science
—	SPL 206	Public Policy	3	
—	SIP 301	Population Policy	3	

Semester	Course Code	Course Name	Credits	Faculty/Program
5	SIP 305	Urban and Rural Community Development	3	Social Sciences & Politics / Government Studies
6	SIP 303	Regional Problem & Potential Analysis	3	
2	SIK 105	Introduction to Journalism	3	Social Sciences & Politics / Communication Studies
4	SIK 213	Media Relations	3	
6	SIK 309	Corporate Social Responsibility	3	
3	SPS 303	Gender and Development	3	Social Sciences & Politics / Sociatry
4	SPS 407	Empowerment of Border Communities	3	
3	TP3110	Community-Based Development	2	Engineering / Urban and Regional Planning
2	TP3205	Urban and Rural Infrastructure	3	
4	TP2201	Social and Demographic Analysis	3	
5	INF-55201-302	Web Programming	4	Engineering / Informatics Engineering
5	TIN-3350	Information System Analysis and Design	3	Engineering / Industrial Engineering
—	TIN-4472	Multi-Criteria Decision Analysis	3	
4	TIN-3354	Quality Control and Assurance	3	
—	TIN-4473	Quality Engineering	3	

3. Courses for Students Outside the Statistics Study Program

In addition, the Statistics Study Program (PS Statistika) offers opportunities for students from outside the program to take courses organized by PS Statistika. Table 5.19 presents the list of elective courses available for students outside the Statistics Study Program. Some courses have prerequisites that students must complete before enrolling. However, these prerequisites do not need to be taken within PS Statistika. Students may fulfill the prerequisite requirement outside PS Statistika, as long as the syllabus of the external course is similar to the required prerequisite course.

Table 5.19. List of Courses Offered by the Statistics Study Program

No	Code	Course Name	Prerequisites
1	MPS-104	Exploratory Data Analysis	-
2	MPS-202	Statistical Methods	-
3	MPS-204	Introduction to Linear Programming	-

No	Code	Course Name	Prerequisites
4	MPS-302	Introduction to Mathematical Statistics I	MPS-202
5	MPS-304	Regression Analysis	MPS-202
6	MPS-305	Nonparametric Statistics	MPS-202
7	MPS-306	Databases	MPS-102
8	MPS-402	Survey Analysis and Design	MPS-202
9	MPS-404	Actuarial Mathematics I	MPS-302, MPS-201
10	MPS-405	Experimental Design	MPS-202
11	MPS-501	Multivariate Analysis	MPS-202, MPS-205
12	MPS-502	Introduction to Financial Statistics	MPS-202
13	MPS-503	Statistical Computation	MPS-306
14	MPS-504	Categorical Data Analysis	MPS-202
15	MPS-506	Statistical Quality Control	MPS-202
16	MPS-604	Time Series Methods	MPS-302
17	MPS-615	Introduction to Financial Mathematics I	-

The Statistics Study Program (PS Statistika) conducts periodic evaluations and curriculum reviews. Based on these evaluations, minor revisions were made to several courses offered in the 2014 Curriculum. The revisions include: (1) Course code and syllabus modifications, (2) Addition and removal of certain courses. These curriculum changes were implemented starting in the 2014/2015 academic year. The course equivalence for students from the 2014 cohort or earlier is provided in Table 5.20. Meanwhile, the general course equivalence in PS Statistika is presented in Table 5.21.

Table 5.20. Course Equivalency for the Statistics Study Program

Previous Course	Code	New Course	Code
Mathematics	MPU-101	Calculus 1	MPS-101
Matrix Algebra and Vectors	MPS-0512	Matrix Algebra and Vectors	MPS-103
Exploratory Data Analysis	MPS-0109	Exploratory Data Analysis	MPS-104
Calculus	MPS-0209	Calculus 2	MPS-201
Statistical Methods	MPS-0102	Statistical Methods	MPS-202
Databases	MPS-0509	Statistical Databases	MPS-203

Previous Course	Code	New Course	Code
Linear Algebra for Statistics	MPS-0912	Linear Algebra for Statistics	MPS-205
Advanced Calculus	MPS-0712	Advanced Calculus	MPS-301
Introduction to Mathematical Statistics I	MPS-0812	Introduction to Mathematical Statistics I	MPS-302
Elementary Differential Equations	MPS-0309	Elementary Differential Equations	MPS-303
Regression Analysis	MPS-0202	Introduction to Linear Models	MPS-304
Nonparametric Statistics	MPS-1012	Nonparametric Statistics	MPS-305
Introduction to Mathematical Statistics II	MPS-1112	Introduction to Mathematical Statistics II	MPS-401
Survey Analysis and Design	MPS-0101	Survey Analysis and Design	MPS-402
Actuarial Mathematics I	MPS-0211	Actuarial Mathematics I	MPS-404
Experimental Design	MPS-0302	Experimental Design	MPS-405
Introduction to Measure and Probability Theory	MPS-1212	Introduction to Measure and Probability Theory	MPS-403
Multivariate Analysis 1	MPS-0502	Multivariate Analysis	MPS-501
Statistical Computation	MPS-0210	Statistical Computation	MPS-502
Categorical Data Analysis	MPS-0409	Categorical Data Analysis	MPS-503
Introduction to Statistical Quality Control	MPS-1202	Statistical Quality Control	MPS-504
Special Project	MPS-0106	Special Project	MPS-601
Communication Techniques	MPS-0310	Communication Techniques	MPS-602
Research Methodology	MPS-0104	Research Methodology	MPS-603
Time Series Methods 1	MPS-0107	Forecasting Methods	MPS-306
Time Series Methods 2	MPS-0207	Time Series Methods	MPS-604
Internship	MPS-0103	Internship	MPS-605
West Kalimantan Data Studio	MPS-0301	West Kalimantan Data Studio	MPS-606
Seminar	MPS-0602	Seminar	MPS-701

Previous Course	Code	New Course	Code
Final Project	MPS-0702	Final Project	MPS-801
Numerical Methods	MPS-0802	Numerical Methods	MPS-311
Operations Research	MPS-0311	Operations Research	MPS-515
Introduction to Linear Programming	MPS-0111	Introduction to Linear Programming	MPS-413
Decision Theory	MPS-0205	Decision Theory	MPS-411
Stochastic Processes	MPS-0201	Stochastic Processes	MPS-412
Survival Model	MPS-1002	Survival Model	MPS-511
Actuarial Mathematics II	MPS-0411	Actuarial Mathematics II	MPS-512
Introduction to Financial Statistics	MPS-0108	Introduction to Financial Statistics	MPS-513
Introduction to Spatial Data Analysis	MPS-0511	Introduction to Spatial Data Analysis	MPS-611
Introduction to Panel Data Analysis	MPS-1102	Introduction to Panel Data Analysis	MPS-612
Queueing Theory	MPS-1402	Queueing Theory	MPS-613
Risk Theory	MPS-1502	Risk Theory	MPS-614
Interest Theory	MPS-1312	Introduction to Financial Mathematics I	MPS-615
Community Service Program (KKM)	MPS-0214	Community Service Program (KKM)	MPS-616
Bayesian Theory	MPS-1212	Bayesian Theory	MPS-713

Table 5.21: General Course Equivalency in the Statistics Study Program

Old Course Code	Old Course Name	Credits (SKS)	Semester	=	New Course Code	New Course Name	Credits (SKS)	Semester	Status
UMG-101	Religious Education	3	2	=	MKWU1	Religion	3	2	Mandatory
MG-111	Civic Education (PPKn)	3	7	=	MKWU2	Pancasila	2	7	Mandatory
				=	MKWU3	Citizenship	2	6	Mandatory
UMG-103	Indonesian Language	3	3	=	MKWU4	Indonesian Language	2	1	Mandatory

Old Course Code	Old Course Name	Credits (SKS)	Semester	=	New Course Code	New Course Name	Credits (SKS)	Semester	Status
UMG-104	Basic Social and Cultural Sciences	3	4	=	Removed	(Course Eliminated)	-	-	Removed

Additional Notes

- Students from the 2018 and 2019 cohorts are not required to take all newly introduced mandatory courses, which include: Entrepreneurship, Algorithms and Statistical Software, Data Mining and Business Intelligence, Time Series Methods, and Statistical Quality Control.
- The minimum required SKS for mandatory courses for students from 2018 and 2019 is 107 SKS. The remaining SKS must be fulfilled through elective courses. Meanwhile, students from 2017, 2016, 2015, and 2014 follow the SKS requirements outlined in the previous curriculum guide.
- Courses such as Physics, Chemistry, Biology, Mathematical Logic, and Set Theory (for students from 2014 to 2019) can be retaken with the same course code if the student received grades E, D, or D+.
- For students from 2018 and 2019, not all prerequisites for the Special Project course need to be completed, as some newly introduced mandatory courses have not been taken yet.
- The Internship course (Kerja Praktek) carries 2 SKS for students from 2013, 2014, 2015, and 2018, while students from 2016 and 2017 must complete 3 SKS.
- Students from 2016 or earlier who have already completed Civic Education (PPKn) are not required to take Pancasila and Citizenship courses (refer to Table 5.22).

Syllabus

Table 5.22: General Course Syllabus

No	Course Code	Course Name	Credits (SKS)	Topics Covered
1	MKWU1	Religion	3	
		Islam		Islamic Studies in Higher Education, Humanity and Faith, Religion as a Source of Happiness, Integration of Faith and Morality, Building a Qur'anic Personality, Islam in Indonesia, Unity in Diversity, Islam and Modernization, Contributions to Civilization, Role of Campus Mosques
		Catholicism		Human Life and Scripture, Relationship with Self, Others, Environment, and God, Religion and Faith in Pluralism, Jesus Christ, Church and Social Faith
		Protestantism		Religion and Its Role, Christian Belief in God, Human Nature in Christianity, Christian Ethics and Character Development, Relationship Between Faith and Science, Technology, and Art, Interfaith Harmony, Creation and Stewardship, Social Etiquette
		Hinduism		Purpose and Function of Hindu Studies, Historical Contributions, Theology of Brahmavidya, Role of Veda in Law and Ethics, Hindu Concept of Leadership and Morality, Hindu Religious Art, Social Harmony Based on Hindu Teachings
		Buddhism		Structure and Content of Tripitaka, Purpose and Meaning of Life, Universal Buddhist Law in Daily Life, Buddhist Theology, Moral Foundations, Harmony Between Science, Art, and Buddhism, Role of Buddhism in Indonesian National Identity
		Confucianism		Confucian Studies as Educational Components, Life and Afterlife, Integration of Belief, Morality, and Ethics, Diversity in Confucian Thought, Contributions to Civilization, Role of Confucian Philosophy in Modern Society, Education and Social Development
2	MKWU2	Pancasila	2	History of Pancasila in Indonesia, Pancasila as National Ideology, Philosophical System, Ethical Framework, Foundation for Scientific Development

No	Course Code	Course Name	Credits (SKS)	Topics Covered
3	MKWU3	Citizenship	2	Citizenship and National Education, National Identity, Unity and Integration, Constitutional Rights, Balanced Duties and Rights, Pancasila-Based Democracy, Fair Law Enforcement, National Security, Defense Strategies
4	MKWU4	Indonesian Language	2	Academic Texts (Book Reviews, Proposals, Reports, Scientific Articles)

Table 5.23: Syllabus for Science Courses (Kemipaan Courses)

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Topics Covered
1	MPU-105	Introduction to Information Technology	2	None	
		Device Types			Background, Development, Types of Devices
		Information & Communication Technology			History of Computer Systems, Evolution of Computing, System Components, How Computers Work, Input/Output/Storage, Data & Information
		Office Applications			Writing Techniques (Table of Contents, List of Tables, Bibliography, Equations, Page Numbering, Image/Table Numbering), Formulas
		Internet Applications			Introduction to the Internet (Cyber Ethics, Self-Security), Email & Mailing Lists, E-learning (Concepts & Usage), Cloud Storage (Google Drive/Dropbox), File Management (Form Creation/Survey), Blogs (Creation, Customization)

Table 5.24: Syllabus for Mandatory Courses in the Statistics Study Program

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
1	MPS-101	Calculus 1	3	-	Set Theory and Mathematical Logic, Real Number System, Inequalities, Absolute Values, Coordinate Systems, Functions (Definition, Relations, Graphs), Limits (Definition, Properties, Methods), Continuity, Differentiation (Rules, Chain Rule, Parametric Derivatives, Implicit Differentiation, Higher-Order Derivatives, Taylor Series)	*Purcell, E.J. & Varberg, D. (1994), Calculus and Analytical Geometry, Erlangga*; *Stewart, J. (2001), Calculus, Erlangga*
2	MPS-102	Algorithms and Statistical Software	3	-	Introduction to Statistical Software (SPSS, Minitab, Eviews, R), Data Management (Entry, Import/Export, Transformation), Basic Algorithm & Programming Concepts, Sequential Programming, Branching, Loops, Matrix Programming, Data Sorting, Procedures and Functions, Programming with R, SPSS, Minitab, and Eviews	-
3	MPS-103	Matrix Algebra and Vectors	3	-	Linear Equations, Matrices, Determinants, Cofactors, Vectors	*Anton, H. & Rorres, C. (2004), Elementary Linear Algebra, Erlangga*; *Leon, S. (2001), Linear Algebra and Applications, Erlangga*
4	UMG-105	English Language	3	-	Pronunciation, Tenses, Active & Passive Voice, Argumentation, Verbal & Clauses, Vocabulary, Reading Strategies, Basic Writing Techniques, Essay Planning, Referencing Skills, Scientific Writing	-

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
5	MPS-104	Exploratory Data Analysis	3	-	Exploratory Analysis, Stem-and-Leaf Plots, Numerical Summaries, Box & Dot Plots, Standardization, Transformation, Random Sampling, Sampling Distributions, One-Sample Analysis, Group Comparisons, One-Way ANOVA, Software Usage	*Tukey, J.W. (1977), Exploratory Data Analysis, Addison Wesley*; *Aunuddin (2005), Statistics: Design & Analysis, IPB Press*
6	MPS-201	Calculus 2	3	-	Indefinite Integrals (Definition, Properties, Substitution, Partial Fractions, Trigonometric Methods), Definite Integrals (Area Under a Curve, Odd & Even Functions, Improper Integrals), Applications (Area Calculation, Volume of Rotation, Arc Length, Center of Mass, Pappus' Theorem)	*Purcell, E.J. & Varberg, D. (1994), Calculus and Analytical Geometry, Erlangga*; *Supama et al. (2003), Calculus II, Universitas Gajah Mada*
7	MPS-202	Statistical Methods	4	-	Data Sources & Types, Tables & Graphs, Sample Statistics, Permutations & Combinations, Probability Distributions, Sampling Distribution, Point Estimation, Interval Estimation, Hypothesis Testing (One-Sample, Two-Independent Samples, Paired Samples), Software Applications	*Walpole, R.E. & Myers, R.H. (2008), Probability and Statistics for Engineers & Scientists, Wiley*; *Kusnandar et al. (2019), Statistical Methods with Minitab, Excel & R, Untan Press*
8	MPS-203	Statistical Databases	3	MPS-102 *	Database concepts and applications, database system models, data modeling using Entity Relationship Model, relational data model, basic Structured Query Language (SQL), advanced SQL. Each topic includes the use of statistical software.	*Elmasri, R., & Navathe, S.B. (2011), Fundamentals of Database Systems, 6th ed., Addison-Wesley*; *Klemens & Ben (2009), Modeling with Data,*

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
						Princeton University Press
9	MPS-204	Entrepreneurship	3	-	Entrepreneurial Mindset – Basic Concepts – Definitions of Entrepreneurship & Entrepreneurs – Difference between Entrepreneurs & Managers. Entrepreneurial Characteristics & Motivation – Traits of Entrepreneurs – Entrepreneurial Behavior – Motivating Factors. Small & Medium Enterprises – Business Types – Organizational Business Models – Characteristics of Business Systems. Business Startup Strategies – Identifying Business Opportunities – Initial Questions – Five Success Keys. Creativity & Innovation Strategies – Importance of Innovation – Developing Creativity – Innovation Process. Final Preparation – Building Confidence – Presentation Skills – Handling Questions – Business Proposal Presentation.	*Longenecker, G.J., Moore, C.W., Petty, W. (2001), Entrepreneurship (Small Business Management), Vol. 1 & 2, Jakarta: Salemba Empat*; *Meredith, Geffrey G., et al. (2000), Entrepreneurship (Theory & Practice), Jakarta: PPM*
10	MPS-205	Linear Algebra for Statistics	3	-	Theoretical concepts of partitioned matrices, general vector space, eigenvalues & eigenvectors, quadratic forms, matrix rank & canonical forms, applying matrix concepts in statistics.	*Anton, H. & Rorres, C. (2004), Elementary Linear Algebra, Erlangga*; *Johnson, R.A. & Wichern, D.W. (2002), Applied Multivariate Statistical Analysis, 5th ed., Prentice Hall*

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
11	MPS-301	Advanced Calculus	2	MPS-101, MPS-201 *	Multivariable functions & limits (definition, curvature graphs, vector-valued functions, limits & continuity), multivariable derivatives (partial derivatives, gradients, implicit differentiation, chain rule), applications of derivatives, multiple integrals & applications.	*Bartle, R.G. & Sherbert, D.R. (2000), Introduction to Real Analysis, 3rd ed., Wiley*; *Spiegel, M. & Robert, W. (2006), Schaum's Outline of Advanced Calculus, Erlangga*
12	MPS-302	Introduction to Mathematical Statistics 1	3	MPS-202 *	Random Variables (Discrete & Continuous, Expectation Properties, Moment-Generating Functions), Special Probability Distributions (Bernoulli, Binomial, Hypergeometric, Geometric for Discrete; Uniform, Gamma, Normal for Continuous), Joint Distributions (Discrete & Continuous, Independent Random Variables, Conditional Distribution, Random Sampling), Random Variable Properties (Correlation & Conditional Expectation), Functions of Random Variables (CDF Techniques, Transformation Methods).	*Bain, L.J. & Engelhart, M. (1992), Introduction to Probability and Mathematical Statistics, 2nd ed., Duxbury Press*; *Walpole, R.E. & Myers, R.H. (2009), Probability & Statistics for Engineers and Scientists, 9th ed., Virginia Polytechnic Institute*
13	MPS-303	Elementary Differential Equations	3	MPS-101 *	First-Order Ordinary Differential Equations (Basic Concepts, Direct Integration, Homogeneous Solutions, Non-Homogeneous Solutions, Variable Separation, Exact & Non-Exact Equations, Bernoulli's Equation & Lagrange Method), Second & Higher-Order Ordinary Differential Equations (Basic Concepts, Undetermined Coefficients, Variation of Parameters, Differential Operator Methods, Euler-Cauchy Equations).	*Shepley, L.R. (1984), Differential Equations, John Wiley*; *William, E.B. & Richard, C. (1992), Elementary Differential Equations and Boundary Value Problems, John Wiley*

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
14	MPS-304	Introduction to Linear Models	3	MPS-202 *	Simple Linear Regression & Correlation, Multiple Linear Regression (Model & Assumptions), Ordinary Least Squares (OLS), Best Model Selection + Practical Sessions (Backward & Forward Regression, Stepwise Regression), Dummy Variables. Each topic includes the use of statistical software.	*Montgomery, D.C. & Peck, E.A. (2006), Introduction to Linear Regression Analysis, John Wiley*
15	MPS-305	Nonparametric Statistics	2	MPS-202 *	Parametric vs Nonparametric Research, Hypothesis Testing for K Samples, Comparative Hypothesis Testing for 2 Samples, Comparative Hypothesis Testing for K Paired & Independent Samples, Associative Hypothesis Testing. Each topic includes the use of statistical software.	*Sugiyono (2007), Nonparametric Statistics for Research, Alfabeta*; *Siegel, S. (1997), Nonparametric Statistics for Social Sciences, Gramedia*
16	MPS-306	Forecasting Methods	2	MPS-202 *	Forecasting Problems, Importance & Properties, Decomposition Methods, Exponential Smoothing, Exponential Smoothing for Seasonal Data.	*Makridakis, Wheelwright & McGee, Forecasting Methods & Applications, Revised Edition, Jakarta: Binarupa Aksara*
17	MPS-401	Introduction to Mathematical Statistics 2	3	MPS-302 *	Summation of Random Variables, Ordered Statistics, Distribution Limits, Sampling Distributions, Sufficiency & Exponential Family, Point Estimation, Interval Estimation, Hypothesis Testing.	*Bain, L.J. & Engelhart, M. (1992), Introduction to Probability & Mathematical Statistics, Duxbury Press*

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
18	MPS-402	Survey Analysis & Design	3	MPS-202 *	Introduction, Sampling Types, Simple Random Sampling, Systematic Random Sampling, Stratified Sampling, Cluster Sampling, Multistage Sampling, Surveys. Each topic includes the use of statistical software.	-
19	MPS-403	Introduction to Measure Theory & Probability	3	MPS-302 *	Set Operations, Closed Under, Sigma Algebra, Measurable Spaces, Probability Spaces, Random Variables, Random Variable Distributions.	*Athreya, K.B. & Lahiri, S.N. (2006), Measure Theory & Probability Theory, Springer*; *Durrett, R.A. (1996), Probability: Theory & Examples, Duxbury Press*
20	MPS-404	Actuarial Mathematics 1	3	MPS-302, MPS-201 *	Survival Distributions & Mortality Tables (Survival Functions, Time Until Death, Discrete Age Models, Mortality Intensity, Mortality Tables, Fractional Age Assumptions), Life Insurance Models (Continuous & Discrete), Life Annuities (Continuous & Discrete), Usage of SOA Table Manager for Mortality Rates. Each topic includes the use of statistical software.	*Bowers, N.L., et al. (1997), Actuarial Mathematics, Society of Actuaries*
21	MPS-405	Experimental Design	3	MPS-202 *	Completely Randomized Design, Treatment Mean Comparisons, Randomized Block Design, Designs with More Than Two Treatment Factors, Blocking Structures. Each topic includes the use of statistical software.	*Mattjik, A. & Sumertajaya (2013), Experimental Design with SAS & Minitab, IPB Press*; *Suparno, A. & Nusantara A.D. (2013), Experimental Design: Applications with*

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
						Minitab, SAS, & CoStat, Alfabeta
23	MPS-501	Multivariate Analysis	4	MPS-202, MPS-205 *	Terminology, Data Screening, Principal Component Analysis, Factor Analysis, Multidimensional Scaling, Cluster Analysis. Each topic includes the use of statistical software.	*Johnson, R.A. & Wichern, D.W. (2013), Applied Multivariate Statistical Analysis, 6th ed., Pearson*; *Hardle, W. & Simar, L. (2003), Applied Multivariate Statistical Analysis*
24	MPS-502	Statistical Computation	3	-	Discussion of the structure and algorithms of statistical software packages, Macro programming in SPLUS & R, Algorithm structures in statistical applications. Each topic includes the use of statistical software.	*Dalgaard, P. (2002), Introductory Statistics with R, Springer*
25	MPS-503	Categorical Data Analysis	3	MPS-202 *	Discrete Distributions, Categorical Response Variable Analysis (2x2 & bxk Contingency Tables, Association Measures), Logit & Loglinear Models. Emphasis on practical applications. Each topic includes the use of statistical software.	*Agresti, A. (2002), Categorical Data Analysis, Wiley*; *Hosmer, D.W. & Lemeshow, S. (2000), Applied Logistic Regression, Wiley*

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
26	MPS-504	Statistical Quality Control	3	MPS-202 *	Introduction: Definitions, Quality Assurance, Technology & Productivity, Quality Costs, Quality Assurance Methods. Inference on Process Quality: Parameter Estimation, Hypothesis Testing. Seven Tools Diagram: Pareto Chart, Fishbone Diagram, Histogram, Check Sheets, Scatter Diagrams, Defect Concentration Charts. Control Charts: Basic Principles, Control Limits, Sample Size & Frequency, Rational Subgroups, Pattern Analysis. Variable Probability Distributions: Normal, Exponential, Gamma, Weibull Distributions. Attribute Probability Distributions: Poisson, Binomial, Hypergeometric Distributions. Control Charts for Variables: $\bar{X}$ & R Charts, $\bar{X}$ & S Charts, I & MR Charts. Control Charts for Attributes: P Chart, C Chart, U Chart. Each topic includes the use of statistical software.	*Montgomery, D.C. (2013), Statistical Quality Control, 7th ed., Wiley*; *Oakland, J.S. (2013), Statistical Process Control, 5th ed., Butterworth-Heinemann*
27	MPS-601	Special Project	2	Completed: MPS-101, MPS-102, MPS-103, MPS-104, MPS-201, MPS-202, MPS-203, MPS-205, MPS-302, MPS-303, MPS-304	Laboratory assistance for introductory courses in the Statistics Study Program at FMIPA Untan.	-

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
28	MPS-602	Communication Techniques	2	-	Communication Processes, Verbal & Non-Verbal Communication, Written & Oral Communication, Organizational Communication, Cross-Cultural & Intercultural Communication, Business Communication Technology, Business Presentation Techniques.	*Fiske, J. (2015), Introduction to Communication Science, Buku Litera*; *Harjana, A. (2015), Organizational Communication Strategies, Penerbit Buku Kompas*
29	MPS-603	Research Methodology	2	-	Types & Methods of Research, Research Design & Preliminary Studies, Problem Formulation & Hypothesis Design, Abstract & Background, Literature Review & Citation Methods, Research Variables & Data Collection, Scientific Writing Techniques & Conclusion Drawing, Research Proposal & Presentation Practice.	*Creswell, J.W. (1994), Research Design: Qualitative & Quantitative Approaches, SAGE Publications*
30	MPS-604	Time Series Methods	3	MPS-302, MPS-306 *	Basic Time Series Concepts (Stationarity, ACF, PACF), Time Series Variations, Models for Stationary (ARMA) & Non-Stationary Processes, Model Specification, Parameter Estimation, Model Testing, Forecasting, Seasonal Models (p,d,q)(P,D,Q). Each topic includes the use of statistical software.	*Cryer, J.D. & Chan, K.S. (2008), Time Series Analysis with Applications in R, Springer*
31	MPS-605	Internship	2	≥ 90 SKS, odd & even semesters	Identifying statistical activities & challenges outside campus, applying knowledge & skills in statistical research outside campus, recording, processing & compiling a research report tailored to the chosen topic.	-

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
32	MPS-606	West Kalimantan Data Studio	3	Completed at least 3 SKS of minor elective courses	Data modeling in West Kalimantan related to business & financial statistics, social & education statistics, and industrial & environmental statistics.	-
33	MPS-607	Data Mining & Business Intelligence	3	MPS-203 *	Role of statistics in data mining, Introduction to R for data mining, Association Rule Method, Classification via Association Rule, Decision Tree Classification, Naïve Bayes Classifier, KNN Classification, Support Vector Machine Concepts & Applications, Unsupervised Learning, Optimization Techniques, Machine Learning Applications. Each topic includes the use of statistical software.	*Han, J., Kamber, M. & Pei, J. (2012), Data Mining Concepts and Techniques, 3rd ed., Elsevier*
34	MPS-701	Seminar	3	120 SKS, output draf tugas akhi dengan syarat dan ≥ ketentuan yang akan disampaikan pada metodologi penelitian	Pengajuan judul penelitian, perumusan masalah, tujuan, kajian Pustaka, metode ilmiah, hasil penelitian, pembahasan, kesimpulan. Mempertahankan pendapat di depan penguji. Tugas akhir yang diujikan berupa Skripsi.	

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
35	MPS-801	Tugas Akhir	6	Tugas akhir berupa skripsi dan jurnal ilmiah	Menyusun Jurnal Ilmiah dan mempertahankan pendapat di depan penguji. Tugas akhir yang diujikan berupa Jurnal Ilmiah.	

Table 5.25: Syllabus for Elective Courses in the Statistics Study Program

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
1	MPS-311	Numerical Methods	3	MPS-201 *	Error Analysis, Roots of Nonlinear Equations, Linear Systems with LU Decomposition, Interpolation, Numerical Differentiation & Integration. Each topic includes the use of statistical software.	*Chapra, S.C. (2012), Applied Numerical Methods with MATLAB for Engineers & Scientists, 3rd ed., McGraw-Hill*; *Munir, R. (2003), Numerical Methods, 3rd ed., Informatika*
2	MPS-411	Decision Theory	3	MPS-202 *	Principles of Decision Making, Subjective & Objective Probability, Loss & Risk Functions, Decision Trees, Utility Theory, Value of Information, Decision Strategies, Bayesian Decision Functions. Each topic includes the use of statistical software.	*Parmigian, G., et al. (2009), Decision Theory: Principles & Applications, John Wiley & Sons*

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
3	MPS-412	Stochastic Processes	3	MPS-302 *	Probability Theory Review, Introduction to Stochastic Processes, Markov Chains (Definition, Transition Probability Matrix, First Step Analysis, Long-Term Behavior, State Classification, Recurrence), Poisson Processes, Continuous-Time Markov Chains (Pure Birth & Death Processes), Renewal Processes (Definition, Theorems, Concepts & Applications).	*Ross, S. (2010), Introduction to Probability Models, Academic Press*; *Taylor, H. & Karlin, S. (1998), An Introduction to Stochastic Modelling, Academic Press*
4	MPS-413	Introduction to Linear Programming	2	-	Linear Programming Models (Relation to Operations Research, Model Formation), Graphical Solutions (Graphical Method, Cases), Simplex Method (Algorithm, Maximum Pattern Solution, Special Cases), Linear Programming Applications, Theoretical Concepts (Convex Sets, Feasible Solutions), Simplex Theory (Basis Solution Refinement, Optimality Conditions), Duality (Primal-Dual Problems, Duality Theorems, Solution Analysis), Sensitivity Analysis, Integer Programming (Branch & Bound Algorithm).	-
5	MPS-511	Survival Models	3	MPS-302 *	Survival Distributions, Types of Lifetime Data (Success-Failure, Complete Sample, Type I & II Censored Sample, Mixed Censored Sample, Accelerated Life Testing), Statistical Inference for Various Data & Survival Models. Each topic includes the use of statistical software.	*London, D. (1997), Survival Models and Their Estimation, 3rd ed., ACTEX Publications*

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
6	MPS-512	Actuarial Mathematics 2	3	MPS-404 *	Survival Functions: Joint-Life Principles, Case Studies, Joint-Life Probability, Distribution T, Survival Status, Last-Survivor Status, Force of Failure for T(xy), Relationship Between Joint-Life & Last-Survivor Models, Dependent Lifetime Models, Special Two-Life Annuities, Variance of T(x) & T(y), Annuity Reserve, Contingency Functions. Each topic includes the use of statistical software.	*Bowers, et al. (1997), Actuarial Mathematics, 2nd ed., ACTEX Publications*
7	MPS-513	Introduction to Financial Statistics	3	MPS-202 *	Financial Terminology, Options, and Portfolio.	-
8	MPS-514	Official Statistics	3	-	-	-
9	MPS-515	Operations Research	3	MPS-413 *	Introduction to Operations Research (Definition, Benefits, and Purpose), Transportation & Transshipment Problems (Scenarios, Models, Solution Techniques + Applications), Assignment & Traveling Salesman Problems (Techniques & Algorithms). Each topic includes the use of statistical software.	*Taha, H. (1997), Operations Research, Binarupa Aksara*; *Munir, R. (2001), Discrete Mathematics for Computing, Informatika Bandung*
10	MPS-611	Introduction to Spatial Data Analysis	3	MPS-302 *	Introduction to Spatial Data, Spatial Processes, Covariance Functions, Semivariogram Models, Experimental Semivariograms, General Linear Models, Interpolation & Spatial Prediction, Kriging Methods (Simple Kriging, Ordinary Kriging, Universal Kriging, Multivariate Kriging—CoKriging). Each topic includes the use of statistical software.	*Cressie, N.A.C. (1993), Statistics for Spatial Data, John Wiley*; *Schabenberger, O. & Gotway, C.A. (2005), Statistical Methods for Spatial Data Analysis, Chapman & Hall*

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
11	MPS-612	Introduction to Panel Data Analysis	3	MPS-202 *	GLS Method, Fixed-Effects Models (One-Way & Two-Way), Random-Effects Models (One-Way & Two-Way), Fixed & Random Effects Model Estimation, Breusch-Pagan Test, Specification Tests, Model Selection & Validation (Hausman Test). Each topic includes the use of statistical software.	*Baltagi, B.H. (2005), Econometric Analysis of Panel Data, 3rd ed., Wiley*; *Hsiao, C. (2014), Analysis of Panel Data, 3rd ed., Cambridge University Press*
12	MPS-613	Queueing Theory	3	MPS-302 *	Simple Queues, Birth & Death Models, M/G/1 & G/M/1 Systems, Markov Chain Formulation, Transient Solutions, Queueing Networks, Simulation Models.	*Brian, D.B. (1996), An Introduction to Queueing Theory, Arnold*; *Averill, M.L. & David, K.W. (1991), Simulation Modelling and Analysis, McGraw Hill*
13	MPS-614	Risk Theory	3	MPS-302 *	Introduction: Risk Management Definition & Functions, Risk Identification (Principles, Techniques, Potential Risk List), Risk Classification (Potential Losses, Responsibility for Losses), Risk Measurement & Mitigation (Comparative Analysis of Risk Calculation Methods, Hazard Analysis), Utility Theory & Insurance (Expected Utility Model, Stop-Loss Reinsurance Optimization), Individual Risk Models (Mixed Distributions, Convolution, Transformations), Compound Risk Models (Compound Distributions, Compound Poisson, Panjer Recursion, Individual & Combined Risk Models).	-

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
14	MPS-615	Introduction to Financial Mathematics 1	3	-	Interest Rate Measurement, Interest Rate Problem Solving, Basic Annuities, Advanced Annuities, Yield.	*Kellison, S.G. (1991), The Theory of Interest, Wiley*; *Lyuu, Y.D. (2004), Financial Engineering & Computation, Cambridge University Press*
15	MPS-616	Community Service Program (KKM)	3	-	-	-
16	MPS-711	Geographic Information Systems	3	-	GIS Fundamentals, Key GIS Components (Hardware, Software, Brainware), Spatial Data Systems (Vector & Raster Data), Types of Spatial Data in Disaster Management (Mapping, Assessment, Monitoring, Management, Forecasting). Each topic includes the use of statistical software.	*Longley, P. et al. (2005), Geographic Information System & Science, Wiley*; *Kennedy, M. (2013), Introducing GIS with ArcGIS, Wiley*
17	MPS-712	Structural Equation Modeling	3	MPS-501 *	Path Analysis, Structural Equation Models (First-Order & Second-Order), Measurement & Structural Models, Parameter Estimation (Maximum Likelihood), Model Fit Tests (Chi-Square, CFI, GFI, AGFI, Error Minimization & Fit Indexes). Each topic includes the use of statistical software.	*Kline, R.B. (2011), Principles & Practice of Structural Equation Modeling, Guilford Press*

No	Course Code	Course Name	Credits (SKS)	Prerequisites	Syllabus	References
18	MPS-713	Bayesian Theory	3	MPS-302 *	Probability & Uncertainty Measurement, Case Studies, Discrete & Continuous Random Variables, Bayesian Inference, Conjugate Prior Distributions, Prior Information & Density Functions, Predictive Prior Distributions, Decision Models (Certainty & Uncertainty, Gains & Losses, Probabilistic & Non-Probabilistic Criteria), Utility Theory (Utility Functions, Decision-Making Under Uncertainty), Truncated Distributions (Diffuse Priors, Point Estimation, Loss Functions), WinBugs Software Applications. Each topic includes the use of statistical software.	-
19	MPS-714	Introduction to Financial Mathematics 2	3	MPS-615 *	Topics include Amortization Schedules, Sinking Funds, Payment Periods, Securities, Bonds, and Practical Applications.	*Kellison, S.G. (1991), The Theory of Interest, Wiley*; *Lyuu, Y.D. (2004), Financial Engineering & Computation, Cambridge University Press*

Table 5.26: Syllabus for Minor Courses in the Statistics Study Program

Field of Interest: Business and Financial Statistics

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
1	PTE 501	Business Feasibility	Agribusiness	5	3	-	Project concepts, cost-benefit fundamentals, project design & analysis, financial & economic analysis, investment feasibility measurement, shadow pricing,

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
							import-export parity valuation, sensitivity analysis, comparative project advantage.
2	PTE 503	Consumer Behavior	Agribusiness	5	3	-	Introduction, decision-making, consumer learning, brand habits & loyalty, low-involvement decision making, consumer perception & attitude, attitude change & reinforcement, consumer environment, situational influences, family & cultural effects on purchasing decisions.
3	PPT 442	Project Analysis	Soil Science	7	3	-	Project definition, national planning programs, project activity planning, factors affecting project analysis, project scheduling, cost planning, cost-benefit analysis, financial & economic analysis, relative price change concepts, financial-economic value transformation, project control.
4	PTPT 454	Economic Analysis of Livestock Enterprises	Animal Husbandry	7	3	-	Concept of livestock business at macro & micro levels, small & medium-sized livestock businesses, large-scale livestock enterprises.
5	EKO 101	Introduction to Economics	Development Economics	1	4	-	Economics as a study of resource allocation in response to unlimited human needs. Division into macro & microeconomics—micro covering individual economic behavior, macro covering aggregate economic mechanisms.
6	EKO 108	Digital Economics	Development Economics	2	2	-	Introduction to the use of information media & supporting devices in applying modern technology for economic purposes. Course designed to support academic activities through digital media utilization.
7	EKO 104	Microeconomics	Development Economics	2	4	-	Basic microeconomic concepts, consumer behavior & demand determination, producer behavior in resource allocation & production costs, price-setting theory in perfect competition, monopolistic

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
							competition, oligopoly, and monopoly markets, factor demand across output & input markets, introduction to general equilibrium & welfare economics.
8	EKO 106	Macroeconomics	Development Economics	2	4	-	(1) Macro-equilibrium theory, (2) Consumption theory, (3) Investment theory, (4) Money market equilibrium (LM), (5) Commodity market equilibrium (LS), (6) Stability policy via LS & LM models, (7) Aggregate demand, (8) Aggregate supply, (9) Inflation & unemployment, (10) Budget deficit, inflation & productivity, (11) Labor market, (12) Economic growth & productivity, (13) Open macroeconomic model.
9	EKO 101	Introduction to Economics	Management	1	4	-	Economics as the study of resource allocation to meet unlimited human needs. Divided into macro & microeconomics—micro covers individual economic behavior, macro examines aggregate economic mechanisms.
10	EKM 402	Business Feasibility Study	Management	7	3	-	Techniques & factors for assessing project success, including technical, market, financial, HR, management, legal aspects, and economic & environmental impacts. Comprehensive analysis considers all factors for project viability.
11	EKM 307	Marketing Communication	Management	5	3	-	Planning & managing all marketing communication activities, media selection, trends in 21st-century marketing, promotional opportunities, brand management, message & visual creativity, budget planning, marketing research, future trends in marketing.
12	EKM 313	Consumer Behavior	Management	6	3	-	Understanding consumer behavior as a reference for marketing strategies in product design, pricing, distribution, & promotion. Covers segmentation,

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
							decision-making process, attitudes, motivation, social & cultural influences on purchasing behavior.
13	EKM 213	Banks and Financial Institutions	Management	4	3	-	Functions & roles of financial institutions & markets, financial intermediation & innovation, government involvement, interest rate determination, influence on funding & investment decisions, differences in interest rates, money market, stock & bond market, derivatives, non-bank financial institutions (mutual funds, venture capital, investment banks, leasing, factoring, insurance, credit unions).
14	EKM 102	Introduction to Business	Islamic Economics	2	3	-	Legal reviews, business organizations, functional approaches to understanding management, external environmental factors affecting business operations. Management functions approached as a systematic business process.
15	EKA 211	Portfolio & Investment Analysis	Accounting	4	3	-	Portfolio theory, use of financial securities, asset management strategies, investment processes, investor decision-making considerations, portfolio formation & investment analysis applications.
16	IKS 361	Customer Relationship Management	Information Systems	3	3	-	Integrated approach to identifying, acquiring, & retaining customers, managing customer interactions across channels, departments, businesses & geographies, maximizing customer value, leveraging CRM for enhanced business performance. Topics: CRM fundamentals, customer relations, CRM implementation projects, customer databases, segmentation, value creation, technology applications, social media in CRM.
17	IKS 585	Accounting & Financial	Information Systems	6	3	-	Health informatics definitions, scope, ethical standards, security & legal aspects, data acquisition, storage & retrieval, knowledge management, data

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
		Information Systems					mining, text mining, electronic health records, patient data management, monitoring, medical imaging, decision-making support, public health & informatics applications, telemedicine, bioinformatics.
18	IKS 564	E-Business	Information Systems	5	3	-	E-Business definitions & concepts, business types & trends, E-Business information systems, online advertising strategies, digital payment concepts, web usability, value chain, mobile commerce, security & legal aspects, ethics & social impact of E-Business.
19		Patient Safety & Occupational Health in Nursing	Nursing	3	2	-	Focusing on health & safety of nurses in patient care, ensuring a hazard-free healthcare environment, applying occupational health principles across nursing procedures, risk minimization strategies in nursing. Teaching methods: QBL (question-based learning), CL (collaborative learning), CBL/PBL (case & problem-based learning), interactive lectures, role-playing.
20	SPM 302	Economic & Industrial Sociology	Sociology	-	3	-	-
21	INF-55201-302	Web Programming	Computer Science	5	4	-	-
22	TIN-2240	Introduction to Management & Business	Industrial Engineering	3	2	-	-
23	TIN-2260	Work System Design & Ergonomics	Industrial Engineering	3	2	-	-
24	TIN-3350	Information System Analysis & Design	Industrial Engineering	5	3	-	-

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
25	TIN-2241	Cost Analysis & Estimation	Industrial Engineering	4	2	-	-
26	TIN-4472	Multi-Criteria Decision Analysis	Industrial Engineering	-	3	-	-
27	TKL 5441	Project Management	Environmental Engineering	7	2	-	-

Field of Interest: Social and Industry

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
1	PTSP 157	Population Dynamics & Stock Estimation	Water Resources Management	5	3	-	Scope of population & stock estimation, fish marking & aging, population size estimation, mortality & migration, growth, recruitment, yield per recruit model, overfishing concepts.
2	KHU 107	Basic Climatology	Forestry	3	3	-	Climate & weather definitions, climate restrictions, atmospheric properties, measurement & processing of climate data (solar radiation, temperature, humidity, air pressure, wind, precipitation, cloud formation & classification, rainfall processes), climate classification methods, environment-climate interactions, relationship between climate & vegetation.
3	EKO 101	Introduction to Economics	Development Economics	1	4	-	Economics as the study of resource allocation in response to unlimited human needs, macro vs microeconomic perspectives—micro examines individual behavior, macro assesses aggregate economic mechanisms.

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
4	EKO 208	Islamic Economics & Finance	Development Economics	4	3	-	Introduction to economic & financial studies under Islamic principles, comparative analysis of Islamic vs conventional economics, fiscal & financial fundamentals, Islamic economic institutions & global cooperation.
5	EKO 404	West Kalimantan Economy & Border Areas	Development Economics	7	3	-	Economic development in West Kalimantan & border regions, comparative analysis across cities/counties, economic growth & structural changes, income distribution & poverty, employment & human resources, local government budgets, inflation & overheating, industrialization & SME development, trade policies & regional economic strengths.
6	EKO 312	Population Economics	Development Economics	5	3	-	Demography & population economics applications, demographic transition theories, fertility, mortality, migration.
7	EKO 101	Introduction to Economics	Management	1	4	-	Economics as the study of resource allocation in response to unlimited human needs, macro vs microeconomic perspectives—micro examines individual behavior, macro assesses aggregate economic mechanisms.
8	EKM 211	Human Resource Management	Management	4	3	-	HR roles & organizational functions, HR planning, job analysis & evaluation, recruitment, selection & placement, employee training & development, compensation systems.
9	EKO 108	Digital Economics	Development Economics	2	2	-	Introduction to information media & digital technology for economic applications, facilitating academic activities through digital innovations.
10	EKO 104	Microeconomics	Development Economics	2	4	-	Fundamental microeconomic concepts, consumer behavior, demand analysis, producer behavior, input usage & production costs, price determination in

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
							different market structures (perfect competition, monopolistic competition, oligopoly, monopoly), factor demand theories, general equilibrium & welfare economics.
11	EKO 106	Macroeconomics	Development Economics	2	4	-	Macro-equilibrium theories, consumption & investment theories, money market equilibrium (LM), commodity market equilibrium (LS), stability policies via LS & LM models, aggregate demand & supply, inflation & unemployment, labor market dynamics, economic growth & productivity, open macroeconomic model.
12	EKM 402	Business Feasibility Study	Management	7	3	-	Techniques & factors in project assessment, including technical, market, financial, HR, managerial, legal, and environmental aspects. Comprehensive analysis integrates all factors for determining project viability.
13	EKM 307	Marketing Communication	Management	5	3	-	Managing marketing communication activities, media selection, 21st-century marketing trends, promotional strategies, brand management, budget planning, consumer research, future trends in marketing.
14	EKM 313	Consumer Behavior	Management	6	3	-	Consumer segmentation, decision-making processes, pre-purchase evaluation, consumer attitudes, motivation, self-concept, personality traits, lifestyle influences, cultural & social impacts on purchasing decisions.
15	PTE 501	Business Feasibility	Agribusiness	5	3	-	Project concepts, cost-benefit analysis, financial & economic feasibility, shadow pricing, import-export parity valuation, sensitivity analysis, comparative project advantages.

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
16	PTE 503	Consumer Behavior	Agribusiness	5	3	-	Consumer decision-making, brand loyalty, low-involvement decision processes, perception & attitudes, situational, familial & cultural influences.
17	PPT 442	Project Analysis	Soil Science	7	3	-	Project definition & planning, financial & economic analysis, cost-benefit assessment, financial-economic value transformation, project scheduling & control.
18	SK 203	Data Communication	Computer Systems Engineering	3	3	-	Introduction to data communication, transmission fundamentals, transmission media, error detection & correction, modulation techniques, packet switching simulations, networking protocols, LAN structures.
19	SK 403	Modeling & Simulation	Computer Systems Engineering	-	2	-	Introduction to systems & models, simulation components, data collection & analysis, simulation programming, discrete-event dynamic modeling, validation techniques, time-shared computer system modeling.
20	SK 405	Image & Pattern Modeling	Computer Systems Engineering	-	3	-	Fundamentals of image & pattern recognition, audio signal extraction, classification & clustering techniques, preprocessing techniques in image processing, advanced extraction methods.
21	SK 409	Decision Support Systems	Computer Systems Engineering	-	2	-	Introduction to Decision Support Systems, Decision Modeling, Decision Support System Components & Categories, Analytical Modeling, Optimization with Limited Alternatives, Heuristic Models, Data Mining Models, Case-Based Systems.
22	IKS 361	Customer Relationship Management	Information Systems	3	3	-	Integrated approach to identifying, acquiring & retaining customers, managing interactions across multiple channels, departments & businesses, CRM project implementation, customer database management, customer segmentation, value

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
							creation, CRM technology applications, social media in CRM.
23		Basic Nursing 1	Nursing	1	3	-	Concepts, principles & clinical nursing skills for human needs including activity & exercise, oxygenation, fluid-electrolyte balance, rest & sleep, nutrition, elimination, comfort, hygiene & self-care. Learning includes classroom & laboratory sessions.
24		Health Education & Promotion	Nursing	2	3	-	Theoretical concepts of health education & promotion for clients, teaching-learning methods, health promotion theories & program development.
25		Epidemiology	Nursing	2	2	-	Concepts, history & development of epidemiology, disease frequency measures (incidence & prevalence), natural history of disease, causation concepts, epidemiological data presentation, types of epidemiological research, screening, outbreak investigation introduction, public health surveillance.
26		Patient Safety & Occupational Health in Nursing	Nursing	3	2	-	Focus on nurse health & safety in patient care, hazard-free nursing environments, applying occupational health principles across nursing processes, risk minimization strategies, interactive learning methods (QBL, CL, CBL/PBL, lectures, role-playing).
27		Sport & Art	Nursing	4	3	-	Health issues related to sports & arts, WHO's human health standards, physical education, sports & health concepts, connection between health & various art forms, types of art, cultural & global artistic expressions. Learning includes theory sessions, practical observations through videos, TV broadcasts & live art performances. Evaluations involve tests, presentations, discussions & final exams.

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
28		Disaster Nursing	Nursing	-	-	Clinical Nursing (KMB, Pediatric, Maternity, Psychiatric, Emergency, Critical Care), Community Nursing	Concepts, types, classifications, & characteristics of disasters, health impacts, emergency disaster management principles, disaster preparedness, systematic assessment, nursing interventions during disasters, psychosocial & spiritual support for victims, vulnerable population care, ethical & legal aspects, healthcare provider protection, interdisciplinary approaches, post-disaster recovery, evidence-based practice in disaster nursing, critical thinking, systematic & holistic approaches.
29	SPA 208	Public Policy	Public Administration	4	3	-	-
30	SPA 327	Public Service	Public Administration	6	3	-	-
31	SPO 211	Decision Making	Public Administration	4	3	-	-
32	SPA 213	Public Relations	Public Administration	4	3	-	-
33	SPA 214	Governance Theory & Practice	Public Administration	4	3	-	-
34	SPA 325	Border Area Development	Public Administration	5	3	-	-
35	SPO 314	Philosophy of Science	Political Science	6	3	-	-

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
36	SPL 206	Public Policy	Political Science	-	3	-	-
37	SIP 301	Population Policy	Government Science	-	3	-	-
38	SIP 305	Urban & Rural Community Development	Government Science	5	3	-	-
39	SIP 303	Regional Issues & Potential Analysis	Government Science	6	3	-	-
40	SIK 105	Introduction to Journalism	Communication Science	2	3	-	-
41	SIK 213	Media Relations	Communication Science	4	3	-	-
42	SIK 309	Corporate Social Responsibility	Communication Science	6	3	-	-
43	SPM 209	Sociology of Population	Sociology	-	3	-	-
44	SPM 301	Sociology of Development	Sociology	-	3	-	-
45	SPM 302	Economic & Industrial Sociology	Sociology	-	3	-	-
46	SPM 309	Political Sociology	Sociology	-	3	-	-
47	SPS 303	Gender & Development	Sociatry	3	3	-	-
48	SPS 407	Border Community Empowerment	Sociatry	4	3	-	-

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
49	TP3110	Community-Based Development	Urban & Regional Planning	2	3	-	-
50	TP3205	Urban & Rural Infrastructure	Urban & Regional Planning	3	2	-	-
51	TP2201	Social & Demographic Analysis	Urban & Regional Planning	3	4	-	-
52	INF-55201-302	Web Programming	Informatics Engineering	-	4	-	-
53	TIN-3350	Information System Analysis & Design	Industrial Engineering	-	3	-	-
54	TIN-4472	Multi-Criteria Decision Analysis	Industrial Engineering	-	3	-	-

Field of Interest: Environmental and Disaster Statistics

No	Course Code	Course Name	Study Program	Semester	Credits (SKS)	Prerequisites	Syllabus
1	KMA 706	Agribusiness Strategy & Policy	Agribusiness	7	3	-	Organizational vision, strategic direction determination, competitive advantage sources, strategic management process, analytical aspects, behavioral aspects, business environment considerations.
2	KSE 707	Natural Resource &	Agribusiness	7	3	-	Scope & role of natural resources in economic development, resource scarcity measurement, classification & conservation, economic impact on

		Environmental Economics					resources, cost-benefit analysis, responsible management policies.
3	PTT 441	Remote Sensing	Soil Science	7	3	-	Spatial data analysis via satellite imagery interpretation & digitization, basic physics, electromagnetic spectrum analysis, thermal radiation systems, variable pricing, color composition, training site creation, image annotation using ERDAS IMAGINE.
4	KHU 111	Biodiversity Conservation	Forestry	2	2	KHU 102	History & challenges of biodiversity conservation, threats to tropical biodiversity, conservation movements, natural resource concepts, species extinction, conservation strategies.
5	KHU 203	Land Surveying & Mapping	Forestry	3	3	-	Measurement principles, instruments & techniques, correction methods, GPS surveying, thematic mapping, area calculations, forestry mapping legends, legal survey frameworks, GIS fundamentals.
6	KHU 207	Tropical Wetland & Peat Forest Management	Forestry	3	3	-	Biological & environmental characteristics of peat forests, ecosystem roles & responses, peat soil properties, classification, agricultural & industrial applications, wetland significance in global ecosystems.
7	KHU 303	Remote Sensing	Forestry	5	3	KHU 203	Remote sensing concepts, aerial imagery utilization, tree dimension measurements, photogrammetry & mapping, GIS applications for forest potential assessment.
8	KHU 420	Conservation Area Management	Forestry	6	-		Conservation area definitions & scope, legislative frameworks, ethics & sovereignty principles, socio-economic aspects, valuation methods, conservation planning & participation approaches.
9	KHU 411	Forest & Land Fire Management	Forestry	7	2	-	Causes of forest fires, fire ecology, smoke behavior, fire suppression techniques, controlled burning strategies, impact severity assessment.

10	EKO 203	Industrial Economics	Development Economics	3	3	-	Market structures, industrial behavior & performance, oligopoly market focus, economies of scale, entry barriers, macroeconomic industrial policies, trade sector interactions, industrialization strategies.
11	MPB 2269	Environmental Impact Analysis (AMDAL)	Biology	Odd	2	Plant Ecology, Animal Ecology	Introduction to AMDAL & ANDAL, legal foundations, resource evaluation (biotic & abiotic), impact assessment, resource management approaches, AMDAL phases, ANDAL methods & analysis, scoping, forecasting significant impacts, environmental management & monitoring plans.
12	SK 405	Image & Pattern Modeling	Computer Systems Engineering	Odd	3	-	Fundamentals of image & pattern recognition, basic concepts of sound processing, sound extraction, identification, classification & clustering, image preprocessing & feature extraction.
13	MPL 225	Remote Sensing	Marine Science	3	3	-	Basic remote sensing theories, GEM theory, cartography, satellite imagery analysis.
14	MPL 314	Marine GIS	Marine Science	6	3	-	GIS system components, functions & data structures, digital map editing & transformation, topological operations, map layout design, GIS applications in marine sciences.
15	MPL 318	Marine & Coastal Conservation	Marine Science	6	3	-	Basic conservation concepts, coastal & marine ecosystem protection, evolving paradigms in conservation science.
16	MPL 415	Marine Disaster Mitigation	Marine Science	Odd	2	-	Theories on disaster mitigation processes in coastal & marine environments.
17	MPL 429	Coastal Area Management	Marine Science	7	2	-	Coastal area scope, national & regional marine policies, zoning principles for coastal & small islands, coastal management planning & implementation.
18	MPL 334	Ecotourism	Marine Science	6	2	-	Marine tourism potential, zoning, environmental sanitation, aquatic conservation principles.
19	IKS 585	Accounting & Financial	Information Systems	6	3	-	Healthcare informatics definitions, ethics & security, data acquisition & storage, retrieval systems, knowledge management, data mining & text mining

		Information Systems					applications, electronic health records, computer-based patient data management, telemedicine, bioinformatics.
23	SPA 325	Border Area Development	Public Administration	5	3	-	-
24	SIP 303	Regional Issues & Potential Analysis	Government Science	6	3	-	-
25	SPS 302	Demography & Regional Development	Sociatry	3	3	-	-
26	TPB-106	Basic Geology	Mining Engineering	1	3	-	-
27	TP2103	Environmental Geography	Urban & Regional Planning	1	3	-	-
28	TP3114	Watershed & River Management	Urban & Regional Planning	3	3	-	-
29	INF-55201-302	Web Programming	Informatics Engineering	5	4	-	-
30	TIN-3350	Information System Analysis & Design	Industrial Engineering	5	3	-	-
31	TIN-2241	Cost Analysis & Estimation	Industrial Engineering	4	2	-	-
32	TIN-3354	Quality Control & Assurance	Industrial Engineering	4	3	-	-
33	TIN-3382	Supply Chain Management	Industrial Engineering	6	3	-	-

34	TIN-4472	Multi-Criteria Decision Analysis	Industrial Engineering	-	3	-	-
35	TIN-4473	Quality Engineering	Industrial Engineering	-	3	-	-
36	TIN-4443	Financial Management	Industrial Engineering	-	3	-	-
37	TKS-421	Water Resource Development	Civil Engineering	7	2	-	-
38	TKL 1104	Introduction to Environmental Engineering	Environmental Engineering	1	2	-	-
39	TKL 5424	Environmental Sociology	Environmental Engineering	5	2	-	-
40	TKL 5433	Environmental Health	Environmental Engineering	5	2	-	-
41	TKL 5431	AMDAL & Environmental Studies	Environmental Engineering	7	2	-	-
42	TKL 1135	Maritime Environmental Knowledge	Marine Engineering	1	3	-	-
43		Basic Nursing 1	Nursing	1	3	-	Concepts, principles, & clinical nursing skills for human needs including activity & exercise, oxygenation, fluid-electrolyte balance, rest & sleep, nutrition, elimination, comfort, hygiene, & self-care. Learning includes classroom & laboratory sessions.
44		Health Education & Promotion	Nursing	2	3	-	Theoretical concepts of health education & promotion for clients, teaching-learning methods, health promotion theories & program development.

45		Epidemiology	Nursing	2	2	-	Concepts, history & development of epidemiology, disease frequency measures (incidence & prevalence), natural history of disease, causation concepts, epidemiological data presentation, types of epidemiological research, screening, outbreak investigation introduction, public health surveillance.
46		Patient Safety & Occupational Health in Nursing	Nursing	3	2	-	Focus on nurse health & safety in patient care, hazard-free nursing environments, applying occupational health principles across nursing processes, risk minimization strategies, interactive learning methods (QBL, CL, CBL/PBL, lectures, role-playing).
47		Disaster Nursing	Nursing	-	3	-	Concepts, types, classifications, & characteristics of disasters, health impacts, emergency disaster management principles, disaster preparedness, systematic assessment, nursing interventions during disasters, psychosocial & spiritual support for victims, vulnerable population care, ethical & legal aspects, healthcare provider protection, interdisciplinary approaches, post-disaster recovery, evidence-based practice in disaster nursing, critical thinking, systematic & holistic approaches.

Chapter VI: Physics Department

"The scientist does not study nature because it is useful; he studies it because he delights in it, and he delights in it because it is beautiful. If nature were not beautiful, it would not be worth knowing, and if nature were not worth knowing, life would not be worth living."

— **Henri Poincaré**

Physics comes from the Greek words **φυσικός** (*fysikós*), meaning "natural," and **φύσις** (*fýsis*), meaning "nature." In modern terminology, physics is a discipline that examines **matter, energy, and their interactions**. The **primary goal** of physics is to uncover the various **laws of nature** and formulate them into **fundamental principles**, allowing humanity to understand how the natural world operates.

To achieve this goal, physics employs the **scientific method**, beginning with **in-depth observations** of nature, conducting **experiments** to collect supporting data, and subsequently **formulating results** into **mathematical theories**. These theories must then be **verified** through further observations and experiments. This process makes physics a **dynamic and evolving science**, continuously advancing alongside **human civilization**.

As science has progressed, **physics** has emerged as the **"mother science"**, leading to the development of various **other scientific fields** such as:

- **Geophysics** – The application of physics laws in **earth sciences**
- **Astrophysics** – The study of **celestial bodies** using physics
- **Biophysics** – The application of physics in **biological systems**
- **Econophysics** – The utilization of physics in **economic analysis**

Beyond its role as a **fundamental science**, physics also serves as the **main foundation** for **technological advancements**. Numerous **medical technologies**, such as **CT-Scans, ultrasounds, MRI, and cancer treatments**, are **applications of physics** in healthcare. In the field of **electronics**, rapid developments have been driven by **physicists' ability to engineer the properties of semiconductor materials**, which serve as the backbone of modern **electronic technology**. Similarly, physics plays a crucial role in **natural resource exploration** and **environmental conservation**.

Physics not only drives scientific and technological advancements but also shapes **human thought**. It trains individuals to think **critically, systematically, creatively, and innovatively** while instilling **honesty, precision, discipline, and perseverance**. Furthermore, physics fosters a deep **admiration for nature's order**, encouraging people to **respect their surroundings** and **acknowledge a higher power**.

Given its significance, the establishment of the **Physics Department in West Kalimantan** is **highly necessary**—both as an **educational institution producing exceptional human resources** and as a **research institution driving scientific and technological transformation**. The **Physics Department of FMIPA UNTAN** was officially established through **Dirjen Dikti Depdiknas Decree No. 3494/D/T/2001**, with student admissions beginning in the **2002/2003 academic year**. Initially, the department offered only one program: **the Physics Study Program**. However, in response to local demand, **the Geophysics Study Program** was launched in **2013**, as outlined in **Decree No. 630/E.E2/DT/2013**, dated **July 10, 2013**.

Currently, the **Physics Department has 21 faculty members**, specializing in **Physics or Geophysics**. Among them, **five hold doctoral degrees (S3)**, **nine hold master's degrees (S2)**, and **seven are pursuing doctoral studies** both domestically and internationally. Of these **21 lecturers**, **16 are permanent civil servants (PNS)**, **three are contracted civil servants (CPNS)**, and **two are non-PNS teaching staff**.

The department is led by a **Department Head**, assisted by a **Department Secretary**, along with **two Study Program Heads** and **two Laboratory Heads**. The complete list of faculty members is provided in the following table:

Table 6.1: Faculty Members of the Physics Department

No	Name	NIP/NIDK	Rank	Functional Position
1	Muliadi, S.Si., M.Si. *(Head of Basic Physics Laboratory)*	197005101999031003	III/c	Asistant Professor
2	Andi Ihwan, S.Si., M.Si. *(Doctoral Studies at IPB University)*	197310082002121001	III/d	Associate Professor
3	Mariana Bara Malino, S.Si, M.Sc	197603082002122001	III/c	Asistant Professor
4	M. Ishak Jumarang, S.Si., M.Si. *(Doctoral Studies at IPB University)*	197409212003121004	III/d	Associate Professor
5	Yudha Arman, S.Si., M.Si, D.Sc *(Vice Dean for Academics, FMIPA UNTAN)*	197805132003121002	III/c	Asistant Professor
6	Dr. Yoga Satria Putra, S.Si., M.Si. *(Head of Geophysics Study Program)*	197910252005011002	III/c	Asistant Professor
7	Dr. Azrul Azwar, S.Si, M.Si *(Head of Physics Study Program)*	198107302005011002	III/b	Asistant Professor
8	Boni Pahlanop Lapanporo, S.Si, M.Sc *(Doctoral Studies at Bandung Institute of Technology)*	198011102005011002	III/c	Assistant Professor
9	Dr. Bintoro Siswo Nugroho, S.Si, M.Si *(Secretary of the Physics Department)*	198102062006041003	III/c	Assistant Professor
10	Nurhasanah, S.Si, M.Si *(Head of the Physics Department)*	198011252006042002	III/c	Assistant Professor
11	Joko Sampurno, S.Si., M.Si. *(Doctoral Studies at UCLouvain, Belgium)*	198408252008011004	III/c	Assistant Professor
12	Irfana Diah Faryuni, S.Si., M.Si. *(Doctoral Studies at UCLouvain, Belgium)*	198510132008122004	III/b	Assistant Professor
13	Abdul Muid, S.Si, M.Si *(Doctoral Studies at Bandung Institute of Technology)*	198012172008121001	III/b	Assistant Professor
14	Hasanuddin, S.Si, M.Si., Ph.D. *(Head of Advanced Physics Laboratory)*	198412162008121003	III/b	Assistant Professor
15	Dr. Dwiria Wahyuni, S.Si, M.Sc *(Director of Kedai Perancis UNTAN)*	198206082008122001	III/b	Assistant Professor
16	Muhardi, S.Si, M.Sc *(Head of Geophysics Laboratory)*	198509192018031001	III/b	Assistant Professor
17	Radhitya Perdhana, S.Si, M.Sc.	198911142019031011	III/b	Lecturer
18	Riza Adriat, S.Si, M.Si	198905162019031013	III/b	Lecturer
19	Mega Nurhanisa, S.Si, M.Si	8853370018	-	Lecturer
20	Asifa Asri, S.Si, M.Si	8808270018	-	Lecturer
21	Zulfian, S.Si, M.Si	8838270018	-	Lecturer

VI.1 Physics Study Program

Introduction

The **Physics Study Program (PS Fisika)** at the **Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Tanjungpura (UNTAN)** was officially established through **Dirjen Dikti Depdiknas Decree No. 3494/D/T/2001** and later extended via **Decree No. 2320/D/T/2004**, **Decree No. 1131/D/T/2008**, and **Decree No. 11185/D/T/K-N/2012** issued by **UNTAN's Rector on behalf of Dirjen Dikti**. Currently, **PS Fisika holds a "B" accreditation** under the **National Accreditation Board for Higher Education (BAN-PT) Decree No. 1083/SK/BAN-PT/Akred/S/IV/2018**, valid from **April 17, 2018, until April 17, 2023**.

Vision and Mission

Vision

"To become an excellent institution in the transformation, development, and dissemination of physics and its applications, with a tropical environmental perspective, producing globally competitive graduates."

Mission

To achieve this vision, PS Fisika is committed to:

1. **Providing integrated higher education** to produce **high-quality graduates** who are **adaptive** to **scientific and technological advancements** while maintaining **national identity**.
2. **Conducting targeted, continuous, and environmentally conscious research**, focusing on **local potential in West Kalimantan**.
3. **Executing impactful community engagement activities** that enhance **environmental quality and societal well-being**.
4. **Establishing constructive partnerships** with various **stakeholders**.

Physics Study Areas

The **Physics Study Program at FMIPA UNTAN** does not impose strict specialization boundaries, allowing **students and faculty the flexibility to explore various areas of interest**. Generally, studies focus on three key aspects:

1. **Theoretical Physics** – Through **mathematical formulation, modeling, computation, and simulation**, including:
   - **Theoretical studies on stellar structures and galaxy dynamics**
   - **Optical, electronic, and thermodynamic material properties modeling**
   - **Simulations of various physical systems**, such as **biological systems, fluid systems (rivers, oceans, atmosphere), solid earth systems, and environmental systems**
2. **Experimental Physics** – Through **instrument development and experimental design**, including:

- **Automation in measurement systems**
- **Experimental studies on material characterization and functionalization**

3. **Applied and Interdisciplinary Physics** – Through **the application of physics principles in various fields**, including:
    - **Medical imaging technologies**
    - **Geophysical data utilization**
    - **Photocatalysis and luminescence technology**
    - **Optical, electronic, and mechanical material engineering**
    - **Characterization methods for biological systems**

VI.1.4 Graduate Profile

The graduate profile describes the **roles and career paths** available to graduates of the **Physics Study Program (PS Fisika)** at FMIPA UNTAN. Based on **alumni tracer studies** and **market signals from employers**, graduates can pursue careers in the following fields:

1. Research and Engineering

Graduates can work as **researchers, research assistants, engineers, engineering assistants, surveyors, data analysts, or laboratory technicians** in various research institutions. This includes:

- **Government research agencies** such as **LAPAN, LIPI, BMKG, BATAN**
- **Higher education institutions**
- **Private research organizations**
- **Research & Development (R&D) divisions in industries**

2. Education and Teaching

Graduates can pursue roles as **physics educators** in various institutions, including:

- **Schools and universities**
- **Science communication roles** such as **science book writers, multimedia content creators, and educational media developers**

3. Community Empowerment

Graduates can take active roles in **community development**, serving as:

- **Village facilitators**
- **Public relations specialists**
- **Science communicators for development initiatives**
- **Social activists**

4. Entrepreneurship

Graduates can become **independent entrepreneurs**, applying their **physics knowledge and skills** to **innovative business solutions**, whether directly related to physics or in broader industries.

Note on Career Readiness

While these roles align with **core competencies in physics**, they often require **additional skills and certifications** beyond standard coursework. Graduates are encouraged to **pursue independent learning**, **acquire professional certifications**, and **engage in real-world experiences** to enhance their qualifications. Active **participation from students, faculty, institutions, and stakeholders** is crucial for **career success**.

VI.1.5 Learning Outcomes

The competencies of **Physics Study Program (PS Fisika) students** are developed through **learning outcomes** categorized into four aspects:

1. Attitudes and Values (SI)

Graduates should demonstrate the ability to:

- **SI 1:** Show devotion to **God Almighty** and exhibit **religious values**.
- **SI 2:** Uphold **humanitarian principles** in their professional duties, based on **morality and ethics**.
- **SI 3:** Internalize **academic integrity, norms, and ethical standards**.
- **SI 4:** Be **responsible citizens**, demonstrating **nationalism and patriotism**.
- **SI 5:** Respect **cultural diversity, perspectives, religions, and beliefs**, while valuing **original discoveries**.
- **SI 6:** Work **collaboratively** with **social awareness and environmental consciousness**.
- **SI 7:** Follow **legal principles** with **discipline and responsibility**.
- **SI 8:** Be **accountable for their professional roles** in physics and its applications.
- **SI 9:** Exhibit **self-reliance, perseverance, and entrepreneurial spirit**.
- **SI 10:** Take **ownership and responsibility** for work in their **area of expertise**.

2. Knowledge Mastery (PP)

Graduates should:

- **PP 1:** Master **theoretical concepts and fundamental principles** of **classical and quantum physics**.
- **PP 2:** Understand **mathematical physics, computational physics, and instrumentation techniques**.
- **PP 3:** Have **knowledge of physics-based technologies** and their applications in various **fields**.

3. Specialized Skills (KK)

Graduates should be able to:

- **KK 1:** Formulate **physical phenomena** through analysis based on **observations and experiments**.
- **KK 2:** Develop **mathematical models** that align with hypotheses or predicted outcomes of observed phenomena.
- **KK 3:** Analyze various **alternative solutions** for physical problems and determine **optimal decisions**.
- **KK 4:** Predict **technological applications** based on **physical principles**.
- **KK 5:** Communicate their research findings through **scientific reports** and **academic papers**.

4. General Skills (KU)

Graduates should be able to:

- **KU 1:** Apply **logical, critical, systematic, and innovative** thinking in physics research and applications.
- **KU 2:** Evaluate and document **scientific research findings** in the form of **theses or reports**, ensuring accuracy and integrity.
- **KU 3:** Make **well-informed decisions** in solving **physics-related problems** using **analytical methods**.
- **KU 4:** Engage in **self-learning**, managing their **own professional development**.
- **KU 5:** Develop and maintain **professional networks** with **mentors, colleagues, and peers** within and beyond academia.

VI.1.6 Curriculum Structure

The **Physics Study Program (PS Fisika) curriculum** consists of three types of courses:

1. **Mandatory Courses** (86 CREDITS) – Including **Community Service Program (KKM/PKM) and Thesis**.
2. **Elective Courses** (minimum 58 CREDITS) – Available for **regular students**.
3. **Independent Learning (MBKM) Courses** – Students who participate in the **MBKM program** for **two semesters** can earn up to **40 CREDITS** through external learning experiences, with additional elective courses taken internally or externally.

Course Code System

Each course in **PS Fisika** follows a structured code system:

- **MPF** – Identifies the course as part of the **Physics Study Program**.
- **First Digit** – Represents the **year** when the course is offered (based on a four-year scale).
- **Second Digit** – Represents the **course type**:
  - **1** → Mandatory Course
  - **2** → Elective Course
  - **3** → MBKM Course
- **Third Digit** – Represents the **area of specialization**:
  - **0** → General Physics
  - **1** → Fundamental Physics
  - **2** → Theoretical Physics
  - **3** → Computational Physics
  - **4** → Experimental Physics & Materials Science
  - **5** → Applied & Interdisciplinary Physics
- **Fourth Digit (MBKM Courses Only)** – Represents the **MBKM learning modality**:
  - **1** → Research
  - **2** → Internship

- 3 → Entrepreneurship
    - 4 → Humanitarian Projects
    - 5 → Village Development Projects
    - 6 → Independent Projects
    - 7 → Teaching Assistance
- **Final Digit** – Indicates the **course order** within its category for a given **year and semester**.

Example Course Code: MPF-2113

- **MPF** → Physics Study Program Course
- **2** → Available in the **second year**
- **1** → Mandatory Course
- **1** → Fundamental Physics
- **3** → Third course offered in the **odd semester**

Below is the semester-wise curriculum structure for PS Fisika.

Mandatory Courses Distribution

Semester 1					
No	Code	Credits	Course Name (Indonesian)	Course Name (English)	Prerequisites
1	MKWU-4	2	Bahasa Indonesia	Indonesian Language	-
2	MPF-1111	3	Fisika IA	Physics IA	-
3	MPF-1113	2	Fisika IB	Physics IB	-
4	MPF-1115	2	Praktikum Fisika I	Experimental Physics I	-
5	MKWU-3	2	Kewarganegaraan	Civics Education	-
6	MPF-1103	2	Kimia Dasar	Basic Chemistry	-
7	MPF-1101	3	Matematika I	Mathematics I	-
8	MPF-1131	2	Algoritma Pemrograman	Algorithm and Programming	-
9	MPF-1117	2	Pengukuran dan Analisis Data	Measurements and Data Analysis	-
	Total CREDITS	20			
Semester 2					
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)	Prerequisites
1	MKWU-1	3	Pendidikan Agama	Religion Education	-
2	MPF-1112	3	Fisika IIA	Physics IIA	-
3	MPF-1114	2	Fisika IIB	Physics IIB	-
4	MPF-1116	2	Praktikum Fisika II	Experimental Physics II	-
5	MKWU-2	2	Pancasila	Pancasila	-
6	MPF-1102	3	Matematika II	Mathematics II	-
7	UMG-1106	2	Bahasa Inggris	English Language	-
8	MPF-1132	3	Fisika Komputasi	Computational Physics	-

No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)	Prerequisites
	Total CREDITS	20			
Semester 3					
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)	Prerequisites
1	MPF-2111	3	Fisika Matematika I	Mathematical Physics I	-
2	MPF-2113	4	Mekanika	Mechanics	-
3	MPF-2151	3	Elektronika Dasar	Basic Electronics	-
4	MPF-2115	3	Termodinamika	Thermodynamics	-
5	MPF-2117	4	Listrik Magnet	Electricity and Magnetism	-
6	MPF-2119	3	Fisika Modern	Modern Physics	-
	Total CREDITS	20			
Semester 4					
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)	Prerequisites
1	MPF-2142	3	Fisika Zat Padat	Physics of Solid State	-
2	MPF-2112	3	Fisika Matematika II	Mathematical Physics II	-
3	MPF-2122	4	Fisika Kuantum	Quantum Physics	-
4	MPF-2144	2	Fisika Eksperimen	Experimental Physics I	-
5	MPF-2114	3	Fisika Inti	Introduction to Nuclear Physics	-
6	MPF-2116	3	Gelombang	Waves	-
7	MPF-2118	3	Fisika Statistik	Statistical Physics	-
	Total CREDITS	21			
Semester 5					
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)	Prerequisites
1	-	20	Pilihan/Moda MBKM	Elective Courses/MBKM Program	-
	Total CREDITS	20			
Semester 6					
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)	Prerequisites
1	-	20	Pilihan/Moda MBKM	Elective Courses/MBKM Program	-
	Total CREDITS	20			
Semester 7					
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)	Prerequisites
1	-	20	Pilihan/Moda MBKM	Elective Courses/MBKM Program	-
	Total CREDITS	20			
Semester 8					

No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)	Prerequisites
1	UMG-4101	2	KKM/PKM	Community Service	-
2	MPF-4102	3	Tugas Akhir	Undergraduate Thesis	-
	Total CREDITS	5			

B. Elective Courses

Odd Semester Courses for Physics Study Program					
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)	Prerequisites
1	MPF-3221	3	Astrofisika	Astrophysics	-
2	MPF-3223	3	Fisika Matematik III	Mathematical Physics III	-
3	MPF-3231	3	Simulasi dalam fisika	Physics-Based Simulation	-
4	MPF-4221	3	Astrofisika Relativistik dan Kosmologi	Relativistic Astrophysics and Cosmology	-
5	MPF-3225	2	Fungsi Khusus dan Aplikasinya	Special Functions and Their Applications	-
6	MPF-3227	2	Analisis Vektor dan Tensor	Vector and Tensor Analysis	-
7	MPF-3233	2	Simulasi Molekular	Molecular Simulation	-
8	MPF-4231	2	Kecerdasan Buatan	Artificial Intelligence	-
9	MPF-4233	2	Pengantar Algoritma dan Komputasi pada Mekanika Statistik	Statistical Mechanics Algorithms and Computations	-
10	MPF-3255	3	Aplikasi Mikrokontroler	Microcontroller Applications	-
11	MPF-3257	3	Elektronika Digital	Digital Electronics	-
12	MPF-4257	3	Elektronika Lanjut	Advanced Electronics	-
13	MPF-3251	3	Fisika Lingkungan	Environmental Physics	-
14	MPF-3253	3	Biofisika	Biophysics	-
15	MPF-4253	3	Metode Deteksi Radiasi	Radiation Detection Methods	-
16	MPF-4251	2	Konservasi Lingkungan	Nature Conservation	-
17	MPF-3241	3	Analisis Kuantitatif Mikrostruktur Material	Quantitative Analysis of Microstructure of Materials	-
18	MPF-3243	3	Fisika Zat Padat Lanjut	Physics of Solid State II	-
19	MPF-3245	3	Metode Fabrikasi Material	Material Fabrication Methods	-
20	MPF-4241	2	Fisika Material Komposit	Composite Material Physics	-
21	MPF-4243	2	Praktikum Fisika Material Komposit	Experiment of Composite Material Physics	-
22	MPF-4245	3	Fisika Material	Material Physics	-
23	MPF-3211	3	Studi Literatur	Literature Review	-
24	MPF-4212	3	Media Komunikasi Fisika	Communications in Media for Physics	-

Even Semester Courses for Physics Study Program					
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)	Prerequisites
1	MPF-3224	2	Dinamika Galaksi	Galactic Dynamics	-
2	MPF-4222	2	Komputasi Astrofisika	Computational Astrophysics	-
3	MPF-3226	3	Teori Relativitas	Theory of Relativity	-
4	MPF-3222	2	Sejarah Fisika	The History of Physics	-
5	MPF-4224	3	Nanofotonik	Nanophotonics	-
6	MPF-3228	3	Elektromagnetika	Electromagnetics	-
7	MPF-3232	2	Pemprosesan Sinyal	Signal Processing	-
8	MPF-4232	2	Metode Inversi	Inversion Method	-
9	MPF-3256	3	Instrumentasi	Instrumentation	-
10	MPF-3258	3	Analisis Rangkaian Listrik	Analysis of Electric Circuits	-
11	MPF-4258	3	Penginderaan Jauh	Remote Sensing	-
12	MPF-3254	3	Energi	Energy	-
13	MPF-4256	3	Pengantar Fisika Reaktor	Introduction to Reactor Physics	-
14	MPF-3252	2	Proteksi Radiasi	Radiation Protection	-
15	MPF-4252	3	Fisika Medis	Medical Physics	-
16	MPF-4254	2	Fisika Radiografi	Physics of Radiography	-
17	MPF-3242	3	Pengantar Kristalografi	Basics of Crystallography	-
18	MPF-4242	3	Karakteristik Material	Material Characteristics	-
19	MPF-3244	3	Fisika Atom dan Molekul	Physics of Atoms and Molecules	-
20	MPF-3248	3	Spektroskopi	Spectroscopy	-
21	MPF-4246	3	Pengantar Ilmu dan Teknologi Nano	Introduction to Nanoscience and Technology	-
22	MPF-3246	3	Metode Karakterisasi Material	Material Characterization Methods	-
23	MPF-4248	3	Pengantar Fisika Polimer	Introduction to Polymer Physics	-
24	MPF-3211	3	Studi Literatur	Literature Review	-
25	MPF-4212	3	Media Komunikasi Fisika	Communications in Media for Physics	-

C. Recognized Courses for the MBKM Program

Odd Semester Recognized MBKM Courses				
Mode 1: Research				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3311	3	Studi Literatur	Literature Review
2	MPF-3315	4	Metodologi Penelitian	Research Methodology
3	MPF-3317	4	Konsep Saintek	Concept of Science and Technology

4	MPF-4311	4	Seminar Proposal Riset	Research Proposal Seminar
5	MPF-4313	5	Laporan Kemajuan Riset	Progress Report
Mode 2: Internship				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3321	3	Studi Literatur	Literature Review
2	MPF-3323	2	Survey dan Observasi Lapangan	Survey and Observation
3	MPF-4321	3	Seminar Proposal Magang	Internship Proposal Seminar
4	MPF-3325	4	Komunikasi Publik	Public Communications
5	MPF-3329	8	Praktek Kerja 1	Internship 1
Mode 3: Entrepreneurship				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3331	3	Studi Literatur	Literature Review
2	MPF-3333	4	Survey dan Observasi Pasar	Survey and Observation
3	MPF-3337	4	Konsep Marketing	Marketing Concept
4	MPF-3335	4	Komunikasi Bisnis	Business Communications
5	MPF-4333	5	Laporan Kemajuan Usaha 1	Progress Report 1
Mode 4: Humanity Project				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3341	3	Studi Literatur Proyek I	Literature Review
2	MPF-3343	3	Survey dan Observasi Lapangan Proyek I	Survey and Observation
3	MPF-3345	3	Teknik Penulisan Proyek I	Writing Technique 1
4	MPF-3349	3	Program Kemanusiaan Proyek I	Humanity Project 1
5	MPF-4345	3	Media Komunikasi Fisika Proyek I	Communications in Media for Physics
6	MPF-4343	5	Laporan Akhir Proyek I	Final Report Project 1
Mode 5: Rural Development Project				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3351	3	Studi Literatur	Literature Review
2	MPF-3353	6	Survey dan Observasi Desa	Survey and Observation
3	MPF-4351	5	Seminar Proposal Kegiatan Pembangunan Desa	Rural Areas Development Proposal Seminar
4	MPF-3359	6	Program Inovasi Pedesaan	Innovation Program for Rural Areas
Mode 6: Independent Project				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3361	3	Studi Literatur	Literature Review
2	MPF-3365	4	Metodologi Penelitian	Research Methodology
3	MPF-3367	4	Konsep Saintek	Concept of Science and Technology
4	MPF-4361	4	Seminar Proposal Proyek	Project Proposal Seminar
5	MPF-3369	5	Proyek Independen 1	Independent Project 1
Mode 7: Teaching Assistance				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)

1	MPF-3371	3	Studi Literatur	Literature Review
2	MPF-3373	4	Survey dan Observasi Sekolah	Survey and Observation
3	MPF-3375	4	Metode Pengajaran	Teaching Methods
4	MPF-3377	4	Media Pembelajaran Fisika	Learning Media for Physics
5	MPF-4373	5	Laporan Kegiatan 1	Activity Report 1
Mode 8: Student Exchange (Inter-University)				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1		20	Sesuai dengan mata kuliah yang diambil di universitas tujuan	According to the courses taken at the destination university

Even Semester Recognized MBKM Courses				
Mode 1: Research				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3312	4	Komunikasi Ilmiah	Scientific Communication
2	MPF-3314	4	Teknik Penulisan Ilmiah	Scientific Writing Technique
3	MPF-3318	4	Seminar Hasil	Public Seminar
4	MPF-4312	3	Media Komunikasi Fisika	Communications in Media for Physics
5	MPF-4314	5	Laporan Riset	Research Report
Mode 2: Internship				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3322	4	Manajemen	Management
2	MPF-3328	8	Praktek Kerja 2	Internship 2
3	MPF-4322	3	Media Komunikasi Fisika	Communications in Media for Physics
4	MPF-4324	5	Laporan Praktek Kerja	Internship Report
Mode 3: Entrepreneurship				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3332	4	Pemasaran Produk	Product Licensing
2	MPF-3334	4	Dasar-dasar Akuntansi	Accountancy
3	MPF-3336	4	Eksposisi Produk	Exhibition
4	MPF-4332	3	Media Komunikasi Fisika	Communications in Media for Physics
5	MPF-4334	5	Laporan Kemajuan Usaha 2	Progress Report 2
Mode 4: Humanity Project				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3342	3	Studi Literatur Proyek II	Literature Review
2	MPF-3344	3	Survey dan Observasi Lapangan Proyek II	Survey and Observation
3	MPF-3346	3	Teknik Penulisan Proyek II	Writing Technique 1
4	MPF-3348	3	Program Kemanusiaan Proyek II	Humanity Project 1
5	MPF-4342	3	Media Komunikasi Fisika Proyek II	Communications in Media for Physics
6	MPF-4344	5	Laporan Akhir Proyek II	Final Report Project 1
Mode 5: Rural Development Project				

No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3352	4	Komunikasi Pembangunan	Communication for Development
2	MPF-3358	4	Pemberdayaan Masyarakat Desa	Community Empowerment
3	MPF-4352	3	Media Komunikasi Fisika	Communications in Media for Physics
4	MPF-3354	4	Monitoring dan Evaluasi	Monitoring and Evaluation
5	MPF-4354	5	Laporan Kegiatan	Activity Report
Mode 6: Independent Project				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3362	4	Teknik Penulisan Ilmiah	Writing Technique
2	MPF-3368	8	Proyek Independen 2	Independent Project 2
3	MPF-4362	3	Media Komunikasi Fisika	Communications in Media for Physics
4	MPF-4364	5	Laporan Proyek Independen	Independent Project Report
Mode 7: Teaching Assistance				
No	Code	Credits (CREDITS)	Course Name (Indonesian)	Course Name (English)
1	MPF-3372	6	Inovasi Bahan Ajar	Innovation of Learning Materials
2	MPF-3374	6	Manajemen Pembelajaran	Learning Management
3	MPF-4372	3	Media Komunikasi Fisika	Communications in Media for Physics
4	MPF-4374	5	Laporan Kegiatan 2	Activity Report 2
Mode 8: Student Exchange (Inter-University)				
No	Credits (CREDITS)	Course Name (Indonesia n)	Course Name (English)	
1		20	Sesuai dengan mata kuliah yang diambil di universitas tujuan	According to the courses taken at the destination university

VI.1.6.2 Course Syllabus

A. Compulsory Courses

Semester I					
Course Code	**Subject Name**	**Credit (CREDITS)**	**Prerequisites**	**Topics Covered**	**References**
MKWU-4	**Indonesian Language**	**2 CREDITS**	-	Academic Texts in Macro Genre; Library Exploration; Designing Research Proposals and Activity Proposals; Reporting Research Findings and Activity Outcomes; Scientific Articles.	Kemenristek, 2016, *Indonesian Language Education Module for Higher Education*, Directorate General of Learning and Student Affairs, Ministry of Research and Technology, Jakarta. Awaluddin, 2017, *Introduction to Indonesian Language for Higher Education*, Deepublish Publisher, Yogyakarta. D. A. Lindayani et al., 2017, *Indonesian Language as a General Basic Course*, Gramedia, Jakarta.
MPF-1111	**Physics IA**	**3 CREDITS**	-	Measurement (introduction to physical quantities, mass standard, length standard, time standard, and significant figures); Kinematics in 1 dimension (uniform and accelerated motion); Kinematics in 2 dimensions (projectile motion, uniform circular motion) and 3 dimensions; Dynamics (Newton's laws and applications in translational motion); Kinetic energy and work (kinetic energy theorem, work by force with a general variable); Potential energy and conservation of energy (relationship between work and potential energy, conservative and non-conservative forces, work done on a system by external force, concept and application of conservation law); Linear momentum, impulse, and collisions (impulse-momentum theorem, momentum conservation, collision, center of mass concept); Rigid body rotation (angular velocity and acceleration, rotation with constant angular acceleration, relation between linear and angular kinematics, energy in rotational motion, parallel axis theorem, moment of inertia calculations); Rotational motion dynamics (torque and angular acceleration of rigid bodies, rigid body rotation, work and power in rotational motion, angular momentum and its conservation law).	Halliday, D., Resnick, R., Walker, J. (2013), *Fundamentals of Physics, 10th Edition*. Young, H. D., Freedman, R. A. (2016), *University Physics with Modern Physics, 14th Edition*. Tipler, P. A., Mosca, G. (2008), *Physics for Scientists and Engineers, 6th Edition*.
MPF-1113	**Physics IB**	**2 CREDITS**	-	Fluid mechanics, temperature, heat and the first law of thermodynamics, kinetic theory of gases, entropy and the second law of thermodynamics, heat engines, equilibrium and elasticity, gravity.	Halliday, D., Resnick, R., Walker, J. (2013), *Fundamentals of Physics, 10th Edition*. Young, H. D., Freedman, R. A. (2016), *University Physics with Modern Physics, 14th Edition*.

					Tipler, P. A., Mosca, G. (2008), *Physics for Scientists and Engineers, 6th Edition*.
MPF-1115	**Basic Physics Laboratory I**	**2 CREDITS**	-	Fundamentals of measurement, Mathematical Pendulum Experiment, Force on an Inclined Plane, Determination of Moment of Inertia on an Inclined Plane, Coefficient of Restitution, Moment of Inertia of a Solid Cylinder, Coefficient of Viscosity of Liquids, Hydrostatic Pressure, Archimedes' Principle, Torque, Torricelli's Principle.	Physics Department Laboratory, Faculty of Mathematics and Natural Sciences, UNTAN (2020), *Basic Physics Laboratory I Handbook*.
					Wilson, J. D., Hernndez-Hall, C. A. (2014), *Physics Laboratory Experiments*, Brooks Cole.
					Halliday, D., Resnick, R., Walker, J. (2013), *Fundamentals of Physics, 10th Edition*.
					Young, H. D., Freedman, R. A. (2016), *University Physics with Modern Physics, 14th Edition*.
					Tipler, P. A., Mosca, G. (2008), *Physics for Scientists and Engineers, 6th Edition*.
MKWU-3	**Citizenship Education**	**2 CREDITS**	-	Citizenship education in higher education; The essence and urgency of national identity as a determinant of nation-building and character formation; The urgency of nationality as a parameter of national unity and cohesion; Constitutional values and legal provisions beneath the Constitution; Harmony between state and citizen rights and obligations within democracy rooted in popular sovereignty and consensus deliberation; The essence, instrumentation, and praxis of Indonesian democracy based on Pancasila and the 1945 Constitution; Historical dynamics of constitutional law, socio-political movements, and contemporary justice enforcement; The historical dynamics and urgency of the archipelago perspective as a collective national concept in the global context; The urgency and challenges of national resilience and defense in fostering collective national commitment; *Project Citizen* for the Citizenship Education course.	Kemenristekdikti (2016), *Citizenship Education Module for Higher Education*, Directorate General of Learning and Student Affairs, Jakarta.
					Budimansyah, D. (Ed.) (2006), *Moral Value Education in the Dimension of Citizenship Education*, Bandung: PKN FPIPS UPI Laboratory.
					Pasha, M. K. (2008), *Citizenship Education (Civic Education)*, Yogyakarta: Citra Karsa Mandiri.
					Sunarso et al. (2006), *Citizenship Education*, Yogyakarta: UNY Press.
MPF-1103	**Basic Chemistry**	**2 CREDITS**	-	Introduction; Atoms, Molecules, and Ions; Stoichiometry; Reactions in Aqueous Solution; Gases; Energy Relations in Chemical Reactions; Electron Structure of Atoms; Periodic Table; Chemical Bonding I: Covalent Bonds;	Chang, R. (2003), *General Chemistry: The Essential Concepts*, 3rd Edition, McGraw-Hill.

				Chemical Bonding II: Molecular Geometry and Atomic Orbital Hybridization.	Petrucci, R. H. (1985), *General Chemistry: Principles & Modern Applications*, 4th Edition, Collier Macmillan.
MPF-1101	**Mathematics I**	**3 CREDITS**	-	Vectors (scalar and vector quantities, vector representation, vector components (unit vector, planar vector, and spatial vector), vector operations [addition/subtraction of vectors (graphical and analytical methods), scalar multiplication, dot product and cross product]); Functions and graphs (including transcendental functions); Limit of functions; Differentiation and its applications; Integration; Ordinary Differential Equations (ODE) [introduction to differential equations and their classification, solving differential equations, first-order linear differential equations (separable equation)]; Trigonometry.	Stroud, K. A., Booth, D. J. (2003), *Engineering Mathematics, 5th Edition, Volume 1*, Erlangga, Jakarta.
					Stroud, K. A., Booth, D. J. (2003), *Engineering Mathematics, 5th Edition, Volume 2*, Erlangga, Jakarta.
					Varberg, D., Purcell, E. J., Rigdon, S. E. (2010), *Calculus, 9th Edition, Volume 1*, Erlangga, Jakarta.
					Varberg, D., Purcell, E. J., Rigdon, S. E., Susila, I. N. (Editor) (2011), *Calculus, 9th Edition, Volume 2*, Erlangga, Jakarta.
					Boas, M. L. (2006), *Mathematical Methods in the Physical Sciences, 3rd Edition*, John Wiley.
MPF-1131	**Programming Algorithm**	**2 CREDITS**	-	Definition of Algorithms, Algorithm Examples, Meaning of Programming, Classification of Programming Languages, Introduction to Python, Data Types, Arithmetic Operations, Boolean Operations, Variables and Constants, Flow of Program (if, for, while), Functions and Procedures, Vectors (list, tuple, dict), Matrices (numpy), I/O, Plotting (matplotlib).	Lutz, M. (2013), *Learning Python, 5th Edition*, O'Reilly Media, Sebastopol.
					Kulikov, A., Pevzner, P. (2018), *Learning Algorithms Through Programming and Puzzle Solving*, Active Learning Technologies, San Diego.
					Linge, S., Langtangen, H. P. (2016), *Programming for Computations – Python*, Springer Open, Heidelberg.
MPF-1117	**Measurement and Data Analysis**	**2 CREDITS**	-	Basic concepts of measurement; Measuring instruments; Measurement techniques; Measurement uncertainty; Data collection and processing; Experimental data analysis results; Application of data processing and data presentation tools.	Morris, A. S., Langari, R. (2020), *Measurement and Instrumentation: Theory and Applications, 3rd Edition*, Academic Press.
					Holman, J. P. (2012), *Experimental Methods for Engineers, 8th Edition*, McGraw-Hill, New York.
					Bevington, P., Robinson, D. K. (2003), *Data Reduction and Error Analysis for Physical Sciences, 3rd Edition*, McGraw-Hill.
Semester II					
Course Code	**Subject Name**	**Credit (CREDITS)**	**Prerequisites**	**Topics Covered**	**References**

MPF-1112	**Physics IIA**	**3 CREDITS**	-	Charge (types, quantization, conservation); Conductors and insulators; Coulomb's Law; Electric field from discrete charge sources (general charge configuration and dipole), continuous charge sources, charge in an electric field; Gauss's Law and its application in calculating electric fields (spherical, cylindrical, planar symmetry cases); Electric potential, equipotential surfaces, electric potential due to discrete and continuous charge sources, calculating electric fields from potential, electric potential energy of a charged particle system; Capacitor and capacitance, series-parallel capacitor arrangements, energy in capacitors, capacitors with dielectric materials; Current and resistance, electric circuits; Magnetic field and force (Lorentz force); Crossed fields (electric and magnetic fields perpendicular to each other) in cathode ray tubes, Hall effect; Magnetic force on a current-carrying wire, torque on a current loop, magnetic dipole moment; Magnetic field induced by currents (Biot-Savart Law); Ampere's Law and its application in calculating magnetic fields for straight conductors, solenoids, and toroids; Induction and inductance (Faraday's Law, Lenz's Law), energy transfer, eddy currents, inductors, RC circuits; Energy in the magnetic field.	Halliday, D., Resnick, R., Walker, J. (2013), *Fundamentals of Physics, 10th Edition*.
					Young, H. D., Freedman, R. A. (2016), *University Physics with Modern Physics, 14th Edition*.
					Tipler, P. A., Mosca, G. (2008), *Physics for Scientists and Engineers, 6th Edition*.
MPF-1114	**Physics IIB**	**2 CREDITS**	-	Oscillations; Mechanical waves, sound; Electromagnetic waves; Geometric optics and optical instruments; Interference; Diffraction.	Halliday, D., Resnick, R., Walker, J. (2013), *Fundamentals of Physics, 10th Edition*.
					Young, H. D., Freedman, R. A. (2016), *University Physics with Modern Physics, 14th Edition*.
					Tipler, P. A., Mosca, G. (2008), *Physics for Scientists and Engineers, 6th Edition*.
MPF-1116	**Basic Physics Laboratory II**	**2 CREDITS**	-	Experiments on resistance measurement; Ohm's Law experiment; Kirchhoff's Laws; Capacitors; RLC circuits; Magnetism; Light diffraction; Standing waves; Positive lenses; Organ pipes; Light refraction in prisms; Oscillation in springs.	Physics Department Laboratory, Faculty of Mathematics and Natural Sciences, UNTAN (2020), *Basic Physics Laboratory II Handbook*.
					Wilson, J. D., Hernández-Hall, C. A. (2014), *Physics Laboratory Experiments*, Brooks Cole.

					Halliday, D., Resnick, R., Walker, J. (2013), *Fundamentals of Physics, 10th Edition*. Young, H. D., Freedman, R. A. (2016), *University Physics with Modern Physics, 14th Edition*. Tipler, P. A., Mosca, G. (2008), *Physics for Scientists and Engineers, 6th Edition*.
MKWU-2	**Pancasila**	**2 CREDITS**	-	Pancasila education in higher education; Pancasila in the historical development of Indonesia; The urgency of Pancasila as the foundation of the Republic of Indonesia; Pancasila as state ideology; Pancasila as a philosophical system; Pancasila as an ethical system; Pancasila as the fundamental value in knowledge development.	Kemenristekdikti (2016), *Pancasila Education Module for Higher Education*, Jakarta. Ali, A. S. (2009), *Pancasila: The Path of National Welfare*, Jakarta: Pustaka LP3ES. Bakry, N. M. S. (2010), *Pancasila Education*, Yogyakarta: Pustaka Pelajar. Kaelan (2013), *The National State of Pancasila: Cultural, Historical, Philosophical, Legal, and Practical Applications*, Yogyakarta: Paradigma Publisher.
MPF-1102	**Mathematics II**	**3 CREDITS**	-	Matrices; Vector analysis (including triple product and differential vector operations such as gradient, directional derivative, divergence, and curl); Linear algebra; Infinite series and power series; Partial differentiation.	Boas, M. L. (2006), *Mathematical Methods in the Physical Sciences, 3rd Edition*, John Wiley. Stroud, K. A., Booth, D. J. (2003), *Engineering Mathematics, 5th Edition, Volume 1*, Erlangga, Jakarta. Stroud, K. A., Booth, D. J. (2003), *Engineering Mathematics, 5th Edition, Volume 2*, Erlangga, Jakarta. Varberg, D., Purcell, E. J., Rigdon, S. E. (2010), *Calculus, 9th Edition, Volume 1*, Erlangga, Jakarta. Varberg, D., Purcell, E. J., Rigdon, S. E., Susila, I. N. (Editor) (2011), *Calculus, 9th Edition, Volume 2*, Erlangga, Jakarta. Ruwanto, B. (2002), *Mathematics for Physics and Engineering, Volume 1*, Yogyakarta: Adicita Karya Nusa.
UMG-1106	**English Language**	**2 CREDITS**	-	English usage at an intermediate and pre-advanced level, with a focus on understanding scientific readings and expanding vocabulary and expressions; Sentence structure (grammar) taught in alignment with scientific texts; Improving English proficiency through reading and pronunciation exercises; Refining grammar, expanding vocabulary, and understanding idioms and usage; Special emphasis on correcting common errors.	-

MPF-1132	**Computational Physics**	**3 CREDITS**	-	Taylor series; Error analysis; Floating point number representation; Numerical differentiation; Numerical integration (Composite Trapezoidal Rule, Simpson's 1/3 Rule, Extrapolation, Romberg method); Root finding (Bisection Method, Regula Falsi, Newton-Raphson Method, Secant Method); Ordinary Differential Equations (Euler Method, Heun Method, Runge-Kutta Method, Leapfrog Method); Systems of linear equations (Gaussian Elimination, Jacobi Method, Gauss-Seidel Method); Curve fitting (Linear, Quadratic, Polynomial, Exponential).	Koonin, S. E. (1986), *Computational Physics*, Benjamin/Cummings Publishing Company, California. Hoffman, J. D. (2001), *Numerical Methods for Engineers and Scientists*, Marcel Dekker, Basel. Linge, S., Langtangen, H. P. (2016), *Programming for Computations – Python*, Springer Open, Heidelberg.
Semester III					
Course Code	**Subject Name**	**Credit (CREDITS)**	**Prerequisites**	**Topics Covered**	**References**
MPF-2111	**Mathematical Physics I**	**3 CREDITS**	-	Complex numbers; Multiple integrals and applications; Vector analysis (continuing topics from Mathematics II, including field concepts, line/path integrals, Green's theorem, divergence theorem, and Stokes' theorem); Ordinary differential equations (ODE) [continuing ODE topics from Mathematics I, including first-order linear ODEs (general solutions, Bernoulli equation, exact equations, homogeneous equations), second-order linear ODEs]; Laplace transformation.	Boas, M. L. (2006), *Mathematical Methods in the Physical Sciences, 3rd Edition*, John Wiley. Ruwanto, B. (2002), *Mathematics for Physics and Engineering, Volume 1*, Yogyakarta: Adicita Karya Nusa. Ruwanto, B. (2003), *Mathematics for Physics and Engineering, Volume 2*, Yogyakarta: Adicita Karya Nusa.
MPF-2113	**Mechanics**	**4 CREDITS**	-	Kinematics in 2D and 3D (polar, cylindrical, and spherical coordinates); One-dimensional dynamics (Newton's second and third laws, force dependence on time, velocity, and position); Numerical solutions to Newtonian dynamics (modified Euler and Leapfrog methods); Two-dimensional and three-dimensional dynamics; Oscillations (simple harmonic, damped, forced, coupled oscillations); Introduction to Lagrange and Hamilton formalism; Central forces; Non-inertial reference frames; Rigid body dynamics.	Morin, D. (2007), *Introduction to Classical Mechanics: With Problems and Solutions*, Cambridge University Press. Gregory, R. D. (2006), *Classical Mechanics: An Undergraduate Text*, Cambridge University Press. Symon, K. R. (1971), *Mechanics, 3rd Edition*, Addison-Wesley.
MPF-2151	**Basic Electronics**		-	Fundamental concepts of current and voltage; Direct current (DC); Alternating current (AC); Semiconductor	Smith, R. J. (1995), *Circuits, Devices, and Systems*, John Wiley & Sons.

		3 Credit s		materials; PN diodes; Zener diodes; Bipolar junction transistors (PNP, NPN); Transistor as an amplifier; Field-effect transistors (JFET, MOSFET); Power amplifiers; Operational amplifiers (Op Amp); Filters.	Brophy, J. J. (1990), *Basic Electronics for Scientists*, McGraw-Hill, New York, Fifth Edition.
					Milman, J., Halkias, C. (1992), *Integrated Electronics*, McGraw-Hill, Toronto.
MPF-2115	**Thermodyn amics**	**3 CRED ITS**	-	**Scope of Thermodynamics**: Thermodynamic systems and variables (temperature, pressure, volume), zeroth law of thermodynamics and equilibrium, thermodynamic processes.	Sears, F. W., Salinger, G. L., *Thermodynamics: Kinetic Theory and Statistical Thermodynamics*, Addison-Wesley.
				Equation of State: Ideal gas equation, real gas equation, partial derivatives (expansion and compression coefficients), van der Waals critical constants, relationships between partial and exact differentials.	Alonso, M., Finn, E. J. *Fundamental University Physics, Vol III*, Addison-Wesley.
				First Law of Thermodynamics: Work in thermodynamics, first law of thermodynamics, internal energy, heat flow, heat capacity, enthalpy, general formulation of the first law.	Carrington, G. *Basic Thermodynamics*, Oxford University Press.
				Consequences of the First Law: Energy equations (variables T and V, T and P, P and V), Gay-Lussac-Joule experiment, Joule-Thomson effect, Carnot cycle, heat engines and refrigerators.	Kittel, C. *Thermal Physics*, W. H. Freeman & Co, New York.
				Entropy & Second Law of Thermodynamics: Second law of thermodynamics, entropy (in reversible and irreversible processes), entropy increase principle.	Greiner, W., Neise, L., Stocker, H. *Thermodynamics and Statistical Mechanics*, Springer-Verlag.
				Combination of First and Second Laws: TDS equations (1, 2, 3) + applications to pure substances, ideal gases, van der Waals gases, liquids, solids under hydrostatic pressure, Joule and Joule-Thomson experiments.	
MPF-2117	**Electricity and Magnetism**	**3 CRED ITS**	-	Electric fields in a vacuum; Divergence and curl of the electric field; Electric potential; Electrostatic work and energy; Conductors; Electric fields in materials, polarization, fields of polarized objects; Electric displacement; Linear dielectrics (susceptibility, permeability, dielectric constant); Magnetic fields in a vacuum; Lorentz force; Biot-Savart law; Divergence and curl of the magnetic field; Magnetic potential; Magnetic fields in materials; Magnetization; Fields produced by magnetized materials; Maxwell’s equations.	Griffiths, D. J. (2013), *Introduction to Electrodynamics, 4th Edition*.
					Purcell, E. M., Morin, D. J. (2013), *Electricity and Magnetism, 3rd Edition*.
MPF-2119	**Modern Physics**	**3 CRED ITS**	-	Special relativity; Lorentz transformation; Blackbody radiation; Photoelectric effect; X-rays; Compton effect; Pair production; Atomic matter; Atomic spectra; Atomic models;	Beiser, A. (2003), *Concepts of Modern Physics, 6th Edition*, McGraw-Hill.

				De Broglie waves; Heisenberg uncertainty principle; Schrödinger equation and its solutions; Hydrogen atom.	Krane, K. (2012), *Modern Physics, 3rd Edition*, John Wiley & Sons.
Semester IV					
Course Code	**Subject Name**	**Credit (CRE DITS)**	**Prerequis ites**	**Topics Covered**	**References**
MPF-2142	**Solid State Physics**	**3 CRED ITS**	-	**Crystal Structure**: Periodicity, unit cell and packing factors, seven crystal systems, plane indices and interplanar distances, simple crystals, crystal defects, and crystal bonding.	Kittel, C. (2005), *Introduction to Solid State Physics*, John Wiley & Sons, New York.
				Diffraction by Lattices and Reciprocal Lattices: X-ray diffraction in crystal lattices (X-ray production process, principles of X-ray diffractogram, Bragg's equation); Reciprocal lattice (Fourier analysis: scattered wave amplitude, reciprocal lattice vectors, diffraction condition: Laue condition); Brillouin zones; Structural factors and atomic form factors.	Patterson, J. D., Bailey, B. C. (2007), *Solid-State Physics: Introduction to the Theory*, Springer-Verlag, Berlin Heidelberg.
				Crystal Bonding: Noble gas bonding, ionic crystals, covalent crystals, metallic bonding, hydrogen bonding.	
				Lattice Vibrations: Phonons: dispersion relations, monoatomic lattice vibrations, diatomic lattice vibrations, quantization of lattice vibrations.	
				Thermal Properties of Crystals: Lattice heat capacity (Einstein model, Debye model), thermal conductivity.	
MPF-2112	**Mathematical Physics II**	**3 CRED ITS**	-	Fourier series and Fourier transforms; Special functions; Series solutions of differential equations (Legendre, Bessel, Hermite, and Laguerre functions).	Boas, M. L. (2006), *Mathematical Methods in the Physical Sciences, 3rd Edition*, John Wiley.
					Ruwanto, B. (2002), *Mathematics for Physics and Engineering, Volume 1*, Yogyakarta: Adicita Karya Nusa.
					Ruwanto, B. (2003), *Mathematics for Physics and Engineering, Volume 2*, Yogyakarta: Adicita Karya Nusa.
MPF-2122	**Quantum Physics**	**4 CRED ITS**	-	Birth of quantum theory (issues in classical physics, particle-wave duality); Introduction to Schrödinger's equation, wave function solutions (well-behaved wave functions), time-independent Schrödinger equation; Statistical interpretation of wave functions (probability density and expectation values); Heisenberg uncertainty principle; Time-independent Schrödinger equation for 1D cases (potential barrier, infinite well, harmonic oscillator);	Scherrer, R. J. (2006), *Quantum Mechanics: An Accessible Introduction, 1st Edition*.

				Applications of Schrödinger's equation for hydrogen atom (energy levels, probability cloud, quantum numbers, angular momentum).	Eisberg, R., Resnick, R. (1974), *Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles, 2nd Edition*.
					Griffiths, D. (2018), *Introduction to Quantum Mechanics, 3rd Edition*.
MPF-2144	**Experimental Physics**	**2 CREDITS**	-	Blackbody radiation experiment; Millikan oil drop experiment; Thomson's e/m experiment; Spectrophotometry.	Beiser, A. (1981), *Concepts of Modern Physics, Vol 3*, Jakarta: Erlangga (translated by The Houw Liong).
					Experimental Physics Module, Faculty of Mathematics and Natural Sciences, Universitas Tanjungpura.
MPF-2114	**Nuclear Physics**	**3 CREDITS**	-	**Nuclear Properties**: Mass, radius, spin, magnetic moment, electric moment.	Meyerhof, W. E. (1967), *Elements of Nuclear Physics*, McGraw-Hill.
				Binding Energy: Liquid drop model, Weizsäcker mass formula, mass parabolas.	Arya, A. H. (1966), *Fundamentals of Nuclear Physics*, Allen and Bacon Inc.
				Two-Nucleon System: Nuclear force, deuteron structure, scattering theory, n-p scattering.	Krane, K. S. (1987), *Introductory Nuclear Physics*, John Wiley & Sons.
				Radioactivity: Radioactivity laws, radioactive equilibrium, radioactive decay chains, nuclear stability, alpha decay, beta decay, gamma decay.	
				Nuclear Reactions: Classification, reaction energy, cross-section, reaction mechanisms, compound nucleus model, Wigner's theory, optical model, direct reactions, fission, fusion, nuclear reactor basics.	
				Neutrons: Thermalization, nuclear reactions in the center of mass coordinate system.	
				Nuclear Instrumentation: Particle detectors (Geiger-Müller, scintillation, semiconductor); Particle accelerators (cyclotron, betatron, linac, synchrotron).	
MPF-2116	**Waves**	**3 CREDITS**	-	Waves as functions of space and time; Mechanical and electromagnetic wave equations; Plane wave solutions; Energy and power transmission in waves; Superposition and modulation principles; Wave packets; Dispersion; Polarization and its applications; Physical phenomena and quantities at medium boundaries; Brewster's law, total internal reflection; Interference and interferometers; Spatial and temporal coherence; Diffraction: Kirchhoff formula, Fraunhofer and Fresnel diffraction.	Tjia, M. O. (1994), *Waves*, Dabara Publishers.
					Hecht, E. (1987), *Optics, 2nd Edition*, Addison-Wesley.
					Pedrotti, F. L., Pedrotti, L. S. (1993), *Introduction to Optics*, Prentice Hall.

MPF-2118	**Statistical Physics**	**3 CREDITS**	-	**Statistics**: Probability theory fundamentals, binomial distribution, Poisson distribution, Gaussian distribution, Maxwell speed distribution, Maxwell-Boltzmann distribution.	Poynton, (1967), *Introduction to Statistical Physics*, Longman-Green.
				Statistical Physics Approach: Macroscopic and microscopic states, statistical weighting of microscopic states, maximum entropy principle, equilibrium in open and closed systems, microscopic ensembles, partition functions, equilibrium in thermostats (reservoirs), canonical ensemble, Maxwell-Boltzmann distribution.	Reif, F. (1970), *Fundamentals of Statistics and Thermal Physics*, McGraw-Hill.
				Canonical Ensemble: Paramagnetic properties of solids, internal energy, Helmholtz free energy, heat capacity and entropy, Einstein's heat capacity theory, density of states, Debye's heat capacity theory.	Sears, F. W., Salinger, G. L. (1982), *Thermodynamics, Kinetic Theory, and Statistical Thermodynamics, 3rd Edition*, Addison-Wesley.
				Grand Canonical Ensemble: Partition functions, classical system criteria, equation of state, entropy, Gibbs free energy, thermodynamic and chemical potentials, real gases, virial expansions, critical points.	Kittel, C. (1958), *Elementary Statistical Physics*, John Wiley.
				Quantum Gases: Partition function, Fermi-Dirac distribution, Bose-Einstein distribution.	Krauth, W. (2006), *Statistical Mechanics Algorithms and Computations*, Oxford University Press.
				Fermi-Dirac Statistics: Classical limits, free electron model, electronic heat capacity, magnetic susceptibility.	Purwanto, A. (2007), *Statistical Physics*, Gaya Media, Yogyakarta.
				Bose-Einstein Statistics: Bose-Einstein distribution, blackbody radiation spectrum, crystal heat capacity theory.	Abdullah, M. (2007), *Introduction to Statistical Physics for Students*, ITB, Bandung.
					Huang, K. (1987), *Statistical Mechanics*, John Wiley & Sons.
					Huang, K. (2009), *Introduction to Statistical Physics, 2nd Edition*, CRC Press.

Semesters V, VI, VII, and VIII

UMG-4101	**Community Service/KKM (Field Work Program/PKM)**	**2 CREDITS**	-	**Regular Curriculum (Conventional Mode):**	-
				PKM: Conduct fieldwork at a relevant institution for one month, compile a fieldwork report, and present it in an open seminar.	
				KKM: Implement and document activities related to the Community Service Program.	
				MBKM Program Mode: KKM/PKM is an integrated part of the program, requiring an official Activity Report.	

MPF-4102	**Final Project (Thesis)**	**3 CREDITS**	-	**Regular Curriculum (Conventional Mode):** The final project includes literature review for research proposal development, conducting research, writing a report, and compiling the final findings into a thesis book. **MBKM Program Mode:** The final project is integrated within the program, requiring an official Activity Report.	-

B. Elective Courses

Odd Semester					
Course Code	**Subject Name**	**Credit (CREDITS)**	**Prerequisites**	**Topics Covered**	**References**
MPF-3221	**Astrophysics**	**3 CREDITS**	-	Celestial coordinates; Photometry; Spectroscopy; Telescopes; Celestial mechanics; Planets; Stellar structure; The Sun; Binary systems; Galaxies and their contents; Planet formation; Brief review of General Relativity Theory; Cosmology.	Carroll, B. W., Otslie, D. A. (2007), *An Introduction to Modern Astrophysics, 2nd Edition*, Pearson Education, San Francisco. Binney, J. (2016), *Astrophysics: A Very Short Introduction*, Oxford University Press. Karttunen, H. et al. (2017), *Fundamental Astronomy, 6th Edition*, Springer-Verlag.
MPF-3223	**Mathematical Physics III**	**3 CREDITS**	-	Series solutions of differential equations; Partial differential equations; Functions of complex variables; Integral transformations.	Boas, M. L. (2006), *Mathematical Methods in the Physical Sciences, 3rd Edition*, John Wiley. Riley, K. F. et al. (2007), *Mathematical Methods for Physics and Engineering, 3rd Edition*, Cambridge University Press. Hasanuddin (2019), *Lecture Notes on Mathematical Physics III*.
MPF-3231	**Simulation in Physics**	**3 CREDITS**	-	**Tools of the trade:** Plotting, animation, Graphical User Interface, Object-Oriented Programming; Particle simulation in stationary potential; N-body simulation; Simulation of problems based on Ordinary Differential Equations; Monte Carlo methods.	Gould, H. et al. (2007), *An Introduction to Computer Simulation Methods: Applications to Physical Systems, 3rd Edition*, Pearson Education. Linge, S., Langtangen, H. P. (2016), *Programming for Computations – Python*, Springer Open. Koonin, S. E. (1986), *Computational Physics*, Benjamin/Cummings Publishing Company.

MPF-4221	**Relativistic Astrophysics and Cosmology**	**3 CREDITS**	Modern Physics, Theory of Relativity	Special Relativity; General Relativity; Relativistic Quantum Mechanics and Particle Physics; Spherical Relativistic Stars; Stellar Evolution; White Dwarfs; Neutron Stars; Black Holes; Cosmological Principles; Robertson-Walker Metric; Dark Energy and Universe Dynamics; Inflation and the Early Universe; Standard Cosmological Model.	Hoyng, P. (2007), *Relativistic Astrophysics and Cosmology: A Primer*. Islam, J. N. (2002), *An Introduction to Mathematical Cosmology*.
MPF-3225	**Special Functions and Applications**	**2 CREDITS**	Mathematical Physics I & II	Gamma Function; Beta Function; Airy Function; Bessel Function; Legendre Polynomials and Spherical Functions; Hermite Polynomials.	Akhmedova, V., Akhmedov, E. T. (2019), *Selected Special Functions for Fundamental Physics*. Hassani, S. (2013), *Mathematical Physics*.
MPF-3227	**Vector and Tensor Analysis**	**2 CREDITS**	Mathematical Physics I & II	**Review of Coordinate Systems**: Vector Representation and Basis Vectors; Gradient, Divergence, and Curl Operators. **Introduction to Manifolds**: Definition of manifolds, transformation rules, Covariant and Contravariant Vectors, One-Forms. **Tensor Theory**: Definition, Tensor Operations, Examples of Special Tensors.	Fleisch, D. A. (2011), *A Student's Guide to Vectors and Tensors*. Ruiz-Tolosa, J. R. et al. (2005), *From Vector to Tensor*.
MPF-4223	**Quantum Mechanics**	**3 CREDITS**	Quantum Physics	Mathematical framework of quantum mechanics; Quantum mechanics postulates; Application of operator methods to harmonic oscillator problems; Angular momentum; Spin; Identical particles.	Griffiths, D. (2018), *Introduction to Quantum Mechanics, 3rd Edition*. Zettili, N. (2009), *Quantum Mechanics: Concepts and Applications, 2nd Edition*.
MPF-3233	**Molecular Simulation**	**3 CREDITS**	-	Introduction to statistical mechanics; Monte Carlo simulations; Molecular dynamics simulations; Monte Carlo simulations for various ensembles; Molecular dynamics simulations for various ensembles.	Frenkel, D., Smit, B. (2001), *Understanding Molecular Simulation, 2nd Edition*, Academic Press. Schneider, R., Sharma, A. R., Rai, A. (2008), *Introduction to Molecular Dynamics*, Springer, Berlin, Heidelberg.
MPF-4231	**Artificial Intelligence**	**3 CREDITS**	-	Introduction to AI; Problem-solving and state space; Search and heuristic tracking techniques; Knowledge representation; Expert systems; Uncertainty; Fuzzy logic;	Bojadziev, G., Bojadziev, M. (2007), *Fuzzy Logic for Business, Finance, and Management*, World Scientific. Kusumadewi, S., Purnomo, H. (2010), *Application of Fuzzy Logic for Decision Support*, Graha Ilmu.

				Case-Based Reasoning; Neural networks; Genetic algorithms.	Suyanto (2007), *Artificial Intelligence: Searching, Reasoning, Planning, and Learning*, Informatika, Bandung.
MPF-4223	**Introduction to Algorithms and Computation in Statistical Mechanics**	**3 CREDITS**	-	Monte Carlo methods; Hard disk and ball models; Path integral; Dynamic Monte Carlo.	Gould, H., Tobochnik, J. (2021), *Statistical and Thermal Physics: With Computer Applications, 2nd Edition*, Princeton University Press.
					Krauth, W. (2006), *Statistical Mechanics: Algorithms and Computations*, Oxford University Press.
MPF-3255	**Microcontroller Applications**	**3 CREDITS**	-	Microcontroller development; Microcontroller architecture; Supporting software; Microcontroller programming; I/O port programming; Serial port programming; Parallel port programming; Analog-to-Digital conversion; Microcontroller applications in measurement and control systems.	MacKenzie, I. S. (1995), *The Microcontroller*, Prentice Hall, New Jersey.
					Yeraland, S., Ahluwalia, A. *Programming and Interfacing the 8051*, Addison Wesley Publishing.
					Intel Corporation (1981), *MCS51 - Family of Single Chip Microcomputers User Manual*.
					Axelson, J., *The Microcontroller Idea Book*, Lakeview Research.
MPF-3257	**Digital Electronics**	**3 CREDITS**	-	Number systems; Arithmetic operations in binary number systems; Coding systems; Logic gates; Logic gate circuits; Boolean algebra; Karnaugh maps; Flip-flops; Counters; ADC (Analog to Digital Converter); DAC (Digital to Analog Converter); Registers.	Ritz, H. (1992), *Digital Techniques*, Gramedia.
					Kleitz, W. (1996), *Digital Electronics*, Prentice Hall, New Jersey.
					Milman, J., Halkias, C. (1992), *Integrated Electronics*, McGraw-Hill.
MPF-4257	**Advanced Electronics**	**3 CREDITS**	-	Number systems; Logic gates; Boolean algebra; Adder circuits; Open collector gates and specifications; Flip-flops (RS-FF, D-FF, Master-slave FF, JK-FF); Shift registers; Counters; Schmitt triggers; One-shots; ADC; DAC; Decoder; Multiplexers; De-multiplexers; Display systems.	Ritz, H. (1992), *Digital Techniques*, Gramedia.
					Kleitz, W. (1996), *Digital Electronics*, Prentice Hall, New Jersey.
					Milman, J., Halkias, C. (1992), *Integrated Electronics*, McGraw-Hill.

MPF-3251	**Environmental Physics**	**3 CREDITS**	-	**Introduction to Environmental Physics**: Definition of Environmental Physics; Environmental issues.	Boeker, E., Van Grondelle, R. (1995), *Environmental Physics*, John Wiley & Sons.
				Energy Sources: Various natural resources; Energy sources (fossil energy, nuclear energy, alternative energy sources); Mineral resources; Water resources.	Nebel, B. J., Wright, R. T. (1996), *Environmental Science*, Prentice Hall.
				Environmental Pollution: Pollution control principles; Soil pollution; Water pollution; Air pollution; Noise pollution.	Houghton, J. T. (1988), *The Physics of Atmosphere*, Cambridge University Press.
MPF-3253	**Biophysics**	**3 CREDITS**	-	**Introduction to Biophysics**: Overview of biophysics; Cells, proteins, and membranes.	Cotterill, R. (2003), *Biophysics: An Introduction*, John Wiley & Sons.
				Molecular Transport: Brownian motion; Membrane diffusion; Temperature and free energy.	Rubin, A. B. (2014), *Fundamentals of Biophysics*, Wiley.
				Biophysical Techniques: Atomic and molecular structures; Macromolecule size and shape; Chromatography; Electrophoresis; Spectroscopic fluorescence techniques (fluorophore, absorption and emission); Microscopy techniques (electron microscopy, light microscopy, X-ray fluorescence microscopy); FRET, FRAP, SPT.	Nelson, P. C. (2004), *Biological Physics: Energy, Information, Life*, Chiliagon Science.
MPF-4253	**Radiation Detection Methods**	**3 CREDITS**	-	Introduction to radiation measurement; Errors and statistics in nuclear radiation measurement; Overview of atomic and nuclear structure; Radioactive particles; Interaction of radiation with matter; Interaction of particles with matter; Operating principles of gas-filled detectors, scintillation detectors, semiconductor detectors, and film detectors.	Susetyo, W. (1988), *Gamma Spectroscopy*, Gadjah Mada University Press, Yogyakarta.
					Tsoulfanidis, N. (1983), *Measurement and Detection of Radiation*, McGraw-Hill, New York.
MPF-4251	**Environmental Conservation**	**2 CREDITS**	-	**Watershed (DAS) Management**: Basic concepts of watersheds; Boundaries and capacity of a watershed area; Utilization and planning of watershed management; Water resource conservation and river management; Flood control technology; River damage mitigation technology; Groundwater conservation; Integrated watershed management policies; River management status; Land rehabilitation for water resource conservation.	Asdak, C. (2004), *Hydrology and Watershed Management*, Gadjah Mada University Press, Yogyakarta.
				Land Resources: Land resource evaluation; Land suitability classification; Land assessment procedures; Critical land evaluation; Climate factors and	Munir, M. (2006), *Environmental Geology*, Bayumedia Publishing, Malang.

				measurements; Land-use planning based on climate factors.	
					Bayong, T. (2004), *Climatology*, ITB Press, Bandung.
					Nebel, B. J., Wright, R. T. (1996), *Environmental Science*, Prentice Hall.
MPF-3241	**Quantitative Description of Material Microstructure**	**3 CREDITS**	-	**Image Processing for Materials**: Characteristics of digital images; Grayscale image processing; Binary image processing.	Kurzydlowski, K. J., Ralph, B. (1995), *The Quantitative Description of the Microstructure of Materials*, CRC Press.
				Quantitative Microstructure Analysis: Stereology parameters (volume fraction, interface area, surface area, curvature); Characteristic functions (homogeneity, covariance).	Wojnar, L. (1999), *Image Analysis: Applications in Materials Engineering*, CRC Press.
				Image Analysis Implementation: Basic measurements; Stereology parameters; Edge correction; Measurement precision.	Brandon, D., Kaplan, W. D. (2008), *Microstructural Characterization of Materials, 2nd Edition*, Wiley.
MPF-3243	**Advanced Solid State Physics**	**3 CREDITS**	-	Free electron model; Semiconductors; Energy levels and Fermi energy representation; Quantization of charge carriers (Plasmon, Polariton, Polaron, Exciton); Dielectrics and Ferroelectrics; Magnetism; Defects in solids.	Kittel, C. (2005), *Introduction to Solid State Physics, 8th Edition*, John Wiley & Sons.
					Patterson, J. D., Bailey, B. C. (2007), *Solid-State Physics: Introduction to the Theory*, Springer-Verlag, Berlin Heidelberg.
MPF-3245	**Material Fabrication Methods**	**3 CREDITS**	-	Strengthening mechanisms; Heat treatment; Metal and alloy fabrication techniques; Ceramic fabrication techniques; Polymer fabrication techniques; Composite fabrication techniques.	Callister, W. D. (2012), *Fundamentals of Materials Science and Engineering: An Integrated Approach, 4th Edition*, John Wiley & Sons.
					Rosato, D. V. (2013), *Plastics Engineered Product Design*, Elsevier Ltd.
					Shi, F. (1995), *Ceramic Materials – Progress in Modern Ceramics*, InTech, Rijeka, Croatia.
					Hoa, S. V. (2009), *Principles of the Manufacturing of Composite Materials*, DEStech Publications, Pennsylvania.
MPF-4241	**Composite Material Physics**	**2 CREDITS**	-	Definition of composite materials; Matrix materials and fillers; Types of composites (unidirectional, isotropic, laminated structures, ply structures); Micromechanical analysis of composite materials; Composite material fabrication; Microstructure, defects, cracks, and tears;	Nielsen, L. F. (2005), *Composite Materials*, Springer-Verlag, Berlin Heidelberg.
					Sulistijono (2012), *Mechanics of Composite Materials*, ITS Press, Surabaya.

				Applications of composite materials; Introduction to nanocomposite materials.	Bhagwan, D. A. (2015), *Analysis and Performance of Fiber Composites*, Wiley.
MPF-4243	**Composite Material Physics Laboratory**	**2 CREDITS**	-	Analysis of physical properties of composite forming materials; Composite board fabrication; Testing of physical, thermal, and mechanical properties of composite boards.	Nielsen, L. F. (2005), *Composite Materials*, Springer-Verlag, Berlin Heidelberg.
					Sulistijono (2012), *Mechanics of Composite Materials*, ITS Press, Surabaya.
					Bhagwan, D. A. (2015), *Analysis and Performance of Fiber Composites*, Wiley.
MPF-4245	**Material Physics**	**3 CREDITS**	-	Structure of materials (Gas, Liquid, Crystal, Metal, Alloy); Iron-carbon system; Austenite decomposition; Polymer and composite structures; Crystal lattices; Polymorphism; X-ray diffraction; Crystal defects and dislocations; Material impurities; Atomic diffusion and diffusion processes; Mechanical, thermal, electrical, and magnetic properties; Conductors and insulators; Semiconductors; Material testing methods.	Van Vlack, L. H. (1995), *Science and Technology of Materials*, Erlangga.
					Wyatt, H. (1979), *Metal, Ceramic, and Polymer Science*.
MPF-3211	**Literature Study**	**3 CREDITS**	-	Introduction to literature study; Purpose of literature research; Literature searching; Note-taking strategies for literature reading; Reference management (referencing tools); Practical critical review (critical analysis).	Ridley, D. (2012), *The Literature Review: A Step-by-Step Guide for Students, 2nd Edition*, SAGE.
					Bell, J. (2014), *Doing Your Research Project: A Guide for First-Time Researchers, 6th Edition*, McGraw Hill.
					Various scientific articles related to student interests.
MPF-4212	**Physics Communication Media**	**3 CREDITS**	-	Introduction to science communication; Science communication processes; Types of direct and indirect communication; Focus on indirect communication: science journalism; Physics communication through print and digital media (blogs, social media, digital images, videos, and audio).	Christensen, L. L. (2007), *The Hands-On Guide for Science Communicators: A Step-by-Step Approach to Public Outreach*, Springer.
					Bauer, M. W., Bucchi, M. (2007), *Journalism, Science, and Society: Science Communication between News and Public Relations*, Taylor & Francis.
					Newman, T. P. (2020), *Theory and Best Practices in Science Communication Training*, Routledge Taylor & Francis Group.

Even Semester					
Course Code	**Subject Name**	**Credit (CREDITS)**	**Prerequisites**	**Topics Covered**	**References**
MPF-3224	**Galaxy Dynamics**	**2 CREDITS**	-	Galaxies; Potential Theory; Stellar Orbits; Dynamical Friction; Tidal Tides; Dark Matter.	Binney, J., Tremaine, S. (1987), *Galactic Dynamics*, Princeton University Press. Sparke, L. S., Gallagher, J. S. (2007), *Galaxies in the Universe, 2nd Edition*, Cambridge University Press. Carroll, B. W., Otslie, D. A. (2007), *An Introduction to Modern Astrophysics, 2nd Edition*, Pearson Education.
MPF-4222	**Astrophysical Computation**	**2 CREDITS**	-	N-body simulations with various techniques: Direct N-body; Barnes-Hut Tree; Fast Multipole Method; Smoothed Particle Hydrodynamics; Adaptive Mesh Refinement.	Dehnen, W., Read, J. I. (2011), *N-body Simulations of Gravitational Dynamics*, The European Physical Journal Plus. Aarseth, S. (2010), *Gravitational N-Body Simulations*, Cambridge University Press. Hockney, R. W., Eastwood, J. W. (1988), *Computer Simulation Using Particles*, IOP Publishing.
MPF-3226	**Theory of Relativity**	**3 CREDITS**	Modern Physics, Mechanics, Electricity and Magnetism, Vector and Tensor Analysis	**Special Relativity**: Postulates of special relativity; Kinematic consequences of special relativity; Lorentz transformation; Relativistic Doppler effect; Relativistic dynamics; Minkowski spacetime; Lorentz group; Relativistic field theory; Relativistic hydrodynamics.	Gron, O. (2020), *Introduction to Einstein's Theory of Relativity*.
				General Relativity: Limitations of special relativity; Equivalence principle; General covariance principle; Einstein's field equations; Classical tests of general relativity.	Hartle, J. (2013), *Gravity: An Introduction to Einstein's General Relativity*.
MPF-3222	**History of Physics**	**2 CREDITS**	-	Concepts and discoveries in Ancient Greek era; Physics in the Golden Age of Islam; The Renaissance in Europe; The rise of Classical Physics; Challenges in Classical Physics and the birth of Modern Physics; Recent developments in Physics.	Heilborn, J. L. (2018), *The History of Physics: A Very Short Introduction*.

MPF-4224	**Nanophotonics**	**3 CREDITS**	Electromagnetics, Special Functions and Applications	Maxwell's equations and electromagnetic waves; Schrödinger equation; Electrons in periodic structures; Quantum confinement effects; Quantum dots; Plasmon resonance; Metal nanoparticles; Photonic crystals; Light interaction with nanoscale structures.	Gaponenko, S. (2010), *Introduction to Nanophotonics*.
					Xu, H. (2017), *Nanophotonics: Manipulating Light with Plasmon*.
MPF-3228	**Electromagnetics**	**3 CREDITS**	Electricity and Magnetism, Mathematical Physics I and II	**Special Techniques for Calculating Potential**: Laplace's equation; Image method; Separation of variables; Multipole expansion.	Griffiths, D. J. (2013), *Introduction to Electrodynamics, 4th Edition*.
				Electromagnetic Waves: Maxwell's equations; Electromagnetic waves in vacuum; Electromagnetic waves in dielectric media; Reflection and transmission of waves; Waves in conductive media; Absorption and dispersion of waves; Dielectric function of materials.	Vanderlinde, J. (2005), *Classical Electromagnetic Theory, 2nd Edition*.
				Electromagnetic Wave Scattering: Scattering by conducting cylinders and spheres; Scattering by dielectric cylinders and spheres.	
				Electromagnetic Wave Radiation: Dipole radiation; Antennas; Radiation from point charges.	
MPF-3232	**Signal Processing**	**2 CREDITS**	-	Discrete linear systems; Continuous and discrete Fourier transforms; LTIS systems; Z-transform; Digital filters; Fast Fourier transform; Digital filter design: FIR and IIR filters.	Mitra, S. K. (2006), *Digital Signal Processing: A Computer-Based Approach, 3rd Edition*, McGraw-Hill.
					Oppenheim, A., Schafer, R. (2009), *Discrete-Time Signal Processing, 3rd Edition*, Prentice-Hall.
MPF-4232	**Inverse Methods**	**2 CREDITS**	-	**Modeling in Physics**: Least squares method; Linear inversion; Weighted linear inversion; Damped linear inversion; Non-linear inversion; Gauss-Newton method; Gradient method; Global approaches; Monte Carlo methods; Simulated Annealing method; Genetic algorithms; Probabilistic representation of inverse problems.	Tarantola, A. (1987), *Inverse Problem Theory: Methods for Data Fitting and Model Parameter Estimation*, Elsevier.
					Chapra, C. S., Canale, R. P. (2014), *Numerical Methods for Engineers, 7th Edition*, McGraw-Hill.
					Gould, H., Tobochnik, J., Christian, W. (2017), *An Introduction to Computer Simulation Methods: Applications to Physical Systems, 3rd Edition*, CreateSpace Independent Publishing.
MPF-3256	**Instrumentation**	**3 CREDITS**	-	**Instrumentation Characteristics**: Types of sensors; Signal conditioning; Signal processing; Signal display.	Holman, J. P. (1984), *Experimental Methods for Engineers*, McGraw-Hill.

				Measurement Instruments: Temperature and humidity measurement; Pressure measurement; Flow measurement; Distance measurement; Various measuring instruments for physical properties.	Eckman, D. P. (1950), *Industrial Instrumentation*, John Wiley & Sons.
					Skoog, Holler & Nieman (1998), *Principles of Instrumental Analysis, 5th Edition*.
MPF-4258	**Remote Sensing**	**3 CREDITS**	-	Remote sensing concepts; Wireless Sensor Network (WSN); Artificial Neural Networks; Satellite imagery; Unmanned Aerial Vehicle (UAV); Internet of Things (IoT); Remote sensing application software.	Canty, M. J. (2014), *Image Analysis, Classification, and Change Detection in Remote Sensing*.
					Rees, W. G. (2013), *Physical Principles of Remote Sensing*.
					Mather, P., Tso, B. (2009), *Classification Methods for Remotely Sensed Data, 2nd Edition*.
					Sutanto (1999), *Remote Sensing*, Gadjah Mada University Press.
MPF-3258	**Electrical Circuit Analysis**	**3 CREDITS**	-	Circuit concepts; DC resistive circuits; Mesh and node analysis for DC circuits; Circuit transitions; Sinusoidal circuit analysis; Steady-state sinusoidal response in frequency domain; Power and power factor; Polyphase circuits; Frequency response and resonance; Fourier method for waveform analysis; Complex frequency; Laplace transform method; State variable analysis; Coupled circuits and transformers.	Edminister, J. A. (2004), *Electrical Circuit Theory and Problems*, Erlangga.
					Hayt, W. H. Jr. (2004), *Electrical Circuits 1*, Erlangga.
					Hayt, W. H. Jr. (2004), *Electrical Circuits 2*, Erlangga.
MPF-3254	**Energy**	**3 CREDITS**	-	Thermal and electrical conversion of solar, chemical, and nuclear energy; Thermal, optical, and electrical properties of energy conversion materials; Physics and thermodynamics; Efficient energy usage; Energy economics; Energy issues in Indonesia.	Culp Jr., A. W. (1979), *Principles of Energy Conversion*, McGraw-Hill.
					Duffie, J. A., Beckman, W. A. (1980), *Solar Engineering of Thermal Processes*, John Wiley & Sons.
MPF-4256	**Introduction to Reactor Physics**	**3 CREDITS**	-	Decay theory; Microscopic and macroscopic cross-sections; Reactor components and working principles; Reactor fuel cycle; Neutron generation reactions; Neutron interactions; Fission reactions; Neutron flux; Neutron transport equations; Diffusion equations and solutions for various reactor types; Criticality analysis; Reactor kinetics and solution methods including hourly equations, reactivity, point reactor kinetics, inverse methods, approximation	Lamarsh, J. R. (1972), *Introduction to Nuclear Reactor Theory*, Addison-Wesley.

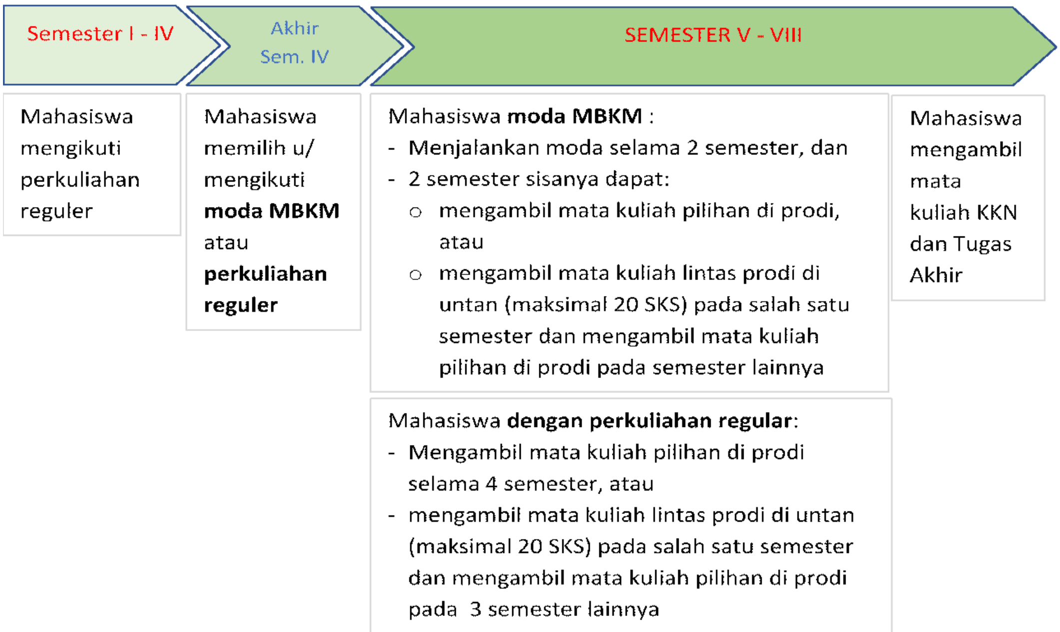
				methods, and reactivity-power analysis with feedback.	
MPF-3252	**Radiation Protection**	**3 CREDITS**	-	Nuclear properties; Alpha-beta-gamma decay theory; Radiation definition; Radiation sources; Interaction of radiation with matter; Radiation detectors; Radiation activity; Effects of radiation on living cells; Radiation protection and monitoring systems.	Martin, A., Harbinson, S. A. (2000), *An Introduction to Radiation Protection*, John Wiley & Sons.
MPF-4252	**Medical Physics**	**3 CREDITS**	-	**Applications of Physics Principles in Human Body**: Mechanical aspects; Thermal transport; Electrical and magnetic properties; Optics; Acoustics; Atomic and nuclear physics.	Cameron, J. R., Skofronick, J. G. (1992), *Medical Physics*, Wiley.
				Introduction to Medical Instrumentation: Diagnostic tools; MEG; CT Scan; Radiology.	Cameron, J. R., Skofronick, J. G., Grant, R. M. (1996), *Physics of the Human Body*, Medical Physics Publications.
				Use of Physics in Treatment: Radiation therapy using X-rays and radioactive particles.	Hani, A. R. (2010), *Health Physics*, Nuha Medika.
MPF-4254	**Radiography Physics**	**2 CREDITS**	-	**History of Radiography**: Laboratory applications; Medical uses; Industrial applications.	Yaffe, M. J., Rowlands, J. A. (1997), *X-ray Detectors for Digital Radiography*, Phys. Med. Biol.
				Fundamentals of Radiography: Atomic physics; Nuclear physics; Interaction of matter with radiation; Physical quantities and units.	Campeau, F. E. (2000), *Radiography*, Lippincott Williams.
				Radiography Systems: Radiography sources; Radiographic objects; Radiation detectors; Radiation protection.	
				Conventional and Digital Radiography Technologies.	
MPF-3242	**Introduction to Crystallography**	**3 CREDITS**	-	**Crystal Formation**: Symmetry in crystals; Crystal structure; Lattice structure; Unit cells; Morphology and angular relationships in crystals.	Giacovazzo, C. et al. (2011), *Fundamentals of Crystallography, 3rd Edition*, Oxford.
				Crystal Symmetry: Point groups; Space symmetry elements; Space symmetry groups; Reciprocal lattice.	Borchardt-Ott, W. (2011), *Crystallography: An Introduction, 3rd Edition*, Springer.
				X-ray Diffraction in Crystals; **Inorganic Crystals and Minerals**; **Physical Properties of Crystals and Tensor Representation**.	Liang, D. (2011), *Fundamentals of X-Ray Crystallography, 2nd Edition*, Alpha Science International.
					Verma, A. R. (1991), *Crystallography Applied to Solid State Physics*, Wiley.

MPF-4242	**Material Characteristics**	**3 CREDITS**	-	**Mechanical Properties of Materials**; **Optical Properties of Materials** (Photonic Materials); **Electrical Properties of Materials**; **Thermal Properties of Materials**; **Magnetic Properties of Materials**; **Material Degradation**.	Callister, W. J., Rethwisch, D. G. (2010), *Materials Science and Engineering: An Introduction, 8th Edition*, John Wiley & Sons. Askeland, D. R., Fulay, P. P. (2009), *Essentials of Materials Science and Engineering, 2nd Edition*, Cengage Learning.
MPF-3244	**Atomic and Molecular Physics**	**3 CREDITS**	-	**History of Atomic Theory Development**; **Spectra and Atomic Transitions**; **Single-Electron Atoms**; **Alkali Elements and Multi-Electron Atoms**; **Atomic Orbitals**; **Molecules and Molecular Orbitals**; **Applications of Atomic-Molecular Theory**.	Foot, C. J. (2005), *Atomic Physics*, Oxford University Press. Beiser, A. (2003), *Concepts of Modern Physics, 6th Edition*, McGraw-Hill. Krane, K. S. (2012), *Modern Physics, 3rd Edition*, John Wiley & Sons.
MPF-3248	**Spectroscopy**	**3 CREDITS**	-	**UV-Visible Spectroscopy**: Electromagnetic radiation; Quantitative and qualitative analysis; Predicting wavelengths using Woodward-Fieser rules.	Sastrohamidjojo, H. (2019), *Basic Principles of Spectroscopy*, Gadjah Mada University Press.
				Infrared Spectroscopy: Vibration modes; Factors affecting vibration; Functional group identification; Organic compounds with heteroatoms; Infrared spectrum interpretation.	Pavia, D. L., Lampman, G. M., Kriz, G. S. (2001), *Introduction to Spectroscopy, 3rd Edition*, Thomson Learning.
				Nuclear Magnetic Resonance (NMR) Spectroscopy: Nuclear spin positioning; Magnetic moments; Energy absorption; Resonance mechanisms; Chemical shifts and shielding effects; NMR spectrometer; Spectrum interpretation methods.	Griffiths, P. R., Gauglitz, G., Moore, D. S. (2014), *Handbook of Spectroscopy, 2nd Edition*, Anal Bioanal Chem.
				Mass Spectrometry: Molecular ions; Fragmentation patterns; Functional group-related fragmentation.	
MPF-4246	**Introduction to Nanoscience and Nanotechnology**	**3 CREDITS**	-	**Size Effects on Material Properties**; **Nanostructured Material Synthesis**; **Characterization of Nanostructured Materials**; **Quantum Dots**; **Nanowires**; **Carbon Nanotubes**; **Nanocomposite Materials**.	Abdullah, M. (2009), *Introduction to Nanoscience*, Institut Teknologi Bandung. Prasad, N. P. (2004), *Nanophotonics*, John Wiley. Cao, G. (2004), *Synthesis, Properties & Applications*, Imperial College Press. Hosokawa, M., Nagi, K., Naiko, M., Yokoyama, T. (2007), *Nanoparticle Technology Handbook*, Elsevier.

MPF-3246	**Material Characterization Methods**	**3 CREDITS**	-	**Material Characterization Instruments**: Scanning Electron Microscope (SEM); Transmission Electron Microscope (TEM); Atomic Force Microscope (AFM); X-ray Characterization (X-Ray Diffraction—XRD); UV-Visible Spectroscopy; SEM-Energy Dispersive X-Ray (EDX); Fourier Transform Infrared Spectroscopy (FTIR).	Abdullah, M., Khairurrijal (2010), *Nanomaterial Characterization: Theory, Applications, and Data Processing*, CV. Rezeki Putra, Bandung.
MPF-4248	**Introduction to Polymer Physics**	**3 CREDITS**	-	**Types of Polymers**; **Polymer Nomenclature**; **Trade Names of Polymers**; **Polymer Branching and Cross-linking**; **Polymerization Processes** (Condensation, Addition, Step Growth, Chain Growth, Stereoregular Polymers); **Polymer Reactions**; **Polymer Properties and Structures**; **Temperature Dependence, Transition, and Relaxation in Polymers**; **Viscoelasticity Models**; **Chemical Stress Relaxation**.	Eisele, U. (1990), *Introduction to Polymer Physics*, Springer Verlag.
					Aklon, J. J., McKnight, W. J., Shen, M. (1972), *Introduction to Polymer Viscoelasticity*, John Wiley & Sons.
					Stevens, M. P. (1975), *Polymer Chemistry: An Introduction*, Addison-Wesley.

C. Learning Activity Modes in MBKM

A distinctive feature of the Merdeka Belajar Kampus Merdeka (MBKM) Curriculum is that students have the opportunity to develop themselves according to their individual skills and expertise. In the MBKM Curriculum, students can select one of eight available modes during Semester V of their studies.



General Procedure for Implementing MBKM Learning Modes

The submission process for MBKM learning modes is carried out by the applicant (student) by attaching the following documents:

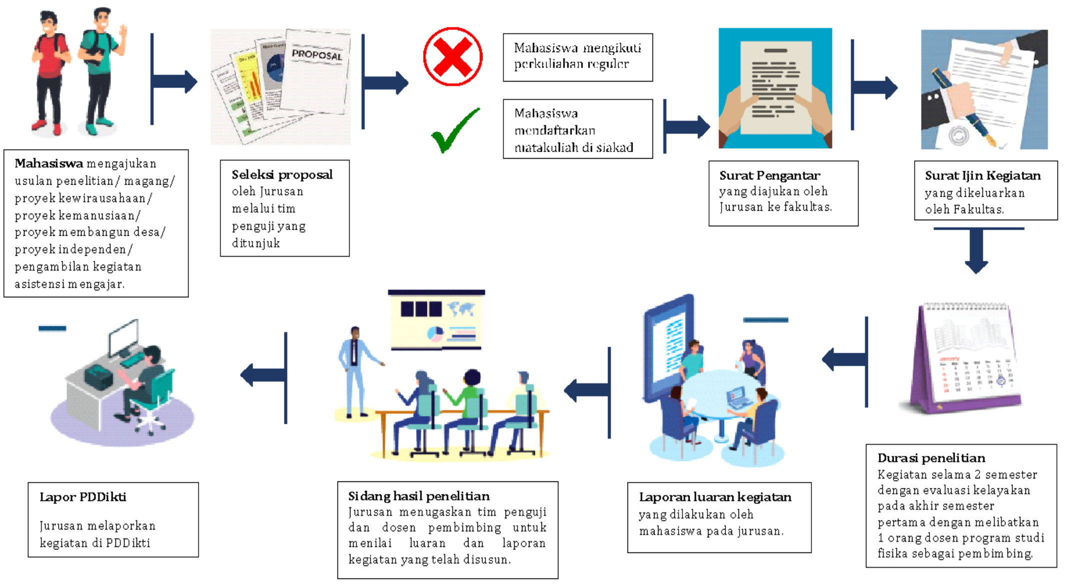
- **Student ID Card (KTM)**
- **Latest Academic Transcript (LIHS)**
- **MBKM Application Form signed by the Academic Advisor (PA) and Head of Study Program (Kaprodi)**
- **Letter of Commitment from the Supervisor**
- **Parent's Permission Letter to participate in MBKM activities**
- **Student's Statement Letter committing to full-time participation, signed on a Rp 10,000 stamp**
- **MBKM Mode Proposal that has been approved by the supervisor**

All documents must be uploaded via the designated link provided by the Department of Physics.

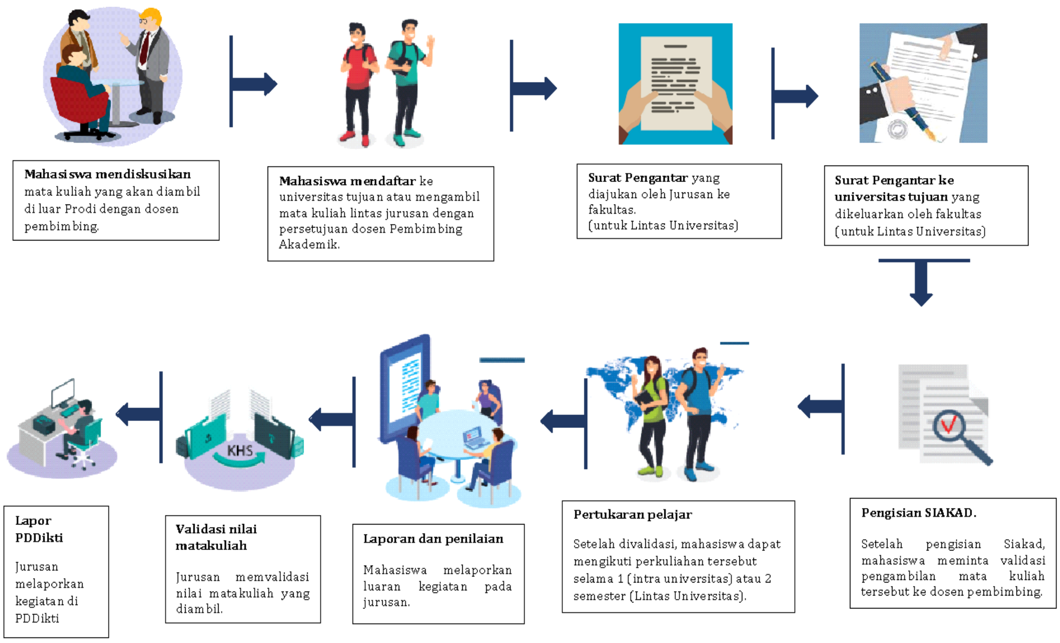
Infographic of the General Implementation Procedure for MBKM Learning Modes

The following are the available MBKM learning modes:

1. **Research Mode,Internship Mode, Entrepreneurship Mode, Humanitarian Project Mode, Village Development Project Mode, Independent Project Mode, and Teaching Assistant Mode**



2. Student Exchange Mode



Mode Name: 1. Research

Credit Equivalency: Up to 40 CREDITS

Implementation: Conducted over two consecutive semesters

Description	For students passionate about becoming researchers, Merdeka Belajar can be realized through research activities at research institutions or study centers. Through research, students develop critical thinking skills, which are essential for various fields of study at higher education levels. Critical thinking enhances students' ability to analyze, understand, and apply research methodologies effectively. Students aspiring to pursue a research career may find opportunities to intern at central research laboratories, an experience highly sought after. Additionally, laboratories and research institutions often lack research assistants for short-term research projects (1 semester to 1 year).
Expected Outcomes	An article accepted for publication in a Sinta 2 or higher academic journal.
Standard Operating Procedure (SOP)	1. Before filling out Siakad, students must submit a research proposal containing: Research title, Research location, Research objectives, Advisor's consent form, Research framework
	2. The Department conducts proposal selection through an appointed examination team.
	3. If the proposal is rejected, students must continue with regular coursework.
	4. If the proposal is accepted, students register for courses in Siakad.
	5. The Department submits an application to the Faculty for an Introduction Letter.
	6. The Faculty issues an Activity Permit Letter.
	7. Students conduct research for two semesters, with an evaluation at the end of the first semester, involving at least one faculty member as a supervisor.

	8. At the end of the research period, students submit their research output report to the Department.			
	9. The Department assigns an examination team and a supervisor to assess the research outputs and final report.			
	10. The Department reports research activities to PDDikti.			
Periode	Course Code	Course Name	CREDITS	Indicators
Semester I MBKM (6 months)	MPF-3311	Literature Review	3	Literature review document
	MPF-3315	Research Methodology	4	Research framework document
	MPF-3317	Science and Technology Concepts	4	Science and technology application plan
	MPF-4311	Research Proposal Seminar	4	Seminar approval
	MPF-4313	Research Progress Report	5	Research evaluation results
Semester II MBKM (6 months)	MPF-3312	Scientific Communication	4	Participation in a scientific seminar as a speaker
	MPF-3314	Scientific Writing Techniques	4	Manuscript document
	MPF-3318	Research Results Seminar	4	Submitted manuscript
	MPF-4312	Physics Communication Media	3	Research communication document in media
	MPF-4314	Research Report	5	Accepted manuscript
Additional Courses in Semester II MBKM	UMG-4101	KKM/PKM (Community Service / Field Work Program)	2	Submission of research report as a replacement for KKM/PKM
	MPF-4102	Final Project	3	Submission of research report as a replacement for Final Project

Mode Name: 2. Internship

Credit Equivalency: Up to 40 CREDITS

Implementation: Conducted over two consecutive semesters

Description	Students often lack real-world work experience in industry or professional fields, making them less prepared for employment. Short-term internships (less than six months) are insufficient to provide substantial industry experience and competencies. Companies that accept interns also express that short internships are not beneficial and can even disrupt activities in the workplace.			
Objectives	The internship program (1-2 semesters) provides students with adequate workplace experience through experiential learning. During the internship, students gain: Hard skills (technical skills, complex problem-solving, analytical thinking, etc.)., Soft skills (professional ethics, communication, teamwork, etc.). Meanwhile, industries benefit by discovering talented individuals who, if suitable, can be recruited directly, reducing recruitment and initial training costs. Students already familiar with the workplace will be better prepared to enter their careers. Through this program, industry challenges flow into universities, updating teaching materials, faculty learning methods, and relevant research topics in higher education institutions.			
Expected Outcome	Internship Certificate or Official Internship Statement			
Standard Operating Procedure (SOP)	1. Before filling out Siakad, students must submit an internship proposal containing: Internship title, Internship location, Internship objectives, Advisor's consent form, Daily activity framework			
	2. The Department conducts proposal selection through an appointed examination team.			
	3. If the proposal is rejected, students must continue with regular coursework.			
	4. If the proposal is accepted, students register for courses in Siakad.			
	5. The Department submits an application to the Faculty for an Introduction Letter.			
	6. The faculty issues an Activity Permit Letter.			
	7. Students conduct internship activities for two semesters, with an evaluation at the end of the first semester, involving at least one faculty member as a supervisor.			
	8. At the end of the internship period, students submit their internship report to the Department.			
	9. The Department assigns an examination team and a supervisor to assess the internship outcomes and final report.			
	10. The Department reports internship activities to PDDikti.			
Study Plan	Course Code	Course Name	CREDITS	Indicators
Semester I MBKM (6 months)	MPF-3321	Literature Review	3	Literature review document
	MPF-3323	Field Survey and Observation	2	Internship location feasibility report
	MPF-4321	Internship Proposal Seminar	3	Passed seminar proposal
	MPF-3325	Public Communication	4	Ability to communicate ideas effectively (written & spoken)
	MPF-3329	Work Practice 1	8	Passed first internship seminar (Evaluation)
Semester II MBKM (6 months)	MPF-3322	Management	4	Successfully completing the internship program (proven by positive evaluation from workplace)
	MPF-3328	Work Practice 2	8	Passed second internship seminar (Evaluation)
	MPF-4322	Physics Communication Media	3	Research communication documentation in media

	MPF-4324	Internship Report	5	Final report submission
Additional Courses in Semester II MBKM	UMG-4101	KKM/PKM (Community Service / Field Work Program)	2	Submission of internship report as a replacement for KKM/PKM
	MPF-4102	Final Project	3	Submission of internship report as a replacement for Final Project

Mode Name: 3. Entrepreneurship

Credit Equivalency: Up to 40 CREDITS

Implementation: Conducted over two consecutive semesters

Description	According to the Global Entrepreneurship Index (GEI) in 2018, Indonesia had only 21% entrepreneurs across various fields, ranking 94th out of 137 surveyed countries. Meanwhile, IDN Research Institute (2019) found that 69.1% of Indonesian millennials were interested in entrepreneurship. Unfortunately, this potential has not been properly managed. The Kampus Merdeka policy supports the development of students' entrepreneurial interests through structured educational programs. The aim of the entrepreneurship program is to help students with entrepreneurial interests develop their businesses early, with proper guidance.			
Expected Outcome	Startup business establishment			
Standard Operating Procedure (SOP)	1. Before filling out Siakad, students must submit an entrepreneurship project proposal containing: Activity title, Location of activity, Purpose of activity, Activity framework			
	2. The Department selects proposals through an appointed evaluation team.			
	3. If the proposal is rejected, students must continue with regular coursework.			
	4. If the proposal is accepted, students register for courses in Siakad.			
	5. The Department submits an application to the Faculty for an Introduction Letter.			
	6. The faculty issues an Activity Permit Letter.			
	7. Students conduct entrepreneurial activities for two semesters, with an evaluation at the end of the first semester, involving at least one faculty member as a supervisor.			
	8. At the end of the activity period, students submit their business development report to the Department.			
	9. The Department assigns an examination team and a supervisor to assess the business outcomes and final report.			
	10. The Department reports the entrepreneurship activities to PDDikti.			
Periode	Course Code	Course Name	CREDITS	Indicators
Semester I MBKM (6 months)	MPF-3331	Literature Review	3	Literature review document
	MPF-3333	Market Survey and Observation	4	Business plan document
	MPF-3337	Marketing Concepts	4	Business development and marketing strategy framework
	MPF-3335	Business Communication	4	Engagement with consumers/stakeholders
	MPF-4333	Business Progress Report 1	5	Business plan evaluation
Semester II MBKM (6 months)	MPF-3332	Product Marketing	4	Product/startup licensing registration
	MPF-3334	Basic Accounting	4	Business financial report document

	MPF-3336	Product Exhibition	4	Participation in product exhibitions
	MPF-4332	Physics Communication Media	3	Business activity communication document in media
	MPF-4334	Business Progress Report 2	5	Final report seminar
Additional Courses in Semester II MBKM	UMG-4101	KKM/PKM (Community Service / Field Work Program)	2	Submission of entrepreneurship report as a replacement for KKM/PKM
	MPF-4102	Final Project	3	Submission of entrepreneurship report as a replacement for Final Project

Mode Name: 4. Humanitarian Project

Credit Equivalency: Up to 40 CREDITS

Implementation: Conducted over two consecutive semesters

Description	Indonesia frequently experiences natural disasters, such as earthquakes, volcanic eruptions, tsunamis, and hydrological disasters. Universities have played a significant role in disaster relief efforts through various humanitarian programs. However, student involvement has been mostly voluntary and short-term. Additionally, international organizations (UNESCO, UNICEF, WHO, etc.) have conducted in-depth studies and pilot projects for development in Indonesia and other developing countries. Students, with their youthful energy, scientific knowledge, and enthusiasm, can act as “foot soldiers” in humanitarian projects both in Indonesia and abroad. The objective of this program is to train students to develop social awareness, identify problems, and contribute solutions aligned with their interests and expertise.			
Expected Outcome	Publication of project processes and results in video and written formats on online and print media.			
Standard Operating Procedure (SOP)	1. Students register for the humanitarian project by submitting a proposal, outlining a program that can be implemented as part of an existing humanitarian project organized by government agencies or humanitarian organizations (UNICEF, UN, ACT, etc.).			
	2. The Department selects proposals through an appointed evaluation team.			
	3. If the proposal is rejected, students must continue with regular coursework.			
	4. If the proposal is accepted, students register for courses in Siakad.			
	5. The Department submits an application to the Faculty for an Introduction Letter.			
	6. The faculty issues an Activity Permit Letter.			
	7. Students must participate in two humanitarian projects (one per semester), with eligibility evaluation at the end of the first semester, involving at least one faculty member as a supervisor.			
	8. At the end of the program, students submit their project output report to the Department.			
	9. The Department assigns an examination team and a supervisor to assess the project results and final report.			
	10. The Department reports the project activities to PDDikti.			
Periode	Course Code	Course Name	CREDITS	Indicators
Semester I MBKM (6 months)	MPF-3341	Literature Review for Project I	3	Literature review document

	MPF-3343	Field Survey and Observation for Project I	3	Survey and observation report
	MPF-3345	Writing Techniques for Project I	3	Humanitarian program framework
	MPF-3349	Humanitarian Program Project I	3	Program achievement percentage (50% evaluation)
	MPF-4345	Physics Communication Media for Project I	3	Project communication documentation in media
	MPF-4343	Final Report for Project I	5	Passed final seminar (100% evaluation)
Semester II MBKM (6 months)	MPF-3342	Literature Review for Project II	3	Literature review document
	MPF-3344	Field Survey and Observation for Project II	3	Survey and observation report
	MPF-3346	Writing Techniques for Project II	3	Humanitarian program framework
	MPF-3348	Humanitarian Program Project II	3	Program achievement percentage (50% evaluation)
	MPF-4342	Physics Communication Media for Project II	3	Project communication documentation in media
	MPF-4344	Final Report for Project II	5	Passed final seminar (100% evaluation)
Additional Courses in Semester II MBKM	UMG-4101	KKM/PKM (Community Service / Field Work Program)	2	Submission of project report as a replacement for KKM/PKM
	MPF-4102	Final Project	3	Submission of project report as a replacement for Final Project

Mode Name: 5. Village Development Project

Credit Equivalency: Up to 40 CREDITS

Implementation: Conducted over two consecutive semesters

Description	For students with strong technical skills and a keen interest in community development, the Merdeka Belajar initiative can be realized through village development projects. These projects may be part of Dikti programs, collaborations with institutions/companies, or independent initiatives. The main focus of these projects is to support underprivileged

	communities in remote areas, helping them establish essential infrastructure. Through village development projects, students become active contributors in creating functional facilities that benefit society. Students with a background in physics are expected to utilize their scientific knowledge to develop solutions that improve community welfare. Additionally, they can amplify local needs to a global audience, ensuring the voices of rural communities are heard.			
Objectives	1. Providing students with opportunities to apply their knowledge, technology, and skills while collaborating with stakeholders.			
	2. Accelerating development in rural areas.			
Expected Outcome	Publication of project processes and results in video and written formats on online and print media.			
Standard Operating Procedure (SOP)	1. Before filling out Siakad, students must submit a village development project proposal, including: Project title, Implementation location and timeframe, Project objectives, Project mentor, Approval from the village head, Project execution framework.			
	2. The Department selects proposals through an appointed evaluation team.			
	3. If the proposal is rejected, students must continue with regular coursework.			
	4. If the proposal is accepted, students register for courses in Siakad.			
	5. The Department submits an application to the Faculty for an Introduction Letter.			
	6. The Faculty issues an Activity Permit Letter.			
	7. Students conduct village development activities for two semesters, with an eligibility evaluation at the end of the first semester, involving at least one faculty member as a supervisor.			
	8. At the end of the program, students submit their project output report to the Department.			
	9. The Department assigns an examination team and a supervisor to assess the project results and final report.			
	10. The Department reports the project activities to PDDikti.			
Study Plan	Course Code	Course Name	CREDITS	Indicators
Semester I MBKM (6 months)	MPF-3351	Literature Review	3	Literature review document
	MPF-3353	Village Survey and Observation	6	Survey and observation report
	MPF-4351	Village Development Proposal Seminar	5	Passed seminar proposal
	MPF-3359	Rural Innovation Program	6	Innovation program plan for community benefit (Evaluation)
Semester II MBKM (6 months)	MPF-3352	Development Communication	4	Conducting project seminars with local village authorities
	MPF-3358	Community Empowerment	4	Innovation product resulting from community empowerment
	MPF-4352	Physics Communication Media	3	Project communication documentation in media
	MPF-3354	Monitoring and Evaluation	4	Program achievement percentage
	MPF-4354	Final Report	5	Passed final seminar

Additional Courses in Semester II MBKM	UMG-4101	KKM/PKM (Community Service / Field Work Program)	2	Submission of project report as a replacement for KKM/PKM
	MPF-4102	Final Project	3	Submission of project report as a replacement for Final Project

Mode Name: 6. Independent Project

Credit Equivalency: Up to 40 CREDITS

Implementation: Conducted over two consecutive semesters

Description	Students with interest in creating works for competitions or developing innovative ideas can opt for the Independent Project mode. This mode ideally complements relevant coursework taken by students, but can also serve as an interdisciplinary supplement. Independent projects are conducted as team-based work, either within the same discipline or across disciplines. The goal is to help students develop innovative products, conduct research-based education and development, and enhance student achievements in national and international competitions. The independent project can either supplement or replace required coursework, with equivalency calculated based on student contributions as verified by activities coordinated under faculty supervision.			
Expected Outcome	An innovative work submitted to national or international competitions, implemented in society, or filed for a patent.			
Standard Operating Procedure (SOP)	1. Students submit an independent project proposal that contains innovative ideas.			
	2. The Department selects proposals through an appointed evaluation team.			
	3. If the proposal is rejected, students must continue with regular coursework.			
	4. If the proposal is accepted, students register for courses in Siakad.			
	5. The Department submits an application to the Faculty for an Introduction Letter.			
	6. The faculty issues an Activity Permit Letter.			
	7. Students conduct project activities for two semesters, with an eligibility evaluation at the end of the first semester, involving at least one faculty member as a supervisor.			
	8. At the end of the program, students submit their project output report to the Department.			
	9. The Department assigns an examination team and a supervisor to assess the project results and final report.			
	10. The Department reports the project activities to PDDikti.			
Study Plan	Course Code	Course Name	CREDITS	Indicators
Semester I MBKM (6 months)	MPF-3361	Literature Review	3	Literature review document
	MPF-3365	Research Methodology	4	Research framework document
	MPF-3367	Science and Technology Concepts	4	Science and technology application plan
	MPF-4361	Independent Project Proposal Seminar	4	Passed seminar proposal
	MPF-3369	Independent Project 1	5	Progress report evaluation
Semester II MBKM (6 months)	MPF-3362	Scientific Writing Techniques	4	Activity report draft
	MPF-3368	Independent Project 2	8	Successful participation in competition

	MPF-4362	Physics Communication Media	3	Project communication documentation in media
	MPF-4364	Independent Project Report	5	Final report submission
Additional Courses in Semester II MBKM	UMG-4101	KKM/PKM (Community Service / Field Work Program)	2	Submission of project report as a replacement for KKM/PKM
	MPF-4102	Final Project	3	Submission of project report as a replacement for Final Project

Mode Name: 7. Teaching Assistance

Credit Equivalency: Up to 40 CREDITS

Implementation: Conducted over two consecutive semesters

Description	Teaching assistance activities involve classroom learning or laboratory development.			
Expected Outcome	Innovative learning media			
Standard Operating Procedure (SOP)	1. Students submit a teaching assistance proposal, including: Activity title, Location and implementation schedule, Activity objectives, Activity mentor, Approval from the target school principal, Activity execution framework.			
	2. The Department selects proposals through an appointed evaluation team.			
	3. If the proposal is rejected, students must continue with regular coursework.			
	4. If the proposal is accepted, students register for courses in Siakad.			
	5. The Department submits an application to the Faculty for an Introduction Letter.			
	6. The faculty issues an Activity Permit Letter.			
	7. Students conduct teaching assistance activities for two semesters, with eligibility evaluation at the end of the first semester, involving at least one faculty member as a supervisor.			
	8. At the end of the activity period, students submit their project output report to the Department.			
	9. The Department assigns an examination team and a supervisor to assess the project results and final report.			
	10. The Department reports the teaching assistance activities to PDDikti.			
Study Plan	Course Code	Course Name	CREDITS	Indicators
Semester I MBKM (6 months)	MPF-3371	Literature Review	3	Literature review document
	MPF-3373	School Survey and Observation	4	Feasibility document
	MPF-3375	Teaching Methods	4	Improvement in student skills (pre-test & post-test) and teacher abilities (evaluated by supervisor)
	MPF-3377	Physics Learning Media	4	Learning media product
	MPF-4373	Activity Report 1	5	Report document

Semester II MBKM (6 months)	MPF-3372	Innovative Teaching Materials	6	Innovative learning material product
	MPF-3374	Learning Management	6	Improvement in learning quality or laboratory infrastructure
	MPF-4372	Physics Communication Media	3	Project communication documentation in media
	MPF-4374	Activity Report 2	5	Final report submission
Additional Courses in Semester II MBKM	UMG-4101	KKM/PKM (Community Service / Field Work Program)	2	Submission of project report as a replacement for KKM/PKM
	MPF-4102	Final Project	3	Submission of project report as a replacement for Final Project

Mode Name: 8. Student Exchange

Credit Equivalency: Up to 40 CREDITS (Inter-University Exchange), Up to 20 CREDITS (Intra-University Exchange)

Implementation: Conducted over two consecutive semesters (Inter-University Exchange), Conducted over one semester (Intra-University Exchange)

Description	Currently, full credit transfer exchange programs are commonly conducted with partner universities abroad, but domestic inter-university credit transfers remain limited. The student exchange program is designed to cultivate student values outlined in Minister of Education and Culture Regulation (Permendikbud) No. 3 of 2020, including: Respecting cultural diversity, perspectives, religions, beliefs, and original ideas, Collaborating and fostering social sensitivity and concern for society and the environment.			
Objectives	1. Cross-campus learning (domestic and international), living with host families at the destination campus, expanding students' understanding of Bhinneka Tunggal Ika, and strengthening cross-cultural and ethnic bonds.			
	2. Building friendships among students across regions, ethnicities, cultures, and religions, fostering national unity and cohesion.			
	3. Facilitating knowledge transfer to bridge educational disparities, both between domestic universities and between domestic and international higher education systems.			
Expected Outcome	Students successfully complete inter-university courses with a minimum grade of B for each subject.			
Standard Operating Procedure (SOP)	1. Before filling out Siakad, students discuss the courses they wish to take outside their department with their academic advisor. Courses can be taken in another department within the same university, the same department in a different university, or a different department in a different university. Only courses listed in Siakad are eligible for enrollment outside the institution.			
	2. Students enroll at the host university or cross-department courses with academic advisor approval (can be through Dikti programs).			
	3. The Department submits an application to the Faculty for an Introduction Letter (Inter-University Exchange).			
	4. The faculty issues the Introduction Letter to the host university (Inter-University Exchange).			
	5. After filling out Siakad, students request validation for course enrollment from their academic advisor.			
	6. Upon validation, students attend the courses for one semester (intra-university exchange) or two semesters (inter-university exchange) in either in-person or online formats.			
	7. At the end of the program, students submit their activity report to the Department.			
	8. The Department validates the grades of the courses taken.			
	9. The Department reports the exchange activities to PDDikti.			
Study Plan	Course Code	Course Name	CREDITS	Indicators
Semester I MBKM (6 months)	Based on courses taken at the host university	Completed course	-	Passed with a minimum grade of B

Semester II MBKM (6 months)	Based on courses taken at the host university	Completed course	-	Passed with a minimum grade of B

VI.1.6.3 Curriculum Transition Rules

a. General Rules

The MBKM Curriculum applies to students from the 2020 cohort onward and is not retroactive. Therefore, the following transition rules are necessary:

1. The MBKM Curriculum is effective from the 2021/2022 academic year and applies to students from the 2020 cohort onward.
2. Courses taken in Semesters I and II by 2020 cohort students remain recognized as completed courses under the following conditions (see section b for more details):
    a. Courses with the same name in the MBKM curriculum are acknowledged as mandatory courses.
    b. Courses with credit hour adjustments in the MBKM Curriculum maintain their recognition, provided the student does not retake them.
    c. Courses no longer listed in the MBKM Curriculum will be reclassified as elective courses.
    d. Students who wish to retake courses must adhere to the following rules:
        1. The credit weight of retaken mandatory physics courses will follow the MBKM Curriculum.
        2. Courses reclassified as electives can be taken within the respective study program, with credit hours matching those available in that program.
    e. Total credits earned in the first year remain unchanged, provided students do not retake courses.
3. MBKM learning modes are available in Semester V (starting in the 2022/2023 academic year), with registration procedures following the guidelines in Point 4.d.
4. Student participation in any of the following academic activities may be converted into course credits:
    - National or international seminars
    - Summer courses
    - Workshops (minimum one full-day workshop)
    - Participants may receive credit for "Literature Study" (3 CREDITS).
    - Speakers may receive credit for "Physics Communication Media" (3 CREDITS).

5. Students in the 2021 cohort, who started their studies in the 2021/2022 academic year, will fully adopt the MBKM Curriculum.
6. Students from the 2019 cohort and earlier will continue following the KKNI Curriculum in full.
7. Students from the 2019 cohort and earlier are only permitted to retake mandatory courses from the KKNI Curriculum (elective courses cannot be retaken).

VI.1.9 Transition Rules for Curriculum Changes

To accommodate students who enrolled before the implementation of the Merdeka Belajar (MBKM) Curriculum, PS Fisika has established transition rules to ensure a smooth academic progression.

General Transition Guidelines

1. The MBKM Curriculum applies only to students from the 2020 intake and later.
2. The previous curriculum (KKNI Curriculum) remains applicable to students from the 2019 intake and earlier.
3. Courses already completed by students from the 2020 intake under the KKNI Curriculum will be recognized within the MBKM framework according to the conversion rules listed below.
    - Students from the 2019 intake and earlier must complete all mandatory courses from the KKNI Curriculum, may take additional courses from the MBKM Curriculum as electives, and may not repeat elective courses from the KKNI Curriculum.

Semester I				
KKNI Credit	**KKNI Course Name**	**MBKM Credit**	**MBKM Course Name**	**Transition Rule**
4	Fisika IA	3	Fisika IA	Credit adjusted
3	Fisika IB	2	Fisika IB	Credit adjusted
2	Biologi Kontekstual	-	-	Reclassified as elective
3	Kimia Dasar I	2	Kimia Dasar	Credit adjusted
3	Matematika I	3	Matematika I	No change
2	Pengenalan Teknologi Informasi	-	-	Reclassified as elective
3	Bahasa Indonesia	2	Bahasa Indonesia	Credit adjusted
2	Metode Pengukuran	2	Pengukuran dan Analisis Data	Converted & renamed
Semester II				

KKNI Credit	KKNI Course Name	MBKM Credit	MBKM Course Name	Transition Rule
4	Fisika IIA	3	Fisika IIA	Credit adjusted
3	Fisika IIB	2	Fisika IIB	Credit adjusted
3	Kimia Dasar II	-	-	Reclassified as elective
3	Matematika II	3	Matematika II	No change
3	Statistika Dasar	-	-	Reclassified as elective
3	Pendidikan Agama	3	Pendidikan Agama	No change
3	Bahasa Inggris	2	Bahasa Inggris	Credit adjusted
Semester III				
KKNI Credit	**KKNI Course Name**	**MBKM Credit**	**MBKM Course Name**	**Transition Rule**
3	Pendidikan Kewarganegaraan	2	Kewarganegaraan	Credit adjusted
3	Fisika Matematika I	3	Fisika Matematika I	No change
3	Mekanika I	4	Mekanika	Credit adjusted
4	Elektronika Dasar	3	Elektronika Dasar	Credit adjusted
3	Termodinamika	3	Termodinamika	No change
3	Elektromagnetika I	4	Listrik Magnet	Credit adjusted
2	Algoritma Pemrograman	2	Algoritma Pemrograman	Moved to Semester II
Semester IV				
KKNI Credit	**KKNI Course Name**	**MBKM Credit**	**MBKM Course Name**	**Transition Rule**
3	Fisika Matematika II	3	Fisika Matematika II	No change
3	Mekanika II	-	-	Removed
3	Elektromagnetika II	-	-	Removed
3	Fisika Modern	3	Fisika Modern	Moved to Semester III
3	Gelombang	3	Gelombang	No change
4	Fisika Komputasi I	4	Fisika Komputasi I	Moved to Semester II
Semester V				

KKNI Credit	KKNI Course Name	MBKM Credit	MBKM Course Name	Transition Rule
3	Fisika Matematika III	-	-	Removed
3	Fisika Kuantum I	4	Fisika Kuantum	Moved to Semester IV, Credit adjusted
2	Fisika Eksperimen I	2	Fisika Eksperimen	Moved to Semester IV
4	Fisika Inti	3	Fisika Inti	Moved to Semester IV, Credit adjusted
3	Fisika Statistik	3	Fisika Statistik	Moved to Semester IV
Semester VI				
KKNI Credit	**KKNI Course Name**	**MBKM Credit**	**MBKM Course Name**	**Transition Rule**
3	Fisika Kuantum II	-	-	Removed
2	Fisika Eksperimen II	-	-	Removed
4	Fisika Zat Padat	3	Fisika Zat Padat	Moved to Semester IV, Credit adjusted
2	Metode Penelitian	-	-	Removed
Semester VII				
KKNI Credit	**KKNI Course Name**	**MBKM Credit**	**MBKM Course Name**	**Transition Rule**
2	KKM/PKM	2	KKM/PKM	No change
2	Kerja Mandiri Terpantau	-	-	Removed
6	Skripsi	3	Tugas Akhir	Credit adjusted
2	Kewirausahaan	-	-	Removed

VI.2 Geophysics Study Program

Introduction

West Kalimantan is a province in Indonesia with abundant natural resources, including minerals found in both terrestrial environments and river estuaries. Its equatorial position also makes it a unique region for atmospheric studies.

Proper management of natural resources using scientific and technological methods can significantly contribute to economic growth at the local, regional, and national levels. At the local scale, sustainable resource management enhances community well-being, while at the regional level, it provides employment opportunities, boosts regional income, improves infrastructure, and reduces disparities. On a national scale, resource management positively impacts Indonesia's overall economic development.

Given these needs, ongoing scientific research and technology development must support the utilization of West Kalimantan's natural resources through professional and continuous assessments. The Geophysics Study Program (PS Geofisika) at FMIPA UNTAN was established to advance knowledge and technology in geophysics, focusing on the study and development of Kalimantan's natural resources.

Geophysics Study Programme received accreditation "B" from the National Accreditation Board for Higher Education (BAN-PT) through Decree No. 2272/SK/BAN-PT/Akred/S/VII/2019, valid from July 9, 2019, to July 9, 2024.

VI.2.2 Vision and Mission

Vision

"To become a leading institution in geophysics education and research, specializing in the unique natural resources of West Kalimantan, and producing graduates who are competitive at the national and international levels."

Mission

The **Geophysics Study Program (PS Geofisika)** aims to:

1. **Deliver comprehensive geophysics education**, focusing on the **distinct natural resources of West Kalimantan**.
2. **Advance geophysics research and applications**, particularly in **local geological and atmospheric phenomena**.
3. **Provide training, consulting, and services** to assist communities in addressing geophysical challenges.
4. **Build strong collaborations** with stakeholders, including government agencies, industries, and research institutions.

VI.2.3 Objectives

The **Geophysics Study Program (PS Geofisika)** aims to achieve the following objectives:

- **Develop graduates who can apply geophysics methods** to solve **theoretical and practical problems**.
- **Equip students with independent learning capabilities**, enabling them to **adapt to advancements in geophysics and related fields**.
- **Instill professional ethics**, supported by **critical thinking and analytical skills** for applying geophysics in **various industries and research sectors**.
- **Prepare graduates for national and international collaborations**, ensuring they can **communicate effectively and contribute responsibly in their field**.
- **Promote knowledge and skills** to enable graduates to **efficiently plan and manage natural resources** with an **environmental focus**.

VI.2.4 Geophysics Study Areas

The **Geophysics Study Program (PS Geofisika)** is divided into three primary research and application areas:

1. Solid Earth Geophysics

This field focuses on:

- **Seismic studies**, including **earthquakes and subsurface imaging**
- **Gravitational and magnetic field analysis** for mineral exploration
- **Geoelectrical methods** to investigate underground structures
- **Rock mechanics and petrophysics**, analysing the physical properties of earth materials

2. Atmospheric Sciences

Research in atmospheric sciences explores:

- **Meteorology and climatology**, focusing on **tropical weather patterns**
- **Cloud physics**, analysing **precipitation processes**
- **Environmental monitoring**, such as **air pollution studies**
- **Extreme weather forecasting**, including **monsoons, hurricanes, and climate variability**

3. Hydrology of Rivers and Estuaries

This area covers:

- **Hydrodynamic studies** in rivers and estuaries
- **Sediment transport analysis**
- **Coastal geomorphology**, assessing shoreline changes
- **Water resource management and conservation**

By integrating these specialized fields, **PS Geofisika** contributes to **natural disaster mitigation**, **resource exploration**, **environmental monitoring**, and **climate research** in **West Kalimantan and beyond**.

VI.2.5 Goals and Strategies for Achievement

The **Geophysics Study Program (PS Geofisika)** has established **strategic goals** based on several considerations:

1. **Alignment with UNTAN and FMIPA Goals** – Ensuring program objectives support **institutional development**.
2. **Faculty Resources** – Planning academic activities based on **available lecturers specializing in geophysics**.
3. **Student Enrollment Capacity** – Structuring the curriculum to **accommodate one class intake (40 students) per year**.

Program Goals

To fulfill its vision and mission, PS Geofisika aims to:

1. **Implement modern higher education management**, adhering to **national academic standards**.
2. **Enhance collaborations** with **government agencies and industries related to geophysics**.
3. **Increase faculty participation** in **professional geophysics associations**.
4. **Develop graduates with competitive skills**, capable of contributing **scientifically and professionally**.

Short-Term Goals (2014-2018)

Vision as an Institution Providing Education and Geophysical Research Based on the Unique Natural Resources of West Kalimantan	Providing Education and Geophysical Research Based on the Unique Natural Resources of West Kalimantan
	Improving internal organization to meet basic academic program needs, including laboratories and learning facilities.
	Expanding the number of faculty members.
	Increasing faculty members with doctoral (PhD) qualifications through study assignments.
	Enhancing the availability of reference books, textbooks, and journals.
	Improving the quality and quantity of research and community service activities, emphasizing West Kalimantan's unique natural resources.
	Refining the curriculum.
	Establishing institutional collaborations.
	Conducting research published in national or international journals.
Vision to Produce Competitive Graduates at National and International Levels	Expanding student participation in scientific development activities, especially geophysics-related seminars and workshops.

	Providing work-preparation training through project management courses, practical work, and field studies.
	Increasing student engagement in collaborations with external institutions, including stakeholder visits to agencies such as BMKG, LAPAN, etc..
	Actively sharing competition information to encourage students to participate in science, technology, arts, and sports competitions.
	I've ensured that the table formatting remains intact while providing a clear and structured translation. Let me know if you need any modifications or further translations! Happy to assist.

Short-Term Achievement Strategies (2014-2018)

- Form a **Curriculum Development Team** to update **geophysics course content**.
- Recruit additional **faculty members** specializing in **geophysics and atmospheric sciences**.
- Support faculty members in **pursuing doctoral studies** domestically and internationally.
- Enhance **research funding** to facilitate **high-quality investigations** into Kalimantan's geological and meteorological systems.
- Utilize **open-access research databases** to enrich learning materials.

Mid-Term Goals (2019-2023)

Vision as an Institution: Providing Education and Geophysical Research Based on the Unique Natural Resources of West Kalimantan	Increasing the number of textbooks authored by faculty members.
	Enhancing the quality of faculty and student research.
	Sending faculty members for further PhD studies.
	Expanding the number of faculty members.
	Targeting BAN-PT B accreditation.
	Improving the use of information technology in program management (utilizing Google Drive for file storage).
	Strengthening collaborations with other universities.
	Building partnerships with government and private institutions through: Excursions to major, Student internships, Collaborative research projects exploration/exploitation companies,
Vision to Produce Competitive Graduates at National and International Levels	Improving student organization structures to support academic activities.

	Engaging students in seminars and activities related to geophysics at the national level.
	Promoting various programs and activities to enhance graduates' soft skills.
	Providing work-preparation training through project management courses, practical work, and field studies.
	Involving students in faculty research activities.

Medium-Term Achievement Strategies (2019-2023)

1. Promoting book writing incentives from RISTEKDIKTI to Geophysics faculty members.
2. Providing institutional incentives for faculty members who publish research in national or internationally indexed journals.
3. Analyzing faculty-to-student ratio and assessing faculty needs, followed by requests for additional teaching staff, through contract-based or civil servant recruitment mechanisms.
4. Offering institutional incentives for the development of teaching modules and materials that support Geophysics curriculum implementation.
5. Utilizing Google Drive for academic database management, ensuring organized and easily accessible program data.
6. Collaborating with HAGI and HMGI, fostering partnerships with other universities through Geophysics online courses, webinars, and information-sharing platforms.
7. Involving students in faculty research projects.
8. Encouraging faculty members by providing extensive opportunities and information on scholarships for graduate studies, both domestically and abroad.

Long-Term Goals (2024-2028)

Vision as an Institution: Providing Education and Geophysical Research Based on the Unique Natural Resources of West Kalimantan	Developing laboratories in accordance with National Certification Body requirements.
	Targeting BAN-PT A accreditation.
	Establishing the institution as a leading center for geophysical education and research.
	Enhancing the quality of faculty and students to compete in national and international research and community service programs.
	Expanding collaborations with universities both domestically and internationally.

	Increasing the program's participation in national and international geophysics expert meetings.
Vision to Produce Competitive Graduates at National and International Levels	Improving student quality to promote Geophysics Study Program through conference proceedings and international journal publications.
	Encouraging national and international publications for faculty and students.
	Engaging students in seminars and activities related to geophysics at the national level.
	Supporting programs and activities that strengthen the soft skills of geophysics graduates.
	Providing career preparation training through project management courses, practical work, and field studies.

Long-Term Achievement Strategies (2024-2028)

1. Develop a laboratory expansion plan and propose funding for laboratory equipment through grants for practical and research purposes.
2. Participate in laboratory and technician certification programs.
3. Evaluate and update the Geophysics Study Program curriculum.
4. Provide Geophysics-related services, including geoelectric surveys and conductivity meter analysis.
5. Encourage students to participate in the PKM 5 Fields Creativity Program, aiming for journal publications or presentations at national and international seminars.
6. Support faculty participation in research and community service competitions.
7. Enhance the quality of faculty research and community service.
8. Involve students in faculty research and community service projects.
9. Establish collaborations with stakeholders such as BMKG, LAPAN, and the Mining Department, covering guest lectures, joint research, and academic publications.
10. Actively engage in the Indonesian Geophysics Experts Association (HAGI) and establish a West Kalimantan HAGI branch.
11. Participate in scientific meetings, including seminars, conferences, and workshops at national and international levels.
12. Encourage and provide extensive opportunities for faculty members to apply for postgraduate scholarships, both domestically and abroad.

VI.2.6 Graduate Profile and Learning Outcomes

Graduate Profile

Graduates of the **Geophysics Study Program (PS Geofisika)** are expected to Apply **scientific and ethical principles** in geophysical research and practice, Analyze developments in **solid-earth geophysics, atmospheric science, and hydrology**, and solve geophysical problems using **mathematical modeling, field data, and technology**.

Graduates can pursue careers as:

1. **Research Assistants** – Supporting scientific investigations at **universities, research institutions (LIPI, BMKG, LAPAN), and government agencies (ESDM, BPBD)**.
2. **Surveyors** – Conducting **geophysical surveys using seismic, gravitational, magnetic, and electrical methods**.
3. **Consultants** – Providing expert **analysis, modelling, and interpretation** of geophysical data.
4. **Industry Practitioners** – Applying geophysical methods in **natural resource exploration, environmental monitoring, and disaster mitigation**.
5. **Entrepreneurs** – Creating **geophysics-based businesses** such as **geospatial data services, mapping technologies, and mineral exploration consulting**.
6. **Educators** – Teaching geophysics in **high schools, universities, and professional training programs**.

Graduates may also pursue **advanced studies (MSc/PhD)** to become **academics, lecturers, or senior researchers** in geophysics-related fields.

The **learning outcomes or qualification profile** of graduates from the **Geophysics Study Program** are:

Geophysics Study Program Learning Outcomes	
Attitudes and Values	
SI 1	Devout to God Almighty and able to demonstrate religious values.
SI 2	Uphold humanitarian values in carrying out duties based on religion, morals, and ethics.
SI 3	Contribute to improving the quality of life in society, the nation, and civilization based on Pancasila.
SI 4	Act as a responsible citizen with national pride and patriotism.
SI 5	Respect cultural diversity, perspectives, religions, beliefs, and original findings of others.
SI 6	Collaborate and demonstrate social sensitivity and care for society and the environment.
SI 7	Obey laws and maintain discipline in society and the state.
SI 8	Internalize academic values, norms, and ethics.
SI 9	Exhibit responsibility for work in their field of expertise independently.
SI 10	Internalize the spirit of independence, perseverance, and entrepreneurship.
General Skills	
KU 1	Apply logical, critical, systematic, and innovative thinking in developing or implementing science and technology in their field.
KU 2	Demonstrate independent, high-quality, and measurable performance.
KU 3	Analyze the implications of scientific, technological, or artistic development, producing solutions, design concepts, or critiques.
KU 4	Document scientific study findings as theses or final reports, published in scientific journals.
KU 5	Make appropriate decisions in solving problems within their field based on analytical results.

KU 6	Maintain and expand professional networks within and outside their institution.
KU 7	Take responsibility for achieving team results, supervise, and evaluate assigned taCredits.
KU 8	Conduct self-assessment of work teams and manage independent learning.
KU 9	Document, store, secure, and retrieve data to ensure authenticity and prevent plagiarism.
Knowledge Mastery	
PP 1	Understand fundamental scientific disciplines supporting geophysics (physics, mathematics, chemistry, biology, and geology).
PP 2	Understand geophysics and its relation to other sciences such as geology, geodesy, rock physics, geochemistry, geography, atmospheric science, hydrology, oceanography, hydrodynamics, computation, and IT.
PP 3	Understand geophysical methods including seismic, gravity, magnetic, electrical, and electromagnetic techniques.
PP 4	Understand research design, data acquisition, processing, and interpretation in geophysics, atmospheric science, and oceanography.
PP 5	Understand exploration concepts for natural resources (energy, minerals, mining, groundwater, etc.) using geophysical methods.
Specific Skills	
KK 1	Formulate geophysical, atmospheric science, and river hydrology phenomena based on observation and experimentation.
KK 2	Develop mathematical or physical models aligned with hypotheses of applied geophysics phenomena.
KK 3	Operate geophysical methods such as seismic, gravity, magnetic, electrical, and electromagnetic techniques.
KK 4	Conduct research design, data acquisition, processing, and interpretation in geophysics, atmospheric science, and river hydrology.
KK 5	Execute natural resource exploration (energy, minerals, mining, groundwater, etc.) using geophysical methods.
KK 6	Disseminate geophysical research findings through reports or scientific papers following standardized academic guidelines.

VI.2.7 Curriculum Structure

The Geophysics Study Program curriculum for the 2021/2022 academic year is based on two competency-based curricula: the 2015 Geophysics Curriculum and the 2021 Geophysics Curriculum. The 2015 curriculum applies to students from the 2014 to 2019 cohorts. The 2021 curriculum applies to students from the 2020 and 2021 cohorts. Students from all cohorts within the Geophysics Study Program may choose elective courses from both curricula. However, for mandatory courses, students from the 2014 to 2019 cohorts are not permitted to take mandatory courses listed in the 2021 curriculum, and vice versa.

2015 Curriculum Structure

Mandatory Courses

Semester	Course Code	Course Name	Credits (CREDITS)	Organizer
I	MPU 111	General Biology	2	Biology / FMIPA
	MPU 109	General Chemistry	3	Chemistry / FMIPA
	MKWU4	Indonesian Language	2	UPT MKDU
	MPG 101	Mathematics 1	3	Mathematics / FMIPA

	MPG 103	Physics 1	4	Physics / FMIPA
	MPG 107	Introduction to Information Technology	2	Physics / FMIPA
	MPF 105	Measurement Methods	2	Physics / FMIPA
	MPG 101	Introduction to Geophysics	2	Geophysics / FMIPA
Total Credits			**20**	
II	MKWU1	Religion	3	UPT MKDU
	UMG 106	English Language	3	UPT MKDU
	MPG 102	Physics 2	4	Physics / FMIPA
	MPM 104	Basic Statistics	3	Statistics / FMIPA
	MPG 102	Mathematics 2	3	Mathematics / FMIPA
	MPG 108	Atmospheric Science	2	Geophysics / FMIPA
	MPG 110	Physical Oceanography	2	Geophysics / FMIPA
Total Credits			20	
III	MKWU3	Citizenship	2	UPT MKDU
	MPF-211	Mathematical Physics I	3	Physics / FMIPA
	MPF-221	Basic Electronics	4	Geophysics / FMIPA
	MPF-227	Thermodynamics	3	Physics / FMIPA
	MPF-229	Programming Algorithms	3	Geophysics / FMIPA
	MPG-201	Mechanics	3	Physics / FMIPA
	MPG-203	General Geology	3	Geophysics / FMIPA
Total Credits			21	
IV	MKWU2	Pancasila	2	UPT MKDU
	MPF-212	Mathematical Physics II	3	Physics / FMIPA
	MPF-218	Waves	3	Geophysics / FMIPA
	MPG-202	Geophysics Instrumentation	3	Geophysics / FMIPA
	MPG-204	Geodynamics	3	Geophysics / FMIPA
	MPG-206	Geophysics Computation	3	Geophysics / FMIPA
	MPG-208	Electricity & Magnetism	3	Geophysics / FMIPA
Total Credits			20	
V	MPF-313	Mathematical Physics III	3	Physics / FMIPA
	MPG-301	Seismology	3	Geophysics / FMIPA
	MPG-303	Mapping	2	Geophysics / FMIPA
	MPG-307	Gravity and Magnetic Methods	4	Geophysics / FMIPA
	MPG-309	Data Analysis & Geophysics Inversion Methods	3	Geophysics / FMIPA
	MPG-311	Ocean Dynamics	2	Geophysics / FMIPA
Total Credits			17	
VI	MPG-302	Geo-Electricity & Electromagnetic Methods	4	Geophysics / FMIPA
	MPG-304	Selected Topics in Geophysics	2	Geophysics / FMIPA

	MPG-306	Seismic Methods	4	Geophysics / FMIPA
	MPG-308	Meteorology & Climatology	2	Geophysics / FMIPA
	MPG-312	Field Course	2	Geophysics / FMIPA
	MPF-100	Research Methodology	2	Physics / FMIPA
Total Credits			16	
VII	UMG-401	KKM / Internship	2	Geophysics / FMIPA
	MPF-402	Supervised Independent Work	2	Geophysics / FMIPA
	MPF-408	Entrepreneurship	2	UPT MKDU
	MPG-405	Final Project (Thesis)	6	Geophysics / FMIPA
Total Credits			12	
VIII	UMG-401	KKM / Internship	2	Geophysics / FMIPA
	MPG-405	Final Project (Thesis)	6	Geophysics / FMIPA
Total Credits			8	
Total Mandatory Course Credits			126	

Elective Courses for Odd Semester

Solid Earth Geophysics

Semester	Course Code	Course Name	Credits (CREDITS)
Odd	MPG-1121	Continuum Mechanics	2
	MPG-1122	Indonesian Geology	2
	MPG-1123	Soil and Rock Physics	2
	MPG-1124	Rock Mechanics	3
	MPG-1125	Environmental Geophysics	2
	MPG-1126	Mining Geophysics	2
	MPG-1127	Geodynamics	3
	MPG-1128	Geophysics Inversion	3
	MPG-1129	Selected Topics in Geophysics	2
	MPG-1130	Peat Soil	2
River and Estuary Hydrology			
Odd	MPG-1221	Ocean Dynamics	2
	MPG-1222	River Hydraulics	2
	MPG-1223	Computational Fluid Dynamics	2
	MPG-1224	River and Coastal Geomorphology	2
Meteorology - Atmospheric Science			
Odd	MPG-1321	Hydrometeorology	2
	MPG-1322	Weather Observation and Data Analysis	2

	MPG-1323	Satellite Meteorology	2
Supporting Courses for Three Specialization Fields			
Odd	MPG-1021	Advanced Geophysics Computation	2
	MPG-1022	Natural Disaster Mitigation	2
	MPG-1023	Project Management	2

Elective Courses for Even Semester

Solid Earth Geophysics

Semester	Course Code	Course Name	Credits (CREDITS)
Even	MPG-2121	Geochemistry	2
	MPG-2122	Crystallography and Mineralogy	3
	MPG-2123	Electromagnetic Field Theory	2
	MPG-2124	Oil and Gas Geology	2
	MPG-2125	Paleomagnetism	2
	MPG-2126	Geophysical Well Logging	2
	MPG-2127	Earth's Interior Physics	2
	MPG-2128	Applied Seismology	3
	MPG-2129	Petrophysics	2
River and Estuary Hydrology			
Even	MPG-2221	Estuary Dynamics	2
	MPG-2222	Sediment Transport	2
	MPG-2223	Fluid Energy Conversion	2
	MPG-2224	Oceanographic Modeling	2
Meteorology - Atmospheric Science			
Even	MPG-2321	Tropical Meteorology and Climatology	2
	MPG-2322	Air Pollution Meteorology	2
	MPG-2323	Environmental Meteorology	2
Supporting Courses for Three Specialization Fields			
Even	MPG-2021	Sedimentology and Stratigraphy	3
	MPG-2022	Geostatistics	2
	MPG-2023	Remote Sensing Imagery	2
	MPG-2024	Nonlinear Geophysical Methods	2

VI.2.7 Courses Syllabus

Mandatory Courses

Semester 1	
MKWU 4 Indonesian Language (2 credits)	
Material	The development, status, and function of Bahasa Indonesia, variations in Bahasa Indonesia, enhanced spelling system, word structure and diction, effective sentences in Bahasa Indonesia, paragraph structure, logical reasoning in composition, scientific writing topics, manuscript conventions and editing, framework for academic writing, citation, and bibliography writing.
References	1. Arifin, E.Z. *Cermat Berbahasa Indonesia untuk Perguruan Tinggi*. Jakarta: Akademika Pressindo, 2008.
	2. Hs. Widjono. *Bahasa Indonesia Mata Kuliah Pengembangan Kepribadian di Perguruan Tinggi*. Jakarta: PT. Grasindo, 2008.
	3. Suhertuti, et al. *Bahasa Indonesia sebagai Sarana Komunikasi Ilmiah*. Bogor: Irham Publishing, 2011.
	4. Dalman. *Keterampilan Menulis*. Jakarta: Raja Grafindo Persada, 2014.
	5. Depdiknas. *Ejaan Yang Disempurnakan*. Jakarta: Gramedia, 2008.
MPU-101 Mathematics I (3 credits)	
Material	Number systems, inequalities and absolute values, functions, limits and continuity, derivatives, and integrals.
References	1. Purcell, E. J. & Varberg, D., 1994. *Kalkulus dan Geometri Analitis*. 4th ed. I Nyoman Susila, Bana Kartasasmita, Rawuh, translator. Jakarta: Erlangga.
	2. Stewart, J., 2001. *Kalkulus*. 4th ed. I Nyoman Susila & Hendra Gunawan, translator. Jakarta: Erlangga.
	3. Tim Logika dan Kalkulus, 2013. *Logika dan Kalkulus*. Program Studi Matematika Universitas Tanjungpura.
MPU-105 Introduction to Information Technology (2 CREDITS)	
Material	Types & evolution of computer devices, history of computer systems, system components, system operations, input, output, storage, data and information, document writing techniques with office applications, introduction to the Internet, email, mailing lists, e-learning, cloud storage, file management, blog creation, and customization.
References	1. Jogiyanto H.M., *Pengenalan Komputer*. Yogyakarta: Andi Offset.
	2. Turban E., Leidner, D., McLean, E., & Wetherbe, J., 2005. *Information Technology for Management: Transforming Organizations in the Digital Economy*, 5th edition. John Wiley & Sons, Inc., Indianapolis.
	3. Brian K. Williams, Stacey C. Sawyer, *Using Information Technology*, 7th edition. McGraw-Hill, 2007.
	4. Siarto E., 2010. *Head First WordPress*. O'Reilly, Sebastopol.
	5. Google Drive, WordPress, Yahoo Groups.
MPU-111 General Biology (2 CREDITS)	
Material	Basic concepts of life, cells, animal and plant structures, reproduction in animals and plants, growth and control systems in plants, circulatory and nervous systems in animals, respiratory and digestive systems in animals, photosynthesis, cellular respiration, evolutionary mechanisms, cell cycle, animal and plant systematics, genetics, and ecology.
References	1. Campbell, N.A., Reece, J.B., Urry, L.A., Cain, M.L., & Wasserman, S.A., *Biology*, Volumes 1, 2, and 3, 8th edition, translated by Wulandari, T.D., 2008. Erlangga Publishing, Jakarta.
	2. Johnsoggayer, W.H., Laubenggayer, R.A., & Delany, L.E., 2000. *General Biology*. Holt Rinehart and Winston, New York.
	3. Storer, T.I. & Usinger, R.L., 1995. *General Biology*. McGraw Hill Publishing Company, Ltd.

	4. Simpson, G.G. & Bech, W.S., 1995. *An Introduction to Biology*. Brace and Word, St. Louis.
	5. Ruse, M., 1982. *Darwinism Defended*. The Benjamin Cummings Publishing Company, California, New Delhi.
MPF-105 Measurement Methods (2 CREDITS)	
Material	Basic measurement concepts, measuring instruments, measurement uncertainty, data collection and processing, and experimental data analysis results.
References	Holman, J.P., 1985. *Metode Pengukuran Teknik*, 4th ed., translated by Jasjfi, E. Jakarta: Erlangga.
MPF-101 Physics I (4 CREDITS)	
Material	Theoretical concepts and fundamental principles of physics including unit systems, vector algebra, mechanics (kinematics and dynamics), fluids, kinetic gas theory and thermodynamics, temperature, heat and first law of thermodynamics, kinetic gas theory, entropy and second law of thermodynamics, equilibrium and elasticity, gravity.
References	1. Halliday, D., Resnick, R., & Walker, J., 2013. *Fundamentals of Physics*, 8th edition. John Wiley & Sons, Inc.
	2. Rosyid, F., Firmansyah, E., & Dyan, P., 2014. *Fisika Dasar*, Volume 1. Periuk Publishing, Yogyakarta.
	3. Tim Diktat Fisika Dasar, 2011. *Diktat Fisika Dasar*. Mathematics Study Program, Universitas Tanjungpura.
MPG-101 Introduction to Geophysics (2 CREDITS)	
Material	Geology and geophysics, Earth's formation and geochronology, Earth's temperature, earthquakes and their observation, events, magnitude scale, and seismology studies, gravitational force, Earth's crust dynamics and gravity exploration, geomagnetism and geomagnetic exploration, Earth's electricity and geoelectric exploration, electromagnetic methods.
References	Santoso, D., 2009. *Pengantar Teknik Geofisika*. ITB Press, Bandung.

Semester II

MKWU1 Religion (3 CREDITS)	
Islamic Religion	
Material	Faith and its implications in Islam, piety and its impact on life, human nature and dignity in Islam, superiority of humans over other creatures, human function and responsibility in Islam, meaning of Islam and its scope, classification of religions and Islam, scope of Islamic teachings, Al-Qur'an, its content and structure, As-Sunnah, its function and significance, reasoning applied through ijtihad, meaning and scope, comparison of good and evil in ethics and philosophy, implementation of ethics in social life, meaning and objectives, legal foundations, religious harmony framework, religious development, religious harmony building strategies, implementation steps, core Islamic teachings on religious harmony, religious harmony in Indonesia, Islamic law and its scope, Islam and economy, commerce in Islam, partnership, banks, principles and concepts of Islamic banking, cooperatives, meaning and role of politics in Islam, contribution of Islam to national politics, Islamic perspectives on jurisprudence, problem-solving through jurisprudence, family formation in Islam, inheritance law, Islamic society formation, Islamic history, civilization, peace values in Islam, science in Islam, halal and haram in technology, technology use in Islam.
References	1. Al Qur’an Al Karim and CD Al Qur’an: *Holy Qur’an*.
	2. Al Hadist and CD Al Hadist: *Kutub Al Tis’ah*, Penerbit Al Bayan.
	3. Abduh, Syekh Muhammad, 1979. *Risalah Tauhid*, translated by K.H. Firdaus, Jakarta.
	4. Aminuddin, 1981. *Sejarah Kebudayaan Islam*, Jakarta, Hidakarya Agung.
	5. Baiquni, 1983. *Islam dan Ilmu Pengetahuan Modern*, Pustaka, Bandung.

	6. Mubarak, Zakky, Dr. MA, 2007. *Menjadi Cendikiawan Muslim, Kuliah Islam di Perguruan Tinggi*, Penerbit Yayasan Ukhuwah Insaniah, Jakarta.
Christian Religion	
Material	Religion and its function in human life, God in Christian belief, humanity in Christian teachings, ethics and Christian character development, relationship between Christian faith and science, technology, and art, fostering interfaith harmony, God's creation and preserving it, proper social interactions.
References	1. Kemenristekdikti, 2016. *Modul Pendidikan Agama Kristen Untuk Perguruan Tinggi*. Jakarta: Dirjen Belmawa Kemenristekdikti.
	2. Ariarajah, Wesley, 1989. *Alkitab dan Orang-orang yang Berkepercayaan Lain*. Jakarta: BPK Gunung Mulia.
	3. Chandra, Robby I., 2006. *Pendidikan Menuju Manusia Mandiri*. Bandung: Generasi Infomedia.
	4. Fletcher, Verne H., 2007. *Lihatlah Sang Manusia: Suatu Pendekatan pada Etika Kristen Dasar*. Jakarta: BPK Gunung Mulia.
	5. Sitompul, Einar M., 2006. *Gereja Menyikapi Perubahan*. Jakarta: BPK Gunung Mulia.
	6. Suseno, Franz Magnis, 2004. *Menjadi Saksi Kristus di Tengah Masyarakat Majemuk*. Jakarta: Obor.
	7. Wilardjo, Liek, 2004. *Ilmu dan Agama di Perguruan Tinggi: Dipadukan atau Diperbincangkan?* dalam *Jurnal Waskita*, Vol 1 No 1.
	8. Yewangoe, AA., 2002. *Iman, Agama dan Masyarakat dalam Negara Pancasila*. Jakarta: BPK Gunung Mulia.
Catholic Religion	
Material	Human life calling according to scripture, relationship of humans with themselves, others, environment, and God, religion and faith in pluralism, Jesus Christ, church, and socialized faith.
References	1. Kemenristekdikti, 2016. *Modul Pendidikan Agama Kristen Untuk Perguruan Tinggi*. Jakarta: Dirjen Belmawa Kemenristekdikti.
	2. Dahler, Franz & Candra, Julius, 1989. *Asal dan Tujuan Manusia – Teori Evolusi yang Menggemparkan Dunia*, Yogyakarta: Kanisius.
	3. Go Piet, Ocarm, 2007. *Hubungan Antaragama dan Kepercayaan*. Jakarta: Dokpen KWI.
	4. Harjawyata, Frans. OCSO (ed.), 1998. *Yesus dan Situasi Zaman-Nya*. Yogyakarta: Kanisius.
	5. Ismartono, I., S.J., 1993. *Kuliah Agama Katolik*. Jakarta: Obor.
	6. Komisi Kateketik KWI, 2007. *Materi Pokok Pendidikan Agama Katolik, Modul untuk Universitas Terbuka*. Jakarta: Universitas Terbuka.
	7. Pilarczyk, Daniel E., 2002. *Beriman Katolik*. Jakarta: Penerbit Obor.
UMG-106 English Language (3 CREDITS)	
Material	English sounds: Letters and words, self-introduction and asking personal data, noun phrases, simple sentences, compound sentences, complex sentences, verbal and nominal sentences, statement sentences (positive and negative), interrogative sentences (Yes/No, Wh, tag question), exclamation sentences (imperative/order/command, warning, prohibition, request), present tense, past tense, degree of comparison, countable and uncountable nouns, adverbs of frequency, relative clauses, active and passive voice, direct and indirect speech, conditional sentences, gerunds and infinitives, affixes and derivation, English for bilingual instruction.
References	1. Yan Haryanto, Endang Sulasbawiatini & Johanna B.S. Pantow, 2007. *Materi Pokok Pendidikan Bahasa Inggris S-1 PGSD*. Jakarta: Universitas Terbuka – Depdiknas.
	2. Rohana Abdullah, 2007. *Bahan Ajar Cetak: Bahasa Inggris (S-1 PJJ PGSD)*. Jakarta: Depdiknas–Ditjen Ketenagaan.
	3. Slamet Riyanto, 2007. *How to Say It*. Yogyakarta: Pustaka Pelajar.
	4. Ramelan, 1999. *English Phonetics*. Semarang: IKIP Semarang Press.

MPM-102 Mathematics II (3 CREDITS)	
Material	Trigonometry, differentiation, integration, matrices, vector algebra.
References	1. K.A. Stroud, Dexter J. Booth, translated by Zulkifli Harahap, 2003. *Matematika Teknik*, 5th edition. Erlangga, Jakarta.
	2. Purcell, E.J., Varberg, D., Rigdon, S.E., 2003. *Kalkulus*, Volume I. Erlangga, Jakarta.
MPM-104 Basic Statistics (3 CREDITS)	
Material	Introduction, descriptive statistics and exploratory data analysis, probability and random variable distributions, sampling distribution, population parameter estimation, hypothesis testing, simple regression analysis.
References	1. Kusnandar, D., 2004. *Metode Statistik dan Aplikasinya dengan Minitab dan Excel*. Madyan Press.
	2. Weiss, N.A., 2012. *Introductory Statistics*, 9th edition. Addison-Wesley, Boston, USA.
	3. Hamilton, L.C., 1992. *Regression with Graphics: A Second Course in Applied Statistics*. Wadworths, Inc., Belmont, USA.
	4. Ott, L., 1984. *An Introduction to Statistical Methods and Data Analysis*, 2nd edition. Duxbury Press, Boston, USA.
MPG-102 Physics II (4 CREDITS)	
Material	Electricity, basic magnetic concepts, waves, sound, and basic optics.
References	1. Halliday, D., Resnick, R., Walker, J., 2013. *Fundamentals of Physics*, 8th edition. John Wiley & Sons, Inc.
	2. Rosyid, F., Firmansyah, E., & Dyan, P., 2014. *Fisika Dasar*, Volume 1. Periuk Publishing, Yogyakarta.
	3. Tim Diktat Fisika Dasar, 2011. *Diktat Fisika Dasar*, Mathematics Study Program, Universitas Tanjungpura.
MPG-108 Atmospheric Science (2 CREDITS)	
Material	Weather and climate elements, Earth's atmosphere, atmospheric boundary layer, radiative transfer, hydrostatic equilibrium, thermodynamics and atmospheric stability, atmospheric dynamics, near-surface winds, tropical and equatorial circulation variations, seasonal monsoon system variations.
Reference	Bayong Tjasyono, 2008. *Sains Atmosfer*. ITB, Bandung.
MPG-110 Physical Oceanography (2 CREDITS)	
Material	Definition, scope, and relation of physical oceanography with other courses, physical properties of seawater, ocean water dynamics, water movement due to oceanographic property differences, coastal processes, shoreline changes and profiles, oceanographic conditions in estuarine zones, mixing processes in the ocean, ocean fronts (boundary layers).
References	1. Bowden, K.F., 1983. *Physical Oceanography of Coastal Waters*. Ellis Horwood Limited, England.
	2. Guilcher, A., 1988. *Coral Reef Geomorphology*. John Wiley & Sons, New York.
	3. Horikawa, K., 1988. *Nearshore Dynamics and Coastal Processes*. University of Tokyo Press.
	4. Komar, P.D., 1976. *Beach Processes and Sedimentation*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey, USA.
	5. Pinet, P.R., 1992. *Oceanography: An Introduction to the Planet Oceanus*. West Publishing Company, USA.
	6. Poerbandono & E. Djunasjah, 2005. *Survei Hidrografi*. PT. Refika Aditama, Bandung.
	7. Sunamura, T., 1992. *Geomorphology of Rocky Coasts*. John Wiley & Sons, New York.

	8. Supangat, A., & Susanna, 2008. *Pengantar Oseanografi*. Pusat Riset Wilayah Laut dan Sumberdaya Non-hayati, Badan Riset Kelautan dan Perikanan, Departemen Kelautan dan Perikanan.
	9. The Open University Team, 1989. *Seawater: Its Composition, Properties, and Behaviour*. Pergamon Press, Oxford.
	10. The Open University Team, 1997. *Waves, Tides, and Shallow Water Processes*. Butterworth-Heinemann, Oxford.
	11. Tomczak, M., 1996. *Shelf and Coastal Oceanography*. Flinders University of South Australia, Adelaide.
Semester III	
MKWU3 Citizenship (2 CREDITS)	
Material	Pancasila as philosophy, foundation of the state, and national ideology; national identity; state and constitution; Indonesian democracy; rule of law and human rights; rights and obligations of citizens; Indonesian geopolitics (national insight); Indonesian geostrategy (national resilience); national integration.
References	1. Achmad Sanusi, 2006. *Memberdayakan Masyarakat dalam Pelaksanaan 10 Pilar Demokrasi* dalam *Pendidikan Nilai Moral dalam Dimensi Pendidikan Kewarganegaraan*. Bandung: Laboratorium PKn UPI.
	2. Armaidy Armawi, 2012. *Karakter Sebagai Unsur Kekuatan Bangsa*. Presented at *Workshop Pendidikan Karakter bagi Dosen Pendidikan Kewarganegaraan di Perguruan Tinggi*, August 31–September 2, 2012, Hotel Bintang Griya Wisata, Jakarta.
	3. As'ad Said Ali, 2009. *Negara Pancasila: Jalan Kemaslahatan Berbangsa*. Jakarta: LP3ES.
	4. Zamroni, 2001. *Pendidikan untuk Demokrasi*. Yogyakarta: Bigraf Publishing.
MPF-211 Mathematical Physics I (3 CREDITS)	
Material	Infinite series, complex numbers, linear equations: vectors, matrices, and determinants, partial differential equations, multiple integrals, vector analysis, Fourier series, ordinary differential equations.
References	1. Boas, M.L., 1983. *Mathematical Method in Physical Sciences*. John Wiley & Sons.
	2. Spiegel, M.R., 1987. *Mathematical Handbook of Formula and Tables*. McGraw-Hill, Inc.
MPF-221 Basic Electronics (4 CREDITS)	
Material	DC circuits, AC circuits, semiconductor theory, diode circuits, bipolar transistors, operational amplifiers, amplifier circuits, filters.
References	1. Sutrisno, 1986. *Elektronika, Teori dan Penerapannya*, Volume I. ITB Publishing, Bandung.
	2. Brophy, 1969. *Basic Electronics for Scientists and Engineers*. John Wiley.
	3. Alley & Atwood, 1973. *Engineering Electronics*. John Wiley.
	4. Milman & Halkias, 1992. *Integrated Electronics*. McGraw-Hill, Toronto.
	5. Ahmad Fali O., 2007. *Elektronika Dasar*, Teaching Material, Universitas Sriwijaya.
	6. Electronic Lab.
MPF-227 Thermodynamics (3 CREDITS)	
Material	Scope of thermodynamics: thermodynamic systems and variables (temperature, pressure, volume), zeroth law and thermal equilibrium, thermodynamic processes, equation of state: ideal gas equation, real gas equation, partial differential (expansion coefficient and compression coefficient), Van der Waals gas critical constants, first law of thermodynamics: thermodynamic work, internal energy, heat transfer, heat capacity, enthalpy, general form of first law. Consequences of first law: energy equations (variables T-V, T-P, P-V), Gay-Lussac-Joule experiment, Joule-Thomson expansion, Carnot cycle, heat engines and refrigerators. Entropy & second law: reversible and irreversible processes, entropy principle, combination

	of first and second law: TDS equations, phase transition, third law. Applications in simple systems, kinetic gas theory, transport phenomena.
References	1. Sears, F.W., & Salinger, G.L., *Thermodynamics: Kinetic Theory and Statistical Thermodynamics*. Addison-Wesley.
	2. Alonso, M., & Finn, E.J., *Fundamental University Physics*, Volume III. Addison-Wesley.
	3. Carrington, G., *Basic Thermodynamics*. Oxford University Press.
	4. Kittel, C., *Thermal Physics*. W.H. Freeman and Co., New York.
	5. Greiner, W., Neise, L., & Stocker, H., *Thermodynamics and Statistical Mechanics*. Springer-Verlag.
MPF-229 Algorithm and Programming (3 CREDITS)	
Material	Introduction to algorithms: history and development, principles of algorithms, introduction to programming software (Freemat, Octave), pseudo code, flowchart, Freemat as a calculator, introduction to MATLAB programming language, simple calculations, input and output programming, conditional branching, arrays (indexed variables), matrix operations, matrix manipulations, subroutine and function, case studies.
References	1. Griffiths, D.F., 2005. *An Introduction to MATLAB*. University of Dundee, Stockholm, Sweden.
	2. Cyders, G., & Schaefer T., *Basic Numerical Method and Freemat*.
	3. Tiatmodjo, B., 2002. *Metode Numerik, Dilengkapi dengan Program Komputer*. Beta, Yogyakarta.
MPG-201 Mechanics (3 CREDITS)	
Material	Unit systems and measurement of physical quantities, vectors, mass, force and motion, statics, kinematics, dynamics, work and energy, impulse and momentum, moment of inertia, angular momentum.
References	Halliday, D., Resnick, R., & Walker, J., 2013. *Fundamentals of Physics*, 8th edition. John Wiley & Sons, Inc.
MPG-203 General Geology (3 CREDITS)	
Material	Earth formation theories and plate tectonics, minerals and rocks, geological processes and landscape changes, geomorphology, remote sensing, structural geology, stratigraphy, geological history, fossils, Earth's paleogeography, geological mapping.
References	Noor, D., 2009. *Pengantar Geologi*, 1st edition. Graha Ilmu.
Semester IV	
MKWU2 Pancasila (2 CREDITS)	
Material	Pancasila education in higher education, Pancasila in the historical development of Indonesia, urgency of Pancasila as the foundation of the Republic of Indonesia, Pancasila as a state ideology, Pancasila as a philosophical system, Pancasila as an ethical system, Pancasila as a foundation of scientific development.
References	1. Kemenristekdikti, 2016. *Modul Pendidikan Pancasila Untuk Perguruan Tinggi*. Jakarta: Dirjen Belmawa Kemenristekdikti.
	2. Ali, As'ad Said, 2009. *Negara Pancasila Jalan Kemaslahatan Berbangsa*. Jakarta: Pustaka LP3ES.
	3. Bakry, Noor Ms., 2010. *Pendidikan Pancasila*. Pustaka Pelajar, Yogyakarta.
	4. Kaelan, 2013. *Negara Kebangsaan Pancasila: Kultural, Historis, Filosofis, Yuridis dan Aktualisasinya*. Yogyakarta: Penerbit Paradigma.
MPF-212 Mathematical Physics II (3 CREDITS)	
Material	Variational calculus, coordinate transformation, differential equation series solutions, partial differential equations, complex variable functions, integral transformations.
References	1. Boas, M.L., 1983. *Mathematical Methods in Physical Sciences*. John Wiley & Sons.

	2. Spiegel, M.R., 1987. *Mathematical Handbook of Formulas and Tables*. McGraw-Hill, Inc.
MPF-218 Waves (3 CREDITS)	
Material	Simple harmonic motion, damped harmonic motion, oscillatory forces, transverse wave motion, electromagnetic waves.
Reference	Pain, H.J., 2005. *The Physics of Vibration and Waves*, 9th edition. John Wiley & Sons.
MPG-202 Geophysics Instrumentation (3 CREDITS)	
Material	Sensors, signal processing, op-amps for signal filtering, op-amps for voltage and current regulation, digital electronics, geoelectrical instrumentation, seismic instrumentation, magnetic instrumentation, induced polarization instrumentation, electromagnetic instrumentation, gravimeter, telemetry systems.
References	1. Telford, W.M., & Sheriff, R.E., 1998. *Applied Geophysics*. Cambridge University Press, New York.
	2. Carden, F., Henry, R., & Jedlicka, R., 2002. *Telemetry Systems Engineering*. Artech House.
MPG-204 Geodynamics (3 CREDITS)	
Material	Plate tectonics, stress and strain, elasticity and flexibility, heat transfer, fluid mechanics, rock rheology, flow in porous media.
Reference	Turcotte, D.L., & Schubert, G., *Geodynamics*, 2nd edition. Cambridge University Press.
MPG-206 Geophysics Computation (3 CREDITS)	
Material	Principles and basic concepts in geophysics computation, linear and nonlinear regression analysis, regression solution methods, Newton and Lagrange interpolation theory, Eigenvalue theory and search algorithms, finite difference equations, arrays, grids, PDE solutions, parabolic, elliptic, and hyperbolic PDE solutions and algorithms.
References	1. Kosasih, P.B., 2006. *Komputasi Numerik: Teori dan Aplikasi*. Andi Offset, Yogyakarta.
	2. Grandis, H., 2009. *Pemodelan Inversi Geofisika*.
	3. Tiatmodjo, B., 2002. *Metode Numerik, Dilengkapi dengan Program Komputer*. Beta, Yogyakarta.
	4. Cyders, G., & Schaefer T., *Basic Numerical Method and Freemat*.
	5. Trauth, M.H., 2006. *MATLAB Recipes for Earth Sciences*. Springer, Netherlands.
MPG-208 Electricity & Magnetism (3 CREDITS)	
Material	Coulomb's law, electric field (higher mathematical analysis), superposition principle for continuous charge distribution, electric potential, electrostatic field energy, Gauss's law (integral and differential form and applications), Poisson and Laplace equations, dielectric properties, polarization and charge redistribution, electrostatic and conductor properties, electric current, magnetostatics, magnetic interactions, Lorentz force, Biot-Savart law, Ampere's law, magnetic induction, divergence and curl of B field, vector potential and gauge concept, magnetism in materials, vector M, surface and volume currents.
References	1. Reitz, J.R., 1990. *Dasar-Dasar Teori Listrik Magnet*. ITB, Bandung.
	2. Griffiths, D.J., 1989. *Introduction to Electrodynamics*. Prentice Hall, New Jersey.
	3. Pollack & Stump, *Electromagnetism*.
	4. Berkeley Physics Course - Vol. II.
Semester V	
MPF-313 Mathematical Physics III (3 CREDITS)	

Material	Complex functions, solving ordinary differential equations (ODE) using series methods (Legendre and Bessel functions), special functions (factorial, gamma function, beta function), partial differential equations (PDE), integral transformations.
References	1. Mary L. Boas, 1996. *Mathematical Methods in the Physical Sciences*. John Wiley & Sons.
	2. Spiegel, Murray, 1981. *Complex Variable*. Schaum Series.
	3. G. Arfken & Hans J. Weber, 2005. *Mathematical Method for Physicists*. Academic Press.
	4. Erwin Kreyszig, 1993. *Advanced Engineering Mathematics*. John Wiley & Sons.
MPG-301 Seismology (3 CREDITS)	
Material	General concepts of seismology, stress and strain, seismic wave equation, ray theory: travel time, ray theory: amplitude and phase, reflection seismology, surface waves and normal modes, earthquakes and source theory, earthquake prediction, instruments, noise, and anisotropy.
Reference	Shearer, P.M., 2009. *Introduction to Seismology*, 2nd edition. Cambridge University Press, New York.
MPG-303 Mapping (2 CREDITS)	
Material	Measurement with leveling instruments, measurement with angular measurement instruments.
Reference	Heinz Frick, 1979. *Ilmu dan Alat Ukur Tanah*. Kanisius, Yogyakarta.
MPG-307 Gravity and Magnetic Methods (4 CREDITS)	
Material	Basic theory of gravity methods, gravity data acquisition, gravity data processing, gravity data interpretation, basic theory of magnetic methods, magnetic data acquisition, magnetic data processing, magnetic data interpretation.
References	1. Kaufman, A.A. & Hansen, R.O., 2008. *Principles of the Gravitational Methods*, 1st edition. Elsevier, Amsterdam.
	2. Kaufman, A.A., Klienberg, R.L., & Hansen, R., 2009. *Principles of the Magnetic Methods in Geophysics*, 1st edition. Elsevier, Amsterdam.
MPG-309 Geophysical Data Analysis and Inversion Methods (3 CREDITS)	
Material	Modeling, linear regression and linear inversion, linear inversion resolution, linear inversion with prior information, non-linear inversion, global approach to non-linear inversion.
References	1. Grandis, H., 2009. *Pengantar Pemodelan Inversi Geofisika*. Bhumi Printing, Bandung.
	2. Menke, W., 2012. *Geophysical Data Analysis: Discrete Inverse Theory: MATLAB Edition*, 3rd edition. Academic Press.
MPG-311 Ocean Dynamics (2 CREDITS)	
Material	Ocean formation, landmass and ocean distribution, physical and chemical properties of seawater, oceans and climate, tides, waves, currents, sediments and sedimentation, pelagic system, benthic system.
References	1. Bengen, 2001. *Sinopsis Ekosistem dan Sumberdaya Alam Pesisir dan Laut*. PKSPL-IPB, Bogor.
	2. Mappa, H. & Kaharuddin, M.S., 1991. *Himpunan Mahasiswa Teknik Geologi*. Faculty of Engineering, Universitas Hasanuddin, Makassar.
	3. Munir, M., 1996. *Geologi Mineral Tanah*. Pustaka Jaya, Jakarta.
	4. Nontji, A., 1987. *Laut Nusantara*. Djambatan Publishing, Jakarta.
	5. Nybakken, J.W., 1992. *Biologi Laut: Suatu Pendekatan Ekologis*. Gramedia, Jakarta.
	6. Knauss, J.A., 1978. *Introduction to Physical Oceanography*. Prentice Hall Inc., New Jersey.
	7. Hutabarat, S. & Evans, S.M., *Pengantar Oseanografi*. Universitas Indonesia Press, Jakarta.

	8. Kramidibrata, S., 1985. *Perencanaan Pelabuhan*. Ganeca Exact, Bandung.
Semester VI	
MPG-302 Geo-Electricity and Electromagnetic Methods (4 CREDITS)	
Material	Basic theory of resistivity methods, effects of inhomogeneous media, resistivity field equipment, electrode layout and field procedures, resistivity method interpretation, electromagnetic theory, electromagnetic method equipment, EM field system for basic surveys, EM field procedures, electromagnetic method interpretation.
References	1. Telford, W.M., Geldart, L.P., & Sheriff, R.E., 1991. *Applied Geophysics*, 2nd edition. Cambridge University Press, USA.
	2. Bhattacharya, P.K., & Patra, H.P., *Direct Current Geoelectric Sounding*. Elsevier.
MPG-304 Geophysics Selected Topics (2 CREDITS)	
Material	Geothermal and renewable energy, geothermal sources, geothermal system thermodynamics, geothermal system hydrology, geothermal geology, geothermal exploration, Indonesia's geothermal potential.
Reference	Glassley, W.A., 2010. *Geothermal Energy: Renewable Energy and the Environment*. CRC Press, USA.
MPG-306 Seismic Methods (4 CREDITS)	
Material	Elastic wave theory, seismic data acquisition, seismic data processing, seismic data interpretation, seismic reflection behavior, pitfalls in seismic data interpretation, geophysical interpretation.
References	1. Yilmaz, O., 2001. *Seismic Data Analysis: Processing, Inversion, and Interpretation of Seismic Data*, Volume 1. Society of Exploration Geophysicists, USA.
	2. Priyono, A., 2006. *Diktat Kuliah: Metode Seismik 1*. ITB, Bandung.
MPG-308 Meteorology and Climatology (2 CREDITS)	
Material	Earth and atmosphere, atmospheric static equilibrium, atmospheric kinematics, atmospheric dynamics, geostrophic motion, atmospheric boundary layer and shear stress, monsoon and tropical cyclones, atmospheric waves.
References	1. Bayong Tjasyono, 2002. *Meteorologi Fisik*. ITB, Bandung.
	2. Bayong Tjasyono, 2002. *Meteorologi Dinamik*. ITB, Bandung.
	3. Bayong Tjasyono, 2008. *Klimatologi*. ITB, Bandung.
MPG-312 Field Study (2 CREDITS)	
Material	In this course, students apply knowledge gained from Geology, Geo-Electricity and Electromagnetic Methods, Oceanography, and Atmospheric Science to field practice, including data collection, processing, and analysis.
MPF-100 Research Methodology (2 CREDITS)	
Material	This course aims to help students understand research theories and concepts, familiarize themselves with research analysis, and apply them effectively in geophysics research. Specifically, students will learn about the research process, including problem definition, literature review, theoretical framework development, hypothesis formulation, data collection and analysis, and writing research reports. Students will also be introduced to various statistical analysis methods, both parametric and non-parametric, equipping them with skills to process their research data. Additionally, students will gain an overview of qualitative research design, considering the current paradigm shift towards both qualitative and quantitative research. The course also reviews relevant research developments by examining academic publications.
References	1. Uma Sekaran, 2012. *Research Methods for Business*, 12th edition. John Wiley & Sons.
	2. Emory William & D. Cooper, 2011. *Business Research Methods*, 9th edition. Irwin Corp, New Jersey.

	3. Articles from Emerald, Ebscohost, ProQuest, and dissertations.
Semester VII	
UMG-401 Community Service and Internship (2 CREDITS)	
Material	This course involves student internships in industries or research institutions under the supervision of field mentors, aiming to enhance skills and broaden professional insights. At the end of the internship, students must submit a written report, which will be evaluated by examiners assigned by the study program. Additionally, as part of Community Service (PKM) and Student Field Work (KKM), students participate in service activities in a designated area assigned by the faculty or university, lasting approximately one month.
MPF-402 Independent Supervised Work (2 CREDITS)	
Material	This course covers fundamental concepts supporting expertise groups (geophysics, atmospheric science, and oceanography). Students conduct literature studies for research design and collaborate with faculty mentors to determine research topics to be explored in Independent Supervised Work.
MPF-408 Entrepreneurship (2 CREDITS)	
Material	This course introduces students to principles and practices of entrepreneurship. Topics include business establishment, organizational structures, market needs assessment, funding strategies, human resource management, marketing and competitive analysis, financial reporting, business feasibility evaluation, customer service, and business protection.
References	1. David, W., 2008. *Strategic Marketing*. Richard D. Irwin, Inc., Toppan Company LTD, Tokyo.
	2. Kasmir, 2010. *Analisis Laporan Keuangan*. PT. Raja Grafindo Persada, Jakarta.
	3. Kasmir & Jafkar, 2011. *Studi Kelayakan Bisnis*. Prenada Media, Jakarta.
	4. Kasmir, 2011. *Customer Service*. PT. Raja Grafindo Persada, Jakarta.
	5. Kasmir, 2014. *Kewirausahaan*. PT. Raja Grafindo Persada, Jakarta.
MPF-404 Thesis (6 CREDITS)	
Material	This course focuses on conducting research related to geophysics, atmospheric science, and oceanography. Students work under faculty supervision to develop their research proposals, execute their studies, compile findings into a final report, and present their work before an academic panel. The thesis course includes literature reviews, data collection, analysis, and scientific publication. Students are expected to learn the entire research process, from topic selection, conducting research, writing reports, presenting findings, and publishing results in academic journals.

Elective Courses – Odd Semester	
MPG-313 Continuum Mechanics (2 CREDITS)	
Material	Vectors and tensors, stress, strain and deformation, general principles of constitutive equations, fluid mechanics, linearized elasticity theory.
Reference	Lawrence E. Malvern, 1987. *Introduction to the Mechanism of a Continuous Medium*, New Jersey.
MPG-315 Indonesian Geology (2 CREDITS)	
Material	Seismology and neotectonics, gravity field, stratigraphy, granite, volcanic rocks, tertiary volcanism, quaternary volcanism, oil and gas, coal, metallic mineral resources, structural history, tectonic evolution.

References	1. Sukandarrumidi, H.Z. Kotta, & F.W. Maulana. *Geologi Umum*.
	2. Sriyoni, Drs., M.Si. *Geologi dan Geomorfologi Indonesia*.
MPG-317 Soil and Rock Physics (2 CREDITS)	
Material	Basic concepts of soil and rock physics, porous and heterogeneous media, mechanical behavior of dry rocks, fluid circulation, mechanical behavior of fluid-saturated rocks, acoustic properties, electrical conductivity, dielectric properties, thermal conductivity, magnetic properties.
References	1. Gueguen, Y. & Palciauskas, V., 1994. *Introduction to The Physics of Rock*. Princeton University Press, New Jersey.
	2. Mitchell, J.K. & Soga, K., 2005. *Fundamental of Soil Behavior*. John Wiley & Sons, USA.
MPG-319 Geochemistry (2 CREDITS)	
Material	Study of atoms, chemical elements in nature, history of chemistry in nature, past and future of geochemistry.
Reference	G. Daumann, 1958. *Geochemistry*. Moscow.
MPG-321 Rock Mechanics (3 CREDITS)	
Material	Rock as a material, stress and strain analysis, friction on rock surfaces, deformation and failure in rocks, linear elasticity, rock laboratory testing, poroelasticity and thermoelasticity.
Reference	Jeager, J.C., Cook, N.G.W., & Zimmerman, R.W., 2007. *Fundamentals of Rock Mechanics*, 4th edition. Blackwell Publishing, USA.
MPG-323 Geographic Information Systems (2 CREDITS)	
Material	Geographic Information Systems (GIS), GIS subsystems and development stages, basic GIS data concepts, GIS data sources, mapping and cartography, map projection systems, ArcGIS interface introduction, georeferencing, digitization and editing, overlay and query, cartographic representation.
References	1. Environmental System Research Institute (ESRI), 1995. *Understanding GIS: The Arc Info Method*, USA.
	2. ESRI, 1995. *Understanding GIS: The Arc/Info Method*, USA: California.
	3. Laurini, Robert & Derek Thompson, 1992. *Fundamentals of Spatial Information Systems*, London: Academic Press Limited.
	4. Eddy Prahasta, 2002. *Konsep-Konsep Dasar Sistem Informasi Geografis*, Informatika Bandung.
	5. Indarto D., 2013. *Sistem Informasi Geografis*, Graha Ilmu, Yogyakarta.
	6. Budiyanto E., 2010. *Sistem Informasi Geografis dengan Arc View GIS*, Andi, Yogyakarta.
	7. David PL., 1999. *Basic Science and Remote Sensing Initiative*, Department of Geography, Michigan State University.
	8. Eddy Prahasta, 2005. *Konsep-Konsep Dasar Sistem Informasi Geografis*, Informatika Bandung.
	9. Beni Rahardjo, 2009. *Tutorial ArcGIS*.
	10. Nuryadin R., 2005. *Panduan Menggunakan MapServer*, Informatika Bandung.
	11. Charter, Denny, 2004. *Desain dan Aplikasi GIS*, PT. Elex Media Komputindo, Jakarta.
MPG-325 Hydrodynamics (2 CREDITS)	
Material	Mathematical equations governing fluid motion (continuity equation, momentum equation, Bernoulli equation), mathematical models describing flow patterns (streamline, pathline, streakline, stream tube), wave theory including linear wave theory.

Reference	Bernard Le Mehaute, 1976. *An Introduction to Hydrodynamics and Water Waves*. Springer Science+Business Media, New York.
MPG-327 Earth's Interior Physics (2 CREDITS)	
Material	Basic thermodynamics of solid bodies, elasticity modulus, lattice vibrations, equation of state, melting processes, transport properties, Earth model construction.
Reference	Poirier, J.P., 2000. *Introduction to The Physics of Earth's Interior*, 2nd edition. Cambridge University Press, USA.
MPG-329 Advanced Geophysics Computation (2 CREDITS)	
Material	Numerical methods for solving physics problems, including linear and nonlinear regression, interpolation, root-finding algorithms, and differential equations. The course begins with an introduction to computational physics, covering numerical vs. analytical solutions and error analysis in computation.
References	1. Kosasih, P.B., 2006. *Komputasi Numerik: Teori dan Aplikasi*. Andi Offset, Yogyakarta.
	2. Grandis, H., 2009. *Pemodelan Inversi Geofisika*.
	3. Tiatmodjo, B., 2002. *Metode Numerik, Dilengkapi dengan Program Komputer*. Beta, Yogyakarta.
	4. Cyders, G., & Schaefer T., *Basic Numerical Method and Freemat*.
	5. Trauth, M.H., 2006. *MATLAB Recipes for Earth Sciences*. Springer, Netherlands.
MPG-407 Coal Exploration (2 CREDITS)	
Material	This course equips students with knowledge of coal exploration, including coal structure, X-ray analysis and porosity in coal, application of NMR methods, geoelectric, magnetic, and seismic methods in coal exploration.
References	1. Alexeev, A.D., 2012. *Physics of Coal and Mining Processes*. CRC Press, USA.
	2. Dentith, M. & Mudge, S.T., 2014. *Geophysics for The Mineral Exploration Geoscientist*. Cambridge University Press, UK.
MPG-409 Mineral Exploration (2 CREDITS)	
Material	This course provides knowledge on mineral exploration, including Indonesia's mineral potential, mining industry development, and geophysical methods used in mineral exploration. Topics covered include mineral and rock classification, Indonesia's mineral potential, data acquisition, data processing and geophysical interpretation, gravity and geomagnetic methods, radiometry, resistivity and electromagnetic methods, seismic methods.
Reference	Dentith, M. & Mudge, S.T., 2014. *Geophysics for The Mineral Exploration Geoscientist*. Cambridge University Press, UK.
MPG-411 Petroleum Geology (2 CREDITS)	
Material	This course covers petroleum geology, including Earth structure, geological time, geological history, stratigraphy, rocks and minerals, weathering, erosion and deposition, coastal erosion and deposition, depositional basins, structural geology, oil traps, petroleum sources, geological considerations and engineering practices, reservoir rocks, recovery techniques, and exploration techniques.
Reference	Peter K. Link, 1996. *Basic Petroleum Geology*. Oklahoma.
MPG-413 Natural Disaster Mitigation (2 CREDITS)	
Material	This course provides knowledge on natural disaster mitigation, covering Indonesia's geological and geographic conditions, disaster definitions, and earthquake-related hazards such as tsunamis, landslides, floods, and hydrometeorological events.
References	1. BNPB, 2012. *Tanggap, Tangkas, Tangguh Menghadapi Bencana*. BNPB, Jakarta.
	2. Kementerian Negara Perencanaan Pembangunan Nasional dan Badan Koordinasi Nasional Penanganan Bencana, 2006. *Rencana Aksi Pengurangan Risiko Bencana 2006-2009*. Perum Percetakan Negara RI.

MPG-415 Project Management (2 CREDITS)	
Material	This course helps students understand and apply comprehensive project management principles. It covers three main areas: project behavior and dynamics, feasibility and investment decision-making (market aspects, technical aspects, financial analysis, environmental impact), and strategic and operational project planning (time management, scheduling techniques, resource allocation).
Reference	Project Management Institute, 2004. *A Guide to the Project Management Body of Knowledge*, 4th edition. Project Management Institute, Inc.
MPG-417 Hydrometeorology (2 CREDITS)	
Material	This course covers hydrometeorology and hydrology, including macro cloud physics, water vapor physical processes, mixing and convection, cloud droplet formation, condensation growth, collision and coalescence, ice crystal formation, precipitation processes, thunderstorm electrification, and radar applications for cloud physics.
Reference	Bayong Tjasyono, 2002. *Mikrofisika Awan dan Hujan*. ITB, Bandung.
MPG-419 Oceanographic Modeling (2 CREDITS)	
Material	This course explores oceanographic problem-solving using numerical simulations. Students learn computational techniques, modeling approaches, grid system concepts, and practical applications of ocean modeling in scientific research.
References	1. Kowalik, Z. & Murty, T.S., 1993. *Numerical Modeling of Ocean Dynamics*. World Scientific, London.
	2. Tiatmodjo, B., 2002. *Metode Numerik, Dilengkapi dengan Program Komputer*. Beta, Yogyakarta.
	3. Kosasih, P.B., 2006. *Komputasi Numerik: Teori dan Aplikasi*. Andi Offset, Yogyakarta.
MPG-421 Coastal Geomorphology (2 CREDITS)	
Material	Introduction to coastal geomorphology, coastal processes, wave-generated winds, wave theory and dynamics, breaker zone circulation, sediment transport, nearshore systems, coastal dune formation, mangrove and swamp systems, coral reef formation, cliffs and rocky shorelines.
Reference	Robin Davidson & Arnott, 2010. *Introduction to Coastal Processes and Geomorphology*. Cambridge University Press.
MPG-423 Mining Geophysics (2 CREDITS)	
Material	This course provides an introduction to mining geophysics and geophysical methods applied in mineral extraction. Topics include data acquisition, processing, and interpretation techniques, as well as gravity, geomagnetic, radiometric, resistivity, electromagnetic, and seismic methods.
Reference	Dentith, M. & Mudge, S.T., 2014. *Geophysics for The Mineral Exploration Geoscientist*. Cambridge University Press, UK.
MPG-425 Environmental Geophysics (2 CREDITS)	
Material	This course covers environmental geophysics, including the scope of environmental science, ecology and environmental geology, geological processes and natural disasters, water sources and pollution, waste management, soil and environmental interactions, mineral resources and environmental concerns, energy sources, global warming, geophysical methods for environmental studies, society and sustainable development.
References	1. Keller, E.A., 2012. *Introduction to Environmental Geology*, 5th edition. Prentice Hall, USA.
	2. Telford, W.M., Geldart, L.P., & Sheriff, R.E., 1990. *Applied Geophysics*, 2nd edition. Cambridge University Press, USA.
MPG-427 Petrophysics (2 CREDITS)	
Material	This course provides an introduction to petrophysics, covering topics such as minerals and rocks, petroleum geology, porosity and permeability, resistivity and water saturation models, wettability, Darcy’s law applications, fractured reservoirs, stress effects on reservoir rocks, and rock-fluid interactions.

Reference	Tiab, D. & Donaldson, E.C., 2004. *Petrophysics: Theory and Practice of Measuring Reservoir Rock and Fluid Transport Properties*, 2nd edition. Gulf Professional Publishing, USA.
Elective Courses – Even Semester	
MPF-212 Sedimentology and Stratigraphy (3 CREDITS)	
Material	Sedimentology is a branch of geology that specifically studies sedimentary rocks, including their formation processes. Topics covered include sedimentology definitions, rock formation, sediment cycles, sources and sediment transport media, sediment texture and structure, sedimentary rock classification, facies and depositional environments, marine depositional systems, deltaic systems, coastal depositional systems, and carbonate depositional systems.
References	1. Sam Boggs Jr., 2009. *Petrology of Sedimentary Rocks*. Cambridge University Press, England.
	2. Matthew R. Bennett, 2009. *Glacial Geology: Ice Sheets and Landforms*. Wiley-Blackwell, UK.
	3. Gary Nichols, 2009. *Sedimentology and Stratigraphy*. Wiley-Blackwell, UK.
	4. Maurice E. Tucker, 2003. *Sedimentary Rocks in the Field*. Wiley-Blackwell, UK.
MPF-218 Mineralogy (3 CREDITS)	
Material	This course covers fundamental concepts of minerals, crystallography, systematic mineral identification, igneous rocks, sedimentary rocks, and metamorphic rocks.
References	1. Wilson, J.R., 2010. *Minerals and Rocks*. Ventus Publishing ApS.
	2. Price, M. & Walsh, K., 2005. *Pocket Nature: Rock and Mineral*. Dorling Kindersley, London.
MPG-202 Electromagnetic Field Theory (2 CREDITS)	
Material	This course covers electromagnetic fields, including classical electrodynamics, electromagnetic waves, electromagnetic potentials, relativistic electrodynamics, particles and electromagnetic fields, electromagnetic field interactions with materials, arbitrary source distributions, radiation systems, and electromagnetic radiation.
Reference	Bo Thidé, 2003. *Electromagnetic Field Theory*. Sweden.
MPG-204 Geostatistics (2 CREDITS)	
Material	This course introduces statistical methods in geophysics, covering univariate statistics, frequency analysis and simulation, statistical distributions, stochastic models (time series analysis and forecasting), regionalized variable concepts and variogram modeling, regularization models and volume-variance relations, dispersion, estimation, and estimation variance, Kriging variance and Kriging procedures, and advanced geostatistics.
References	1. Sarma, D.D., 2009. *Geostatistics with Applications in Earth Sciences*, 2nd edition. Springer.
	2. Munadi, S., 2005. *Pengantar Geostatistika*. Universitas Indonesia.
	3. Gunadi, 2000. *Metode Statistik*. Universitas Gadjah Mada.
MPG-314 Paleomagnetism (2 CREDITS)	
Material	This course provides knowledge about paleomagnetic phenomena occurring on both continental and oceanic plates. Topics include geomagnetism and paleomagnetism, rock magnetization, paleomagnetic methods and techniques, magnetic field reversals, oceanic and continental paleomagnetism, and plate tectonics.
Reference	McElhinny, M.W. & McFadden, P.L., 2000. *Paleomagnetism: Continents and Oceans*, Volume 73. Academic Press, USA.
MPG-316 Crystallography of Rocks (2 CREDITS)	

Material	This course covers the fundamentals of crystallography, including crystal introduction, crystal systems, crystal morphology and symmetry, mineral chemistry, physical mineral properties, analytical methods, mineral formation processes, mineral associations in rocks, systematic mineralogy, economic minerals, and rare minerals.
References	1. Wilson, J.R., 2010. *Minerals and Rocks*. Ventus Publishing ApS.
	2. Price, M. & Walsh, K., 2005. *Pocket Nature: Rock and Mineral*. Dorling Kindersley, London.
MPG-318 Well Logging Geophysics (2 CREDITS)	
Material	This course provides knowledge on geophysical data analysis and inversion techniques, covering modeling and parameter estimation for linear and nonlinear cases. Topics include fundamental well log interpretation, self-potential logs, resistivity logs, porosity logs, gamma-ray logs, log interpretation, lithology logging, mapping techniques, and case studies.
Reference	Asquith, G. & Gibson, C., 1982. *Basic Well Log Analysis for Geologists*, No. 3. The American Association of Petroleum Geologists, Oklahoma.
MPG-320 Remote Sensing Imaging (2 CREDITS)	
Material	This course covers remote sensing imaging, including sensor systems, microwave imaging, image analysis, and applications in geophysical research.
Reference	*Fundamentals of Remote Sensing*, Canada.
MPG-322 Non-Linear Geophysics Methods (2 CREDITS)	
Material	This course introduces non-linear geophysics, examining the natural phenomena on Earth that exhibit non-linear characteristics. Topics include basic concepts of non-linear geophysics, discrete dynamic systems, cellular automata methods, lattice Boltzmann methods, chaos theory, fractals, and computational applications in non-linear geophysics.
References	1. Feldman, D.P., 2012. *Chaos and Fractals: An Elementary Introduction*. Oxford University Press, USA.
	2. Wahyu, S., *Fisika Sistem Kompleks*. ITB Press, Bandung.
MPG-324 Applied Seismology (3 CREDITS)	
Material	This course covers applied seismology, including introductory concepts, stress and strain analysis, seismic wave equations, travel time and inversion techniques, seismic amplitude and phase analysis, reflection seismology, surface waves and normal modes, earthquake mechanisms and seismic source theory, earthquake prediction, instrumentation and noise analysis.
Reference	Peter M. Shearer, 2009. *Seismology*. Cambridge University Press.
MPG-326 Fluid Mechanics (3 CREDITS)	
Material	This course covers fluid mechanics, including fluid statics, fundamental equations in integral form for a control volume, introduction to differential analysis of fluid motion, inviscid incompressible flow, dimensional analysis and similitude, internal and external viscous incompressible flow, open channel flow, compressible and incompressible fluid dynamics.
Reference	Philip J. Pritchard & John C. Leylegian, 2011. *Introduction to Fluid Mechanics*, 8th edition. John Wiley & Sons, Inc., USA.
MPG-328 Tropical Climatology (2 CREDITS)	
Material	This course examines tropical climatology, covering atmospheric characteristics, global energy balance, vertical atmospheric structure, convection, meridional atmospheric structure, fluid motion equations, flow equilibrium, general atmospheric circulation, ocean circulation, wind systems, and climate dynamics.
Reference	John Marshall, 2008. *Atmosphere, Ocean, and Climate Dynamics*. Massachusetts Institute of Technology Press.
MPG-330 Estuary Dynamics (2 CREDITS)	

Material	This course studies estuary systems, which are semi-enclosed water bodies interacting with the ocean and subject to complex hydrodynamic processes. Topics include estuary classification, estuarine hydrodynamics, tidal dynamics in estuaries, water circulation, mixing processes, salt intrusion, pollutant dispersion, and sediment dynamics.
References	1. McDowell, D.M. & O'Connor, B.A., 1977. *Hydraulic Behavior of Estuaries*.
	2. Ippen, A.T., 1966. *Estuary and Coastline Hydrodynamics*. McGraw-Hill, Inc.
	3. Officer, C.B., 1976. *Physical Oceanography of Estuaries (And Associated Coastal Water)*. John Wiley & Sons.
MPG-332 Sediment Transport (2 CREDITS)	
Material	This course covers sediment transport processes, closely linked to fluid mechanics, hydrodynamics, sedimentology, and stratigraphy. Topics include sediment transport in clastic environments, fluid velocity and bed shear stress, fluid and sediment properties, sediment particle initiation, bedform dynamics, effective bed roughness, suspended sediment transport in steady uniform flows, sediment transport in waves, combined wave and current transport, erosion and deposition processes in non-uniform flow, cohesive sediment transport models.
Reference	Leo C. van Rijn, 1993. *Principles of Sediment Transport in Rivers, Estuaries, and Coastal Seas*. Aqua Publications, Netherlands.
MPG-334 Signal Processing (2 CREDITS)	
Material	This course introduces signal processing techniques, covering signal definitions, discrete systems and signal spaces, analog systems and signal spaces, time-domain signal analysis, Fourier transformation of analog signals, discrete Fourier transformation, frequency-domain signal analysis, time-frequency signal transformations, wavelet transformations.
Reference	Allen, R.L. & Mills, D.W., 2004. *Signal Analysis: Time, Frequency, Scale, and Structure*. IEEE Press, USA.

Chapter VII: Chemistry Programme/Department

VII.1 INTRODUCTION

West Kalimantan is one of Indonesia's provinces rich in natural resources, characterised by its tropical peatlands and wetlands, as well as its mineral wealth. The management and development of these resources require expertise in relevant scientific disciplines, supported by fundamental sciences, one of which is chemistry. The presence of the Chemistry Study Programme at the Faculty of Mathematics and Natural Sciences (FMIPA) of Tanjungpura University (UNTAN) is expected to be a pioneer in research development focused on the management and processing of biotic and abiotic natural resources, while also delivering education to enhance human resources and promoting community engagement. All these aspects form part of the university's *Tri Dharma*—the three pillars of higher education.

The teaching and learning process within the Chemistry Programme at FMIPA UNTAN is conducted based on the Ministry of National Education's Directorate General of Higher Education decree No. 3494/D/T/2001, which granted permission to establish the Chemistry Study Programme. This permit was later extended through decrees No. 2322/D/T/2004 and No. 1140/D/T/2008. According to the accreditation decree issued by the National Accreditation Board for Higher Education (BAN-PT) under No. 833/SK/BAN-PT/Akred/S/VIII/2018 on 20th March 2018, the Chemistry Study Programme at FMIPA UNTAN holds an A-level accreditation, valid for five years until 20th March 2023.

VII.2 VISION AND MISSION

VII.2.1 Vision

A vision represents a strategic outlook on the future of an institution and the role it aspires to achieve. The vision of the Chemistry Study Programme at FMIPA UNTAN is:

"The Chemistry Study Programme aims to become an institution pioneering the development of West Kalimantan's natural resources, producing graduates who are ethical, high-quality chemists, and capable of competing at regional, national, and international levels."

VII.2.2 Mission

A mission outlines the tasks that the institution will undertake to fulfil its vision. The missions of the Chemistry Study Programme at FMIPA UNTAN are as follows:

1. To conduct innovative and creative education that produces environmentally conscious graduates capable of solving chemistry-related issues within society for the betterment of human welfare.
2. To carry out fundamental and applied research that supports the development of West Kalimantan's natural resources, enhancing educational and community service activities.
3. To contribute to community engagement by applying fundamental science, technology, and its applications to improve societal well-being.

VII.3 OBJECTIVES

The objectives of the Chemistry Study Programme at FMIPA UNTAN are formulated in accordance with the *Tri Dharma* of Higher Education—comprising education, research, and community engagement. These objectives are as follows:

1. **Producing Chemistry Graduates Who:**
   a. Support the needs of the government and society by contributing skilled human resources across various fields.

b. Develop themselves as scientists and professionals capable of identifying problems and proposing strategic solutions.
c. Possess the ability to work independently and collaboratively in teams while demonstrating leadership skills.
d. Uphold noble character, faith, and strong religious values.
e. Demonstrate proficiency in English.
f. Master and utilise communication and information technology for self-development.
g. Compete effectively at regional, national, and international levels.

2. **Generating Research Outputs That** Cover fundamental and applied research, particularly focusing on the development and management of West Kalimantan's natural resources.
3. **Applying Scientific Knowledge and Technology That** Contribute to societal welfare through practical applications of chemistry-related research.

VII.4 PROFILE OF THE CHEMISTRY STUDY PROGRAMME

Based on **Table 7.1**, the number of students admitted to the Chemistry Study Programme through the **National University Entrance Examination (SBMPTN)** has steadily increased each year. Meanwhile, the number of students accepted via the **National Selection for State Universities (SNMPTN)** and **Independent Selection** has fluctuated but remained relatively stable. The high number of students admitted through the **SNMPTN route** indicates the strong quality of student intake within the Chemistry Programme.

Table 7.1 presents the number of students enrolled in the Chemistry Study Programme through different selection pathways over the years:

Academic Year	Number of Students (SBMPTN)	Number of Students (SNMPTN)	Number of Students (Independent Selection)
2014/2015	19	7	27
2015/2016	7	16	28
2016/2017	27	33	24

From **2012 to 2017**, the total number of students enrolled in the Chemistry Study Programme remained **relatively consistent**, averaging **336 students per academic year**. The highest student enrolment occurred during the **2015/2016 and 2016/2017 academic years**, largely due to an increased intake capacity, leading to a rise in the number of students passing the selection process.

Table 7.2 The trend in total student enrolment per academic year

Academic Year	Total Number of Students
2012/2013	323
2013/2014	330
2014/2015	322
2015/2016	346
2016/2017	362

Table 7.3 provides an overview of the **average Grade Point Average (GPA)** of students in the Chemistry Programme. Based on the available data, the **average GPA** has remained **consistent at approximately 3.13**, despite minor fluctuations, indicating that the academic process and student performance are progressing effectively.

Table 7.3 outlines the average GPA of Chemistry students over the academic years:

Academic Year	Average GPA
2012/2013	3.13
2013/2014	3.03
2014/2015	3.14
2015/2016	3.2
2016/2017	3.13

Table 7.4 presents data on the percentage of students with GPAs in three different ranges: **below 2.75, between 2.75 and 3.50, and above 3.50**. The highest percentage falls within the **2.75 – 3.50 GPA range**, consistently exceeding **80% each year from 2012 to 2017**. This suggests that **the majority of Chemistry students demonstrate strong academic competence**, which enhances their **employability**, as most companies require a **minimum GPA of 2.75 – 3.00** for job applications.
In contrast, students with a **GPA below 2.75** represent **only 5% of the total student population**. Although this percentage is relatively low, it remains an area of academic concern. To address this, **academic advisors (PA lecturers)** work **more intensively** with students who require support to improve their academic standing. Meanwhile, students with **GPAs above 3.50** constitute an average of **10%** annually. These students graduate **with honours (Cum Laude)**, giving them **competitive advantages in pursuing careers at national and international levels**.

Table 7.4. The percentage distribution of student GPAs across different years

Academic Year	Percentage of Students with GPA <2.75	Percentage of Students with GPA 2.75–3.50	Percentage of Students with GPA >3.50
2012/2013	4%	80%	16%
2013/2014	10.53%	84.21%	5.26%
2014/2015	11.32%	84.21%	7.54%
2015/2016	3.39%	81.13%	10.17%
2016/2017	14.28%	86.44%	11.43%

Table 7.5 summarises the employment status of Chemistry graduates. The **tracer study** conducted by the university indicates that **81% of graduates work in fields directly related to their chemistry expertise**. The study also reveals that **the majority of graduates are employed by government institutions, including state-owned enterprises (BUMN)**.

Table 7.5 The types of employer institutions hiring Chemistry graduates

Employer Type	Number of Graduates
Government Institutions (including BUMN)	82
Non-Profit Organisations/NGOs	3
Private Companies	73
Entrepreneurs (self-employed)	18
Other Industries	20
Not Disclosed	9

Table 7.6 summarizes employer feedback regarding the **competence of Chemistry graduates** based on skills such as **integrity, technical expertise, English proficiency, IT skills, communication, teamwork, and self-development**. In general, **graduates are rated positively**

Table 7.6. Employer feedback regarding the **competence of Chemistry graduates**

Skill Category	Excellent	Good	Adequate
Integrity (ethics and morality)	60%	40%	0%
Expertise in chemistry	48%	50%	2%
English proficiency	28%	60%	12%
Information technology skills	58%	40%	2%
Communication skills	38%	56%	5%
Teamwork	50%	50%	0%
Personal development	48%	50%	2%

These findings **underscore the strong technical and professional capabilities** of Chemistry graduates, ensuring **their competitiveness in the workforce**.

Student of the Chemistry Study Programme at FMIPA Untan **Achievements and Reputation Over the Last Five Years** demonstrated outstanding achievements in both **academic and non-academic fields**. Their accomplishments span **international, national, and regional levels**, reflecting strong competence and engagement in various domains.

1. International Achievements

- **Student Mobility Ambassador for FICEM Erasmus Plus International Mobility Scholarship**
  - Awarded under the **French-Indonesian Consortium in Engineering and Management (FICEM)**.
  - Participated in the **Master Exchange Programme in MSc Project Management for Environmental Studies**, France (14 February – 5 July 2017).
  - Duration: **4 months and 20 days**.
- **UNTAN Summer School and Student Engagement Programme** (2017 & 2018).
- **Research and Cultural Exchange Programme**
  - Participated in **Science, Engineering, and Culture Exhibition (SCENE), Kochi – Japan (13–20 May 2015).**

2. National Achievements

- **Finalist at the 32nd National Scientific Week (PIMNAS)** – Universitas Udayana, Bali (2019).
- **Recipient of National Award for Millennial Women with a Vision of Sustainable Development (2019).**
- **Finalist at the 28th National Scientific Week (PIMNAS)** – Universitas Halu Oleo, Kendari (2015).
- **Winner (1st Place) of Miss Coffee Indonesia / Coffee Ambassador Indonesia** – Indonesian Ministry of Tourism, Jakarta (25 August 2015).
- **Ranked 6th in the National Science Olympiad (OSN-PERTAMINA) in the Theory Category (2015).**
- **Bronze Medal Winner in Poster Category at the 27th National Scientific Week (PIMNAS)** – Universitas Diponegoro, Semarang (2014).

- **2nd Place in National Chemistry Competition** – Represented regional level at ON-MIPA-PT, Indonesian Ministry of Research, Technology and Higher Education, Jakarta (14–17 May 2017).
- **1st Place in National Chemistry Competition** – Represented regional level at ON-MIPA-PT, Indonesian Ministry of Research, Technology and Higher Education, Jakarta (23–26 May 2016).
- **Ranked in the Top 15 of National Outstanding Students Selection (2014)** – Indonesian Ministry of Education and Culture.
- **Champion in Various National Scientific Writing Competitions** – Hosted by major Indonesian universities.

3. Regional (Provincial) Achievements

- **1st Place in the Scientific Writing Competition (LKTI) – Research and Development of West Kalimantan Province (2018).**
- **Winner of the HIV/AIDS Intelligence Ambassador Award – West Kalimantan (2017).**
- **Crowned Tourism Ambassador for West Kalimantan (2017).**
- **1st Place in Traditional Poetry Performance Competition – West Kalimantan (October 2016).**
- **2nd Place in the 11th West Kalimantan Provincial Sports Week (2014)** – Judo (90 kg weight class).
- **Champion in Scientific Writing Competitions** – Organised by **UNTAN's Anniversary Celebration, Research and Development of West Kalimantan Province, and other institutions**.

The Chemistry Study Programme at FMIPA UNTAN is supported by **26 lecturers**, comprising **24 permanent academic staff** and **2 contract lecturers**, ensuring excellence in teaching and research. **Figure 7.8** describes the percentage distribution of the classification of educational levels and functional positions of lecturers in the Chemistry Study Program. **Table 7.8** details the names of lecturers in the Chemistry Study Program at FMIPA UNTAN, including their NIP (Employee Identification Number), rank, and respective functional positions.

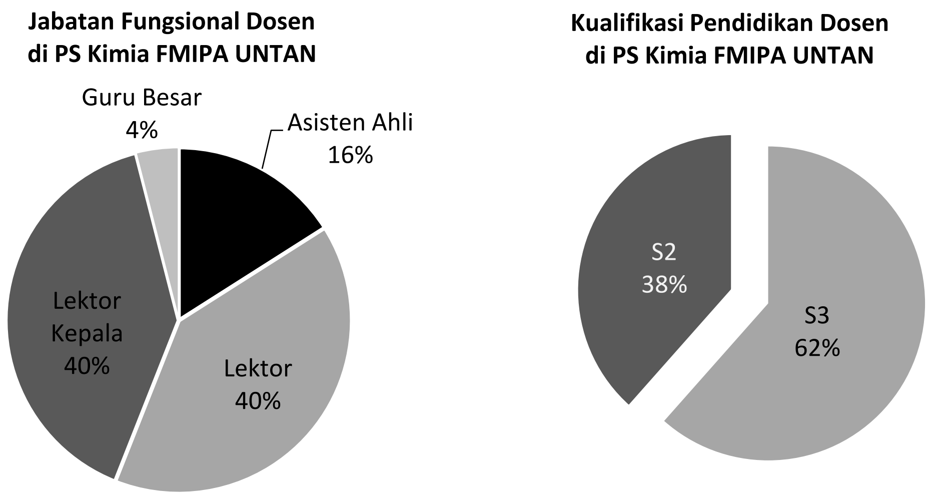


Figure 7.8: Description of the classification of functional positions and educational levels of lecturers in the Chemistry Study Program.

1. Academic Qualifications and Functional Positions

The educational qualifications of the Chemistry Programme's lecturers are as follows:

- **Doctoral Degree (PhD):** 16 lecturers

- **Master's Degree (MSc):** 10 lecturers

Academic ranks within the programme are classified as:

- **Assistant Lecturer:** 16%
- **Lecturer:** 40%
- **Senior Lecturer:** 40%
- **Professor:** 4%

Table 7.8: List of Chemistry Lecturers at FMIPA UNTAN

No.	Name	NIP/NIDN/NIDK	Rank	Functional Position
1	Prof. Dr. Thamrin Usman, DEA	196211101988111001 / 0010116210	IV/d	Professor
2	H. Afghani Jayuska, S.Si, M.Si.	197107072000121001 / 0007077106	IV/a	Associate Professor
3	Dr. Gusrizal, S.Si., M.Si.	197108022000031001 / 0002087103	IV/b	Associate Professor
4	Hj. Risa Nofiani, Ph.D.	197411152000122001 / 0015117402	IV/b	Associate Professor
5	Titin Anita Zaharah, S.Si, M.Sc.	196904191996012002 / 0019046902	IV/a	Associate Professor
6	Dr. Nelly Wahyuni, S.Si, M.Si.	197506022000032001 / 0002067505	IV/b	Associate Professor
7	Puji Ardiningsih, S.Si., M.Si.	197201271998022001 / 0027017203	IV/a	Associate Professor
8	Berlian Sitorus, S.Si., M.Si., M.Sc., Ph.D.	197410102000122006 / 0010107407	IV/a	Associate Professor
9	Dr. Endah Sayekti, S.Si., M.Si.	197206222000122001 / 0022067209	IV/a	Associate Professor
10	Rudiyansyah, S.Si., M.Si., Ph.D.	197201242000121001 / 0024017205	IV/a	Associate Professor
11	Dr. Andi Hairil Alimuddin, S.Si., M.Si.	197109202000121001 / 0020097107	III/d	Associate Professor
12	Dr. Muhamad Agus Wibowo, S.Si., M.Si.	197301092000031001 / 0009017305	III/d	Associate Professor
13	Dra. Harlia, S.Si., M.Si.	195909161989032002 / 0016095908	III/d	Lecturer
14	Dr. Ari Widiyantoro, S.Si., M.Si.	197304012000121001 / 0001047303	III/d	Lecturer
15	Dr. Ajuk Sapar, S.Si., M.Si.	197112312000121001 / 0031127114	III/d	Lecturer
16	Dr. Anis Shofiyani, S.Si., M.Si.	197311152000122001 / 0015117304	III/d	Lecturer
17	Imelda H. Silalahi, S.Si., M.Si, Ph.D.	197605062000122001 / 0006057605	III/d	Lecturer

No.	Name	NIP/NIDN/NIDK	Rank	Functional Position
18	Dr. Anthoni B. Aritonang, S.Si., M.Si.	196803082000031001 / 0008036810	III/d	Lecturer
19	Lia Destiarti, S.Si., M.Si.	198312022008122002 / 0002128301	III/c	Lecturer
20	Dr. Winda Rahmalia, S.Si., M.Si.	198402272008122004 / 0027028401	III/b	Assistant Lecturer
21	Dr. Adhitiyawarman, S.Si., M.Si.	198409192008121001 / 0019098401	III/b	Assistant Lecturer
22	Intan Syahbanu, S.Si., M.Si.	198511042012122002 / 0004118502	III/b	Assistant Lecturer
23	Nurlina, S.Si., M.Sc.	198510232012122002 / 0023108503	III/b	Assistant Lecturer

The Chemistry Study Program is also supported by **one administrative staff member** and **two laboratory technicians** who assist in ensuring the smooth operation of academic and laboratory activities. the table below provides details on the administrative personnel and laboratory technicians supporting academic and research activities.

Table 7.2: Administrative and Laboratory Staff of the Chemistry Study Programme FMIPA UNTAN

No.	Name	Education	Position
1.	Rumiris Sitorus, S.Kom.	Bachelor's Degree	Administrative Staff
2.	Yoga Pratama, S.Si.	Bachelor's Degree	Laboratory Technician
3.	Desi Salbeti, S.Si.	Bachelor's Degree	Laboratory Technician

VII.4 CURRICULUM

VII.4.1 Graduate Profile

Graduates of the Chemistry Study Programme at FMIPA UNTAN are expected to fulfil the following roles:

1. **Practitioners:** Competent in the fundamentals of chemistry and able to apply their knowledge across various sectors.
2. **Researchers:** Equipped with foundational chemistry expertise to conduct scientific research, either in the development or application of chemical science and technology.
3. **Consultants:** Knowledgeable in chemistry principles and capable of solving chemistry-related issues.
4. **Entrepreneurs:** Possessing entrepreneurial skills, strategic planning abilities, and chemistry-based technological expertise to adapt to challenges in different environments.

VII.4.2 Learning Outcomes

Learning outcomes represent the minimum qualification criteria regarding graduates' abilities, encompassing **attitudes, knowledge, and skills** (including general and specific skills) as stated in the graduate learning outcomes formulation based on the **National Higher Education Standards** (*Permenristekdikti No. 44 of 2015*).

The **Chemistry Study Program's graduate learning outcomes** refer to the **Indonesian National Qualifications Framework (KKNI)** as described in **Government Regulation No. 8 of 2012**.

The **learning outcomes (CP)** that shape the graduate profile of the **Chemistry Study Program** are formulated in **Table 7.2**. The learning outcomes describe the overall results of the learning process that a student has undergone during their studies at **PS Kimia FMIPA UNTAN**, where the elements of learning outcomes include:

- **Attitudes and values**,
- **General competencies**,
- **Specific competencies**, and
- **Knowledge**.

These elements are interconnected and form a cause-effect relationship. In general, **CP serves as a distinguishing feature, description, or specification** of the **Chemistry Study Program at FMIPA UNTAN** compared to chemistry programs at other higher education institutions.

Moreover, **learning outcomes function as components for curriculum development and learning design**. The graduate learning outcomes of **PS Kimia** consist of **formulated statements** covering **attitudes, general skills, specific skills, and knowledge mastery**, as follows:

Attitude Formulation	
S1	Have faith in God Almighty and demonstrate religious values.
S2	Uphold humanity values in fulfilling duties based on religion, morality, and ethics.
S3	Contribute to enhancing the quality of social life, nation-building, and civilization advancement based on Pancasila.
S4	Act as a proud and patriotic citizen, possessing nationalism and a sense of responsibility towards the country.
S5	Respect cultural diversity, viewpoints, religions, beliefs, and the original ideas of others.
S6	Work collaboratively, show social sensitivity, and demonstrate concern for society and the environment.
S7	Abide by laws and maintain discipline in societal and national life.
S8	Internalize academic values, norms, and ethics.
S9	Show responsibility for work in one's field independently.
S10	Internalize the spirit of self-reliance, perseverance, and entrepreneurship.
General Skills Formulation	
KU1	Able to apply logical, critical, systematic, and innovative thinking in the development or implementation of science and technology while considering and integrating humanities values appropriate to their field of expertise.
KU2	Able to demonstrate independent, high-quality, and measurable performance.
KU3	Able to assess the implications of scientific and technological development or implementation by applying humanities values, scientific principles, methods, and ethics to generate solutions, ideas, and designs, compile scientific descriptions in the form of theses or final reports, and upload them to the university portal.
KU4	Able to compile scientific descriptions of the above studies in the form of theses or final reports, and upload them to the university portal.
KU5	Able to make accurate decisions in solving problems within their field of expertise based on information and data analysis.

KU6	Able to maintain and develop professional networks with mentors, colleagues, and peers within and beyond their institution.
KU7	Able to take responsibility for team achievements, supervise and evaluate assigned tasks.
KU8	Able to self-evaluate team performance and manage independent learning.
KU9	Able to document, store, secure, and retrieve data to ensure authenticity and prevent plagiarism.
Specific Skills Formulation	
KK1	Able to master and apply knowledge and technology related to identification, isolation, transformation, and chemical synthesis, while integrating humanities values to generate applicable solutions for problem-solving.
KK2	Able to adapt to various situations through a chemical synthesis approach, supported by entrepreneurial skills, planning abilities, and chemical sciences expertise in managing wetland and tropical peat resources.
KK3	Able to identify and solve problems related to chemistry, formulate hypotheses, and design experiments to address challenges in the field.
KK4	Able to make strategic decisions and provide alternative solutions based on simple chemical experiments.
KK5	Able to take responsibility for their own work, supervise employees under their management, and ensure team, institutional, or organizational work achievements.
KK6	Able to prepare, handle, and manage chemical materials and instruments responsibly, both in academic learning and professional chemistry-related work.
KK7	Able to document, process information and data, and communicate scientific descriptions effectively both in writing and verbally, while maintaining honesty, respect for others' work, and upholding scientific ethics.
Knowledge Mastery Formulation	
PP1	Able to master the theoretical concepts of structure, properties, and changes, including energy and kinetics, as well as the processes of isolation, identification, separation, characterization, transformation, and chemical synthesis.
PP2	Able to understand the operational basics of chemical instruments, including their components, functions, operational procedures, and data analysis from these instruments.
PP3	Able to integrate chemical sciences with information and communication technology (ICT).
PP4	Able to master the fundamentals of chemical skills, whether through chemical techniques, utilizing available chemical instruments, or using ICT tools (chemistry-related software).
PP5	Able to master the principles and techniques for handling hazardous chemical materials safely.

Supporting learning outcomes complement the main competencies and highlight the unique expertise of Chemistry Study Program graduates at FMIPA UNTAN. These competencies distinguish graduates and align with the program's vision and mission, focusing on the development of natural resources in West Kalimantan.
The supporting learning outcomes for Chemistry Study Program graduates are as follows:

1. Able to perform isolation and characterization of organic soil materials from peat.
2. Able to design water treatment systems for high organic content.
3. Able to apply various techniques for synthesis, characterization, and analysis of inorganic compounds derived from local natural resources in West Kalimantan, such as clay, silica from limestone, iron sand, and other materials.
4. Able to separate and characterize rare earth metals.
5. Able to apply green chemistry principles by processing waste into valuable products.
6. Able to isolate and identify secondary metabolite compounds from wetland tropical plants in West Kalimantan's natural resources.
7. Able to synthesize and characterize organic compounds based on local natural resources in West Kalimantan.
8. Able to isolate and characterize endophytic microbes from endemic plants in West Kalimantan as well as marine organisms.

9. Able to isolate and characterize secondary metabolites from endophytic microbes found in endemic plants and marine organisms in West Kalimantan.
10. Able to understand chemical marker relationships related to food decomposition due to microbial activity and oxidative reactions.
11. Able to integrate principles of chemical analysis, biology, metabolism, engineering, and sensor analysis to develop safe and nutritious food products.
12. Able to apply basic biotechnology principles in the fields of food and health.
13. Able to use acquired knowledge to create natural resource-based products or enhance the value of existing natural resource-based products.
14. Able to formulate and propose solutions to environmental problems using research-based products.

VII.4.3 Curriculum Structure

The Chemistry Study Program curriculum is designed to support the realization of its vision, implementation of its mission, and achievement of its goals. It aligns with the vision and mission of the Chemistry Study Program, the Faculty of Mathematics and Natural Sciences (FMIPA) UNTAN, and UNTAN itself. The curriculum's alignment with the vision and mission is reflected in the learning outcomes of the courses within the Chemistry Study Program structure. Some elective courses (MKP) specifically emphasize learning outcomes that distinguish the program's focus on the development of West Kalimantan's natural resources, such as Humat Chemistry, Geochemistry and Mineralogy, Polymer Chemistry, Essential Oil Chemistry, Natural Product Chemistry, Agrochemical Synthesis, Organic Synthesis, and Marine Chemistry.

The curriculum is future-oriented, evident in the learning outcomes designed to address scientific and technological challenges related to chemistry. Some courses developed to align with future-oriented competencies include Nano Materials, Computational Chemistry, Organometallic Chemistry, Molecular Genetics, and Genetic Engineering. Some elective courses from previous curricula are retained but updated to incorporate content related to West Kalimantan's natural resource potential, which is expected to develop in the future. For example, Radiochemistry now includes knowledge of uranium, a radioactive element that is part of West Kalimantan’s local resources, along with Geochemistry and Mineralogy, Marine Chemistry, Organic Natural Product Chemistry, Polymer Chemistry, Humat Chemistry, and Essential Oil Chemistry.

Course learning outcomes also integrate local content aligned with UNTAN's 7in1 mission, which includes entrepreneurship development, renewable energy sources, peatland utilization, mining potential empowerment, marine potential empowerment, border region development, local culture promotion, and competitive human resource development. This alignment reinforces the Chemistry Study Program's vision and mission, focusing on processing West Kalimantan’s natural resources—both existing and potential future resources, such as those that support renewable energy or advanced material mining (e.g., uranium, rare earth metals, iron sand, etc.).

The Chemistry Study Program uses a prerequisite-based course selection system, ensuring a structured competency progression. Graduates must complete at least 144 credits, as outlined in Table 7.4, while the overall curriculum structure is detailed in Table 7.5.

Table 7.4: Courses Required for a Bachelor of Science in Chemistry

Course Type	Credits (SKS)	Description
Mandatory Courses	125	86.806% of the total 144 Credits. Consists of 11 Credits of general mandatory courses (MKWU), 8 CREDITS of fundamental science courses, and 106 credits of Chemistry Study Program courses.
Elective Courses	19	13.194% of the total 144 credits. The number of elective courses (MKP) provided by the Chemistry Study Program is 90 credits.
Total	144	—

VII.4.4 Research Groups/Areas of Interest

The research groups/areas of interest in the **Chemistry Study Program at FMIPA UNTAN** include:

1. **Inorganic-Physical Chemistry**
2. **Analytical Chemistry**
3. **Organic Chemistry**
4. **Biochemistry**

VII.4.5 Course Code System

Each course in the Chemistry Study Programme is assigned a unique code reflecting its discipline and academic level. The structure of course codes is as follows:

1. **The first two letters (MK)** represent the academic discipline (Chemistry Programme).
2. **The third letter (K)** identifies the specific programme (Chemistry). **The fourth and fifth letters (WU)** indicate whether the course is a compulsory university course.
3. **The first numerical digit** denotes the academic year in which the course is offered (1 for the first year, 2 for the second year, and so on).
4. **The second numerical digit** signifies the sub-discipline within Chemistry:
   a. *1*: Analytical Chemistry
   b. *2*: Inorganic Chemistry
   c. *3*: Physical Chemistry
   d. *4*: Organic Chemistry
   e. *5*: Biochemistry
5. **The last two numerical digits** indicate the course's sequential position within the sub-discipline.

Example:

- *MPK 3204*
  - *MPK*: Chemistry Programme course
  - *3*: Offered in the third year
  - *2*: Inorganic Chemistry category
  - *04*: The fourth course in Inorganic Chemistry

VII.4.6 Final Year Project Guidelines

Final Project (Thesis) Procedure in the Chemistry Study Program

1. Students take the Research Methodology course in semester 6 or 7 and complete Form TA-1.

2. Students submit Form TA-1 to the study program, which then assigns a Final Project Advisor.
3. Students develop a Research Proposal under the guidance of their assigned advisor.
4. The outcome of steps (1) to (3) is a Research Proposal and assigned Final Project Advisor.
5. In the following semester, students plan their Final Project (TA) in LIRS.
6. Students request a Research Proposal Seminar (SP) by submitting Form TA-2 to the study program.
7. The study program appoints examiners and schedules the SP Research Seminar.
8. Once students receive approval to proceed to the research stage (Form TA-3), they must participate in Laboratory Orientation.
9. The faculty issues an official decree (SK) for the Final Project Advisor, based on a proposal from the department.
10. Students conduct research in laboratories or field locations, with ongoing supervision by their advisor.
11. Students compile their thesis and request a Research Results Seminar (SH) by submitting Form TA-4, including the approved thesis document.
12. Students present their Research Results Seminar (SH), where advisors and examiners assess and provide recommendations (Forms TA-5 and TA-6).
13. The faculty issues an official decree (SK) for Final Project Examiners, based on a proposal from the department.
14. Students revise their thesis if required during the Research Results Seminar, and obtain final approval from examiners (Form TA-7).
15. Students prepare a draft of their publication article.
16. After all relevant documents for the thesis defense are completed and verified, students proceed with their Undergraduate Thesis Defense.
17. The results of the undergraduate thesis defense and all related documents are submitted to the faculty for processing as FMIPA graduates.

Table 7.5: Chemistry Department Curriculum Structure at FMIPA UNTAN

Mandatory Courses				
Semester	**Course Code**	**Course Name**	**Credits**	**Prerequisite Course**
I	MKWU 101	Citizenship	2	—
	MKWU 102	Indonesian Language	2	—
	UMG 101	English Language	2	—
	MPU 101	Mathematics	3	—
	MPU 103	Basic Physics	3	—
	MPU 105	Introduction to Information Technology	2	—
	MPK 1001	Basic Chemistry I	3	—
	MPK 1002	Basic Chemistry Lab I	1	—
	MPK 1003	Biology	3	—
Total credits of Semester I			**21**	—
II	MKWU 103	Pancasila	2	—
	MKWU 104	Religious Education	3	—
	MPK 1004	Basic Chemistry II	3	—
	MPK 1005	Basic Chemistry Lab II	1	—
	MPK 1006	Chemistry Statistics Application	2	—
	MPK 1007	Advanced Mathematics	3	—
	MPK 1008	Modern Physics	3	—
	MPK 1401	Basic Organic Chemistry	3	—

	MPK 1402	Basic Organic Chemistry Lab	2	—
Total credits of Semester II			22	—
III	MPK 2101	Introduction to Chemical Analysis	3	MPK 1004
	MPK 2102	Laboratory for Introduction to Chemical Analysis	2	MPK 1004
	MPK 2201	Molecular Structure and Chemical Bonding	3	MPK 1004
	MPK 2301	Atomic Structure	3	MPK 1004
	MPK 2403	Organic Compound Reactions	3	MPK 1401
	MPK 2404	Laboratory for Organic Compound Reactions	2	MPK 1401
	MPK 2501	Biochemistry I	3	MPK 1401
	MPK 2009	Environmental Chemistry	2	MPK 1004
Total Credits of Semester III			**21**	—
IV	MPK 2103	Separation and Purification Methods I	3	MPK 2101
	MPK 2104	Laboratory for Separation and Purification Methods	2	MPK 2101
	MPK 2203	Structure and Reactions of Inorganic Compounds	3	MPK 2201
	MPK 2302	Thermodynamics and Chemical Equilibrium	4	MPK 2301
	MPK 2406	Physical Organic Chemistry	3	MPK 2403
	MPK 2502	Biochemistry II	3	MPK 2501
	MPK 2503	Laboratory for Biochemistry	2	MPK 2501
	MPK 2011	Laboratory Techniques	1	—
Total Credits of Semester IV			21	—
V	MPK 3105	Chemical Instrumentation	3	MPK 2103
	MPK 3204	Chemistry of Elements	3	MPK 2203
	MPK 3205	Laboratory for Chemistry of Elements	2	MPK 2203
	MPK 3303	Chemical Dynamics	3	MPK 2302
	MPK 3304	Laboratory for Thermodynamics and Chemical Equilibrium	1	MPK 2302
	MPK 3408	Organic Compound Analysis	3	MPK 2405
	MPK 3409	Natural Product Chemistry	3	MPK 2405
	MPK 3013	Separation and Purification Methods II	2	MPK 2301, MPK 1401
Total Credits of Semester V			20	—
VI	MPK 3015	Research Methodology	3	—
	MPK 3206	Coordination Chemistry	4	MPK 3204
	MPK 3207	Laboratory for Coordination Chemistry	2	MPK 3204
	MPK 3208	Inorganic Material Analysis	2	MPK 3204, MPK 3105
	MPK 3307	Laboratory for Chemical Dynamics	1	MPK 3303
		Elective Course 1	2	—
		Elective Course 2	2	—
		Elective Course 3	2	—
		Elective Course 4	2	—
Total Credits of Semester VI			20	—
VII	UMG 401	Internship/Student Work Lecture	2	>110 Credits
	MPK 4016	Final Project	4	>120 Credits
	MPK 3015	Research Methodology*	—	—
		Elective Course 5	2	—
		Elective Course 6	2	—
		Elective Course 7	2	—
		Elective Course 8	2	—
		Elective Course 9	3	—
Total Credits Semester VII			17	—
VIII	MPK 4017	Thesis Defense	2	—
Total Credits of Semester VIII			2	—
Total Credits			144	

*Noted! The Research Methodology course (*Mata Kuliah Metodologi Penelitian*) can be taken in either the even semester (semester 6) or the odd semester (semester 7).

Elective Courses

Odd Semester

Semester	Course Code	Course Name	Credits (CREDITS)	Prerequisite Course
Odd	MPK 2010	Entrepreneurship	2	—
	MPK 2202	Geochemistry and Mineralogy	2	—
	MPK 2405	Essential Oil Chemistry	2	—
	MPK 3014	Computational Chemistry	2	MPK 2103
	MPK 3106	Pharmaceutical Analysis	2	—
	MPK 3107	Selected Topics in Analytical Chemistry	2	MPK 3204
	MPK 3108	Corrosion Chemistry	2	MPK 3206
	MPK 3109	Chemical Waste Treatment	2	MPK 2201, MPK 2302
	MPK 4211	Nano Materials	2	MPK 2101
	MPK 3305	Solid-State Chemistry	3	MPU 103, MPK 2201, MPK 2301, MPK 2302
	MPK 4212	Organometallic Chemistry	2	MPK 3204
	MPK 3306	Polymer Chemistry	3	MPK 2302, MPK 2406
	MPK 3410	Stereochemistry	2	MPK 2406
	MPK 3411	Selected Topics in Organic Chemistry	2	MPK 2406
	MPK 3412	Marine Chemistry	2	MPK 2406
	MPK 3413	Bioorganic Chemistry	2	MPK 2406
	MPK 3504	Food Biochemistry	3	MPK 2502
	MPK 3505	Medical Biochemistry	3	MPK 2502
	MPK 3506	Selected Topics in Biochemistry	3	MPK 2502
	MPK 3507	Toxicology	2	MPK 2502
Total CREDITS for Odd Semester			**45**	—
Even Semester				
Semester	**Course Code**	**Course Name**	**Credits (CREDITS)**	**Prerequisite Course**
Even	MPK 2012	Industrial Management	2	—
	MPK 3110	Food Material Analysis	2	—
	MPK 3111	Environmental Contamination Analysis	2	MPK 3105
	MPK 3112	Quality Testing of Chemical Analysis Methods	2	MPK 3105
	MPK 3113	Humat Chemistry	2	MPK 3105
	MPK 3209	Radiochemistry	2	—
	MPK 3210	Material Chemistry	2	MPK 2201
	MPK 3308	Surface Chemistry	2	MPK 1006, MPK 3303
	MPK 3309	Polymer Degradation	3	MPK 3303
	MPK 3310	Selected Topics in Physical Chemistry	3	MPK 2301, MPK 2302, MPK 3303
	MPK 3311	Catalysis Chemistry	2	MPK 3303
	MPK 2407	Pesticide Chemistry	2	MPK 2403
	MPK 3414	Organic Synthesis	3	MPK 3303
	MPK 3415	Agrochemical Synthesis	2	MPK 2403
	MPK 3416	Structure Determination of Natural Compounds	2	MPK 2406
	MPK 3508	General Biotechnology	3	MPK 2406
	MPK 3509	Molecular Genetics and Genetic Engineering	3	MPK 3408
	MPK 3510	Advanced Biochemistry	3	MPK 2502
	MPK 3511	Enzymology	3	MPK 2502
Total CREDITS for Even Semester			**45**	—

VII.6.6 Course Descriptions

Semester I	
MKWU 101. Citizenship (2 CREDITS)	
Material	The foundations of Citizenship Education taught in higher education; the essence and urgency of national identity as a determinant of nation-building and character formation; the importance of national unity as a parameter for national cohesion and integrity; constitutional values and norms within legislation under the Constitution; harmony between state and citizen rights and obligations in a democratic system based on people's sovereignty and consensus-based decision-making; the nature, instrumentation, and practice of Indonesian democracy based on Pancasila and the 1945 Constitution; historical dynamics of constitutional, socio-political, and cultural aspects, including contemporary law enforcement for justice; the historical significance and urgency of the Nusantara perspective as a concept and collective national vision in global interactions; the importance and challenges of national resilience and defense in strengthening national commitment; students conduct Project Citizen as part of the Citizenship Education coursework.
References	Primary Reference: Kemenristekdikti. 2016. *Citizenship Education Module for Higher Education.* Jakarta: Directorate General of Learning and Student Affairs, Kemenristekdikti.
	Supplementary References: Budimansyah, D (Ed). 2006. *Moral Value Education in Citizenship Education Dimensions.* Bandung: Civic Education Laboratory, FPIPS UPI.
	Pasha, MK. 2008. *Citizenship Education (Civic Education).* Yogyakarta: Citra Karsa Mandiri.
	Sunarso et al. 2006. *Citizenship Education.* Yogyakarta: UNY Press.
MKWU 102. Bahasa Indonesia (2 SKS)	
Material	Academic Texts in Macro Genre; Exploring the World of Literature; Designing Research Proposals and General Proposals; Reporting Research Results and Project Outcomes; Self-Actualization through Scientific Articles; Reading and Summarizing Scientific Articles following the Enhanced Spelling System (EYD) and Indonesian Standard Dictionary (KBBI).
References	Primary Reference: Kemenristekdikti. 2016. *Indonesian Language Education Module for Higher Education.* Jakarta: Directorate General of Learning and Student Affairs, Kemenristekdikti.
	Supplementary References: Awalludin. 2017. *Introduction to Indonesian Language for Higher Education.* Yogyakarta: Deepublish.
	Dyah Amiyah Lindayani et al. 2016. *Indonesian Language as a General Course Subject.* Jakarta: Gramedia.
	Surono et al. 2009. *Indonesian Language for Higher Education.* Faculty of Letters UNDIP, FaSindo.
UMG 101. English Language (2 CREDITS)	
Material	Using English at the intermediate and pre-advanced levels, with a focus on scientific reading comprehension and expanding vocabulary and expressions as much as possible. Sentence structure (grammar) is taught according to the scientific texts. Emphasis is placed on scientific reading comprehension, vocabulary enrichment, and expressions in English. Improving English proficiency through reading and pronunciation exercises, grammar corrections, vocabulary enhancement, and understanding idioms and usage. Special attention is given to correcting common errors.
References	
MPU 101. Mathematics (3 CREDITS)	
Material	Number Systems, Inequalities and Absolute Values, Functions, Limits and Continuity, Derivatives, Integrals.
References	Purcell, E. J. & Varberg, D. 1994. *Calculus and Analytical Geometry*, 4th ed. Translated by I Nyoman Susila, Bana Kartasasmita, Rawuh. Erlangga, Jakarta.
	Stewart, J. 2001. *Calculus*, 4th ed. Translated by I Nyoman Susila & Hendra Gunawan. Erlangga, Jakarta.
	Tim Logika dan Kalkulus. 2013. *Logic and Calculus*. Mathematics Study Program, Untan.
MPU 103. Physics (3 CREDITS)	
Material	Fluids, Temperature, Heat, and the First Law of Thermodynamics, Kinetic Theory of Gases, Entropy and the Second Law of Thermodynamics, Equilibrium and Elasticity, Gravitation.
References	Halliday, D., Resnick, R., Walker, J. 2013. *Fundamentals of Physics*, 8th ed. John Wiley & Sons, Inc.
	Rosyid, F., Firmansyah, E. & Dyan, P. 2014. *Basic Physics, Volume 1*. Periuk, Yogyakarta.
	Basic Physics Handbook Team. 2011. *Basic Physics Handbook*. Mathematics Study Program, Universitas Tanjungpura.
MPU 105. Introduction to Information Technology (2 CREDITS)	
Material	Types and development of computer devices, history of computer systems, computer system components, how systems work, input, output, storage, data, and information, writing techniques using office applications,

	introduction to the internet, email, mailing lists, e-learning, cloud storage, file management, creating and customizing blogs.
References	Jogiyanto H.M. *Introduction to Computers*. Andi Offset, Yogyakarta.
	Turban E., Leidner, D., McLean, E., & Wetherbe, J. 2005. *Information Technology for Management: Transforming Organizations in the Digital Economy*, 5th ed. John Wiley & Sons, Inc., Indianapolis.
	Brian K. Williams & Stacey C. Sawyer. 2007. *Using Information Technology*, 7th ed. McGraw-Hill.
	Siarto E. 2010. *Head First WordPress*. O'Reilly, Sebastopol.
	Online sources: Google Drive, WordPress, Yahoo Groups.
MPK 1001. Basic Chemistry I (3 CREDITS)	
Material	Atoms, Molecules, and Ions, Stoichiometry, Reactions in Aqueous Solutions, Gases, Energy Relations in Chemical Reactions, Electron Structure of Atoms, Periodic Table, Chemical Bonding I: Covalent Bonding, Chemical Bonding II: Molecular Geometry and Atomic Orbital Hybridization.
References	Chang, R. 2003. *Basic Chemistry: Core Concepts*, Vol. 2, 3rd ed. Translated by Suminar Setiati Achmadi. Erlangga, Jakarta.
	Petrucci, R.H. 1985. *General Chemistry: Principles & Modern Applications*, 4th ed. Collier Macmillan, Inc.
MPK 1002. Basic Chemistry Practicum I (1 CREDITS)	
Material	Introduction to chemistry equipment and cleaning methods, solution preparation and dilution, qualitative testing: specific reaction tests, titrimetry: acid-base titration, solid purification: recrystallization of table salt, separation of two solutions: binary mixture distillation, colorimetry: colorimetric analysis, mixture composition: ternary diagram.
References	Mendham, J., Denney, R.C., Barnes, J.D., & Thomas, M. 2000. *Vogel's Textbook of Quantitative Chemical Analysis*, 7th ed. Pearson Education Limited.
	Svehla, B. 1998. *Vogel's Qualitative Inorganic Analysis*, 7th ed. Longman Group Limited.
MPK 1003. Biology (3 CREDITS)	
Material	General Biology discusses the basic concepts of life, cell definition and structure in animals and plants, fundamental concepts of evolution, animal and plant biodiversity, plant and animal structures, plant and animal reproduction and coordination systems, cellular respiration and photosynthesis, cell cycle, mitosis and meiosis, genetics, ecology and ecosystems.
References	Campbell, N.A., Reece, J.B., Urry, L.A., Cain, M.L., & Wasserman, S.A. 2008. *Biology*, Vols. 1, 2, & 3, 8th ed. Translated by Wulandari, T.D. Erlangga, Jakarta.
	Johnsoggayer, W.H., Laubenggayer, R.A., & Delany, L.E. 2000. *General Biology*. Holt Rinehart and Winston, New York.
	Storer, T.I., & Usinger, R.L. 1995. *General Biology*. McGraw Hill Pub. Company, Ltd.
	Simpson, G.G., & Bech, W.S. 1995. *An Introduction to Biology*. Brace and Word, St. Louis.
	Ruse, M. 1982. *Darwinism Defended*. The Benjamin Cummings Pub. Company, California, New Delhi.
Semester II	
MKWU 103. Pancasila (2 CREDITS)	
Material	Pancasila Education taught in higher education, Pancasila in the historical flow of the Indonesian nation, The urgency of Pancasila as the foundation of the Republic of Indonesia, Pancasila as the state ideology, Pancasila as a philosophical system, Pancasila as an ethical system, Pancasila as the foundation of scientific development values.
References	Primary Reference: Kemenristekdikti. 2016. *Pancasila Education Module for Higher Education.* Jakarta: Directorate General of Learning and Student Affairs, Kemenristekdikti.
	Supplementary References: Ali, As'ad Said. 2009. *Negara Pancasila Jalan Kemaslahatan Berbangsa.* Jakarta: Pustaka LP3ES.
	Bakry, Noor Ms. 2010. *Pancasila Education.* Pustaka Pelajar, Yogyakarta.
	Kaelan. 2013. *Negara Kebangsaan Pancasila: Kultural, Historis, Filosofis, Yuridis dan Aktualisasinya.* Yogyakarta: Paradigma Publisher.
MKWU 104. Islamic Religious Education (3 CREDITS)	
Material	Islamic Religious Education (PAI) in higher education, God-consciousness in humans, Religion guarantees happiness, Integrating faith, Islam, and ihsan in shaping an ideal person, Building a Qur'anic personality, Grounding Islam in Indonesia, Islam fostering unity in diversity, Islam facing modernization challenges, Islam's contribution to the development of world civilization, The role and function of campus mosques in promoting Islamic culture.
References	Primary Reference: *Al-Qur'an Al-Karim & CD Al-Qur'an: Holy Qur'an.*
	Al-Hadith & CD Al-Hadith: Kutub Al-Tis'ah. Published by Al Bayan.

	Kemenristekdikti. 2016. *Islamic Religious Education Module for Higher Education.* Jakarta: Directorate General of Learning and Student Affairs, Kemenristekdikti.
	Supplementary References: Mukti Ali. *Understanding Islam.* Jakarta: PT Bulan Bintang.
	Faiz, Fakhruddin. 2003. *Qur'anic Hermeneutics: Between Text, Context, and Contextualization.* Yogyakarta: Qalam.
	Kuntowijoyo. 1990. *Islam Paradigm.* Bandung: Mizan.
	Madjid, Nurcholis. 2008. *Islam: A Civilization Religion.* Jakarta: Paramadina.
	Othman, Ali Issa. 1982. *Humans According to Al-Ghazali.* Translated by Johan Smith & Anas Mahyudin Yusuf. Bandung: Pustaka.
MPK 1004. Basic Chemistry II (3 CREDITS)	
Material	Solutions: Ideal and Non-Ideal Solutions, Electrolyte and Non-Electrolyte Solutions, Chemical Equilibrium, Chemical Thermodynamics: Application of thermodynamic laws in homogeneous and heterogeneous mixtures, Electrochemistry, Chemical Kinetics: Reaction rate and order, Introduction to Organic Compounds, Polymers, Nuclear Chemistry, Crystallography, Biochemistry.
References	Chang, R. 2003. *Basic Chemistry: Core Concepts*, Vol. 2, 3rd ed. Translated by Suminar Setiati Achmadi. Erlangga, Jakarta.
	Mahan, B.H. *University Chemistry.* John Wiley & Sons.
	Slabaugh, W.H., Pearsons, T.D. 1976. *General Chemistry*, 3rd ed. John Wiley & Sons.
MPK 1005. Basic Chemistry Practicum II (1 CREDITS)	
Material	Chemical equilibrium, Chemical thermodynamics, Reaction kinetics, Organic and biochemical compound reactions, Colligative properties of solutions, Colorimetric analysis.
References	Svehla, B. 1998. *Vogel's Qualitative Inorganic Analysis*, 7th ed. Longman Group Limited.
	Mendham, J., Denney, R.C., Barnes, J.D., & Thomas, M. 2000. *Vogel's Textbook of Quantitative Chemical Analysis*, 7th ed. Pearson Education Limited.
MPK 1006. Statistical Applications in Chemistry (2 CREDITS)	
Material	Errors in chemical analysis, Definitions (mean, median, accuracy, precision, absolute error, relative error), Types of errors in experimental data, Systematic errors, Statistical treatment of random errors, Single-factor experiment, Two-factor experiment, Comparison between treatment means (BNT test), Analysis of data from a series of experiments (t-test, F-test).
References	Gomez, K.A., & Gomez, A.A. 1984. *Statistical Procedures for Agricultural Research*. Translated by Endang Sjamsuddin & Justika S. Baharsjah. UI-Press, Jakarta.
MPK 1007. Advanced Mathematics (3 CREDITS)	
Material	Integrals and applications (Integration techniques: Substitution method, Partial method, Rational function integrals, Trigonometric function integrals, Trigonometric substitution integrals), Properties of definite integrals, Variable transformation in definite integrals, Flat area calculation in Cartesian coordinates, Flat area calculation in polar coordinates, Volume of solid of revolution, Differential equations (First-order linear DE, First-order nonhomogeneous linear DE, nth-order linear DE, First- and second-order DE applications, Laplace Transform).
References	Purcell, E.J., & Varberg, D. 1994. *Calculus and Analytical Geometry*, 4th ed. Translated by I Nyoman Susila, Bana Kartasasmita, & Rawuh. Erlangga, Jakarta.
	Supama et al. 2003. *Calculus II.* Faculty of Mathematics and Natural Sciences, Universitas Gajah Mada.
	Stroud, K.A. 2001. *Engineering Mathematics*, 5th ed. Erlangga, Jakarta.
MPK 1008. Modern Physics (3 CREDITS)	
Material	Light and its properties: Classical understanding of light as electromagnetic waves (EMW), Light spectrum, Examples of high-frequency EMW: X-Ray and applications in XRD, Quantum properties of light: Photon concept (Black body radiation and ultraviolet catastrophe, Photoelectric effect, Compton effect), Wave properties of particles: De Broglie wave, Particle wave interpretation, Phase velocity and group velocity, Particle diffraction, Particle in a box, Heisenberg uncertainty principle and applications, Atomic structure and semi-classical models: Atomic nucleus, Electron orbit, Atomic spectrum, Bohr model, Energy levels and spectra, Nuclear motion, Atomic excitation, Laser applications, Introduction to quantum theory of the hydrogen atom: Schrodinger equation and its applications to hydrogen atoms, Quantum numbers, Electron probability density, Zeeman effect.
References	Baiquni, A. 1978. *Modern Physics*. Balai Pustaka, Jakarta.
	Beiser, A. 1987. *Concepts of Modern Physics*. McGraw-Hill.
	Giancoli, D.C. 1984. *General Physics*. Prentice Hall.
	Halliday, D., & Resnick, R. 1987. *Physics*, Vol. 1 & 2. Erlangga, Jakarta.
	Krane, K. 1983. *Modern Physics*. John Wiley & Sons.

MPK 1401. Basic Organic Chemistry (3 CREDITS)	
Material	Atomic and molecular structure, Orbitals and their role in covalent bonding, Molecular formulas and structural formulas, Aromaticity: Benzene and substituted benzene, Nomenclature and structural isomerism, Alkanes, alkenes, and alkynes, Introduction to stereochemistry, Study of organic compounds based on functional groups, nomenclature, physical properties, and applications: Alkyl Halides, Alcohols, Ethers and related compounds, Aldehydes and Ketones, Carboxylic acids and their derivatives, Amines, Carbohydrates, Amino acids and Proteins, Lipids and related natural products.
References	Fessenden, R.J. & Fessenden, J.S. 1994. *Organic Chemistry*, 5th ed. Brooks Cole.
	Morrison, R.T. & Boyd, R.N. 1983. *Organic Chemistry*, 4th ed. Allyn & Bacon.
	Solomon, T.W.G. 1988. *Organic Chemistry*, 4th ed. John Wiley & Sons.
MPK 1402. Organic Chemistry Practicum (2 CREDITS)	
Material	Basic techniques in organic chemistry laboratories, including determination of physical constants (refractive index, melting point, boiling point, and polarization angle), Isolation of organic compounds, Distillation, Crystallization, Qualitative analysis of organic compounds, Recognition reactions for functional groups.
References	Becker, H. 1973. *Organicum: Practical Handbook of Organic Chemistry*. Addison Wesley Publishing Corp.
	Fiescher, L. & Fiescher, M. 1986. *Experiments in Organic Chemistry*. Reinhold Publishing Corp.
	Furniss, B.S. 1990. *Vogel's Textbook of Practical Organic Chemistry*, 5th ed. Longman.
Semester III	
MPK 2101. Introduction to Chemical Analysis (3 CREDITS)	
Material	Scope of Analytical Chemistry (Analytical chemistry and chemical analysis, Role of analytical chemistry in science, Steps in performing chemical analysis), Qualitative analysis (Basics of qualitative testing, Preliminary tests for ions, Cation classification, Anion reactions), Gravimetric analysis (Gravimetric calculations, Properties of precipitates and precipitating agents, Precipitate handling, Applications of gravimetric methods), Solution chemistry (Electrolyte solutions, Chemical equilibrium, Activity coefficients, Buffer solutions), Titrimetric analysis (Aspects and calculations in titrimetric analysis, Acid-base titration, Precipitation titration, Complex formation titration, Redox titration).
References	Mendham, J., Denney, R.C., Barnes, J.D., & Thomas, M. 2000. *Vogel's Textbook of Quantitative Chemical Analysis*, 7th ed. Pearson Education Limited.
	Skoog, D.A., West, D.M., & Holler, F.J. 1996. *Fundamentals of Analytical Chemistry*, 7th ed. Saunders College Publishing.
	Svehla, B. 1998. *Vogel's Qualitative Inorganic Analysis*, 7th ed. Longman Group Limited.
MPK 2102. Introduction to Chemical Analysis Practicum (2 CREDITS)	
Material	Qualitative analysis: Reactions with cations and reactions with anions, Quantitative analysis: Acid-base titration in aqueous solutions, Iodometric titration, Permanganometric titration, Complexometric titration, Precipitation titration, Gravimetric analysis.
References	Svehla, B. 1998. *Vogel's Qualitative Inorganic Analysis*, 7th ed. Longman Group Limited.
	Skoog, D.A., West, D.M., & Holler, F.J. 1996. *Fundamentals of Analytical Chemistry*, 7th ed. Saunders College Publishing.
	Mendham, J., Denney, R.C., Barnes, J.D., & Thomas, M. 2000. *Vogel's Textbook of Quantitative Chemical Analysis*, 7th ed. Pearson Education Limited.
MPK 2201. Molecular Structure and Chemical Bonding (3 CREDITS)	
Material	Chemical structure, Chemical bonding: Valence bond theory, Molecular orbital theory, Structure and bonding properties, Ionic solids and ionic bond energy, Covalent character in ionic compounds.
References	Atkins, P., Overton, T., Rourke, J., Weller, M., & Armstrong, F. 2009. *Shriver and Atkins' Inorganic Chemistry*, 5th ed. OUP Oxford.
	Housecroft, C.E. & Sharpe, A.G. 2008. *Inorganic Chemistry*, 3rd ed. Pearson Education Limited, London.
	Huheey, J.E., Keiter, E.A., & Keiter, R.L. 1993. *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th ed. HarperCollins College Publishers.
	Miessler, G.L., Fischer, P.J., & Tarr, D.A. 2014. *Inorganic Chemistry*, 5th ed. Pearson Education, Inc., New Jersey.
MPK 2301. Atomic Structure (3 CREDITS)	
Material	Introduction and principles of quantum theory, Dynamics of microscopic systems, Principles of quantum mechanics, Techniques and applications of quantum theory, Atomic structure and spectra, Term symbols and microstates.
References	Atkins, P.W. 2006. *Physical Chemistry*, 8th ed. Oxford University Press, Oxford.

	House, J.E. 2004. *Fundamentals of Quantum Chemistry*, 2nd ed. Elsevier Science, USA.
	Levine, I.N. 2009. *Physical Chemistry*, 6th ed. McGraw-Hill, New York.
MPK 2403. Organic Compound Reactions (3 CREDITS)	
Material	Reactions occurring in organic compounds based on their functional groups (alkyl halides, alcohols, alkanes, alkenes, alkynes, carbonyl compounds, and aromatic compounds), Classification of organic compound reactions based on their mechanisms. After completing this course, students will be able to classify reactions occurring in organic compounds and explain these reactions based on their mechanisms.
References	Fessenden, R.J. & Fessenden, J.S. 1982. *Organic Chemistry I and II*. Erlangga, Jakarta.
	Issac, N.S. 1990. *Physical Organic Chemistry*. Longman.
	Marc, Yerry. 1990. *Advanced Organic Chemistry: Mechanism and Structure*. McGraw-Hill, Kogakusha.
	Solomons, T.W. Graham & Craig B. Fryhle. 2004. *Organic Chemistry*, 8th ed. John Wiley & Sons, Singapore.
MPK 2404. Organic Compound Reaction Practicum (2 CREDITS)	
Material	Advanced organic compound synthesis, Electrophilic and nucleophilic substitution reactions in aliphatic and aromatic compounds, Reactions in amine compounds, Use of protective groups in chemical reactions.
References	Becker, H. 1973. *Organicum: Practical Handbook of Organic Chemistry*. Addison Wesley Pub. Corp.
	Fiescher, L. & Fiescher, M. 1986. *Experiment in Organic Chemistry*. Reinhold Publishing Corp.
	Furniss, B.S. 1990. *Vogel's Textbook of Practical Organic Chemistry*, 5th ed. Longman.
MPK 2501. Biochemistry I (3 CREDITS)	
Material	Definition, philosophy, and scope of biochemistry, Major chemical elements of living matter, Life at the molecular level, types of cells, and the effects of water on dissolved biomolecules, Structure and properties of biomolecules: amino acids, lipids, carbohydrates, nucleic acids, Catalysis and biochemical reaction control, Fundamentals of enzymes, enzymatic reactions, enzyme activity, enzyme kinetics, and enzyme regulation.
References	Nelson, D.L. & Cox, M.M. 2008. *Principles of Biochemistry*, 5th ed. W.H. Freeman and Company.
	Mathews, C.K., Van Holde, K.E., & Ahern, A.G. 2000. *Biochemistry*, 3rd ed. Benjamin/Cummings Publishing.
MPK 2009. Environmental Chemistry (2 CREDITS)	
Material	Atmospheric chemistry, Global warming: Greenhouse gases, mechanisms and effects of global warming, efforts to minimize global warming, Ozone layer depletion: Oxygen reactions in the stratosphere, Chapman reaction mechanism (ozone formation and depletion), ozone layer depletion phenomenon, effects of ozone depletion on life, efforts to minimize ozone depletion, Acid rain: Mechanisms and effects of acid rain, efforts to minimize acid rain, Green chemistry: Specific aspects of green chemistry, application of green chemistry principles in research and industrial processes, Water chemistry: Water characteristics, water body characteristics, alkalinity, and acidity.
References	Essington, M.E. 2004. *Soil and Water Chemistry*. GRC Press LLC, Florida.
	Manahan, S.E. 2005. *Environmental Chemistry*, 8th ed. GRC Press LLC, Florida.
	Schnoor, J.L. 1996. *Environmental Modeling: Fate and Transport of Pollutants in Water, Air, and Soil*. John Wiley and Sons, Inc., New York.
	Sharma, S.K. & Mudhoo, A. 2010. *Green Chemistry for Environmental Sustainability*. CRC Press, New York.
Semester IV	
MPK 2103. Separation and Purification Methods for Chemical Compounds I (3 CREDITS)	
Material	Fundamentals of chromatography, Retention, resolution, Chromatography classification, Gas-liquid chromatography, Liquid-liquid chromatography, Thin-layer chromatography, Ion chromatography, Supercritical fluid chromatography, Electrochemistry: potentiometry, voltammetry, coulometry, amperometry, and polarography.
References	Mendham, J., Denney, R.C., Barnes, J.D., & Thomas, M. 2000. *Vogel's Textbook of Quantitative Chemical Analysis*, 7th ed. Pearson Education Limited.
	Ravindranath, B. 1989. *Principles and Practice of Chromatography*. Ellis Horwood Limited.
	Skoog, D.A., Holler, F.J., & Nieman, T.A. 1998. *Principles of Instrumental Analysis*, 5th ed. Harcourt Brace College Publisher.
	Willard, H.H., Merritt, L.L., Dean, J.A., & Settle, F.A. 1988. *Instrumental Methods of Analysis*, 7th ed. Wadsworth.
Semester V	

MPK 3105. Chemical Instrumentation (3 CREDITS)	
Material	Electromagnetic radiation properties, Energy-matter interactions, Atomic spectroscopy: atomic absorption, atomic emission spectrometry, Molecular spectroscopy: UV-visible and IR spectrometry, NMR spectroscopy, and Mass Spectrometry (MS).
References	
References	Pecsok, R.L., & Shield, L.D. 1985. *Modern Methods of Chemical Analysis*. John Wiley & Sons.
	Skoog, D.A., Holler, F.J., & Nieman, T.A. 1998. *Principles of Instrumental Analysis*, 5th ed. Harcourt Brace College Publisher.
	Willard, H.H., Merritt, L.L., Dean, J.A., & Settle, F.A. 1988. *Instrumental Methods of Analysis*, 7th ed. Wadsworth.
MPK 3204. Elemental Chemistry (3 CREDITS)	
Material	Periodic properties of elements: valence electron configurations, atomic parameters, natural occurrence of elements, metallic characteristics, oxidation states, Compound characteristics based on periodic table position: coordination numbers, bond enthalpy trends, anomalies, binary compounds, periodicity exceptions, Physical and chemical properties of hydrogen, elements from groups 1 to 18, d-block and f-block elements.
References	Atkins, P., Overton, T., Rourke, J., Weller, M., & Armstrong, F. 2009. *Shriver and Atkins' Inorganic Chemistry*, 5th ed. OUP Oxford.
	Housecroft, C.E., & Sharpe, A.G. 2008. *Inorganic Chemistry*, 3rd ed. Pearson Education Limited, London.
	Miessler, G.L., Fischer, P.J., & Tarr, D.A. 2014. *Inorganic Chemistry*, 5th ed. Pearson Education, Inc., New Jersey.
MPK 3205. Elemental Chemistry Practicum (2 CREDITS)	
Material	Hydrogen gas production, Halogen properties, Photochemical reduction of ferric ions, Activated carbon characterization, Alum synthesis, Reactivity of first-row transition elements, Acidity determination of natural minerals.
References	
References	Atkins, P., Overton, T., Rourke, J., Weller, M., & Armstrong, F. 2009. *Shriver and Atkins' Inorganic Chemistry*, 5th ed. OUP Oxford.
	Laboratory manual prepared by the practicum supervisors.
MPK 3303. Chemical Dynamics (3 CREDITS)	
Material	Reaction kinetics: rate equations, reaction order, half-life, reaction mechanisms, activation energy, Arrhenius equation, collision theory, reaction cross-section, transition state theory, diffusion-controlled reactions.
	Surface chemistry: surface tension, contact angle, surfactants, adsorption on solid surfaces, various adsorption isotherms.
	Colloid chemistry: colloid system types, surface charge formation, double layers, zeta potential, electrokinetic phenomena, colloidal stability, viscosity.
References	Atkins, P.W. 2006. *Physical Chemistry*, 8th ed. Oxford University Press, Oxford.
	Levine, I.N. 2009. *Physical Chemistry*, 6th ed. McGraw-Hill, New York.
MPK 3304. Thermodynamics and Chemical Equilibrium Practicum (1 CREDITS)	
Material	Adsorption isotherms, Determination of ionization constants via spectrophotometry, Viscosity of liquids as a function of temperature, Solute distribution between immiscible solvents, Thermochemistry.
References	Daniels, F. *Experimental Physical Chemistry*. McGraw-Hill.
MPK 3408. Organic Compound Analysis (3 CREDITS)	
Material	Introduction to spectroscopy, UV spectroscopy: chromophores, electronic transitions, UV spectra, IR spectroscopy: functional groups, Hooke's Law, IR spectra, Mass spectrometry: base peak, molecular ion, abundance, mass spectrum, Nuclear Magnetic Resonance (NMR): proton chemical shifts (^{1}H NMR), carbon chemical shifts (^{13}C NMR).
References	Manitto, P. 1981. *Biosynthesis of Natural Products*. John Wiley & Sons.
	Nakanishi, N., Goto, T., Ito, S., Natori, S., & Nazoe, S. 1983. *Natural Product Chemistry*, Vol. 1–3. Kodansha Academic Press.
	Silverstein & Bassler. 1981. *Spectrometric Identification of Organic Compounds*. John Wiley & Sons.
	Williams & Fleming. 1973. *Spectroscopic Methods in Organic Chemistry*, 2nd ed. McGraw-Hill.
MPK 3409. Natural Product Chemistry (3 CREDITS)	
Material	Primary and secondary metabolites, biogenetic origins, Biosynthetic pathways: acetate, shikimate, mevalonate, and methylerythritol phosphate, Physiological properties, sources, and functions of compound classes:

	polyketides, lignans, phenylpropanoids, coumarins, flavonoids, stilbenoids, terpenoids, steroids, xanthones, alkaloids, peptides.
References	Dewick, P.M. 2009. *Medicinal Natural Products: A Biosynthetic Approach*, 3rd ed. John Wiley & Sons.
	Cooper, R. & Nicola, G. 2015. *Natural Products Chemistry: Sources, Separations, and Structures*. CRC Press, Taylor & Francis Group.
	Herbert, R.B. 1989. *The Biosynthesis of Secondary Metabolites*, 2nd ed. Chapman & Hall.
	Manitto, P. 1981. *Biosynthesis of Natural Products*. John Wiley & Sons.
	Nakanishi, N., Goto, T., Ito, S., Natori, S., & Nazoe, S. 1983. *Natural Product Chemistry*, Vol. 1–3. Kodansha Academic Press.
MPK 3013. Separation and Purification Methods for Chemical Compounds II (2 CREDITS)	
Material	Phase changes and their use in chemical separation, Extraction methods, Chromatography, Ultrafiltration, Flotation, Dialysis, Electrophoresis.
References	Fifield, S.W. & Kealey, D.K. 1995. *Principle and Practice of Analytical Chemistry*, 4th ed. Chapman and Hall.
	Meloan, C.E. 1999. *Chemical Separations: Principles, Techniques and Experiments*. John Wiley & Sons.
	Pecsok, R.L. & Shield, L.D. 1985. *Modern Methods of Chemical Analysis*. John Wiley & Sons.
	Skoog, D.A., West, D.M., & Holler, F.J. 1996. *Fundamentals of Analytical Chemistry*, 7th ed. Saunders College Publishing.
Semester VI	
MPK 3015. Research Methodology (3 CREDITS)	
Material	Research philosophy, Types of research, Population and sampling, Statistics, Scientific method (problem formulation, hypothesis, and conclusion), Proposal writing for research.
References	
References	Institut Pertanian Bogor. 2015. *Scientific Writing*, Bogor.
	William, N. 2011. *Research Methods: The Basics*. Taylor and Francis, New York.
MPK 3206. Coordination Chemistry (4 CREDITS)	
Material	Introduction to coordination compounds, Historical development of coordination chemistry, Ligands and metal centers, Nomenclature of coordination compounds, Isomerism in coordination chemistry, Pre-1930s coordination theories, Valence bond theory, crystal field theory, and molecular orbital theory, Electronic transitions and spectral properties of complexes, Luminescence and Jablonski diagrams, Electronic transition types using Orgel and Tanabe-Sugano diagrams, Symmetry, point groups, and term symbols in coordination chemistry, Reaction kinetics and mechanisms of coordination compounds.
References	
References	Atkins, P., Overton, T., Rourke, J., Weller, M., & Armstrong, F. 2009. *Shriver and Atkins' Inorganic Chemistry*, 5th ed. OUP Oxford.
	Carter, R.L. 1998. *Molecular Symmetry and Group Theory*. John Wiley & Sons, Inc., New York.
	Housecroft, C.E. & Sharpe, A.G. 2008. *Inorganic Chemistry*, 3rd ed. Pearson Education Limited, London.
	Huheey, J.E., Keiter, E.A., & Keiter, R.L. 1993. *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th ed. HarperCollins College Publishers.
	Miessler, G.L., Fischer, P.J., & Tarr, D.A. 2014. *Inorganic Chemistry*, 5th ed. Pearson Education, Inc., New Jersey.
	Effendy. 2007. *A New Perspective on Coordination Chemistry*. Malang.
MPK 3207. Coordination Chemistry Practicum (2 CREDITS)	
Material	Preparation of complex and double salts, Synthesis of potassium tris(oxalato)aluminate hydrate ($K_3[Al(C_2O_4)_3]\cdot 3H_2O$), Composition determination of complex compounds, Isomerization of complexes: synthesis of cis and trans potassium dioxalatodiaquochromate(III), Determination of coordination numbers of copper(II) complexes, Reactions of ethylenediamine complexes, SiO_2 and Al_2O_3 extraction from sludge, TiO_2 synthesis.
References	*Laboratory manual prepared by the practicum supervisors*.
	Atkins, P., Overton, T., Rourke, J., Weller, M., & Armstrong, F. 2009. *Shriver and Atkins' Inorganic Chemistry*, 5th ed. OUP Oxford.
MPK 3208. Inorganic Material Analysis (2 CREDITS)	
Material	X-ray diffraction (XRD), X-ray fluorescence (XRF), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Diffuse reflectance UV-Vis spectrometry, Gas sorption analyzer (GSA), Thermal analysis (DTA-TGA-DSC).

References	Callister, Jr., William D. 2007. *Materials Science and Engineering: An Introduction*, 7th ed. John Wiley & Sons, Inc., USA.
	Rubinson & Rubinson. 2000. *Contemporary Instrumental Analysis*. Prentice Hall.
	Willard, L., Merritt, J., Dean, F., & Settle. 1998. *Instrumental Methods of Analysis*, 7th ed. Wadsworth Publishing.
MPK 3307. Chemical Dynamics Practicum (1 CREDITS)	
Material	Determination of hydrolysis reaction rates, Chemical kinetics experiments, Reaction rate constants and activation energy, Kinetics of simple chemical reactions, Reactions in solution, Complex reactions, Homogeneous catalysts, Photochemistry.
References	
References	Daniels, F. *Experimental Physical Chemistry*. McGraw-Hill.
Semester VII	
Internship and Community Service	
Material	Students opting for internships undertake placements in industries or research institutions under the guidance of field supervisors, developing skills and broadening their knowledge of professional roles in their field. At the end of the internship, students must submit a written report, evaluated by examiners appointed by the program.
	Students participating in community service (KKM) engage in social service activities in designated areas assigned by the faculty or university for approximately one month.
References	
MPK 4016. Final Project (6 CREDITS)	
Material	Students design and conduct research under the supervision of a team of academic advisors, and upon completion, compile their findings into a thesis.
References	
Semester VIII	
MPK 4017. Thesis Defense (2 CREDITS)	
Material	Students present their research findings and comprehensive chemistry knowledge in an open seminar.
References	

Elective Course	
Odd Semester Elective Courses	
MPK 2010. Entrepreneurship (2 CREDITS)	
Material	Definition and elements of entrepreneurship, Entrepreneurial conditions in Indonesia, Characteristics of entrepreneurs, Starting a business: business opportunities, Business management, Business evaluation, Entrepreneurship development in Indonesia.
MPK 3014. Computational Chemistry (2 CREDITS)	
Material	Basic concepts of computational chemistry and simple programming techniques for solving chemical problems, Computational chemistry methods: molecular mechanics, semi-empirical methods, ab initio methods, and electron correlation, Computational chemistry for predicting the physical and chemical properties of substances at the molecular level using computers and chemistry software, Application of computational chemistry in molecular modeling.
References	Cramer, C.J. 2004. *Essentials of Computational Chemistry: Theories and Models*, 2nd ed. John Wiley & Sons, West Sussex. Pranowo, H.D., & Hetadi, A.K.R. 2011. *Introduction to Computational Chemistry*. Lubuk Agung Publishing, Bandung.
MPK 3106. Pharmaceutical Analysis (2 CREDITS)	
Material	Techniques and principles for analyzing pharmaceutical components in various drug formulations and biological matrices, Chemical and physicochemical analysis methods for pharmacological, pharmacodynamic characterization, and toxicological studies.
References	Indonesian Pharmacopoeia, Editions I, II, III. Sudjadi & Rohman, A. 2004. *Drug and Food Analysis*. Pustaka Pelajar, Yogyakarta.

MPK 3107. Selected Topics in Analytical Chemistry (2 CREDITS)	
Material	Discussion of special topics related to developments in analytical chemistry, including separation, purification, and measurement techniques.
References	Scientific publications/journals in the field of analytical chemistry.
MPK 3108. Corrosion Chemistry (2 CREDITS)	
Material	Electrochemical corrosion: electrochemical reactions, Types of corrosion: uniform corrosion, bimetallic corrosion, crevice corrosion, pitting corrosion, Hydrogen-induced damage, selective leaching, Erosion corrosion, intergranular corrosion, stress corrosion cracking, Corrosion rate determination, units of corrosion rate and calculations, Corrosion testing, Mixed potential theory, Polarization curve experiments for anodic and cathodic reactions, Passivation and passive layers, Active-passive corrosion environments, Effects of oxidizing agents, Antifouling.
References	Fontana, M.G. 1987. *Corrosion Engineering*, 3rd ed. McGraw-Hill. Jones, D.A. 1992. *Principles and Prevention of Corrosion*. Macmillan Publishing Company. Konstantinou, I.K. 2006. *Antifouling Paint Biocides*. Springer-Verlag Berlin. Piron, D.L. 1991. *The Electrochemistry of Corrosion*. NACE. Shreier, L.L. 1976. *Corrosion, Volume I*. Newnes-Butterworths. West, J.M. 1980. *Basic Corrosion and Oxidation*. Ellis Horwood Limited.
MPK 3109. Chemical Waste Treatment (2 CREDITS)	
Material	Waste treatment methods: Physical (adsorption and membrane technology), Chemical (photocatalysis and oxidation), Biological (microbial applications), Environmental regulations on waste treatment.
References	PP RI No. 101 Tahun 2014. Permen LH No. 18 Tahun 2009. Scientific journals on waste treatment research.
MPK 2202. Geochemistry and Mineralogy (2 CREDITS)	
Material	Earth and its formation processes: structure and composition of the Earth, Sedimentation and sedimentation processes, Metamorphism and metamorphic rocks, Isotopes in geochemical concepts, Hydrosphere, Biosphere, Origin of minerals: characterization and applications.
References	Mason, B., & Moore, C.B. 1992. *Principles of Geochemistry*, 4th ed. John Wiley & Sons, New York. Nesse, W.D. 2009. *Introduction to Mineralogy*. Oxford University Press, Oxford.
MPK 4211. Nano Materials (2 CREDITS)	
Material	Definition, classification, and perspectives on nanomaterials, Properties and characterization of nanomaterials (optical, electrical, magnetic, mechanical, and chemical), Synthesis of nanomaterials (vapor-phase formation and phase synthesis), Applications of nanomaterials in structural mechanics, pigments, biomedical materials, electronic materials, and magnetic materials.
References	Klabunde, K.J. 2001. *Nanoscale Materials in Chemistry*. John Wiley & Sons. Wilson, M., Simmon, M., & Raguse, B. 2002. *Nanotechnology: Basic Science and Emerging Technologies*. UNSW Press Book.
MPK 4212. Organometallic Chemistry (2 CREDITS)	
Material	General properties of organometallic complexes, Metal-carbon and metal-hydrogen bonding, Various reactions of organometallic complexes, Applications in organic synthesis, Bioorganometallic chemistry.
References	Crabtree, R.H. 2009. *The Organometallic Chemistry of the Transition Metals*. John Wiley & Sons, New York.
MPK 3305. Solid-State Chemistry (3 CREDITS)	
Material	Historical development of materials science, Atomic arrangement in crystalline materials, Factors influencing crystal structure and characterization of solids, Metal alloy systems, Electron transport in solids, Material conductivity: insulators, semiconductors, superconductors, Single-phase metals.
References	West, A.R. 1984. *Solid State Chemistry and Its Applications*. John Wiley & Sons, New York. Callister, W.D. 2007. *Materials Science and Engineering: An Introduction*, 7th ed. John Wiley & Sons (Asia), New York.
MPK 3307. Polymer Chemistry (3 CREDITS)	

Material	Overview of polymers, Polymer synthesis, Polymerization reactions, Polymer processing and analysis.
References	Hammond, P. 2006. *Synthesis of Polymer: Course Material*. MIT Open Courseware, USA. Stuart, B. 2003. *Polymer Analysis*. John Wiley & Sons, New York.
MPK 2405. Essential Oil Chemistry (2 CREDITS)	
Material	Development of the essential oil industry, Chemical composition and uses of essential oils in daily life, Essential oil distillation, Testing and analysis of essential oils, Chemical properties determination, Fragrance applications.
References	Guenter, E. 1987. *Essential Oils*, Vol. 1. UI-Press. Guenter, E. 1990. *Essential Oils*, Vol. IIIA. UI-Press. Guenter, E. 1990. *Essential Oils*, Vol. IVA. UI-Press.
MPK 3410. Stereochemistry (3 CREDITS)	
Material	Basic concepts of stereochemistry, Absolute configuration, Stereochemistry and conformation, Stereochemistry of organic reactions, Principles of asymmetric organic synthesis, Asymmetric synthesis via chiral directing catalysts, Asymmetric synthesis using chiral substrates, Asymmetric reactions between achiral substrates and chiral reagents.
References	Eliel, E.L., Wilen, S.H., & Allinger, N.L. 1983. *Stereochemistry*. John Wiley & Sons, New York. Eliel, E.L., Wilen, S.H., & Mander, L.N. 1994. *Stereochemistry of Organic Compounds*. John Wiley & Sons, New York. Juaristi, E. 1989. *Introduction to Stereochemistry and Conformational Analysis*. John Wiley & Sons, New York.
MPK 3411. Selected Topics in Organic Chemistry (2 CREDITS)	
Material	Recent developments in organic chemistry, Biotransformation of bioactive compounds (microbial transformation and plant transformation/tissue culture), Endophytic studies.
References	Journal of Organic Chemistry. Journal of Natural Product Chemistry. Phytochemistry.
MPK 3412. Marine Chemistry (2 CREDITS)	
Material	Chemical aspects of the ocean, Properties and composition of seawater, Seawater parameters (pH, alkalinity, oxygen, carbon dioxide, etc.), Marine biota and secondary metabolites for defense mechanisms, Historical development of marine science in Indonesia, Seawater, sediment, and marine biota analysis methods, Field trip for direct exploration of marine resources.
References	Atta-ur-Rahman. 2001. *Study in Natural Product*, Vol. 25, Part F. Elsevier. Bhakuni, D.S., & Rawat, D.S. *Bioactive Marine Natural Products*. Springer & Anamaya Publishers. Hutabarat, S., & Evans, S.M. 1985. *Introduction to Oceanography*. UI-Press, Jakarta. Hutagalung, H.P., Setiapermana, D., & Riyono, S.H. 1997. *Seawater, Sediment, and Biota Analysis Methods*. LIPI, Jakarta. Nontji, A. 2002. *Laut Nusantara*. Djambatan.
MPK 3413. Bioorganic Chemistry (2 CREDITS)	
Material	Bioorganic chemistry developments, Oxidative stress and its role in disease progression, Antioxidants and their health benefits, Secondary metabolites (natural compounds) and their health applications, Bioactivity testing.
References	Atta-ur-Rahman. 2001. *Studies in Natural Products Chemistry: Bioactive Natural Products (Part F)*. Elsevier, Netherlands. Chatterjea, M.N.M. 2012. *Textbook of Medical Biochemistry*, 8th ed. Jaypee Brothers Medical Publishers, New Delhi. Langseth, L. 1995. *Oxidants, Antioxidants, and Disease Prevention*. ILSI Europe, Belgium. Liang X-T., & Fang W-S. 2006. *Medicinal Chemistry of Bioactive Natural Products*. John Wiley & Sons, New Jersey.
MPK 3504. Food Biochemistry (3 CREDITS)	
Material	Recent biotechnology research in food production, Biochemical changes in carbohydrates, lipids, proteins, and pigments in food, Enzymatic and non-enzymatic browning reactions, Biochemistry of muscle food (meat and seafood), Biochemistry of milk components and processing, Biochemical reactions in fruits, vegetables, and cereals, Fermented foods, Microbial food safety, Food preservation principles, Food-related diseases.

References	Brody, T. 1999. *Nutritional Biochemistry*. Academic Press. Franzier, W., & Westhoff, D.C. 1988. *Food Microbiology*. McGraw-Hill International. Yui, Y.H. 2006. *Food Biochemistry and Food Processing*. Blackwell Publishing.
MPK 3507. Toxicology (2 CREDITS)	
Material	Introduction: History and development of toxicology, Definition and classification of toxic agents, Absorption and distribution of toxic substances, Metabolism of toxic substances, Effects of chemicals and physiology on xenobiotic metabolism, Mechanisms of toxic action, Toxicity analysis, Applications of toxicology.
References	Hodgson, E. 2004. *A Textbook of Modern Toxicology*, 3rd ed. John Wiley & Sons, USA. Manahan, S.E. 2003. *Toxicological Chemistry and Biochemistry*, 3rd ed. CRC Press, USA.
Elective Courses of Even Semester	
MPK 2012. Industrial Management (2 CREDITS)	
Material	Fundamentals of management, Planning, Decision-making, Financial analysis, Business strategy concepts, Total quality control management.
References	Gluede, W. 1980. *Business Policy & Strategy Management*. McGraw-Hill. Ichikawa. 1974. *Total Quality Control Management*. Harper & Row. Stooner, J.F., Freeman, R.E., & Gilbert, D.R. 1996. *Management*, Vol. I & II. Translated by Sindoro, A. Prenhallindo.
MPK 3110. Food Material Analysis (2 CREDITS)	
Material	Various chemical analyses focusing on food components, Amino acid, carbohydrate, lipid, vitamin, ash, and mineral analysis, Food additive analysis, Organoleptic analysis of food.
References	Gordon, M.H., & Macrae, Q.R. 1992. *Instrumental Analysis of Biological Sciences*. John Wiley & Sons. Mendham, J., Denney, R.C., Barnes, J.D., & Thomas, M. 2000. *Vogel's Textbook of Quantitative Chemical Analysis*, 7th ed. Pearson Education Limited. AOAC Journal.
MPK 3111. Environmental Contamination Analysis (2 CREDITS)	
Material	Environmental sampling aspects, Environmental sampling planning, Water and air environmental sampling techniques, Quality assurance and control in environmental sampling, Environmental contamination analysis (water and air).
References	American Standard Testing Method (ASTM). Hadi, A. 2007. *Principles of Environmental Sampling Management*, 2nd ed. PT Gramedia Pustaka Utama, Jakarta. Indonesian Government Regulation on water, wastewater, and air quality standards. Indonesian National Standards (SNI) on environmental parameter analysis. Journal of Environmental Science. International Journal of Environmental Pollution. International Journal of Environmental Science and Technology.
MPK 3112. Quality Testing of Chemical Analysis Methods (2 CREDITS)	
Material	Performance characteristics of analytical procedures, Precision, accuracy, sensitivity, and detection limits, Comparison of analytical methods based on performance characteristics, Calibration of laboratory glassware, pH meters, and UV-Vis spectrophotometers, Reference materials and traceability, Validation and verification of analytical methods.
References	Caulcutt, R., & Boddy, R. 1983. *Statistics for Analytical Chemists*. Chapman and Hall. Massart, D.L., Dijkstra, A., & Kaufman, L. 1978. *Evaluation and Optimization of Laboratory Methods and Analytical Procedures*. Elsevier Scientific Publishing Company.
MPK 3113. Humic Chemistry (2 CREDITS)	
Material	Soil organic matter, Humic substance formation processes, Separation and classification of humic substances, Characterization of humic substances, Functions and roles of humic substances in nature.
References	Aiken, G.R., McKnight, Wershaw, R.L. 1985. *Humic Substances in Soil, Sediment, and Water: Geochemistry, Isolation, and Characterization*. John Wiley & Sons.

	Hayes, M.H.B., MacCarthy, P., Malcolm, R.L., & Swift, R.S. 1989. *Humic Substances II: In Search of Structure*. John Wiley & Sons. Stevenson, F.J. 1994. *Humus Chemistry: Genesis, Composition, Reaction*, 2nd ed. John Wiley & Sons. Scientific journals on humic substances.
MPK 3209. Radiochemistry (2 CREDITS)	
Material	Introduction to radioactive materials and natural radiation, Nuclear energy, Radiation detection and measurement, Radiation interactions with matter, Gas systems, Aqueous solution systems, Organic compounds, Monomer and polymer systems, Biological and biochemical systems, Applications of radiation techniques in daily life.
References	Friedlander, G. 1981. *Nuclear and Radiochemistry*, 3rd ed. John Wiley & Sons. James, O., & Songster, D. *Principles of Radiation Chemistry*.
MPK 3210. Material Chemistry (2 CREDITS)	
Material	Metals, Ceramics, Polymers, Composites, Biomaterials.
References	Callister, W.D. 2007. *Materials Science and Engineering: An Introduction*, 7th ed. John Wiley & Sons (Asia), New York. Ishizaki, K., Komarneni, S., & Nanko, M. 1998. *Porous Materials: Process Technology and Applications*. Kluwer Academic Publisher, Netherlands.
MPK 3308. Surface Chemistry (2 CREDITS)	
Material	Basic concepts of surface chemistry, Interface between two phases, Surface interactions, Structure and thermodynamics, Colloid chemistry, Surface phenomena.
References	Atkins, P.W. 2006. *Physical Chemistry*, 8th ed. Oxford University Press, Oxford. Ishizaki, K., Komarneni, S., & Nanko, M. 1998. *Porous Materials: Process Technology and Applications*. Kluwer Academic Publisher, Netherlands. Levine, I.N. 2009. *Physical Chemistry*, 6th ed. McGraw-Hill, New York.
MPK 3309. Polymer Degradation (3 CREDITS)	
Material	Definition of polymer degradation, Types and mechanisms of polymer degradation, Applications of polymer degradation.
References	Schnabel, W. 1981. *Polymer Degradation: Principles and Practical Applications*. Hanser International. Stuart, B. 2003. *Polymer Analysis*. Wiley Interscience.
MPK 3310. Selected Topics in Physical Chemistry (3 CREDITS)	
Material	Recent developments in physical chemistry.
References	Journal of Physical Chemistry. Chemical Reviews. Chemistry and Industry. Related and relevant articles for each sub-field.
MPK 3311. Catalysis Chemistry (2 CREDITS)	
Material	History, definition, classification, and perspectives on catalysis, Synthesis, characterization, and applications of catalysts, Homogeneous and heterogeneous catalysts, Carrier catalyst preparation methods, Key parameters determining catalyst performance.
References	Augustine, R.L. 1996. *Heterogeneous Catalysis for the Synthetic Chemist*. Marcel Dekker, Inc., New York. Le Page, J.F. 1987. *Applied Heterogeneous Catalysis: Design, Manufacture, and Use of Solid Catalysts*. Imprimeric Novelle, France.
MPK 2407. Pesticide Chemistry (2 CREDITS)	
Material	Definition and classification of pesticides, Physicochemical properties of pesticides, Pesticide formulation, Inorganic and organic pesticides and their applications, Students will learn the differences between inorganic and organic pesticides, and how to formulate organic pesticides and their applications.
References	Asmaliyah, Etik Erna Wati H., Sri Utami, Kusdi Mulyadi, Yudhistira, & Fitri Windra Sari. 2010. *Introduction to Plant-Based Pesticides and Their Traditional Uses*. Forestry Research and Development Center, Indonesia. Soenandar, M., Aeni, M.N., & Raharjo, A. 2010. *Practical Guide to Making Organic Pesticides*. Agro Media Pustaka, Jakarta.

	Sudarmo, S. 2005. *Practical Guide to Making Safe and Environmentally Friendly Plant-Based Pesticides with Simple Testing Techniques*. Kanisius, Yogyakarta.
MPK 3214. Organic Synthesis (3 CREDITS)	
Material	Synthetic pathways, raw materials, reagents, and reaction conditions for synthesizing target compounds using retrosynthetic approaches, Disconnection techniques and functional group interconversion, Application of retrosynthesis approaches to aromatic and non-aromatic compounds, especially disconnection of C-X, C-N, and C-C bonds.
References	Solomon, T.W.G., & Fryhle, C.B. 2004. *Organic Chemistry*, 8th ed. John Wiley & Sons. Warren, S. 1982. *Organic Synthesis: The Disconnection Approach*. John Wiley & Sons. Warren, S. 1982. *Workbook for Organic Synthesis: The Disconnection Approach*. John Wiley & Sons.
MPK 3415. Agrochemical Synthesis (2 CREDITS)	
Material	Chemical synthesis techniques to enhance the value-added of agricultural products such as carbohydrates and triglycerides through functional group modifications.
References	Laszlo, P. 1995. *Organic Reaction Simplicity & Logic*. John Wiley & Sons. Mackie, R.K., & Smith, D.M. 1982. *Guidebook to Organic Synthesis*. Longmans. Sykes, P. 1989. *Guide to Organic Reaction Mechanisms*. Gramedia. Warren, S. 1985. *Organic Synthesis: The Disconnection Approach*. John Wiley & Sons. Warren, S. 1985. *Workbook for Organic Synthesis: The Disconnection Approach*. John Wiley & Sons.
MPK 3416. Natural Compound Structure Determination (3 CREDITS)	
Material	Application of spectroscopy principles to determine the structure of organic natural compounds, Spectroscopy techniques: ultraviolet, infrared, ^{1}H NMR, ^{13}C NMR, and mass spectrometry, Introduction to 2D NMR spectra (COSY, HSQC, HMBC, ROESY).
References	Budzikiewicz, H.D., Jerassi, C., & Williams, D.H. *Structure Elucidation of Natural Products by Mass Spectrometry*, Vol. I & II. Holden-Day. Crews, P., Rodriguez, J., & Jaspars, M. 2010. *Organic Structure Analysis*, 2nd ed. Oxford University Press. Field, L.D., Sternhell, S., & Kalman, J.R. 2013. *Organic Structures from Spectra*, 5th ed. John Wiley & Sons. Simpson, J.H. 2012. *Organic Structure Determination Using 2D NMR Spectroscopy: A Problem-Based Approach*, 2nd ed. Elsevier Inc.. Scott, A.L. 1964. *Interpretation of the Ultraviolet Spectra of Natural Products*. Pergamon. Webb, G.A. 1978. *Annual Reports on NMR Spectroscopy*, Vol. 8. Academic Press.
MPK 3508. General Biotechnology (3 CREDITS)	
Material	Definition, philosophy, and scope of biotechnology, Aseptic techniques, Cultivation and propagation of microbes, Fermentation, Basic principles of microbial extract isolation and characterization, Bioactivity testing, Enzyme technology: enzyme production (wild type & heterologous expression), enzyme applications, research prospects and challenges, Applications of biotechnology research.
References	Smith, J.E. 2009. *Biotechnology*, 5th ed. Cambridge University Press.
MPK 3509. Molecular Genetics and Genetic Engineering (3 CREDITS)	
Material	Definition, philosophy, and scope of molecular genetics, Genetic engineering techniques: cloning, genetic mutations, research developments, prospects, and applications.
References	Peacock, K.W. 2010. *Global Issues: Biotechnology and Genetic Engineering*. Infobase Publishing. Winnacker. 1986. *From Genes to Clones*. McGraw-Hill International.
MPK 3510. Advanced Biochemistry (3 CREDITS)	
Material	Amino acids and proteins: isolation and purification techniques, Protein amino acid analysis, Determination of N-terminal and C-terminal amino acids, Nucleic acids: electrophoresis and isoelectric focusing, Determination of nucleotide sequences, Introduction to computational biochemistry.
References	Berg, J.M., Tymoczko, J.L., & Stryer, L. 2002. *Biochemistry*, International edition. W.H. Freeman and Company. Jensen, F. 2007. *An Introduction to Computational Biochemistry*. John Wiley & Sons, Ltd.
MPK 3511. Enzymology (3 CREDITS)	

Material	Enzyme purification, Enzyme structure, Enzyme kinetics, Mechanisms of enzyme action, Control of enzyme activity, Enzymes in cellular organization, Enzyme turnover, Clinical aspects of enzymes (diagnostics and treatment), Enzyme technology.
References	Price, N.C., & Stevens, L. 1988. *Fundamentals of Enzymology*. Oxford Science Publications.

Chapter VIII
Biology Department/Study Programme

VIII.1 Introduction

The Biology Department is part of the Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Tanjungpura (UNTAN). It consists of one study program, namely the Biology Study Program. As of 2018, the Biology Department had 19 faculty members, consisting of 18 permanent civil servants (PNS) and one contract-based lecturer. Among them, there are nine lecturers who hold doctoral degrees (PhD), and ten lecturers who hold master's degrees (M.Sc/M.Si).

The Biology Study Program of FMIPA UNTAN is envisioned as an integrated and leading institution in human resource development for environmental and natural resource management, contributing to improved quality of life.
The establishment of the Biology Study Program was based on Dirjen Dikti Depdiknas Decree No. 3494/D/T/2001. The program has received an "A" accreditation rating, as per BAN-PT Decree No. 1129/SK/BAN-PT/Akred/S/IV/2018, valid until 24 April 2023.

Table 8.1: Faculty Members in the Biology Department

No	Name	NIP/NIDK	Rank	Functional Position
1	Dr. Dra. Siti Khotimah, M.Si	196702021997022001	IV/c	Associate Professor
2	Mukarlina, S.Si., M.Si	196804062000032001	III/d	Assistant Professor
3	Dr. Elvi Rusmiyanto P.W., M.Si	197109012000031003	III/d	Assistant Professor
4	Dr. Kustiati, S.Si, M.Si	197212102000032001	IV/a	Associate Professor
5	Masnur Turnip, S.Si., M.Sc	197208181998022001	III/d	Assistant Professor
6	Dr. Rafdinal, S.Si, M.Si	197108311999031002	IV/a	Associate Professor
7	Dr. Junardi, S.Si, M.Si	197206132000031001	IV/a	Associate Professor
8	Dr. Zulfa Zakiah, S.Si., M.Si	197306242000032001	III/d	Assistant Professor
9	Riza Linda, S.Si., M.Si	197005071999032001	III/d	Assistant Professor
10	Dr. Siti Ifadatin, S.Si., M.Si	197103272000032001	III/c	Assistant Professor
11	Tri Rima Setyawati, S.Si., M.Si	197403071999032002	III/c	Assistant Professor
12	Ari Hepi Yanti, S.Si., M.Sc	198404152008012008	III/b	Assistant Professor
13	Diah Wulandari Rousdy, S.Si, M.Sc	198510212008122003	III/b	Assistant Professor
14	Rahmawati, S.Si, M.Sc	198404092008122002	III/b	Assistant Professor
15	Irwan Lovadi, S.Si., M.App.Sc, Ph.D.	197803192001121002	III/c	Assistant Professor
16	Dr. Dwi Gusmalawati, S.Si, M.Si	198408072014042002	III/b	Assistant Professor
17	Riyandi, S.Si, M.Si	198606182015041001	III/b	Lecturer
18	Firman Saputra, S.Si, M.Sc	198302112008121003	III/a	Lecturer
19	Rikhsan Kurniatuhadi, S.Si, M.Si	8823370018	-	Lecturer

Table 8.2: Laboratory and Administrative Staff in the Biology Department

No	Name	Position
1	Emma Khairiah, S.Si	Biology Laboratory Technician
2	Sri Rahayu, S.Si	Zoology Laboratory Technician

No	Name	Position
3	Margie Surahman, S.Si	Biology Laboratory Technician

VIII.2 Vision and Mission

VIII.2.1 Vision

"To be an academically excellent program specializing in tropical wetland biology, globally oriented, and adaptive to technological and information advancements."

VIII.2.2 Mission

To achieve this vision, the Biology Study Program is committed to:

1. Providing integrated education and enhancing learning processes, focusing on quality improvements while optimizing local cultural wisdom.
2. Increasing the quantity and quality of research in tropical wetland biology, ensuring relevance to societal needs and workforce demands, while promoting creative and innovative research applications.
3. Implementing research outcomes in community service programs to support sustainable development.
4. Establishing collaborations with various stakeholders, including government institutions, private organizations, research agencies, and non-governmental organizations (NGOs).

VIII.3 Objectives

The Biology Study Program (PS Biologi) has established the following goals:

1. To produce graduates with strong integrity, high motivation, critical thinking, openness, independence, creativity, and innovative scientific abilities, particularly in tropical wetland and peatland biology in Kalimantan.
2. To develop biological knowledge that can be applied to related scientific fields or serve as a foundation for advanced education.
3. To equip graduates with biological expertise, methodologies, and fundamental skills, encompassing both cognitive and practical competencies, especially in wetland and tropical peatland studies.
4. To enable graduates to apply their knowledge and skills at local, national, and regional levels, ensuring relevance across various societal contexts.
5. To foster collaboration with stakeholders, including government institutions, private enterprises, research agencies, and NGOs, to enhance the quality of higher education's three core missions (Tri Dharma Perguruan Tinggi): education, research, and community service.

VIII.4 Graduate Profile

Graduates of the Biology Study Program (PS Biologi) are expected to play an active role in society and compete at national and regional levels. To achieve this, graduates must possess both fundamental biology knowledge and essential life skills/soft skills.

The core biological competencies required include Cell and molecular biology, bioconservation/ environmental sciences, Biotechnology, and Biosystematics. These competencies align with the six core disciplines in biology, as defined by the Indonesian Biology Professional Association (KOBI). Graduates can pursue careers in various fields, including:

1. Biological Researcher – Conducting scientific investigations in universities, research institutions, and private laboratories.
2. Academic in Biology – Becoming an educator or lecturer at high schools, universities, and training centers.
3. Natural Resource & Environmental Consultant – Advising on biodiversity conservation, environmental sustainability, and ecological assessments.
4. Bio-Entrepreneur (Biotechnology-Based Business Owner) – Applying biological principles in innovative business ventures such as organic farming, sustainable bioproducts, and environmental solutions.

VIII.5 Field study in Biology

Graduates of the Biology Study Program (PS Biologi) are expected to actively contribute to society and compete at both national and regional levels. To achieve this, Biology graduates must possess fundamental knowledge in biology as well as adequate life skills and soft skills.
The core biological competencies refer to graduates' understanding of key areas in biology, including cell and molecular biology, bioconservation/environmental science, biotechnology, and biosystematics. These are outlined within the six core branches of biology as established by the Indonesian Biology Professionals Association (KOBI).
Below are the graduate profiles for the Biology Study Program:
1. Biological Researcher
2. Biology Academic/Faculty Member
3. Consultant in Biological Resources/Environmental Affairs
4. Bio-Entrepreneur (Entrepreneur in the Field of Biology)

VIII.6 Curriculum
VIII.6.1 Learning Outcomes

Learning Outcomes of the Biology Study Programme		
Code	**Attitude and Values (English)**	**Sikap dan Tata Nilai (Indonesia)**
S1	Devoted to God Almighty, and being religious.	Bertakwa kepada Tuhan Yang Maha Esa dan bersikap religius
S2	Upholding human values in carrying out tasks based on religion, morals, and ethics.	Menjunjung tinggi nilai kemanusiaan dalam menjalankan tugas berdasarkan agama, moral dan etika.
S3	Contributing to improving the quality of social life, the nation, the country, and the civilization based on Pancasila.	Berkontribusi dalam peningkatan mutu kehidupan bermasyarakat berbangsa, bernegara, dan beradab berdasarkan Pancasila.
S4	Participating as proud and patriotic citizens, having nationalism and a sense of responsibility to the country and the nation.	Berperan sebagai warga negara yang bangga dan cinta tanah air, memiliki nasionalisme serta rasa tanggung jawab pada negara dan bangsa.
S5	Respect for the diversity of culture, views, religions, and beliefs, as well as the opinions or original inventions of others.	Menghargai keanekaragaman budaya, pandangan, agama dan kepercayaan, serta pendapat atau temuan orisinal orang lain.
S6	Cooperating and having social sensitivity and concern for people and the environment.	Bekerja sama dan memiliki kepekaan sosial serta kepedulian terhadap masyarakat dan lingkungan

Learning Outcomes of the Biology Study Programme		
S7	Obeying the law and discipline in the society and the state.	Taat hukum dan disiplin dalam kehidupan bermasyarakat dan bernegara
S8	Internalizing the values, norms, and academic ethics.	Menginternalisasi nilai, norma, dan etika akademik.
S9	Showing a responsible attitude on the job in one's field of expertise independently.	Menunjukkan sikap bertanggung jawab atas pekerjaan di bidang keahliannya secara mandiri.
S10	Internalizing the spirit of independence, innovation, effort and entrepreneurship.	Menginternalisasi semangat kemandirian, kejuangan, dan kewirausahaan.
Code	**Employment Competence/General Skill**	**Kemampuan Kerja/Keterampilan Umum**
KU1	Being able to implement logical, critical, systematic and innovative ways of thinking in the context of the development or application of science and/or technology according to one's expertise.	Mampu menerapkan pemikiran logis, kritis, sistematis, dan inovatif dalam konteks pengembangan atau implementasi ilmu pengetahuan dan/atau teknologi sesuai dengan bidang keahliannya.
KU2	Being able to demonstrate independent, qualified and measurable performance.	Mampu menunjukkan kinerja mandiri, bermutu, dan terukur.
KU3	Being able to assess the implication of the development or implementation of science, technology or art in accordance with one's expertise based on scientific rules, methods, and ethics in order to produce a solution, design idea or art critique, writing scientific description of the study results in the form of an undergraduate thesis and uploading it on the university's website.	Mampu mengkaji implikasi pengembangan atau implementasi ilmu pengetahuan, teknologi atau seni sesuai dengan keahliannya berdasarkan kaidah, tata cara dan etika ilmiah dalam rangka menghasilkan solusi, gagasan desain atau kritik seni, menyusun deskripsi saintifik hasil kajiannya dalam bentuk skripsi atau tugas akhir dan mengunggahnya dalam laman perguruan tinggi.
KU4	Writing a scientific description of the study results mentioned above in the form of an undergraduate thesis or final project report and uploading it on the university's website.	Menyusun deskripsi saintifik hasil kajian tersebut di atas dalam bentuk skripsi atau laporan tugas akhir dan mengunggahnya dalam laman perguruan tinggi.
KU5	Being able to make appropriate decisions in the context of the settlement of the problem in one's field of expertise, based on the analysis of information and data.	Mampu mengambil keputusan secara tepat dalam konteks penyelesaian masalah di bidang keahliannya, berdasarkan hasil analisis informasi dan data.
KU6	Being able to maintain and develop a network of mentors working with colleagues, peers, both inside and outside the institution.	Mampu memelihara dan mengembangkan jaringan kerja dengan pembimbing kolega, sejawat baik di dalam maupun di luar lembaganya.
KU7	Being able to be responsible for the achievement of group work and supervision, and evaluation of the completion of assigned work to workers who are under one's responsibility	Mampu bertanggung jawab atas pencapaian hasil kerja kelompok dan melakukan supervisi dan evaluasi terhadap penyelesaian pekerjaan yang ditugaskan kepada pekerja yang berada di bawah tanggung jawabnya.
KU8	Being able to conduct the process of self-evaluation on the working groups under one's responsibility, and being able to manage learning independently.	Mampu melakukan proses evaluasi diri terhadap kelompok kerja yang berada dibawah tanggung jawabnya, dan mampu mengelola pembelajaran secara mandiri.

Learning Outcomes of the Biology Study Programme		
KU9	Being able to document, store and rediscover data to ensure the validity and prevent plagiarism.	Mampu mendokumentasikan, menyimpan, mengamankan, dan menemukan kembali data untuk menjamin kesahihan dan mencegah plagiasi.
Code	**Mastery of Knowledge**	**Penguasaan Pengetahuan**
PP1	Mastering the theoretical concepts of molecular and cell biology, structure and development, systematics, physiology, ecology and evolution.	Menguasai konsep teoritis biologi sel dan molekuler, struktur dan perkembangan, sistematika, fisiologi, ekologi dan evolusi.
PP2	Mastering the concepts of statistics, biophysics, organic chemistry and biochemistry.	Menguasai konsep statistika, biofisika, kimia organik dan biokimia.
PP3	Mastering the applied concepts of biology and technology relevant in management and use of sustainable bio-resources and environment through the application of knowledge about wetland and tropical peat ecosystems.	Menguasai konsep aplikasi biologi dan teknologi yang relevan dalam pengelolaan dan pemanfaatan sumber daya hayati dan lingkungannya, terutama pengetahuan tentang ekosistem lahan basah dan gambut tropis.
PP4	Mastering the principles and basic concepts of measurement based on basic technology, software, basic instruments, standardized methods for analysis and synthesis in the general and specific fields of biology.	Menguasai prinsip dan konsep pengukuran berbasis teknologi dasar, perangkat lunak, instrumen dasar, metode standar untuk analisis dan sintesis pada bidang biologi yang umum dan spesifik.
PP5	Mastering the principles and concepts of local wisdom in the use and management of bio-resources on wetland and tropical peat ecosystems.	Menguasai prinsip dan konsep kearifan lokal dalam pemanfaatan & pengelolaan SDH pada ekosistem lahan basah dan gambut tropis.
Code	**Employment Competence/Specific Skills**	**Kemampuan Kerja/Keterampilan Khusus**
KK1	Being able to present alternative solutions to biological problems related to the management of bio-resources and the environment in a sustainable manner through the implementation of knowledge, methods of biology and technology (especially on wetland and tropical peat ecosystems and border areas that are relevant as a basis for appropriate decision-making.	Mampu menyajikan alternatif solusi terhadap masalah biologi terkait pengelolaan sumber daya hayati dan lingkungan secara berkelanjutan melalui penerapan pengetahuan, metode biologi dan teknologi (khususnya tentang ekosistem lahan basah dan gambut tropis serta daerah perbatasan) yang relevan sebagai dasar pengambilan keputusan secara tepat.
KK2	Being able to apply biology science in the scope of daily life is beneficial to society.	Mampu mengaplikasikan keilmuan biologi pada lingkup kehidupan sehari-hari yang bermanfaat bagi masyarakat.
KK3	Being able and skillful in applying local wisdom in the use and preservation of bio-resources and environment as well as wetland and tropical peat ecosystems.	Mampu dan terampil dalam mengaplikasikan kearifan lokal dalam pemanfaatan & pelestarian SDH dan lingkungan ekosistem lahan basah dan gambut tropis.
KK4	Being able to manage bio-resources in wetland and tropical peat ecosystems in a limited scope.	Mampu mengelola sumber daya hayati pada ekosistem lahan basah dan gambut tropis dalam lingkup terbatas.

Learning Outcomes of the Biology Study Programme		
KK5	Being able to communicate effectively both verbally and writing.	Mampu berkomunikasi secara efektif baik verbal maupun tulisan

VIII.6.2 Curriculum Structure

a. Compulsory Courses

Semester I				
No.	Code	Course Name	Credits (SKS)	Prerequisites
1	MKWU 4	Indonesian Language	2 (2-0)	-
2	MPB 1100	General Biology	4 (3-1)	-
3	MPU 103	Basic Physics	3 (2-1)	-
4	MPU 109	Basic Chemistry	3 (2-1)	-
5	MPU 101	Basic Mathematics	3 (3-0)	-
6	MPU 105	Introduction to Information Technology	2 (1-1)	-
7	MKWU 2	Pancasila	2 (2-0)	-
Total Credits			19 SKS	
Semester II				
No	Code	Course Name	Credits (SKS)	Prerequisites
1	MKWU 1	Religious Education	3 (3-0)	-
2	MPB 1200	English	3 (3-0)	-
3	MPB 1201	Organic Chemistry	2 (2-0)	-
4	MPB 1202	Climatology	2 (2-0)	-
5	MPB 1203	Cell and Molecular Biology	2 (2-0)	-
6	MPB 1204	Plant Morphology and Anatomy	4 (3-1)	-
7	MPB 1205	Animal Anatomy	3 (2-1)	-
Total Credits			19 SKS	
Semester III				
No	Code	Course Name	Credits (SKS)	Prerequisites
1	MPB 2106	Biochemistry	3 (2-1)	MPB 1201 (Organic Chemistry)
2	MPB 2107	Microbial Systematics	3 (2-1)	MPB 1100 (General Biology)
3	MPB 2108	Wetland Biology	2 (2-0)	MPB 1100 (General Biology)
4	MPB 2109	Plant Embryogenesis	2 (2-0)	MPB 1204 (Plant Morphology and Anatomy)
5	MPB 2110	Histology	3 (2-1)	MPB 1205 (Animal Anatomy)
6	MPB 2111	Genetics	4 (3-1)	MPB 1203 (Cell and Molecular Biology)
7	MPB 2112	Biostatistics I	2 (2-0)	MPU 101 (Basic Mathematics)
Total Credits			19 SKS	
Semester IV				
No	Code	Course Name	Credits (SKS)	Prerequisites
1	MPB 2213	Biostatistics II	2 (2-0)	MPB 2112 (Biostatistics I)

No	Code	Course Name	Credits (SKS)	Prerequisites
2	MPB 2214	Cryptogamic Systematics	3 (2-1)	MPB 1204 (Plant Morphology and Anatomy)
3	MPB 2215	Invertebrate Systematics	3 (2-1)	MPB 1205 (Animal Anatomy)
4	MPB 2216	Animal Embryology	3 (2-1)	MPB 2110 (Histology)
5	MPB 2217	Microbial Physiology	2 (2-0)	MPB 2107 (Microbial Systematics)
6	MPB 2218	Microtechniques	3 (2-1)	MPB 2110 (Histology), MPB 1204 (Plant Morphology and Anatomy)
Total Credits			16 SKS	
Semester V				
No	Code	Course Name	Credits (SKS)	Prerequisites
1	MPB 3119	Evolution	2 (2-0)	MPB 1100 (General Biology)
2	MPB 3120	Phanerogamae Systematics	3 (2-1)	MPB 1204 (Plant Morphology and Anatomy)
3	MPB 3121	Vertebrate Systematics	3 (2-1)	MPB 1205 (Animal Anatomy)
4	MPB 3122	Plant Ecology	3 (2-1)	MPB 2108 (Wetland Biology)
5	MPB 3123	Animal Ecology	3 (2-1)	MPB 2108 (Wetland Biology)
6	MPB 3124	Conservation Biology	2 (2-0)	MPB 1100 (General Biology)
Total Credits			16 SKS	
Semester VI				
No	Code	Course Name	Credits (SKS)	Prerequisites
1	MPB 3225	Plant Physiology	4 (3-1)	MPB 1204 (Plant Morphology and Anatomy), MPB 2109 (Plant Embryogenesis)
2	MPB 3226	Animal Physiology	4 (3-1)	MPB 1205 (Animal Anatomy), MPB 2110 (Histology)
3	MPB 3227	Biotechnology	2 (1-1)	MPB 1203 (Cell and Molecular Biology)
4	MPB 3228	Research Methodology	3 (3-0)	MPB 2213 (Biostatistics II)
5	MPB 3229	Practical Work / KKM (Community Service)	2 (2-0)	Completion of 90 SKS, GPA ≥2.00
6	MKWU 3	Citizenship	2 (2-0)	-
Total Credits			17 SKS	
Semester VII				
No	Code	Course Name	Credits (SKS)	Prerequisites
1	MPB 4030	Seminar	2	Completion of 120 SKS, GPA >2.00
2	MPB 4131	Entrepreneurship	2 (2-0)	-

No	Code	Course Name	Credits (SKS)	Prerequisites
Total Credits			4 SKS	
Semester VIII				
No	Code	Course Name	Credits (SKS)	Prerequisites
1	MPB 4032	Thesis	6	Completion of >120 SKS
Total Credits			6 SKS	

* Courses are offered in odd and even semesters.

b. Elective Courses

Field study	Code	Course Name	Credits (SKS)	Prerequisites	Semester
Botany	MPB 2233	Ethnobotany	2	General Biology	Even (4)
	MPB 2238	Plant Biochemistry	2	Biochemistry	Even (4)
	MPB 2235	Mangrove Botany	2	Phanerogamae Systematics	Even (6)
	MPB 2236	Orchidology	2	Phanerogamae Systematics	Even (6)
	MPB 2237	Weed Science	3	Plant Ecology	Even (6)
	MPB 3139	Phytopathology	3	Microbial Physiology & Plant Physiology	Odd (7)
	MPB 4140	Plant Ecophysiology	2	Plant Physiology	Odd (7)
	MPB 4141	Tissue Culture Techniques	2	Plant Physiology	Odd (7)
	MPB 4142	Phytohormones	2	Plant Physiology	Odd (7)
	MPB 2234	Nutrient Science	2	Plant Physiology	Even (8)
Zoology	MPB 2243	Animal Nutrition	2	Biochemistry	Even (4)
	MPB 3149	Parasitology	3	Invertebrate Systematics	Odd (5)
	MPB 3150	Entomology	3	Invertebrate Systematics	Odd (5)
	MPB 3151	Carcinology	3	Invertebrate Systematics	Odd (5)
	MPB 3152	Annelida Biology	3	Invertebrate Systematics	Odd (5)
	MPB 3244	Ichthyology	3	Vertebrate Systematics	Even (6)
	MPB 3245	Herpetology	3	Vertebrate Systematics	Even (6)
	MPB 3246	Ornithology	3	Vertebrate Systematics	Even (6)
	MPB 3247	Mammalogy	3	Vertebrate Systematics	Even (6)

	MPB 3248	Primatology	2	Vertebrate Systematics	Even (6)
	MPB 4153	Endocrinology	2	Animal Physiology	Odd (7)
	MPB 4154	Immunology	2	Animal Physiology	Odd (7)
	MPB 4155	Animal Ecophysiology	2	Animal Physiology	Odd (7)
	MPB 4156	Ethology	2	Animal Physiology	Odd (7)
Microbiology	MPB 4159	Industrial Microbiology	2	Microbial Physiology	Odd (5)
	MPB 4160	Food Microbiology	3	Microbial Physiology	Odd (5)
	MPB 4161	Medical Microbiology	2	Microbial Physiology	Odd (5)
	MPB 3257	Mycology	3	Microbial Systematics, Cryptogamic Systematics	Even (6)
	MPB 3258	Environmental Microbiology	3	Microbial Systematics, Microbial Physiology	Even (6)
Genetics & Molecular Biology	MPB 2263	Plant Genetics	2	Genetics	Even (4)
	MPB 2264	Population Genetics	2	Genetics	Even (4)
	MPB 3162	Enzymology	2	Biochemistry	Odd (5)
	MPB 4166	Microbial Genetics	2	Genetics, Microbial Physiology	Odd (5)
	MPB 4165	Genetic Engineering	2	Biotechnology	Odd (7)
Ecology	MPB 2267	Waste Treatment Technology	2	General Biology	Even (4)
	MPB 2271	Ecology of Wetlands and Tropical Peatlands	3	Wetland Biology	Even (4)
	MPB 3176	Soil Biology	3	Invertebrate Systematics, Cryptogamic Systematics, Microbial Systematics	Odd (5)
	MPB 2268	Marine Biology	3	Invertebrate Systematics	Even (6)
	MPB 3272	Limnology	3	Plant Ecology, Animal Ecology	Even (6)
	MPB 3273	Biogeography	2	Conservation Biology	Even (6)

	MPB 2269	Environmental Impact Assessment (EIA)	2	Plant Ecology, Animal Ecology	Odd (7)
	MPB 2270	Environmental Pollution	3	Plant Ecology, Animal Ecology	Even (7)
	MPB 3174	Planktonology	3	Cryptogamic Systematics, Invertebrate Systematics, Plant Ecology, Animal Ecology	Odd (7)
	MPB 4175	Environmental Toxicology	3	Animal Physiology, Plant Physiology	Odd (7)

VIII.6.3 Courses Descriptions

a. Compulsory Courses

SEMESTER I

MKWU 4. Bahasa Indonesia (Indonesian Language) (2 SKS)	
	This general course aims to enable students to express their thoughts orally and in writing using correct Indonesian language rules, to promote Indonesian as a medium of scientific discourse and a unifying national language.
Topics	1. Developing, exploring, and analyzing the context of academic texts collaboratively and independently.
	2. Developing, exploring, and analyzing book review texts collaboratively and independently.
	3. Developing, exploring, and analyzing proposal texts collaboratively and independently.
	4. Developing and exploring report texts collaboratively and independently.
	5. Developing, exploring, and analyzing models of scientific article texts collaboratively and independently.
References	1. Awalludin. 2017. *Pengantar Bahasa Indonesia untuk Perguruan Tinggi*. Deepublish, Yogyakarta.
	2. Kemenristekdikti. 2016. *Modul Pendidikan Bahasa Indonesia Untuk Perguruan Tinggi*. Dirjen Belmawa Kemenristekdikti, Jakarta.
	3. Lindayani, D.A. et al. 2016. *Bahasa Indonesia Sebagai Mata Kuliah Dasar Umum*. Gramedia, Jakarta.
	4. Surono et al. 2009. *Bahasa Indonesia untuk Perguruan Tinggi*. Faculty of Literature UNDIP, FaSindo.
MPB 1100. General Biology (4 SKS)	

Topics	Introduction: definition of biology, its relationship with other sciences, and discoveries in the field of biology.
	Scientific methods in biology: biology as the science of living organisms; scientific and non-scientific approaches; scientific attitudes and products.
	The cell as the basis of life: cell theory, cell structures in living organisms, and differences between animal and plant cells.
	Chemical substances in cells; cellular metabolism (anabolism and catabolism).
	Biodiversity: variation in living organisms; fundamentals of classification.
	Anatomy, physiology, and organ systems: digestive system (including enzymes and vitamins); transport system; coordination system (nerves, hormones, and senses); respiratory, excretory, and reproductive systems.
	Reproduction in living organisms: reproduction in lower and higher plants, lower and higher animals, and microorganisms.
	Genetics: Mendelian laws of inheritance, gene interactions.
	Ecosystems: structure and function, inter-organism interactions (intra- and interspecies).
	Evolution: origin of life, evidence for evolution, and theories of organic evolution.
References	1. Campbell, N.A., Reece, J.B., & Mitchell, L.G. (2004). *Biologi* (Vol. 1–3). Erlangga. Jakarta.
	2. Kimball, J.W. (1982). *Biology* (Transl. by Siti Sutarmi & Nawangsari Sugiri). Vol. 1–3. Erlangga. Jakarta.
	3. Ruse, M. (1982). *Darwinism Defended*. The Benjamin/Cummings Publishing Co. California.
	4. Simpson, G.G. & Bech, W.S. (1985). *An Introduction to Biology*. St. Louis: Brace and Word.
	5. Storer, T.I., & Usinger, R.L. (1978). *General Biology*. New Delhi: McGraw-Hill Publishing Co. Ltd.
	6. Weisz, P.B. (1981). *The Science of Biology*. New York: McGraw-Hill.
	7. Wolfe, L.S., Miller, G., & Tyder, G. (1984). *Biology: The Foundation*. California: Wadsworth Publishing Co., Inc.
MPU 103. Basic Physics (3 SKS)	
Topics	Physics and measurement; fundamentals of vectors; motion in one, two, and three dimensions; Newton's laws of motion and their applications; work and energy; linear momentum and collisions; rotation of rigid bodies about a fixed axis; angular momentum and torque; equilibrium of rigid bodies; simple harmonic motion; universal law of gravitation; fluid and solid mechanics; wave motion; sound waves, superposition and standing waves; temperature; thermal expansion and ideal gases; heat and the First Law of Thermodynamics; kinetic theory of gases; heat engines; entropy and the Second Law of Thermodynamics.
References	1. Nolan, Peter J. *Fundamentals of College Physics*. Melbourne: Wm C. Brown Publisher.

	2. Serway, Raymond A. 1986. *Physics for Scientists and Engineers with Modern Physics*. Saunders and Co.
	3. Giancoli, Douglas C. 1988. *Physics for Scientists and Engineers*. Prentice Hall.
	4. Ohanian & Hans C. 1989. *Physics*. Norton.
MPU 109. Basic Chemistry (3 Credits)	
Topics	Atomic structure; development of the periodic system of elements; stoichiometry; molecular structure; states of matter; chemical energetics; chemical equilibrium; solutions; solubility and complex ion equilibrium; solubility product; colloids; redox concepts; nuclear chemistry; carbon compounds.
References	1. Brady, J.E., & Holum, J.R. (1988). *Fundamentals of Chemistry*. John Wiley and Sons Inc.
	2. Mahan, B.M., & Mayers, R.J. (1987). *University Chemistry*. The Benjamin Cummings Publishing Co.
	3. Brady, J.E. (1990). *General Chemistry: Principles and Structure*. John Wiley and Sons.
MPU 101. Basic Mathematics (3 Credits)	
Topics	Sets, number systems, functions, limits, continuity, derivatives, differentials, tangent and normal lines, higher-order derivatives, extrema of functions, indefinite integrals, applications of definite integrals, vectors, matrices, determinants, and systems of linear equations.
References	1. Anton, H. (1994). *Elementary Linear Algebra* (7th ed.). John Wiley and Sons, Inc.
	2. Anton, H., & Rorres, C. (2000). *Elementary Linear Algebra, Applications Version* (8th ed.). John Wiley and Sons, Inc.
	3. Rainville, E.D. (1974). *Elementary Differential Equations* (5th ed.). MacMillan.
MPU 105. Introduction to Information Technology (2 Credits)	
Topics	Types and development of computer hardware, history of computer systems, system components, system operation, input, output, storage, data and information, document processing using office applications, introduction to internet, email, mailing lists, e-learning, cloud storage, file management, creating and customizing blogs.
References	1. Jogiyanto, H.M. *Pengenalan Komputer*. Yogyakarta: Andi Offset.
	2. Turban, E., Leidner, D., McLean, E., & Wetherbe, J. (2005). *Information Technology for Management* (5th ed.). John Wiley & Sons, Inc.
	3. Williams, B.K., & Sawyer, S.C. (2007). *Using Information Technology* (7th ed.). McGraw-Hill.
	4. Siarto, E. (2010). *Head First WordPress*. O'Reilly.
	5. Google Drive, WordPress, Yahoo Groups

MKWU 2. Pancasila (2 Credits)	
Topics	Why and how Pancasila is taught in higher education; Pancasila in the historical context of Indonesian national development; the urgency of Pancasila as the foundation of the Republic of Indonesia; Pancasila as the national ideology; Pancasila as a philosophical system; Pancasila as an ethical system; Pancasila as the foundational values for the development of science.
References	1. Kemenristekdikti. (2016). *Modul Pendidikan Pancasila Untuk Perguruan Tinggi*. Jakarta: Dirjen Belmawa Kemenristekdikti.
	2. Ali, A.S. (2009). *Negara Pancasila: Jalan Kemaslahatan Berbangsa*. Jakarta: Pustaka LP3ES.
	3. Bakry, N.M. (2010). *Pendidikan Pancasila*. Yogyakarta: Pustaka Pelajar.
	4. Kaelan. (2013). *Negara Kebangsaan Pancasila: Kultural, Historis, Filosofis, Yuridis dan Aktualisasinya*. Yogyakarta: Penerbit Paradigma.

SEMESTER II

MKWU 1. Religion (3 Credits)	
Topics	This course offers religious instruction based on the student’s belief. The topics are tailored by faith group:
	1. Islam: Understanding the human relationship with God, the role of religion in happiness, integrating faith (Iman), practice (Islam), and excellence (Ihsan) in shaping a complete person (Insan Kamil), developing Qur'anic character, contextualizing Islam in Indonesia, promoting unity in diversity, facing modernization, contributing to world civilization, and the function of campus mosques in fostering Islamic culture.
	2. Protestant Christianity: (Same content as above listed under Islam) *(Note: This appears to be a duplication in the source text.)*
	3. Catholicism: Exploring faith in God through Christ within the Church and society to develop personal attitudes and mental growth.
	4. Buddhism: Structure and teachings of the Tripitaka; purpose and meaning of life; universal law in daily life; moral norms as a life pattern; harmony of science and art; Buddhist societal views; interreligious harmony; cultural and political dynamics in an Indonesian context; meditation for character development.
	5. Hinduism: Humanistic personality development; historical relevance of Hinduism; Brahmavidya teachings to instill faith and devotion; importance of the Veda; Hindu views on leadership, ethics, creativity, and harmony; role of religious art; awareness of being a social being in line with Hindu teachings.

	6. Confucianism: Purpose of life and life after death; integration of belief, trust, loyalty, and reverence in forming virtuous character; diversity and Confucian contributions to civilization; principles of modernity and Indonesian identity; social, political, scientific, and educational views; student roles in preserving Confucian culture.
References	A wide selection depending on religion, including:
	1. *The Holy Qur'an*, Hadith collections
	2. Kemenristekdikti modules (2016) for each religion
	3. Ali, Mukti. *Memahami Agama Islam*
	4. Ariarajah, Wesley. *Alkitab dan Orang-orang yang Berkepercayaan Lain*
	5. Ismartono, I., S.J. *Kuliah Agama Katolik*
	6. Ekayana. *Sains dan Buddha Dharma*
	7. Pine, S.H., et al. *Organic Chemistry* (for later course)
	… and others depending on specific religious traditions.
MPB 1200. English Language (3 Credits)	
Topics	Emphasizes the use of English at intermediate to pre-advanced levels with a focus on understanding scientific texts and expanding vocabulary and expressions. Grammar is introduced contextually. The course reinforces skills through exercises in reading, pronunciation, grammar refinement, vocabulary building, and idiom comprehension. Special attention is paid to correcting common errors.
References	*(Not specified in the original document.)*
MPK 1201. Organic Chemistry (2 Credits)	
Topics	Introduction to carbon compounds, including straight-chain and cyclic compounds; aromatic compounds; biomolecules such as proteins, fats, carbohydrates, vitamins, and enzymes.
References	1. Pine, S.H., Hendrickson, J.B., Cram, D.J., & Hammond, G.M. (1983). *Organic Chemistry*. McGraw-Hill, Sydney.
	2. Dowber, J.G., & Moore, A.T. (1990). *Chemistry for Life Science*. Macmillan Education, London.
MPB 1202. Climatology (2 Credits)	
Topics	Definition and scope of climatology; benefits of climatology; understanding the atmosphere, its composition and layer divisions; global climate diversity and climate change; climate and the distribution of living organisms; evolution of climate classification systems; fundamentals of climate classification; global and Indonesian climate classifications, including Köppen; meso- and microclimate variations and climate's impact on microclimates.

	Physical aspects of light, angle and distance influences, radiant intensity, blackbody radiation spectrum distribution, shortwave spectrum characteristics, estimation of direct vs diffuse radiation, longwave radiation, energy budgets and sunlight radiation, photoperiodism, light measurements.
	Understanding temperature: air temperature dynamics and profiles, soil temperature profiles, heat transfer principles, biases in temperature measurement, temperature instruments, measurement units, climatological station measurements, regional temperature variation in Indonesia.
	Humidity and precipitation: air vapor dynamics, humidity profiles, instruments and regulation of air humidity, and stages of the hydrological cycle.
References	1. Lakitan, B. (1994). *Dasar-Dasar Klimatologi*. PT Grafindo Perkasa. Jakarta.
	2. Larcher, W. (1995). *Physiological Plant Ecology*. Springer Verlag. Berlin.
	3. Mather, J.R. (1991). *Climatology: Foundation and Applications*. John Wiley & Sons.
	4. Tjasyono, B. (2004). *Klimatologi* (2nd ed.). ITB Press. Bandung.
	5. Trewartha, G.T., & Horn, L.H. (1995). *An Introduction to Climate*. Trans. Sri Andani. Gadjah Mada University Press. Yogyakarta.
	6. Partridge, I.J., & Ma'shum, M. (2002). *Kapan Hujan Turun*. Dept. of Primary Industries, Queensland.
MPB 1203. Cell and Molecular Biology (2 Credits)	
Topics	Introduction. Basic structure and composition of the plasma membrane and its function. Organization of the cytosol and cytoskeleton: components, structure, and function. Muscle and non-muscle cell movement; mechanisms of flagella and cilia. Nuclear membrane, genetic material, definitions of genome, gene, and cistron; nuclear matrix and nucleolus. Ribosome structure and protein synthesis. History, structure, and function of mitochondria and chloroplasts as energy-generating organelles. Structure and function of cytoplasmic membrane systems: endoplasmic reticulum, Golgi apparatus, lysosomes, and peroxisomes. Cell division—mitosis (karyokinesis and cytokinesis). Intercellular junctions, extracellular matrix, and chemical communication between cells.
References	1. Alberts, B. et al. (1989). *Molecular Biology of the Cell*. Garland Publishing Inc. New York.
	2. Issoegianti, S.M.R. (1993). *Biologi Sel*. UGM Press. Yogyakarta.
	3. Smith & Wood. (1993). *Cell Biology*. Chapman and Hall. London.
	4. Thorpe, N.O. (1984). *Cell Biology*. John Wiley & Sons. New York.
	5. Wolf, S.L. (1993). *Molecular and Cellular Biology*. Wadsworth Publishing. California.
MPB 1204. Plant Morphology and Anatomy (4 Credits)	

Topics	Leaf morphology, stem morphology, root morphology, flower morphology, fruit and seed morphology. Leaf anatomy, primary and secondary stem anatomy, periderm, primary and secondary root anatomy, flower, fruit, and seed anatomy.
References	1. Tjitrosoepomo, G. (1988). *Morfologi Tumbuhan*. Gadjah Mada University Press. Yogyakarta.
	2. Hidayat, E. (1991). *Anatomi Tumbuhan Berbiji*. Ganesha Press. Bandung.
	3. Suradinata, T. (1999). *Struktur Tumbuhan*. Ganesha Press. Bandung.
MPB 1205. Animal Anatomy (3 Credits)	
Topics	Integumentary system: general skin structure and function; fish integument with epidermal and dermal derivatives; tetrapod integument with epidermal derivatives. Skeletal system: general function; skull components; vertebral column; vertebra structure; ribs; sternum; pectoral and pelvic girdles; fins and limbs; types of joints.
	Muscular system: structure and function of skeletal muscles; arrangement and types of major muscles.
	Digestive system: oral cavity, gastrointestinal tract, salivary glands, liver and gallbladder, pancreas.
	Respiratory system: aquatic and cutaneous respiration; gills; swim bladders in fish; lungs in tetrapods.
	Circulatory system: blood and hematopoietic tissue; general circulation; heart; blood and lymph vessels.
	Excretory system: kidneys and urinary tract, general kidney structure.
	Genital system: male and female gonads and ducts; accessory and copulatory organs.
	Nervous and sensory systems: structure and elements; spinal cord layout; cranial and spinal nerves; brain structures; sense organs.
	Endocrine system: structure and function of endocrine glands; neurosecretion.
References	1. Radiopoetra (1975). *Zoologi*. Faculty of Biology, UGM. Yogyakarta.
	2. Elliot (1979). *Guide for Zoology* (4th ed.). Burgess Publishing. New York.
	3. Parker & Haswell (1977). *A Textbook of Zoology* (9th ed.). MacMillan & Co. London.
	4. Sisson & Grossman (1969). *The Anatomy of Domestic Animals* (7th ed.). W.B. Saunders Co. Philadelphia.
	5. Storer & Ussinger (1987). *General Zoology* (7th ed.). McGraw-Hill. New York.
	6. Weichert (1975). *Anatomy of the Chordates* (3rd ed.). McGraw-Hill. New York.

SEMESTER III

MPB 2106. Biochemistry (3 Credits)	
Topics	Introduction. Biomolecules: proteins, amino acids (structure), polysaccharides, glucose (structure), lipids and membranes (structure). Metabolism: glycogen metabolism, glycolysis, alcohol and lactic acid fermentation; Krebs cycle, respiratory chain and oxidative phosphorylation. Lipid metabolism: beta-oxidation, fatty acid biosynthesis; cholesterol metabolism, phospholipid and glycolipid metabolism. Amino acid metabolism. Nucleotide metabolism (chemical structure of nucleotides, nucleosides and nitrogenous bases, DNA synthesis). Structure, manipulation, and expression of nucleic acids. Enzymes, coenzymes, enzyme activity regulation. Catalytic mechanisms, kinetics, and enzyme reaction rates.
References	1. Voet & Voet. 1995. *Biochemistry*, 2nd ed. John Wiley & Sons, USA.
	2. Montgomery, R. et al. 1993. *Biokimia* (translation). Gadjah Mada University Press, Yogyakarta.
	3. Girindra, A. 1986. *Biokimia I*. Gramedia, Jakarta.
MPB 2107. Microbial Systematics (3 Credits)	
Topics	Introduction to systematics, taxonomy and classification; numerical-phenetic classification; molecular-phylogenetic classification; chemotaxonomy; nomenclature; microbial identification; diversity of bacteria, archaea, and fungi; role of culture collections and international databases in microbial systematics.
References	1. Goodfellow, M. 2000. *Microbial Systematics: Background and Users* in Applied Microbial Systematics. Kluwer Academic.
	2. Kendrick, B. 2000. *The Fifth Kingdom*, 3rd ed. Focus Publishing.
MPB 2108. Wetland Biology (2 Credits)	
Topics	Introduction: terminology, definitions, classification, and scope. Economic values: biodiversity resources, energy sources, transport, ecotourism. Ecological functions: habitat, hydrological regulation, natural disaster mitigation, and other attributes (social, cultural, educational, and research). Ecological factors: climatic, physiographic, edaphic (soil), and biotic. Ecological processes: geomorphological and hydrological. Wetland systems: marine, estuarine, palustrine, riverine. Biotic and abiotic factors, characteristic wetland flora and fauna.
References	1. Nirarita et al. 1996. *Ekosistem Lahan Basah di Indonesia*. Wetland International – Canada Fund.
	2. Bengen, D.G. 2001. *Technical Guidelines for Recognizing and Managing Mangrove Ecosystems*. IPB.
MPB 2109. Plant Embryogenesis (2 Credits)	
Topics	Flower, microsporangium, male gametophyte, megasporangium, female gametophyte, pollination and fertilization, endosperm, embryo, apomixis, seed, the relationship between embryology and taxonomy, embryological research.
References	1. Bojwani & Bhatnagar. 1979. *The Embryology of Angiosperms*, 3rd ed. Delhi.

	2. Evert, R.F. 2006. *Esau's Plant Anatomy*, 3rd ed. Wiley, New Jersey.
	3. Fahn, A. 1990. *Plant Anatomy*, 4th ed. Pergamon.
	4. Lersten, N.R. 2004. *Flowering Plant Embryology*. Blackwell, USA.
MPB 2110. Animal Histology (3 Credits)	
Topics	Microscopic composition and histophysiology of epithelial, connective, muscle, and nerve tissues. Blood circulation and lymphatic systems. Endocrine, digestive, respiratory, uropoietic, genital, and integumentary systems.
References	1. Junqueira, L.C. & Carneiro, J. 1992. *Basic Histology I*, 3rd ed. Lange Medical.
	2. Ham, A.W. & Cormack, D.H. 1974. *Textbook of Histology*. Lippincott.
	3. Bloom, W. & Fawcett, D.W. 1979. *Textbook of Histology*. Saunders.
	4. Hammerson, F. & Sobotta, M. 1985. *Histology Color Atlas*. Urban & Schwarzenberg.
MPB 2111. Genetics (4 Credits)	
Topics	Introduction. Cell division: mitosis and meiosis. Mendelian genetics: mono-, di-, trihybrid crosses, modifications, gene interactions, sex linkage, quantitative genetics. Linkage, crossing over, chromosome mapping. Non-Mendelian inheritance, chromosomal variation, sex determination. DNA/RNA: structure, replication, mutation, repair, expression, and protein synthesis. Genetics of cancer, population genetics, and evolution.
References	1. Griffith, A.J.F. et al. 2005. *An Introduction to Genetic Analysis*, 8th ed. Freeman.
	2. Klug, W.S. & Cummings, M.R. 1996. *Essentials of Genetics*. Prentice Hall.
	3. Tamarin, R.H. 1996. *Principles of Genetics*, 5th ed.
	4. Ayala, F.J. & Kiger, J.A. 1984. *Modern Genetics*, 2nd ed. Benjamin/Cummings.
	5. Hodson, A. 1994. *Essential Genetics*.
	6. Nisholl, D.S.T. 1994. *Intro to Genetic Engineering*. Cambridge.
	7. Hartl, D.L. 1990. *Primer of Population Genetics*. Sinauer.
MPB 2112. Biostatistics I (2 Credits)	
Topics	Definitions of statistics and biostatistics; introduction to statistical terms. Data classification and frequency distributions. Presentation of biometric data. Central tendency: mean, median, mode. Measures of variation and dispersion. Hypothesis testing (T, Z, F, chi-square), regression, correlation, proportions, frequencies, PCA, and R test.
References	1. Zar, J.H. 2010. *Biostatistical Analysis*, 5th ed.

	2. Walpole, R.E. 1976. *Elementary Statistical Concepts*. McMillan.
	3. Sudjana. 1992. *Metode Statistika*. Transito, Bandung.

SEMESTER IV

MPB 2213. Biostatistics II (2 Credits)	
Topics	Basic principles, types of experimental design and variance analysis. Parametric statistical methods: scope, definitions of population and sample, parameters and variables, data representation, probability, sampling methods, hypothesis formulation and testing. Analysis of variance: single-factor and factorial designs, comparison of treatment means, regression analysis, correlation, and non-parametric statistical methods.
References	1. Walpole, R.E. (1976). *Elementary Statistical Concepts*. McMillan Pub. Co., New York.
	2. Sudjana. (1992). *Metode Statistika*. Tarsito, Bandung.
	3. Sokal, R.R., & Rohlf, J. (1981). *Biometry: The Principles and Practice of Statistics in Biological Research*. W.H. Freeman & Co., New York.
MPB 2214. Cryptogamic Systematics (3 Credits)	
Topics	Introduction to the plant kingdom, life form types, phylogeny, and basics of plant classification. Study of groups such as Schizophyta (Bacteria and Cyanophyta), Phycophyta (Chlorophyta, Euglenophyta, Bacillariophyta, Phaeophyta, Rhodophyta), Fungi (Ascomycetes, Deuteromycetes, Basidiomycetes), Lichens, Bryophyta (Muscihepaticae, Anthocerotae), and Pteridophyta (Lycopodine, Equisetae, Filicinae). Includes morphology, reproduction, life cycles, collection techniques, preservation, determination, taxonomy basics, nomenclature, diversity, phylogeny, phytogeography, and herbarium preparation.
References	1. Smith, I.G.M. (1955). *Cryptogamic Botany I & II*. McGraw-Hill, New York.
	2. Vashista, B.R. (1978). *Botany for Degree Students Part I: Algae*. S. Chand Co., New Delhi.
	3. Alexopoulos, G.J., & Mims, C.M. (1979). *Introductory Mycology* (3rd ed.). Wiley.
	4. Bold, H.C. (1980). *Morphology of Mushrooms and Fungi* (4th ed.). Wiley.
MPB 2215. Invertebrate Systematics (3 Credits)	
Topics	Scope of animal taxonomy and fundamentals of invertebrate classification. Collection and specimen management techniques. Classification and ecology of phyla: Protozoa, Porifera, Coelenterata, Platyhelminthes, Nemathelminthes, Annelida, Mollusca, Arthropoda, Echinodermata, and other invertebrate phyla.

References	1. Brusca & Brusca. (1990). *Invertebrates*. Sinauer Publishers.
	2. Hegner, I.R., & Engemann, W.J.G. (1988). *Invertebrate Zoology*. MacMillan, New York.
	3. Kotpal, S.K., Agarwal, R.P., & Phetarpal, R.L. (1981). *Modern Textbook for Zoology: Invertebrates*. Rastogi Publications, New Delhi.
	4. Mayr, E., & Ashlock, P.D. (1991). *Principles of Systematic Zoology*. McGraw-Hill.
MPB 2216. Animal Embryology (3 Credits)	
Topics	Introduction, definition, and history of embryology. Female reproductive system: anatomy, ovarian cycle, hormonal control, external influences. Male reproductive system. Gametogenesis: oogenesis and spermatogenesis. Fertilization: theories, mechanisms. Zygote cleavage: segmentation types, mechanisms. Blastulation, gastrulation, neurulation, organogenesis. Extraembryonic membranes. Molecular embryology: gene regulation and developmental genomics.
References	1. Baslinsky, B.I. (1981). *Introduction to Embryology* (4th ed.). W.B. Saunders, London.
	2. Carlson, B.M. (1981). *Patten's Foundations of Embryology* (4th ed.). Tata McGraw-Hill.
	3. Kalthoff, K. (1996). *Analysis of Biological Development*. McGraw-Hill, New York.
	4. Arrey, L.B. (1983). *Development Anatomy*. W.B. Saunders.
	5. McLachlan, J. (1996). *Medical Embryology*. Addison-Wesley.
	6. Glover, D.M. & Hames, B.D. (1989). *Genes and Embryos*. IRL Press, Oxford.
	7. Müller, W.A. (1997). *Developmental Biology*. Springer.
MPB 2217. Microbial Physiology (2 Credits)	
Topics	Introduction to physiological processes in microorganisms. Structure and function of microbial components and metabolism. Organelle functions, metabolism of carbohydrates, lipids, proteins, nitrogen, growth, dormancy, and microbial genetics.
References	Moat, A.G. (1995). *Microbial Physiology*. Wiley & Sons, Singapore.
MPB 2218. Microtechnique (3 Credits)	
Topics	Preparation of various animal microscopy slides, including preserved and fresh specimens. Sectioning methods, challenges and solutions; system-specific techniques; histochemical methods; imaging; microscopy introduction; micrometry; microchemistry; specimen collection and fixation for plants; plant staining, dehydration, infiltration, mounting; preparation techniques such as whole mount, smear, squash, pollen mounting, maceration, sectioning (embedded and non-embedded).
References	1. Johansen, D.E. (1940). *Plant Microtechnique*. McGraw-Hill, New York.

	2. Sass, J.E. (1971). *Botanical Microtechnique*. Iowa State University Press.
	3. Handara, S. (1993). *Staining Methods*. Bharata Karya Aksara, Jakarta.
	4. Gray, P. (1984). *The Microtomist's Formulary and Guide*. Blakiston Co., New York.

SEMESTER V

MPB 3119. Evolution (2 Credits)	
Topics	Introduction; genetics as the basis of evolutionary processes; fundamental patterns of evolution; driving elements of evolution; adaptation and isolation; speciation; macroevolution; evidence of evolution; human fossils and human evolution; evolution and ecology; the future of evolution and life development.
References	1. Dahlar, F., & Chandra, Y. (1984). *Asal dan Tujuan Manusia*. Yayasan Kanisius, Jakarta.
	2. Boy, R.S. (1995). *Evolusi*. Universitas Atma Jaya, Yogyakarta.
MPB 3120. Phanerogamic Systematics (3 Credits)	
Topics	Fundamentals of taxonomy and biosystematics; history of taxonomy; taxon concepts, hierarchy, variation, phytogeography, speciation, plant nomenclature, diversity and phylogenetic relationships among taxa; interrelation with other disciplines; phytogeographic characteristics of Gymnospermae and Angiospermae families including Dicotyledoneae (Dialypetalae, Monochlamydeae, Sympetalae) and Monocotyledoneae, with representative species. Includes plant collection methods, herbarium preparation, identification keys and their use.
References	1. Lawrence, G.H.M. (1964). *Taxonomy of Vascular Plants*. Macmillan Co., New York.
	2. Stace, C.A. (1979). *Plant Taxonomy and Biosystematics*. Edward Arnold, London.
	3. De Vogel, E.V. (1987). *Manual of Herbarium Taxonomy: Theory and Practice*. Rijksherbarium, Leiden.
	4. Tjitrosoepomo, G. (1988). *Taksonomi Tumbuhan*. Gadjah Mada University Press, Yogyakarta.
MPB 3121. Vertebrate Systematics (3 Credits)	
Topics	Evolution and diversity of vertebrates; vertebrate phylogeny and classification; zoogeography. Traits, identification, and classification of vertebrate groups: Pisces, Amphibia, Reptilia, Aves, and Mammalia.
References	1. Colbert, E.H. (1991). *Evolution of the Vertebrates*. John Wiley & Sons, New York.
	2. Jamieson, B.G.M. (1991). *Fish Evolution and Systematics*. Cambridge University Press.
	3. MacKinnon, J. (1999). *Bird Field Guide of Sumatra, Java, Bali and Kalimantan*. LIPI & Birdlife.

	4. Rogers, E. (1986). *Looking at Vertebrates*. Longman, Essex.
	5. Vaughan. (1986). *Mammalogy*. Saunders College, Philadelphia.
	6. Zug, R.G. (1993). *Herpetology: Biology of Amphibians and Reptiles*. Academic Press, San Diego.
MPB 3122. Plant Ecology (3 Credits)	
Topics	Introduction to vegetation and environmental interactions; plant ecological specializations; species and community interactions; community sampling methods, classification and ordination, succession, productivity, mineral cycles. Environmental factors: temperature, light, photosynthesis, soil, and water.
References	1. Barbour, M.G. et al. (1987). *Terrestrial Plant Ecology*. Benjamin/Cummings.
	2. Begon, M. et al. (1990). *Ecology of Individuals, Populations, and Communities*. Blackwell.
	3. Kormondy, E.J. (1969). *Concept of Ecology*. Prentice Hall.
	4. Krebs, C.J. (1972). *Ecology: Experimental Analysis*. Harper & Row.
	5. Odum, E.P. (1971). *Fundamentals of Ecology* (3rd ed.). W.B. Saunders.
	6. Pielou, E.C. (1979). *Population and Community Ecology*. Gordon and Breach.
	7. Pianka, E.R. (1980). *Evolutionary Ecology*. Harper & Row.
MPB 3123. Animal Ecology (3 Credits)	
Topics	Introduction to ecology, its history and principles, application of animal ecology, and ecological relevance to humanity. Animal–environment relationships (heterotrophy, ectotherms vs. endotherms). Animal responses and adaptations (acclimatization, structural/functional adaptations, behavior). Diet types, habitat and niches, populations (definitions, statistics, measurements, abundance, age distribution, ecological pyramids). Interpopulation interactions (predation, herbivory, parasitism, competition, mutualism). Population growth, animal communities, ecosystems, biotic components, and energy flow.
References	1. Begon, M. et al. (1990). *Ecology of Individuals, Populations, and Communities*. Blackwell.
	2. Kormondy, E.J. (1969). *Concept of Ecology*. Prentice Hall.
	3. Kendeigh, S.C. (1980). *Ecology with Emphasis on Animals and Humans*. Prentice-Hall India.
	4. Krebs, C.J. (1972). *Ecology*. Harper & Row.
	5. Odum, E.P. (1971). *Fundamentals of Ecology*. W.B. Saunders.
	6. Pielou, E.C. (1979). *Population and Community Ecology*. Gordon and Breach.

	7. Soetjipto, E.R. (1980). *Basics of Animal Ecology*. Depdikbud Dikti, Jakarta.
	8. Pianka, E.R. (1980). *Evolutionary Ecology*. Harper & Row.
MPB 3124. Conservation Biology (2 Credits)	
Topics	Definitions, objectives, responsibilities, laws and regulations in natural resource (NR) management. Environmental issues: population dynamics, economic impact, technological development, internalizing externalities, natural and artificial resources. Modeling NR management. System approaches in managing biotic and abiotic resources, waste management, and NR conservation.
References	1. Ministry of Environment. (1995). *Environmental Decree No. 51/MENLH/1995 on Liquid Waste Standards*.
	2. Bardi Murachman. (1997). *Industrial Waste Management*. UNS Environmental Lab.
	3. Edmuds, S., & John, L. (1973). *Environmental Management*. McGraw-Hill.
	4. Emil Salim. (1988). *Environmentally Conscious Development*. LP3ES, Jakarta.
	5. Soemarwoto, O. (1989). *Environmental Ecology and Development*. Djambatan, Jakarta.

SEMESTER VI

MPB 3225. Plant Physiology (4 Credits)	
Topics	Introduction: scope of plant physiology; water and plant cells; organic molecules in plants; plant–water relationships; availability and uptake of soil nutrients; nutrient and water transport; transpiration; photosynthesis; phloem translocation; respiration; nitrogen and sulfur assimilation and fixation; seed germination; plant growth and development; phytohormone biosynthesis; roles of phytohormones and growth regulators; plant movements and photoperiodism; dormancy and senescence; stress physiology.
References	1. Taiz, L. & Zeiger, E. (1991). *Plant Physiology*. Benjamin Cummings, California.
	2. Hopkins, W.G. (1999). *Introduction to Plant Physiology*. Wiley, New York.
	3. Salisbury, F.B. & Ross, C.W. (1995). *Plant Physiology* (Indonesian trans.). ITB Press.
	4. Campbell, N.A., & Reece, J.B. (2008). *Biology*, 8th ed. Benjamin Cummings.
	5. Leegood, R.C. et al. (2000). *Photosynthesis: Physiology and Metabolism*. Kluwer.
	6. Marschner, H. (1995). *Mineral Nutrition of Higher Plants*. Academic Press, London.
MPB 3226. Animal Physiology (4 Credits)	

Topics	Introduction to animal physiology and homeostasis. Molecular transport: diffusion, osmosis, active transport. Nervous system: impulses, synapse concepts, neurotransmitters. Sensory systems: vision, hearing, touch, taste, smell. Hormonal regulation: endocrine glands, hormone types, metabolic regulation, electrolyte balance. Reproduction: male and female cycles. Blood circulation: composition, function, heart regulation. Peripheral circulation: blood pressure and flow. Digestion of carbohydrates, proteins, and fats. Gas exchange, respiration organs and mechanics, oxygen and CO_2 transport, respiratory regulation. Osmoregulation and excretion in aquatic and terrestrial animals. Thermoregulation: ectotherms and endotherms. Immune system: specific and nonspecific immunity. Muscles and movement: skeletal and smooth muscle contraction, reflexes.
References	1. Kay, I. (1998). *Introduction to Animal Physiology*. Springer, Singapore.
	2. Ganong, W.F. (1991). *Review of Medical Physiology*, 15th ed. Prentice Intl.
	3. Campbell et al. (2003). *Biology*, Vol. 3. Gramedia.
	4. Wulangi, K.S. (1993). *Principles of Animal Physiology*. Depdikbud Dikti.
MPB 3227. Biotechnology (3 Credits)	
Topics	Expands students' understanding of biotechnology using microorganisms to improve human life. Topics include: overview of DNA, RNA, and proteins; isolation and analysis techniques for DNA/RNA; gene regulation; genetic engineering techniques and applications; animal cell culture; plant tissue culture; genetic variation; and bioethics.
References	1. Fatchiyah et al. (2011). *Molecular Biology: Basic Principles of Analysis*. Erlangga.
	2. Watson, J.D. & Gilman, M. (1992). *Recombinant DNA*.
	3. Benjamin, L. (2000). *Gene VII*.
	4. Brown, T.A. (1995). *Gene Cloning: An Introduction*.
	5. Bowe, D.E. (2003). *Understanding Biotechnology*.
MPB 3228. Research Methodology (3 Credits)	
Topics	Introduction to science; types and roles of research; scientific method and research design; problem formulation; variable selection and measurement; hypothesis development and testing; data collection; experimental design; field plot design; sampling techniques; scale construction; data analysis and interpretation; statistical techniques; proposal writing; presentation methods.
References	1. Trelease, S.F. (1988). *How to Write Scientific and Technical Papers*. Williams & Wilkins.
	2. Wilson, F.B. (1978). *Introduction to Scientific Research*. McGraw-Hill.
	3. Nasir, M. (1983). *Research Methods*. Ghalia Indonesia.

	4. Jarwanto. (1996). *Understanding Statistical Tests*. Liberty, Yogyakarta.
	5. Sudjana. (1992). *Statistical Methods*, 5th ed. Tarsito.
	6. Suharsimi, A. (1996). *Research Procedures: A Practical Approach*, Rev. ed. Rineka Cipta.
MPB 3229. Field Work / Community Service Program (2 Credits)	
Topics	Field Work (Kerja Praktek) is conducted independently under the supervision of the Biology Department. The Community Service Program (Kuliah Kerja Mahasiswa or KKM) follows the official KKM program at Universitas Tanjungpura (Untan).
	Note: Students may choose either option as both carry equivalent credit value.
References	–
MKWU 3. Civic Education (2 Credits)	
Topics	Why Civic Education is taught at university level; the essence and urgency of national identity as a determinant of nation-building and character; national unity as a parameter for cohesion; constitutional norms under national law; harmony of citizen and state responsibilities in a democracy rooted in sovereignty and consensus; democracy in Indonesia based on Pancasila and the 1945 Constitution; historical, constitutional, social-political, and cultural contexts of justice-based law enforcement; insights into national resilience and defense as part of national identity; contemporary global engagement and commitment-building through the “Project Citizen” program.
References	1. Kemenristekdikti. (2016). *Civic Education Module for Higher Education*. Dirjen Belmawa.
	2. Budimansyah, D. (Ed.). (2006). *Moral Values in Civic Education*. FPIPS UPI.
	3. Pasha, M.K. (2008). *Civic Education*. Citra Karsa Mandiri.
	4. Sunarso et al. (2006). *Civic Education*. UNY Press.

SEMESTER VII

MPB 4030. Seminar (2 Credits)	
Topics	Biology topics recommended by academic supervisors for individual or group presentation, literature review, and academic discussion.
References	Adjusted according to the topic discussed.
MPB 4031. Entrepreneurship (2 Credits)	

Topics	Philosophy of entrepreneurship; development of entrepreneurial mindset; career-oriented education; entrepreneurial leadership; intellectual property rights (IPR); business creation; interpersonal skills and sales techniques; small and medium enterprises (SMEs); entrepreneurial ethics.
References	1. Jati, B.M.E. & Priyambodo, T.K. (2015). *Kewirausahaan Technopreneurship untuk Mahasiswa Ilmu Eksakta*. Andi, Yogyakarta.
	2. Meredith, G.G. et al. (1995). *Kewirausahaan: Teori dan Praktek*. CV Taruna Gravica.
MPB 4032. Undergraduate Thesis (6 Credits)	
Topics	Proposal submission, problem formulation, objective determination, literature review, scientific methodology, data collection and analysis, result interpretation, writing and defending the thesis in front of the examiners.
References	Books and resources relevant to the student's research topic.

b. Elective Course Descriptions

BOTANY

MPB 2233. Ethnobotany (2 Credits)	
Topics	Importance and relation to botany branches; fiber-producing plants: history, growth conditions, types, and uses; forest plant sources: wood and cork, wood distillation, pulp production; tannins and dyes: physical/chemical properties, sources, examples; inks, pigments, gums and resins: types, properties, uses; latex products and rubber; essential oils and growth substances; fats and waxes; sugars and starches; medicinal plants; edible plant sources.
References	1. Hill (1979). *Economic Botany*. Tata McGraw-Hill, New York.
	2. Koppel & Hall (1951). *Landbouw in de Indische Archipel*.
MPB 2234. Soil Nutrients Science (2 Credits)	
Topics	Introduction to soil fertility and plant nutrients; soil–plant relationships; nutrient transport in plants; soil pH; nitrogen, phosphorus, potassium, sulfur, calcium, magnesium, micronutrients; soil nutrient management.

References	*(Not specified)*
MPB 2235. Mangrove Botany (2 Credits)	
Topics	Definition of mangroves; distribution, history, and evolution; mangrove anatomy, physiology, reproduction, biomass, litter production; species identification; responses to environmental stresses; mangrove benefits and degradation; mangrove ecosystem research methods.
References	1. Hogarth, P.J. (1999). *The Biology of Mangroves*. Oxford University Press.
	2. Bengen, D.G. (2001). *Mangrove Ecosystem Management Guide*. IPB.
MPB 2236. Orchidology (2 Credits)	
Topics	Biology, classification, habitat, vegetative propagation of orchids; cultivation practices including pests and diseases.
References	*(Not specified)*
MPB 2237. Weed Science (3 Credits)	
Topics	Factors influencing weeds, toxic compounds from weeds, weed dispersion and traits; weed–crop interactions.
References	1. Fox, R.T.V. *Modeling Crop–Weed Interaction*. Can. Inc.
	2. William, J.B. (1987). *Color Atlas of Weed Seedlings*. John Wiley & Sons.
MPB 2238. Plant Biochemistry (2 Credits)	
Topics	Introduction; primary and secondary plant metabolism; terpenoids (essential oils and others), alkaloids, flavonoids, steroids; qualitative and quantitative biochemical methods; other important natural compounds.

References	A range of sources including Dewick (2009), Cseke et al. (2006), Garrett & Grisham (2009), Harborne (1987), Tringali (2004), Robinson (1995), and Sherma (2003).
MPB 3139. Phytopathology (3 Credits)	
Topics	Concepts and classification of plant diseases; causes: fungal, bacterial, viral, mycoplasma, nematode; symptoms, environmental factors, pathogenicity; chemical and biological control strategies.
References	1. Agrios, D.N. (1997). *Plant Pathology*. Academic Press.
	2. Pracaya (1999). *Pests and Plant Diseases*. Penebar Swadaya.
	3. Semangun, H. (1996). *Intro to Plant Diseases*. Gadjah Mada Press.
MPB 4140. Plant Ecophysiology (2 Credits)	
Topics	Biosphere and plant growth; mechanisms of response and adaptation: morphological, physiological; role of light, extreme temperatures, water stress, gas toxicity, nutrient stress, ion toxicity, anthropogenic stress; interspecies interactions including allelopathy.
References	Works by Fitter & Hay (1998), Larcher (1995), Wilkinson (1994), Etherington (1982), and Grillo & Leone (1996).
MPB 4141. Tissue Culture Techniques (2 Credits)	
Topics	Concepts of tissue culture, aseptic techniques, media types; callus, suspension, organ, haploid, and protoplast cultures; in vitro production of secondary metabolites.
References	Deberg & Zimmerman (1991), Gunawan (1988), Kyte & Klyen (1996), Rasdan & Cooking (1997), Vidale (1995).
MPB 4142. Phytohormones (2 Credits)	
Topics	Scope and relation to plant science; definitions of hormones and growth regulators. In-depth study of:

	Auxin, Gibberellin, Cytokinin, Ethylene, Abscisic Acid (ABA), and others like Brassinosteroids, Jasmonic Acid, Salicylic Acid—covering discovery, biosynthesis, transport, and physiological roles.
References	Including but not limited to: Abidin (1990), Davies (1995), Moore (1989), Gausman (1991), Krisnamoorthy (1981), Kusumo (1992), Lincoln & Zeiger (1998), Purohit (1987), Wareing & Phillips (1970), and Wattimena (1988).

ZOOLOGY

MPB 2243. Animal Nutrition (3 Credits)	
Topics	Introduction. Digestive system. Feed composition: carbohydrates, lipids, proteins, vitamins, minerals. Digestion and metabolism of nutrients. Animal nutritional requirements: during growth, reproduction, and lactation. Nutrient characteristics of various feed types: grasses, silage, roots, tubers, cereals.
References	Macdonald, P., et al. *Animal Nutrition*. Pearson.
MPB 3244. Ichthyology (3 Credits)	
Topics	Covers the biology and ecology of fishes including morphology, ecomorphology, taxonomy, locomotion, physiological processes (thermoregulation, buoyancy, respiration, circulation, reproduction strategies, sensory systems, behavior, hormonal communication, feeding, growth, development), speciation, ecology, migration patterns, specialized habitats, conservation, and aquaculture.
References	A collection of sources including Roberts, Kottelat et al., Moyle & Cech, Wootton, Bone & Moore, Nelson, and relevant scientific journals.
MPB 3245. Herpetology (3 Credits)	
Topics	Study of amphibians and reptiles, including their diversity, ecology, reproduction, genetics, conservation, and phylogenetics.
References	Key works by Berry, Corn & Bury, Iskandar, Vitt & Caldwell, Zug, and related journals such as *Journal of Herpetology* and *Herpetological Bulletin*.
MPB 3246. Ornithology (3 Credits)	

Topics	Bird anatomy and physiology, skeletal system, muscles, nerves, respiratory and circulatory systems, sensory organs, special adaptations. Topics also include migration, territorial ecology, communication, mating behavior, reproduction, bird identification, and field research techniques.
References	1. Harrison, C. & Greensmith, A. (1993). *Birds of the World*.
	2. Howes, J. et al. (2003). *Shorebird Study Guide*. Wetland International.
MPB 3247. Mammalogy (3 Credits)	
Topics	Overview of mammalian classification, skeleton, musculature, nervous, respiratory, digestive, and circulatory systems, sensory adaptations, migration, community and territorial ecology, population communication, and reproductive system.
References	1. Jefferson, T.A. et al. (1993). *Marine Mammals of the World*. FAO/UNEP.
	2. Kemp, T.S. (2005). *The Origin and Evolution of Mammals*. Oxford Univ. Press.
MPB 3248. Primatology (2 Credits)	
Topics	Introduction to primate studies, classification, research methods, New World monkeys, Old World monkeys, apes, tarsiers, and slow lorises.
References	1. Fleagle, J.G. et al. (2004). *Primate Communities*. Cambridge Univ. Press.
	2. Wich, S.A. et al. (2009). *Orangutans: Geographic Variation in Ecology and Conservation*. Oxford Univ. Press.
MPB 3149. Parasitology (3 Credits)	
Topics	Definition and scope of parasitology as a multidisciplinary field. Focus on parasitic protozoa (intestinal, blood, and tissue), nematodes, cestodes, trematodes, and arthropods as disease agents and vectors. Covers classification, life cycles, and disease significance.
References	Brown (1989), Garcia & Bruckner (1996), Gillespie & Hawkey (1994), Levine (1990), Mehlhorn (1998), Schmidt & Roberts (2000).

MPB 3150. Entomology (3 Credits)	
Topics	Introduction; insect morphology; insect physiology; insect ecology; insect behavior; insects and the environment; agricultural pest insects; insects of medical importance; insecticide basics; integrated pest management; insect systematics; specimen collection management; applied entomology discussions.
References	1. Sastrodihardjo, S. (1979). *Pengantar Entomologi Serangga*. ITB Press, Bandung.
	2. Borror, D.J., Triplehorn, C.A., & Johnson, N.F. (1992). *Pengenalan Pelajaran Serangga*, 6th ed. Gadjah Mada Univ. Press, Yogyakarta.
	3. Romoser, W.S. (1973). *The Science of Entomology*. MacMillan, New York.
	4. Pyenson, I.L., & Barke, H.E. (1981). *Laboratory Manual for Entomology and Plant Pathology*, 2nd ed. The Avi Publishing.
	5. Daly, H.V., Doyen, J.T., & Ehrlich, P.R. (1978). *Introduction to Insect Biology and Diversity*. McGraw-Hill, New York.
	6–10. Additional references relate to plant stress and ecophysiology (Key & Kosuge 1985; Marcelle et al. 1983; Rozema & Verkleicj 1991; Schulze & Caldwell 1995; Smirnoff 1995).
MPB 3151. Carcinology (3 Credits)	
Topics	Overview of carcinology and its interdisciplinary relevance; classification, nomenclature, and phylogeny of crustaceans; general morphology and anatomical function; reproduction strategies; feeding and growth patterns (including molting and dimorphism); behavior, ecology, and crustacean aquaculture.
References	1. Ingle, R.W. (1996). *Shallow Water Crabs*. Linnaean Society of London.
	2. Mente, E. (2008). *Reproductive Biology of Crustaceans*. Science Publishers.
	3. Mantel, L.H. (1983). *The Biology of Crustacea*. Academic Press.
	4. Provenzo, A. (1985). *The Biology of Crustacea: Economic Aspect*. Academic Press.

	5. Martin, J.W., Crandall, K.A., & Felder, D.L. (2009). *Decapod Crustacean Phylogenetics*. CRC Press.
	6. Sisto, G. (2013). *Crustacean: Structure, Ecology and Life Cycle*. Nofinka, New York.
	7. Chang, E.S., & Thiel, M. (2015). *The Natural History of Crustacean, Vol. 4*. Oxford Univ. Press.
	8. Related journals: *The Crustacea*, *Journal of Crustacean Biology*.
MPB 3152. Annelid Biology (3 Credits)	
Topics	In-depth study of annelid biology and ecology, including Polychaeta, Oligochaeta, and Hirudinea: systematics and phylogeny, diversity, physiology, reproduction, life cycle, regeneration, culture, habitat, and environmental and economic roles.
References	1. Karaca, A. (2011). *Biology of Earthworms*. Springer.
	2. Shain, D.H. (2009). *Annelids in Modern Biology*. Wiley-Blackwell.
	3. Edwards, C.A. (2004). *Earthworm Ecology*. CRC Press.
	4. Mill, P.J. (1978). *Physiology of Annelids*. Academic Press.
	5. Rouse, G., & Pleijel, F. (2006). *Reproductive Biology and Phylogeny of Annelida*. Science Publishers.
	6. Dorresteijn, A.W.C., & Westheide, W. (1999). *Reproductive Strategies in Annelids*. Springer.
	7. Mann, K.H. (1962). *Leeches (Hirudinea)*. Pergamon Press.
	8. Journals: *Zootaxa*, *Meiobenthology*, *Zoological Science*, *Biological Bulletin*, *Hydrobiologia*, *Journal of Marine Science*.

MPB 4153. Endocrinology (2 Credits)	
Topics	Scope and development of endocrinology; classification and mechanisms of hormone action; hypothalamus–pituitary axis; adrenal and thyroid glands; reproductive endocrinology; calcium regulation; pancreatic and gastrointestinal hormones; techniques for measuring hormone levels in blood; functions of hormones in biological control and metamorphosis.
References	1. Turner, C.D. & Bagnara, J.T. (1988). *Endokrinologi Umum* (translated by Harsojo). Airlangga University Press, Surabaya.
	2. Hadley, M.P. (1992). *Endocrinology*. Prentice Hall, New Jersey.
	3. Marshall, P.T. (1980). *Physiology of Mammals and Other Vertebrates*. Cambridge University Press, Cambridge.
	4. Brook, C. & Marshall, N. (1996). *Essential Endocrinology*. Blackwell Science Ltd., Oxford.
MPB 4154. Immunology (2 Credits)	
Topics	Introduction to immunology; components of the immune system: blood cells in invertebrates and vertebrates, lymphatic system; first-line defense: physical, chemical, biological, blood clotting, inflammation; nonspecific immune system: components and mechanisms; specific immune system: components and mechanisms; signaling and immune regulation; immune tolerance; hypersensitivity.
References	1. Davies, H. (1997). *Introductory Immunobiology*. Chapman & Hall.
	2. Janeway, C.A., Travers, P., Walport, M., & Shlomchik, M. (2001). *Immunobiology*. Garland Publishing.
MPB 4155. Animal Ecophysiology (2 Credits)	
Topics	Scope of animal ecophysiology; adaptation principles: protein synthesis and degradation control; types of adaptation: acclimatization and cellular adaptation; stress conditions and influencing factors. Adaptation patterns in aquatic animals (osmoregulation, excretion, thermoregulation, reproduction cycle, buoyancy, feeding); estuarine, freshwater, and terrestrial adaptations: including locomotion, respiration, sensory function, reproduction, feeding, immunity.
References	1. Eckert, R. & Randall, D. (1983). *Animal Physiology: Mechanisms and Adaptation*. Freeman, San Francisco.

	2. Bligh, J., Cloudsley-Thompson, J.L., & Macdonald, A.G. (1976). *Environmental Physiology of Animals*. Blackwell Scientific, Oxford.
	3. Nielsen, K.S. (1991). *Animal Physiology: Adaptation and Environment* (4th ed.). Cambridge University Press.
	4. Willmer, P., Stone, G., & Johnston, I. (2005). *Environmental Physiology of Animals*. Blackwell Publishing.
MPB 4156. Ethology (2 Credits)	
Topics	This course covers the aims, methods, and scope of ethology; foundational concepts such as external stimuli, hierarchical and temporal behavior organization, behavioral physiology, behavioral ontogeny, learning processes, social behavior, behavioral genetics, the phylogenetic development of behavior, the influence of domestication, and the intersection of behavior with psychology and evolutionary ecology.
References	1. Immelmann, K. (1980). *Introduction to Ethology*. Plenum Press, New York.
	2. Lorenz, K. & Kickert, R.W. (1981). *The Foundations of Ethology*. Springer-Verlag, New York.
	3. Krebs, J.C. & Davies, N.B. (2008). *Behavioural Ecology: An Evolutionary Approach* (4th ed.). Blackwell Publishing, Singapore.
	4. Krebs, J.C. & Davies, N.B. (2004). *An Introduction to Behavioural Ecology*. Blackwell Publishing, Oxford.
	5. Lamoureux, V.S. (2011). *Animal Behavior: An Evolutionary Approach*. Apple Academic Press, Canada.
	6. Shettleworth, S.J. (2010). *Cognition, Evolution, and Behavior*. Oxford University Press.
	7. Barnard, C. (2004). *Animal Behavior: Mechanism, Development, Function, and Evolution*. Pearson Education Limited, UK.
	8. Relevant journals: *Ethology*, *Behavioral Ecology*.

MICROBIOLOGY	

MPB 3257. Mycology (3 Credits)	
Topics	Introduction: definition and scope of mycology; the importance of fungi in life; biology and general characteristics of fungi (vegetative and reproductive); fungal growth and ecology; classification of fungi: microscopic and macroscopic; basic techniques for fungal research.
References	1. Alexopoulos, C.J., Mims, C.W., & Blackwell, M. (1996). *Introductory Mycology*. John Wiley & Sons, New York.
	2. Kendrick, B. (1990). *The Fifth Kingdom*. University of Waterloo Press, Waterloo.
MPB 3258. Environmental Microbiology (3 Credits)	
Topics	Microbial communities and ecosystems; measurement of microbial number, biomass, and activity; microbial life in extreme environments; elemental cycles (C, H, O, N, S, P, Fe, others); interactions between microbes and xenobiotics and inorganic pollutants; kinetics; biodegradation influenced by chemical structure and environmental factors; bioremediation across ecosystems; microbial roles in mineral and energy exploration.
References	1. Alexander, M. (1994). *Biodegradation and Bioremediation*. Academic Press, UK.
	2. Atlas, R.M., & Bartha, R. (1993). *Microbial Ecology: Fundamentals and Applications* (3rd ed.). Benjamin/Cummings, Canada.
	3. Madigan, M.T., Martinko, J.M., & Parker, J. (1997). *Brock Biology of Microorganisms*. Prentice Hall International, USA.
MPB 4159. Industrial Microbiology (2 Credits)	
Topics	Scope of industrial microbiology; microbiological fundamentals; isolation and preservation of microbes; screening for bioactive production; microbial uses in food and non-food industries; microbial roles in postharvest deterioration and prevention strategies.
References	1. Crueger, W., & Crueger, A. (1984). *Biotechnology: A Textbook of Industrial Microbiology*. Science Tech Inc., Madison.

	2. Lee, B.H. (1996). *Fundamentals of Food Biotechnology*. VCH Publishers, New York.
	3. Susanto, H., Adhi, T.P., & Suryo. (1992). *Buku dan Monograf Rekayasa Bioproses*. PAU Bioteknologi ITB, Bandung.
	4. Hidayat, N., Padaga, M.C., & Suhartini, S. (2006). *Mikrobiologi Industri*. Andi, Yogyakarta.
	5. Sikyta, B. (1983). *Methods in Industrial Microbiology* (trans. K. Sigler). John Wiley & Sons, New York.
MPB 4160. Food Microbiology (3 Credits)	
Topics	Food as microbial growth medium: composition and factors influencing microbial growth in food. Food contamination. Microbial spoilage. Microbiological indicators of quality and safety. Food preservation: high/low temperature, drying, radiation, chemical preservatives. Foodborne diseases caused by fungi, bacteria, parasites, and viruses. Roles of microbes in food processing.
References	1. Atlas, R.M., Brown, A.E., Dobra, K.W., & Miller, L. (1984). *Experimental Microbiology: Fundamentals and Applications*. Macmillan Publishing.
	2. Jay, J.M. (1988). *Modern Food Microbiology* (5th ed.). Aspen Publishers.
	3. Frazier, W.C., & Westhoff, D.C. (1978). *Food Microbiology*. Tata McGraw-Hill, New Delhi.
	4. Trihendrokesowo. (1989). *Petunjuk Laboratorium Mikrobiologi Pangan*. PAU Pangan & Gizi UGM.
	5. Winarno, F.G., Fardiaz, S., & Fardiaz, D. (1982). *Pengantar Teknologi Pangan*. Gramedia, Jakarta.
MPB 4161. Medical Microbiology (2 Credits)	
Topics	Discovery and scope of medical microbiology. Sterilization methods. Specimen collection and storage. Identification, antigen structure, and pathogenic enzymes of gram-negative enteric bacteria, *Staphylococcus* and *Streptococcus*. Identification, clinical features, and epidemiology of superficial and subcutaneous fungi. Viruses. Role of normal flora.
References	1. Jawetz, E., Melnick, J., & Adelberg, E. (1982). *Medical Microbiology*. Lange Medical Publication.

	2. Gupte, S. (1990). *Medical Microbiology*. Jaypee Brothers.
	3. Soemarno. *Isolasi dan Identifikasi Bakteri Klinik*. Akademi Analis Kesehatan, Yogyakarta.
	4. Brooks, G.F., Butel, J.S., & Ornston, L.N. (1996). *Mikrobiologi Kedokteran* (20th ed.). EGC, Jakarta.

CELLULAR AND MOLECULAR BIOLOGY

MPB 3162. Enzymology (2 Credits)	
Topics	Introduction to enzymology. Enzyme classification. Enzyme mechanisms. Enzymatic reaction kinetics. Factors affecting enzyme activity. Enzyme regulation. Cofactors. Enzyme applications in health and technology. Methods of enzyme isolation and purification.
References	*(Not listed in the original material. Let me know if you'd like me to suggest standard references for enzymology.)*
MPB 2263. Plant Genetics (2 Credits)	
Topics	Study of cells and chromosomes; Mendelian inheritance; gene interaction and gene expression; chemical nature of genetic material; chromosome mapping; extranuclear (cytoplasmic) inheritance; gene regulation; mutation; disease resistance in plants; population genetics; and quantitative inheritance.
References	1. Allard, R.W. (1960). *Principles of Plant Breeding*. John Wiley & Sons, New York.
	2. Crowder, L.B. (1988). *Genetika Tumbuhan* (translation). UGM Press, Yogyakarta.
	3. Gardner, E.J., Simmons, M.J., & Snustad, D.P. (1991). *Principles of Genetics*. John Wiley & Sons, New York.
MPB 2264. Population Genetics (2 Credits)	

Topics	Phenotypic and genetic variation; genotype frequency in populations; multiple alleles, inbreeding, genetic drift, mutation, selection, and migration; molecular population genetics; nucleotide and amino acid substitution patterns; evolution in multigene families, transposons, quantitative genetics, artificial selection, heritability, and speciation.
References	1. Falconer, D.S. (1983). *Quantitative Genetics Problems*. Longman, Hong Kong.
	2. Hartl, D.L. (1987). *A Primer of Population Genetics*. Sinauer Associates, Sunderland, Massachusetts.
	3. Klug, W.S., & Cummings, M.R. (1996). *Essential Genetics*. Prentice Hall, New Jersey.
	4. Mettler, E.M., & Gregg, T.G. (1969). *Population Genetics and Evolution*. Prentice Hall, New Jersey.
	5. Nicholas, F.W. (1996). *Introduction to Veterinary Genetics*. Oxford University Press, UK.
MPB 4165. Genetic Engineering (2 Credits)	
Topics	Techniques in genetic engineering and DNA cloning; applications and ethical concerns. Topics include: DNA isolation and purification, vector systems and characteristics, key enzymes (restriction and ligase), electrophoresis and PCR, sequencing and hybridization (Southern, Northern, Western blots), DNA libraries, recombinant DNA transformation, selection and expression, cloning methods (shotgun, PCR-based, heterologous probes), mutagenesis, genetic engineering in animals and plants, and transgenic products.
References	1. Fatchiyah, Esti L.A., Widyarti, S., & Rahayu, S. (2011). *Biologi Molekular: Prinsip Dasar Analisis*. Erlangga, Jakarta.
	2. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2008). *Molecular Biology of the Cell* (5th ed.). Garland Publishing, New York.
	3. Brown, T.A. (1993). *Genetics: A Molecular Approach* (2nd ed.). Chapman & Hall.
	4. Freifelder, D. (1987). *Microbial Genetics*. Jones & Bartlett Publishers.
	5. Lewin, B. (1997). *Genes VI*. Oxford University Press.

MPB 4166. Microbial Genetics (2 Credits)	
Topics	Introduction: definition of genetics. Genetic material in bacteria and viruses. DNA replication; transcription and translation. Regulation of gene expression. Changes in microbial genetic material.
References	*(No references were listed in the provided material. If you'd like, I can suggest standard textbooks to accompany this course.)*

ECHOLOGY

MPB 2267. Waste Treatment Technology (2 Credits)	
Topics	Introduction to waste definitions (liquid, solid, gas) and the scope of treatment technologies. Environmental impacts of waste. Physical, chemical, and biological characteristics of liquid waste. Waste quality standards, water and effluent criteria. Physical, chemical, and biological treatment methods for liquid, solid, and gaseous waste.
References	1. Crueger, W., & Crueger, A. (1982). *Biotechnology: A Textbook of Industrial Microbiology*. Science Tech Inc., Madison.
	2. Hindarko, S. (2003). *Mengolah Air Limbah Supaya Tidak Mencemari Orang Lain*. Penerbit ESHA, Jakarta.
	3. Sugiharto. (1987). *Dasar-dasar Pengelolaan Air Limbah*. UI Press, Jakarta.
	4. Pruss, A., Giroult, E., & Rushbrook, P. (2005). *Pengelolaan Aman Limbah Layanan Kesehatan*. EGC, Jakarta.
MPB 2268. Marine Biology (3 Credits)	
Topics	Marine environment and climate; geomorphology, tides, waves, and currents; physical and chemical characteristics; marine plankton and primary productivity; seaweeds (algae, angiosperms); marine invertebrates (adaptation, reproduction, feeding); nekton; reptiles and seabirds; marine mammals; coral reef and intertidal ecosystems; marine invasion and conservation.
References	1. Hutabarat, S., & Evans, S.M. (1990). *Pengantar Oseanografi*.

	2. Mann, K.H., & Lazier, J.R. (1995). *Dynamics of Marine Ecosystems*.
	3. Nybakken, J. (1986). *Biologi Laut: Suatu Pengantar Ekologi*. Gramedia.
	4. Parsons, T.R., & Takahashi, M. (1996). *Oceanographic Processes*.
	5. Steele, J.H., Thorpe, S.A., & Turekian, K.K. (2009). *Marine Biology*. Elsevier Academic Press.
MPB 2269. Environmental Impact Assessment (2 Credits)	
Topics	Introduction to EIA (AMDAL) and Detailed EIA (ANDAL); legal foundations; basics of natural and artificial resource evaluation; assessing impacts of resource changes; resource-based environmental management; AMDAL stages; ANDAL methods and analysis; scoping, impact prediction, evaluation, environmental monitoring and management plans.
References	1. Budihardjo, E. (1999). *Metoda-Metoda AMDAL*. Litbang Depdagri, Jakarta.
	2. Hafschmidt, M.M., et al. (1992). *Lingkungan Sistem Alami dan Pembangunan*. Trans. Reksohadiprodjo, Gadjah Mada Univ. Press.
	3. Soemarwoto, O. (2001). *Analisis Mengenai Dampak Lingkungan*. Gadjah Mada Univ. Press.
	4. Soemarmo, G. (2000). *Dasar-dasar AMDAL*. Gadjah Mada Univ. Press.
MPB 2270. Environmental Pollution (3 Credits)	
Topics	Definitions of pollution, environmental carrying capacity, ecosystem degradation; pollutant behavior and transport in ecosystems; water, groundwater, air, noise, and soil pollution: sources, pollutant fate in aquatic, atmospheric, and terrestrial systems; environmental impact assessments; management and control strategies for water, air, and soil pollution, including bioremediation.
References	1. Hafschmidt, M.M. et al. (1992). *Lingkungan Sistem Alami dan Pembangunan*. Gadjah Mada Univ. Press.

	2. Kristanto, P. (2004). *Ekologi Industri*. LPPM, Surabaya.
	3. Mukhtasor. (2007). *Pencemaran Pesisir dan Laut*. Pradnya Paramita, Jakarta.
	4. Petterson, J.W. (1942). *Industrial Waste Management Series*. Lewis Publishers.
	5. Suparmoko. (1994). *Ekonomi Sumber Daya Alam dan Lingkungan*. BPFE, Yogyakarta.
	6. Suprihanto, N. (2005). *Pencemaran Tanah dan Air Tanah*. ITB Press, Bandung.
MPB 2271. Tropical Wetland and Peatland Ecology (3 Credits)	
Topics	Concepts and definitions of wetlands; management, classification, and benefits; role of hydrology and biota; classification by tidal patterns; biogeochemical cycles of nitrogen, sulfur, phosphorus, and methane production; peatland types in Indonesia; ecological function and utilization of tropical peatlands.
References	1. Aksornkoae, S. (1993). *Ecology and Management of Mangroves*. IUCN, Bangkok.
	2. Chapman, V.J. (1976). *Mangrove Vegetation*. J. Cramer, Vaduz.
	3. Groombridge, B. (1992). *Global Biodiversity: Status of the Earth's Living Resources*. Chapman & Hall.
	4. Maun, K.H. (1992). *Ecology of Coastal Waters: A Systems Approach*. Blackwell Scientific.
MPB 3272. Limnology (3 Credits)	
Topics	Introduction to freshwater ecosystems: physical and chemical characteristics; biotic–abiotic relationships; freshwater organisms (phytoplankton, zooplankton, benthos); ecosystem resilience and self-purification; river basins, lakes, reservoirs, ponds; freshwater productivity; disturbances like upwelling, algal blooms, and pollution; economic value and management of freshwater ecosystems.
References	1. Odum, E.P. (1971). *Fundamentals of Ecology*. W.B. Saunders, Philadelphia.

	2. McNaughton, S.J. & Wolf, L.L. (1980). *Ekologi Umum* (translated). Gadjah Mada Univ. Press.
	3. Edmondson, W.T. (1966). *Freshwater Biology*.
	4. Brandy. (1980). *Water Management*. IRRI, Manila.
	5. John, G.I. & McCoy, J. (1986). *Wetland and Environment*. Oxford Printed, New York.
MPB 3273. Biogeography (2 Credits)	
Topics	Introduction to biogeography. Regional divisions of flora and fauna kingdoms. Biogeographic processes: dispersal, adaptation, colonization, extinction. Distribution patterns, endemism, disjunction, island biogeography, and Indonesian biogeography. Applications of biogeography in addressing modern challenges. Supports understanding of biodiversity formation, distribution, and conservation across local, regional, and global scales.
References	1. Brown, J.H., & Lomolino, M.V. (1998). *Biogeography* (2nd ed.). Sinauer Associates, Sunderland.
	2. Huggett, R.J. (2004). *Fundamentals of Biogeography* (2nd ed.). Routledge, London.
	3. Whittaker, R.J., & Fernández-Palacios, J.M. (2007). *Island Biogeography*. Oxford University Press.
	4. Allen, W.C., & Schmidt, K.P. (1983). *Ecological Animal Geography*. John Wiley & Sons, New York.
	5. Ebach, M.C., & Tangney, R.S. (2007). *Biogeography in a Changing World*. CRC Press, Boca Raton.
	6. Journals: *Global Ecology & Biogeography*, *Journal of Biogeography*.
MPB 3174. Planktology (3 Credits)	
Topics	Introduction to plankton studies. Sampling and analytical methods. Diversity and systematics of phytoplankton and zooplankton. Plankton chemistry, flotation and adaptation, vertical distribution, causes of blooms. Plankton as bioindicators. Geographic and seasonal variation. Feeding interactions, predators, utilization, and culture techniques.

References	1. Abel, P.D. (1989). *Freshwater Biology*. John Wiley & Sons, New York.
	2. Edmondson, W.T. (1966). *Freshwater Biology*.
	3. Davies, C.C. (1975). *Marine Planktonology*. Michigan State University Press.
MPB 4175. Environmental Toxicology (3 Credits)	
Topics	Introduction to the principles of environmental toxicology. Xenobiotic classification; eco-kinetics, quantification, and pharmacokinetics. Principles of toxic effects, cellular adaptation. Biological impacts of toxins: tumor formation, neurotoxicity, sensory impairment, liver and kidney toxicity, blood and skin toxicity, teratogenicity. Overview of additives, pesticides, heavy metals, and detoxification mechanisms.
References	1. Duffus, J.H. (1983). *Environmental Toxicology*. Edward Arnold, London.
	2. Durhan, W.F. (1975). *Dangerous Properties of Industrial Materials*. Van Nostrand Reinhold, New York.
	3. Finney, D.J. (1971). *Assay Based on Quantal Responses (Probit Method)*. IRRI, Los Baños.
	4. Mangkoedihardjo, S., & Samudro, G. (2009). *Ekotoksikologi Teknosfer*. Guna Widya, Jakarta.
	5. Pascoe, D. (1983). *Toxicology*. Edward Arnold, London.
	6. Ramade, F. (1987). *Ecotoxicology*. John Wiley & Sons, New York.
MPB 3176. Soil Biology (3 Credits)	
Topics	Introduction to the perspective of soil biology. Soil ecology: terminology, types of soil biota, nutrient and energy cycling, biomass, interactions among soil organisms, and microbes as producers of bioactive compounds. Soil macrofauna: arthropods, vertebrates, earthworms. Earthworm ecology: adaptations, ecological factors, distribution, species associations. Earthworms as soil bio-ameliorators. Roles in ecosystems: decomposing household waste, indicators of heavy metal pollution, and pesticide/fertilizer impacts.

References	Hanafiah, K.A. (2005). *Biologi Tanah: Ekologi dan Makrobiologi Tanah*. PT Rajagrafindo Persada, Jakarta.

IX. Computer Systems Engineering Study Program

A. Introduction

The rapid advancement of computer technology has revolutionized numerous fields, making tasks more efficient and accessible. From instant information exchange to precise industrial automation, computers enhance productivity and competitiveness across sectors.

In **industry**, automation has improved **product quality, efficiency, and corporate competitiveness**. Machines once operated manually are now controlled through **complex computer systems**, allowing **greater precision and diversity in production**.

Additionally, advancements in **wired and wireless networking** have enabled **remote control of industrial processes via the internet**.

Computers also play a vital role in **robotics**, replacing human labor in specialized tasks such as:

- Industrial product packaging
- Machine operation and process automation
- Chemical experimentation in research laboratories
- Medical diagnostics and expert system replacements
- Children's entertainment and robotics-driven toys

Recognizing the importance of computer systems engineering, **Universitas Tanjungpura established the Computer Systems Study Program in 2008**, following approval from the Directorate General of Higher Education (Dirjen Dikti), under **Permit No. 2076/D/T/2008 (July 7, 2008)**. The program officially began accepting students in the **2008–2009 academic year**.

Following **institutional evaluation**, program accreditation was extended until **July 7, 2014**, based on Rector's Approval Letter **No. 7324/II/T/K-N/2011 (June 6, 2011)**.

In **2017**, as part of a nationwide **university program restructuring**, the Ministry of Research, Technology, and Higher Education enacted **Regulation No. 257/M/KPT/2017**, leading to the renaming of the program to **Computer Systems Engineering** through Rector's **Decree No. 3420/UN22/DL/2017 (November 21, 2017)**.

Graduates now earn the **Bachelor of Computer Science (S.Kom) degree**, and in **2018, the program was accredited with a "B" rating** under **National Accreditation Board (BAN-PT) Decree No. 398/SK/BAN-PT/Akred/S/II/2018** (valid until **February 6, 2023**).

B. Vision

"By 2020, to be a leading study program in Computer Systems Engineering, producing graduates with strong character and national competitiveness."

C. Mission

The program is committed to **high-quality education, research, and community engagement**, aiming to:

1. **Deliver outstanding academic programs**, ensuring graduates have expertise in **Computer Networks, Embedded Systems, and Mobile Technology** in accordance with national standards (KKNI).
2. **Conduct active research and publications** involving students in **Computer Technology innovation**.
3. **Support community service projects**, integrating **technological advancements** to meet societal needs.

D. Objectives

To achieve its vision and mission, the program sets the following goals:

- **Produce well-rounded, high-quality graduates** capable of competing **globally**.
- **Develop and advance computer science and technology**, contributing to **national development** and **quality of life improvements**.
- **Apply computer technology** to enhance **living standards and economic competitiveness**.

E. Graduate Profile

The study program aligns with **Universitas Tanjungpura's mission** and the **Faculty of Mathematics and Natural Sciences (FMIPA) objectives**.

With **specialized expertise and research facilities**, graduates gain proficiency in:

- **Embedded Systems**, emphasizing **sensor-based applications**.
- **Computer Networks**, focusing on **network security innovations**.
- **Mobile Applications**, including **software development and Geographic Information Systems (GIS)**.

Graduates qualify for careers as:

1. **Embedded Systems Engineers**
2. **Computer Network Engineers**

3. **Mobile Application Developers**

IX.F Learning Outcomes

a. General Learning Outcomes (Attitudes and General Skills)

Graduates are expected to develop:

1. **Faith in God Almighty and a strong religious character**.
2. **Commitment to humanitarian values**, ensuring ethical conduct in professional duties.
3. **Contributions to societal development**, fostering national and cultural advancement based on Pancasila.
4. **National pride and patriotism**, with a sense of responsibility toward Indonesia's future.
5. **Respect for cultural diversity**, different viewpoints, and original contributions from others.
6. **Strong social awareness and teamwork**, ensuring sensitivity to societal needs.
7. **Discipline and adherence to laws** in personal and professional life.
8. **Integration of academic norms and ethical values**.
9. **Professional accountability**, demonstrating independent expertise in computer systems.
10. **Entrepreneurial mindset**, fostering innovation and self-reliance.
11. **Logical, critical, systematic, and innovative thinking** for technological development.
12. **High-quality, measurable, and independent work performance**.
13. **Ability to analyze the impact of scientific and technological advancements**, ensuring ethical implementation of knowledge.
14. **Scientific research proficiency**, including thesis writing and publication on university platforms.
15. **Decision-making skills**, using data-driven analysis to solve computing challenges.
16. **Professional networking abilities**, maintaining connections within academic and industrial fields.
17. **Leadership and team collaboration**, overseeing projects and ensuring group efficiency.
18. **Self-evaluation and continuous learning**, fostering lifelong education.
19. **Data documentation and security awareness**, ensuring validity and plagiarism prevention.
20. **Proficiency in international languages**, enhancing global competitiveness.

b. Specialized Learning Outcomes

Graduates should:

1. **Understand computer systems functionality**, enabling digital product design and development.
2. **Design and develop embedded systems** using modern methods and tools.
3. **Create computer networks and hardware** suited for organizational needs.
4. **Apply scientific computing principles**, solving technical challenges through model-based solutions.

c. Additional Competencies for Graduates

1. **Basic knowledge of computer and natural sciences (MIPA)**.

2. **Mathematical and physical reasoning skills**, improving computational problem-solving abilities.
3. **Expertise in digital electronics and circuit design** for computer applications.
4. **Programming proficiency**, including algorithm analysis, object-oriented programming (OOP), and data structure implementation.
5. **Web application development skills**, utilizing J2EE and effective database design.
6. **Advanced computing skills**, applying mathematical modeling and numerical analysis to system development.
7. **User-friendly computer interface design**, focusing on peripheral integration.
8. **System security and engineering proficiency**, ensuring robust computer systems.
9. **Real-time signal processing expertise**, relevant to automation and computing applications.
10. **Automation system implementation**, covering industrial PLCs and robotics.
11. **Mobile software development**, integrating Geographic Information Systems (GIS) in distributed environments.
12. **Cybersecurity expertise**, analyzing and solving security-related challenges.
13. **Artificial intelligence application design**, leveraging AI algorithms in computing solutions.

IX.F.4 Additional Learning Outcomes

Graduates of the **Computer Systems Engineering Study Program** are expected to develop:

- **Strong work ethic**, demonstrating honesty, diligence, precision, perseverance, and creativity.
- **Adaptability to professional environments**, ensuring seamless integration into workplace dynamics.

These qualities help graduates **thrive in competitive industries**, enabling them to contribute meaningfully to **technological advancements and organizational success**.

IX.G Faculty & Staff

1. Faculty Members

The **Computer Systems Engineering Study Program** is supported by **experienced lecturers** specializing in various fields:

No	Name	Expertise Area
1	Drs. Cucu Suhery, M.A.	Mathematics
2	Dedi Triyanto, S.T., M.T.	Electrical Engineering & Computer Engineering
3	Sampe Hotlan Sitorus, S.Si., M.Kom.	Mathematics & Computer Science
4	Fatma Agus Setyaningsih, S.Kom., M.Cs.	Computer Science & Artificial Intelligence
5	Tedy Rismawan, S.Kom., M.Cs.	Computer Science & Artificial Intelligence
6	Ikhwan Ruslianto, S.Kom., M.Cs.	Computer Science & Networking
7	Syamsul Bahri, S.Kom., M.Cs.	Computer Science
8	Rahmi Hidayati, S.Kom., M.Cs.	Computer Science
9	Dwi Marisa Midyanti, S.T., M.Cs.	Computer Science
10	Irma Nirmala, S.T., M.T.	Electrical Engineering & Computer Engineering

No	Name	Expertise Area
11	Uray Ristian, S.Kom., M.Kom.	Computer Science & Computer Systems
12	Suhardi, S.T., M.Eng.	Information Technology

2. Administrative & Laboratory Staff

No	Name	Education
1	Yuyun Yuniartika, S.Si. (Administration)	Mathematics

IX.H Curriculum

The **study program** plays a **critical role in delivering high-quality education**, ensuring students acquire **necessary competencies** for the job market.

To maintain academic excellence, the program continuously **evaluates and updates its curriculum** based on industry trends and technological advancements.

1. Evolution of the Curriculum

Initially, the program used the **2010 Content-Based Curriculum**. However, due to **rapid advancements in computer technology**, the curriculum was revised in **2015** to become **Competency-Based Curriculum (CBC)**, aligning with the **Indonesian National Qualifications Framework (KKNI)**.

2. Merdeka Belajar – Kampus Merdeka Implementation

Following **Regulation No. 3/2020** from the Ministry of Education, the program adopted the **Merdeka Belajar – Kampus Merdeka initiative**, allowing students to take **up to 3 semesters outside their study program**.

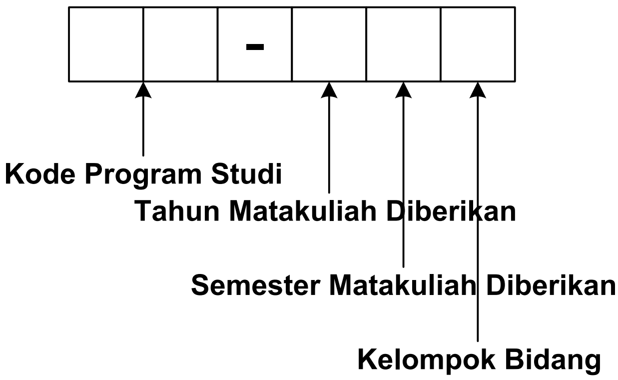
Students can enroll in **elective or required courses** from other departments, **earning credits that count toward graduation**. Course selection must be approved by an **Academic Advisor**, ensuring compatibility with the **learning outcomes of Computer Systems Engineering**.

IX.H.1 Course Code Structure

Each course in the **Computer Systems Engineering curriculum** is assigned a **unique code**, providing information on:

1. **Study Program Code**
2. **Course Year** (when the course is offered)
3. **Field of Study Category**
4. **Semester** (in which the course is delivered)

Further details on **course coding** are outlined in the curriculum guide.



IX.H.2 Mandatory Courses

Mandatory courses are **core subjects that all students must take** to fulfill graduation requirements. Some courses have **prerequisites**, ensuring students build upon foundational knowledge before advancing.

Semester 1			
No	**Code**	**Course Name**	**Credits (SKS)**
1	MKWU4	Indonesian Language	2
2	UMG-105	English I	2
3	MPU-101	Calculus	3
4	MPU-103	Physics I	3
5	MPU-105	Introduction to Information Technology	2
6	SK-103	Discrete Mathematics	3
7	SK-105	Programming Basics	4
Total Credits			**19 SKS**
Semester 2			
No	**Code**	**Course Name**	**Credits (SKS)**
1	MKWU1	Religious Education	3
2	UMG-106	English II	2
3	SK-100	Linear Algebra and Matrices	2
4	SK-102	Advanced Calculus	3
5	SK-104	Physics II	3
6	SK-106	Algorithm Analysis	4
7	SK-108	Database Systems	3
Total Credits			**20 SKS**
Semester 3			
No	**Code**	**Course Name**	**Credits (SKS)**
1	MKWU3	Citizenship	2
2	SK-201	Differential Equations	3
3	SK-203	Data Communication	3

4	SK-211	Electronics	3
5	SK-213	Digital Systems & Engineering	3
6	SK-221	Introduction to Computer Networks	2
7	SK-231	Web Design	2
Total Credits			**18 SKS**
Semester 4			
No	**Code**	**Course Name**	**Credits (SKS)**
1	MKWU2	Pancasila	2
2	SK-200	Probability and Statistics	3
3	SK-202	Computer Organization & Architecture	4
4	SK-204	Artificial Intelligence	2
5	SK-212	Systems & Circuits	3
6	SK-222	Computer Networks	3
7	SK-232	Web Programming	3
Total Credits			**20 SKS**
Semester 5			
No	**Code**	**Course Name**	**Credits (SKS)**
1	SK-301	Operating Systems	2
2	SK-311	Control Systems	2
3	SK-321	Advanced Computer Networks	3
4	SK-331	Software Engineering	3
5	SK-341	Microprocessor Systems	3
6	SK-371	Entrepreneurship	2
7	-	Elective Course	-
Total Credits			**15 SKS**
Semester 6			
No	**Code**	**Course Name**	**Credits (SKS)**
1	SK-300	Numerical Methods	3
2	SK-310	Peripherals & Interfaces	2
3	SK-312	Embedded Systems	3
4	SK-332	Mobile Programming	2
5	SK-370	Research Methodology	2
6	-	Elective Course	-
Total Credits			**12 SKS**
Semester 7			
No	**Code**	**Course Name**	**Credits (SKS)**
1	SK-401	Parallel Processing	3
2	SK-411	Robotics	3
3	SK-471	Scientific Writing & Seminar Techniques	2

4	SK-473	Human-Computer Interaction	2
5	SK-475	Community Service / Internship	2
6	-	Elective Course	-
Total Credits			**12 SKS**
Semester 8			
No	**Code**	**Course Name**	**Credits (SKS)**
1	SK-400	System Security	3
2	SK-470	Professional Ethics	2
3	SK-478	Final Project (Thesis)*	6
4	-	Elective Course	-
Total Credits			**11 SKS**

Note: (*) Can be taken in odd or even semesters.

This curriculum ensures students receive **a solid foundation in computer systems, software engineering, networking, artificial intelligence, and embedded systems**.

IX.H.3 Elective Courses

Students are **free to choose elective courses** available each semester. However, it is recommended that students select electives aligned with their **interests and final project requirements**.

Due to specific considerations, **some elective courses may be rescheduled** (from even to odd semesters or vice versa) or temporarily unavailable.

Starting from the **2015–2016 academic year**, the program introduced **Mandatory Electives (PW)**—elective courses that students **must take** if they specialize in a specific concentration. These concentrations and their required electives are as follows:

A. Embedded Systems Engineers

1. **Transducers and Sensors**
2. **Advanced Logic Design**

B. Computer Network Engineers

1. **Network Security**
2. **Network Programming**

C. Mobile Application Developers

1. **Geographic Information Systems (GIS)**
2. **Mobile Information Systems**

Odd Semester (Elective Courses)			
No	**Code**	**Course Name**	**Credits (SKS)**
1	SK-303	Semester Project 1	2
2	SK-305	Database Management Systems	2
3	SK-307	Fuzzy Logic	2
4	SK-313	Transducers and Sensors (PW)	3

5	SK-323	Network Security (PW)	3
6	SK-333	Multimedia & Animation Programming	2
7	SK-335	Geographic Information Systems (PW)	3
8	SK-403	Modeling and Simulation	2
9	SK-405	Image Recognition & Pattern Recognition	3
10	SK-407	Digital Forensics	2
11	SK-409	Decision Support Systems	2
12	SK-413	Sequential Control Systems	2
13	SK-451	Kampus Merdeka Program 1	max. 3
Total Credits			**33 SKS**
Even Semester (Elective Courses)			
No	**Code**	**Course Name**	**Credits (SKS)**
1	SK-302	Semester Project 2	2
2	SK-304	Machine Learning	2
3	SK-306	Distributed Systems	3
4	SK-314	Advanced Logic Design (PW)	3
5	SK-322	Network Programming (PW)	3
6	SK-334	Mobile Information Systems (PW)	3
7	SK-340	Digital Signal Processing	2
8	SK-402	Cryptography	2
9	SK-404	Real-Time Systems	2
10	SK-406	Artificial Neural Networks	2
11	SK-408	Swarm Intelligence	2
12	SK-472	Computers and Society	2
13	SK-452	Kampus Merdeka Program 2	max. 3
Total Credits			**30 SKS**

The **elective courses allow students to specialize in key areas** like **network security, artificial intelligence, robotics, digital forensics, and mobile computing**, ensuring **flexibility in career pathways**.

I Syllabus

The course syllabus is structured in such a way that each subject includes content relevant to the expected competencies. In addition, there is continuity and reinforcement between courses from the foundational to advanced levels, equipping students with knowledge aligned with the demands of the job market.

The following section presents the syllabi for general education courses, basic science courses, and specialization courses, all tailored to meet the intended learning outcomes. It is expected that the delivery of content for each course achieves at least the minimum standard as designed.

01. MKWU4 – Indonesian Language (2 SKS)	
Content	Students will develop skills in effective written and spoken communication, adhering to proper linguistic rules. This course also emphasizes the role of the Indonesian language as a medium for knowledge dissemination and national unity.
	Topics Covered:
	• Academic writing techniques
	• Book and article review methodologies
	• Scientific proposal and report preparation
	• Linguistic policies and language standardization in Indonesia
Reference	1. Kemenristekdikti (2016). *Indonesian Language Education Module for Universities*. Dirjen Belmawa.
	2. Awalludin (2017). *Introduction to Indonesian Language for Higher Education*. Deepublish, Yogyakarta.
	3. Dyah Amiyah Lindayani et al. (2016). *Indonesian Language as a General Course*. Gramedia, Jakarta.
	4. Surono et al. (2009). *Indonesian Language for Universities*. Faculty of Literature, UNDIP.
02. UMG-105 – English I (2 SKS)	
Content	Students will gain proficiency in technical English, focusing on computer-related terminology and report writing.
	Topics Covered:
	• Word pronunciation and phonetics
	• Tense structures (active/passive voice)
	• Verbal expressions (gerund, infinitive, participle)
	• Clause usage (noun, adjective, adverb, conditional)
	• Technical vocabulary and comprehension
Reference	*(Not provided)*
03. MPU-101 – Calculus (3 SKS)	
Content	Core calculus concepts for engineering and computing.
	Topics Covered:
	• Real number systems and coordinate geometry
	• Functions and graphs
	• Limits and continuity
	• Derivatives and applications
	• Integrals and techniques of integration
Reference	1. Ayres, F.J. *Calculus, Differential & Integral*.

	2. Leithold, L. *The Calculus with Analytic Geometry*.
	3. Purcell, E.J. *Calculus*. Prentice Hall.
	4. Spiegel, M. *Advanced Calculus*.
	5. Strauss, Bradley, G.L., Karl & Smith. *Calculus*. Prentice Hall.
	6. Stroud, K.A. *Mathematics for Engineering*.
04. MPU-103 – Physics I (3 SKS)	
Content	Fundamental physics principles and applications in life and engineering.
	Topics Covered:
	• Physical quantities and units
	• Kinematics and dynamics
	• Newton's laws
	• Momentum, work, energy
	• Thermal physics
	• Oscillations, waves, sound
Reference	1. Alonso & Finn (1994). *Fundamentals of University Physics Vol. I*. Erlangga.
	2. Halliday & Resnick (1996). *Physics I* (3rd ed.). Erlangga.
	3. Sears & Zemansky (1985). *University Physics Vol. I*. Binacipta.
	4. Sutrisno (1997). *Fundamentals of Physics: Mechanics*. ITB Press.
	5. Tipler (1991). *Physics for Science and Technology Vol. I*. Erlangga.
	6. Giancoli. *Physics Vol. 1* (4th ed.). Erlangga.
05. MPU-105 – Introduction to Information Technology (2 SKS)	
Content	Introduction to IT fundamentals, applications, and internet literacy.
	Topics Covered:
	• IT evolution and devices
	• History of computing
	• Hardware components
	• Data processing
	• Office software
	• Internet ethics, e-learning, cloud use

Reference	1. Jogiyanto H.M. *Introduction to Computers*. Andi Offset.
	2. Turban et al. (2005). *Information Technology for Management* (5th ed.). Wiley.
	3. Williams & Sawyer (2007). *Using Information Technology* (7th ed.). McGraw-Hill.
	4. Siarto, E. (2010). *Head First WordPress*. O'Reilly.
06. SK-103 – Discrete Mathematics (3 SKS)	
Content	Foundations for logic, algorithms, and data structures.
	Topics Covered:
	• Sets, functions, relations
	• Logic and proofs
	• Graphs and trees
	• Recursion, combinatorics
Reference	1. Munir, R. (2012). *Discrete Mathematics*. Informatika, Bandung.
	2. Jong Jek Siang (2004). *Discrete Mathematics and Applications*. Andi, Yogyakarta.
07. SK-105 – Programming Fundamentals (4 SKS)	
Content	Programming basics using Alice 3, Greenfoot, and Java.
	Topics Covered:
	• Object manipulation in Alice
	• OOP in Greenfoot
	• Java: variables, control structures, OOP principles, exceptions
Reference	1. Oracle Academy Java Learning Resources.
	2. alice.org
	3. greenfoot.org
	4. Abdul Kadir (2007). *Java Programming Fundamentals*. Andi.
	5. Indrajani & Martin (2007). *Object-Oriented Programming in Java*. Elex Media.
08. MKWU1 – Religious Education (3 SKS)	
Content	Religious perspectives and ethics in life and professions.
	Topics Covered:
	• Moral values and religious faith
	• Humanity and responsibility
	• Spirituality and social harmony

	• Religion and science
Reference	1. Kemenristekdikti (2016). *Islamic Religious Education Module*. Dirjen Belmawa.
	2. Kemenristekdikti (2016). *Christian Religious Education Module*. Dirjen Belmawa.
09. UMG-106 – English II (2 SKS)	
Content	Develop reading, writing, and listening skills in technical contexts.
	Topics Covered:
	• Reading comprehension
	• Academic writing
	• Summarizing texts
	• Scientific essay writing
	• Referencing techniques
Reference	
10. SK-100 – Linear Algebra and Matrices (2 SKS)	
Content	Core concepts for matrix algebra and vector space applications.
	Topics Covered:
	• Determinants, matrix inversion
	• Linear transformation
	• Eigenvalues and eigenvectors
	• Solving linear systems
Reference	1. Anton, H., & Rorres, C. (1995). *Elementary Linear Algebra* (6th ed.). Wiley.
	2. Arifin, A. (2001). *Linear Algebra* (2nd ed.). ITB Press.
	3. Durbin, J.R. (1992). *Modern Algebra* (3rd ed.). Wiley.
	4. Kreyszig, E. (1993). *Advanced Engineering Mathematics* (8th ed.). Wiley.
	5. Leon, S.J. (2001). *Linear Algebra and Its Applications*. Erlangga.
11. SK-102 – Advanced Calculus (3 SKS)	
Content	Students will explore multivariable calculus concepts, preparing them for applications in optimization, physics, and computational modeling.
	Topics Covered:
	• Sequences and infinite series
	• Polar coordinate system and parametric equations
	• Vector calculus and operations

	• Partial and total derivatives
	• Multiple integrals and their applications
Reference	1. Ayres, F.J. *Calculus, Differential & Integral*.
	2. Kreyszig, M. *Advanced Engineering Mathematics*.
	3. Leithold, L. *The Calculus with Analytic Geometry*.
	4. Purcell, E.J. *Calculus*. Prentice Hall.
	5. Spiegel, M. *Advanced Calculus*.
	6. Strauss, G.L., Karl & Smith. *Calculus*. Prentice Hall.
	7. Stroud, K.A. *Mathematics for Engineering*.
12. SK-104 – Physics II (3 SKS)	
Content	Students will learn advanced electromagnetic and optical physics concepts, essential for electronics, telecommunications, and computing applications.
	Topics Covered:
	• Electric fields and potentials
	• Capacitors and dielectric materials
	• DC circuits and magnetic fields
	• Electromagnetic induction and AC circuits
	• Maxwell's equations
	• Light: polarization, interference, diffraction
	• Optics, photometry, and spectroscopy
	• Lasers, holography, X-rays, atomic models
Reference	1. Alonso, M.E.J. & Finn, E.J. (1994). *Fundamentals of University Physics Vol. II*. Erlangga.
	2. Halliday, D. & Resnick, R. (1996). *Physics II* (3rd ed.). Erlangga.
	3. Sears, F.W. & Zemansky, M.W. (1985). *University Physics Vol. II*. Binacipta.
	4. Sutrisno (1997). *Fundamentals of Physics: Mechanics*. ITB Press.
	5. Tipler, P.A. (1991). *Physics Vol. II*. Erlangga.
	6. Giancoli, D.C. *Physics Vol. II*. Erlangga.
13. SK-106 – Algorithm Analysis (4 SKS)	
Content	Students study data structures and algorithm efficiency for computing applications.
	Topics Covered:
	• Java Collections API

	• Searching and sorting algorithms
	• Lists, stacks, queues, sets
	• Trees (binary, AVL), Huffman coding
Reference	1. Nugroho, A. (2008). *Algorithms and Data Structures in Java*. Andi.
	2. Weiss, M.A. (2012). *Data Structures and Algorithm Analysis in Java* (3rd ed.). Pearson.
14. SK-108 – Database Systems (3 SKS)	
Content	Design principles, relational modeling, and security of databases.
	Topics Covered:
	• DB fundamentals and architecture
	• Normalization and relational models
	• SQL and implementation
	• Distributed databases
	• Access control and security
Reference	1. Fathansyah, H. (2014). *Database Systems*. Informatika, Bandung.
15. MKWU3 – Citizenship Education (2 SKS)	
Content	Students develop civic responsibility and knowledge of Indonesia's political system.
	Topics Covered:
	• Civic awareness
	• Democracy and governance
	• Human rights and justice
	• Pancasila and national values
	• Role of citizens in development
Reference	1. Kemenristekdikti (2016). *Citizenship Education Module*. Dirjen Belmawa.
	2. Budimansyah, D. (2006). *Moral Education in Civic Dimensions*. UPI.
	3. Pasha, M.K. (2008). *Civic Education*. Citra Karsa Mandiri.
	4. Sunarso et al. (2006). *Citizenship Education*. UNY Press.
16. SK-201 – Differential Equations (3 SKS)	
Content	Students master ODE techniques for dynamic modeling.
	Topics Covered:
	• First and second-order ODEs

	• Special functions: Gamma, Beta, Bessel
	• Equation systems
	• Mathematical modeling applications
Reference	1. Bronson, R. & Costa, G.B. (2010). *Differential Equations*. Erlangga.
	2. Finizio, N. & Ladas, G. (2006). *Ordinary Differential Equations*. Erlangga.
	3. Kreyszig, E. (2017). *Advanced Engineering Mathematics* (11th ed.). Wiley.
	4. Purcell et al. (2012). *Calculus* (8th ed.). Erlangga.
	5. Spiegel, M.R. (2018). *Advanced Mathematics for Engineers and Scientists*. Erlangga.
	6. Stewart, J. (2015). *Calculus* (4th ed.). Erlangga.
	7. Stroud, K.A. (2018). *Mathematics for Engineering* (3rd ed.). Erlangga.
17. SK-203 – Data Communication (3 SKS)	
Content	Covers network architecture, transmission techniques, and protocols.
	Topics Covered:
	• Error detection and correction
	• TCP/IP protocols
	• Wireless communication
	• Network security principles
Reference	1. Forouzan, B.A. (2013). *Data Communications and Networking*. McGraw-Hill.
	2. Stallings, W. (2017). *Data and Computer Communications*. Pearson.
18. SK-211 – Electronics (3 SKS)	
Content	Fundamentals of electrical and electronic systems.
	Topics Covered:
	• Circuit components
	• Semiconductors
	• Analog/digital systems
	• Microcontroller basics
Reference	1. Sedra, A.S. & Smith, K.C. (2014). *Microelectronic Circuits* (7th ed.). Oxford Univ. Press.
	2. Floyd, T.L. (2018). *Electronic Devices* (10th ed.). Pearson.
19. SK-213 – Digital Systems and Engineering (3 SKS)	
Content	Logical circuit systems and programmable devices.

	Topics Covered:
	• Number systems and Boolean algebra
	• Logic gates
	• Combinational and sequential designs
	• Memory and PLDs
Reference	1. Mano, M.M. & Ciletti, M.D. (2017). *Digital Design* (6th ed.). Pearson.
	2. Tocci, R.J. et al. (2016). *Digital Systems* (11th ed.). Pearson.
20. SK-221 – Introduction to Computer Networks (2 SKS)	
Content	Basic networking concepts and infrastructure.
	Topics Covered:
	• OSI and TCP/IP models
	• LAN, WAN, wireless networks
	• Switches, routers, firewalls
	• IPv4/IPv6 addressing
Reference	1. Kurose, J.F. & Ross, K.W. (2021). *Computer Networking* (8th ed.). Pearson.
	2. Tanenbaum, A.S. & Wetherall, D.J. (2010). *Computer Networks* (5th ed.). Pearson.
21. SK-231 – Web Design (2 SKS)	
Content	HTML structures and responsive design; CSS styling and animation; JavaScript basics and DOM manipulation; web tools and frameworks; intro to UX/UI design.
Reference	1. Duckett, J. (2011). *HTML and CSS: Design and Build Websites*. Wiley Publishing.
	2. McFarland, D.S. (2020). *JavaScript and jQuery: Interactive Front-End Development*. O'Reilly Publishing.
22. SK-232 – Web Programming (3 SKS)	
Content	Structured web design using HTML and CSS; JavaScript for interactivity; PHP for server-side scripting; MySQL database integration; web security practices.
Reference	1. Duckett, J. (2011). *HTML and CSS*. Wiley Publishing.
	2. McFarland, D.S. (2020). *JavaScript and jQuery*. O'Reilly Publishing.
	3. Ullman, L. (2018). *PHP and MySQL for Dynamic Web Sites*. Pearson Publishing.
23. SK-300 – Numerical Methods (3 SKS)	
Content	Error analysis in computation; interpolation; root-finding (Newton-Raphson, Bisection, Secant); numerical differentiation/integration; solving differential equations numerically.
Reference	1. Chapra, S.C. & Canale, R.P. (2014). *Numerical Methods for Engineers* (7th ed.). McGraw-Hill.
	2. Burden, R.L. & Faires, J.D. (2017). *Numerical Analysis* (10th ed.). Cengage Learning.
24. SK-310 – Peripherals and Interface (2 SKS)	

Content	Peripheral devices (storage, I/O, network); communication protocols (USB, UART, SPI, I2C); real-time hardware interaction; interrupts; interface in embedded/robotics.
Reference	1. Stallings, W. (2014). *Computer Organization and Architecture* (10th ed.). Pearson.
	2. Liu, J.W.S. (2000). *Real-Time Systems*. Pearson.
25. SK-312 – Embedded Systems (3 SKS)	
Content	Architecture of embedded systems; microcontroller programming (C & assembly); system interfacing; real-time scheduling; IoT and industrial automation use.
Reference	1. Barr, M. & Massa, A. (2006). *Programming Embedded Systems*. O'Reilly Publishing.
	2. Wolf, W. (2019). *Computers as Components* (4th ed.). Morgan Kaufmann.
26. SK-331 – Software Engineering (3 SKS)	
Content	Agile, Waterfall, DevOps models; software lifecycle and project management; requirements and modeling; testing and validation; UX and human-centered design.
Reference	1. Sommerville, I. (2019). *Software Engineering* (10th ed.). Pearson.
	2. Pressman, R.S. & Maxim, B.R. (2019). *Software Engineering* (9th ed.). McGraw-Hill.
27. SK-341 – Microprocessor Systems (3 SKS)	
Content	Microprocessor architecture; assembly language; memory/I/O interfacing; interrupts; applications in embedded systems, robotics, and IoT.
Reference	1. Brey, B.B. (2019). *The Intel Microprocessors* (8th ed.). Pearson.
	2. Wolf, W. (2019). *Computers as Components* (4th ed.). Morgan Kaufmann.
28. SK-371 – Entrepreneurship (2 SKS)	
Content	Innovation and entrepreneurship basics; business modeling and startup planning; commercialization of tech; marketing and finance; startup case studies.
Reference	1. Ries, E. (2011). *The Lean Startup*. Crown Publishing.
	2. Blank, S. & Dorf, B. (2014). *The Startup Owner's Manual*. Wiley Publishing.
29. SK-401 – Parallel Processing (3 SKS)	
Content	Parallel computing principles; programming models; distributed computing; GPU computing; applications in high-performance computing.
Reference	1. Quinn, M.J. (2017). *Parallel Programming in C with MPI and OpenMP*. McGraw-Hill.
	2. Foster, I. (1995). *Designing and Building Parallel Programs*. Addison-Wesley.
30. SK-411 – Robotics (3 SKS)	
Content	Introduction to robotics; system components; robotic kinematics and dynamics; autonomous control methods; integration of AI in robotics.
Reference	1. Craig, J.J. (2018). *Introduction to Robotics* (4th ed.). Pearson.
	2. Siciliano, B. & Khatib, O. (2019). *Springer Handbook of Robotics*. Springer Publishing.
31. SK-321 – Advanced Computer Networks (3 SKS)	
Content	IEEE standardization for networks; network infrastructure; WAN management and configuration; broadcasting and multimedia; IPv6 and VLAN implementation; VPN and

	tunneling; file transfer protocols; Quality of Service (QoS); network security and incident handling; Frame Relay; cloud computing.
Reference	Stasiak, M., Grabowski, M., Wiśniewski, A., & Zwierzykowski, P. (2010). *Modeling and Dimensioning of Mobile Wireless Networks: From GSM to LTE*. Wiley.
32. SK-331 – Software Engineering (3 SKS)	
Content	Introduction to software engineering; SDLC; software planning; analysis and design modeling; software testing techniques; maintenance; mini-project implementation.
Reference	1. Pressman, R. (2002). *Software Engineering (Vol. 1)*. Andi.
	2. Simarmata, J. (2008). *Software Engineering*. Andi.
	3. Rizky, S. (2011). *Basic Concepts of Software Engineering*. Prestasi Pustaka.
33. SK-341 – Microprocessor Systems (3 SKS)	
Content	Number systems and data formats; microprocessor architecture and programming; instruction sets; assembly programming; I/O interfacing; control buses; timing diagrams; interrupt handling; serial I/O systems.
Reference	1. Brey, B.B. (2005). *The Intel Microprocessors*. Andi.
	2. Budiharto, W. & Firmansyah, S. (2010). *Digital Electronics & Microprocessors*. Andi.
	3. Setiawan, R. (2006). *Microprocessor 8088*. Graha Ilmu.
	4. Tim Lab Mikroprosesor (2007). *AT89S51 Programming in C/C*++. Andi.
34. SK-371 – Entrepreneurship (2 SKS)	
Content	Concepts and context of entrepreneurship in Indonesia; entrepreneurial traits; identifying business opportunities; small business management and evaluation; entrepreneurial development.
Reference	1. Budiyono, A.H. (2004). *Introduction to Management*. Graha Ilmu.
	2. Alma, B. (2000). *Entrepreneurship*. Alfabeta.
	3. Rye, D.E. (1996). *Tools for Executives Entrepreneurs*. Prenhallindo.
	4. Bangun, D. (1989). *Corporate Management*. Dirjen Dikti.
	5. Meredith, G.G. *Entrepreneurship: Theory and Practice*. Binaman.
35. SK-300 – Numerical Methods (3 SKS)	
Content	Error propagation; solving non-linear equations; interpolation; numerical integration; linear systems and matrices; solving ODEs numerically.
Reference	1. Triatmodjo, B. (1996). *Numerical Methods*. Beta Offset.
	2. Hamming, R.W. (1987). *Numerical Methods for Scientists and Engineers*. Dover.
	3. Press, W.H. et al. (2007). *Numerical Recipes*. Cambridge Univ. Press.
36. SK-310 – Peripherals and Interface (2 SKS)	
Content	PC hardware identification; interface classifications; memory, I/O and signal interfacing; PPI, ART, A/D conversion; real-time clock; serial and parallel communication; data acquisition; ADC/DAC systems; stepper motor control using 8255; standard computer access.
Reference	*(Not specified)*

37. SK-312 – Embedded Systems (3 SKS)	
Content	Embedded system overview and architecture; embedded microcontrollers; embedded C and RTOS; design methodologies; low-power systems; multiprocessors; interfacing; mixed-signal systems.
Reference	1. Marwedel, P. (2006). *Embedded System Design*. Springer.
	2. Samek, M. (2009). *Practical UML Statecharts in C/C++*. Elsevier.
	3. Lewis, D. (2002). *Fundamentals of Embedded Software*. Prentice Hall.
	4. Pont, M.J. (2002). *Embedded C*. Addison-Wesley.
38. SK-332 – Mobile Programming (2 SKS)	
Content	Mobile SDK installation; emulator use; UI design and display settings; error handling and interface controls; project development for mobile platforms.
Reference	1. Simon, J. (2011). *Head First Android Development*. O'Reilly.
	2. Mednieks, Z. et al. (2012). *Programming Android* (2nd ed.). O'Reilly.
	3. Gargenta, M. & Nakamura, M. (2014). *Learning Android* (2nd ed.). O'Reilly.
	4. Lee, W.M. (2013). *Android Application Development Cookbook*. Wiley.
39. SK-370 – Research Methodology (2 SKS)	
Content	Types of research; proposal and thesis preparation; research writing and formatting; statistics in research; computer tools for research; presentation skills and reporting.
Reference	Dawson, C.W. (2005). *Projects in Computing and Information Systems: A Student's Guide*. Pearson.
40. SK-401 – Parallel Processing (3 SKS)	
Content	High-performance computing architectures; pipelines, arrays, vectors, multiprocessors; semaphores; inter-process communication; distributed systems; OCCAM, Fortran 90, Sequent-C, C-Linda.
Reference	Jordan, H.F. (2002). *Fundamentals of Parallel Processing*. Pearson.
41. SK-411 – Robotics (3 SKS)	
Content	Introduction to robotics; robot components, actuators, effectors; degrees of freedom (DOF); control mechanisms; kinematics and representations; control architectures (including behavior-based); behavior coordination; robotic navigation; Robot Operating System (ROS).
Reference	1. Mataric, M.J. (2007). *The Robotics Primer*. MIT Press.
	2. Jazar, R.N. (2007). *Theory of Applied Robotics*. Springer.
	3. Braunl, T. (2008). *Embedded Robotics*. Springer.
	4. Siegward, R., Nourbakhsh, I.R., & Scaramuzza, D. (2011). *Introduction to Autonomous Robots*. MIT Press.
	5. Pyo, Y. et al. (2017). *ROS Robot Programming*. ROBOTIS.
42. SK-471 – Scientific Writing and Seminar Techniques (2 SKS)	
Content	Structure of scientific writing; scientific language use; numeric/symbolic notation; terminology and nomenclature; visual aids; citation formats; oral presentation skills for academic settings.

Reference	1. Sulistyo, B. (2006). *Research Methods*. FIB UI.
	2. Kountur, R. (2007). *Research Methods*. PPM Publishing.
43. SK-473 – Human-Computer Interaction (2 SKS)	
Content	Overview of HCI; GUI design and evaluation; I/O technologies; intelligent systems; user-centered design; GUI programming; data visualization; multimedia systems.
Reference	1. Santoso, I. (2010). *Human-Computer Interaction* (2nd ed.). Andi.
	2. Dix, A. et al. (2004). *Human-Computer Interaction* (3rd ed.). Pearson.
	3. Galitz, W.O. (2002). *The Essential Guide to User Interface Design* (2nd ed.). Wiley.
44. SK-475 – Internship/Practical Work (2 SKS)	
Content	Independent industry-based project supervised by faculty; requires a final report and panel presentation; one semester duration; held at UNTAN or external institutions.
Reference	*(Not specified)*
45. SK-400 – System Security (3 SKS)	
Content	Computer security fundamentals; cryptography; OS, hardware, web, and database security; malware; auditing and SOPs; security trends; ethical hacking introduction.
Reference	1. IBISA (2011). *Information System Security*. Andi.
	2. Setiawan, D. (2005). *Computer System Security*. Elex Media.
	3. Crampton, J., Jajodia, S., & Mayes, K. (2013). *Computer Security*. Springer.
46. SK-470 – Professional Ethics (2 SKS)	
Content	Ethics and moral values in the workplace and cyberspace; IT's social impact; anonymity, privacy, and ownership in cyberspace; legal and ethical standards; professional codes.
Reference	1. Supriyanto, A. (2005). *Introduction to Information Technology*. Salemba Infotek.
	2. McLeod, R. Jr. (1995). *Management Information Systems* (Vol. 1). Prenhallindo.
	3. Isnanto, R.R. (2009). *Professional Ethics*. UNDIP.
47. SK-478 – Final Project (6 SKS)	
Content	Capstone research project under two faculty advisors; larger in scope than internship; spans one or two semesters; assessed by faculty panel.
Reference	*Final Project Writing Guidelines*, FMIPA, Universitas Tanjungpura.
48. SK-303 – Semester Project 1 (2 SKS)	
Content	Application of computer science knowledge in a creative or innovative project; followed by structured scientific reporting.
Reference	*(Not specified)*
49. SK-305 – Database Management Systems (2 SKS)	
Content	Database system overview; relational model; normalization and denormalization; data modeling; implementation; query processing.
Reference	Hariyanto, B. (2004). *Database Management Systems*. Informatika.

50. SK-307 – Fuzzy Logic (2 SKS)	
Content	Fundamentals of fuzzy logic; fuzzy sets and operators; inference systems; fuzzy databases and clustering; FMADM applications.
Reference	1. Kusumadewi, S. & Purnomo, H. (2010). *Applications of Fuzzy Logic*. Graha Ilmu.
	2. Kusumadewi, S. & Hartati, S. (2010). *Neuro-Fuzzy*. Graha Ilmu.
51. SK-313 – Transducers and Sensors (3 SKS)	
Content	Principles of sensors and transducers; signal conditioning; various sensor types and applications (vibration, biosensors, chemical, inductive/capacitive, electromagnetic, fluid, force, humidity, radiation, motion, pressure, temperature); basics of wireless sensor networks.
Reference	1. Norton, H.N. (1989). *Handbook of Transducers*. Prentice Hall.
	2. Wilson, J.S. (2005). *Sensor Technology Handbook*. Newnes.
52. SK-323 – Network Security (3 SKS)	
Content	Security concepts and threats; cryptography; digital signatures; IP network and wireless security; SSL/TLS; email/web protection; authentication; firewalls and VPN; OS security (Windows/UNIX); intrusion detection and recovery.
Reference	1. Ariyus, D. (2009). *Multimedia Security*. Andi.
	2. Sadikin, R. (2012). *Cryptography for Network Security*. Andi.
	3. Lockhart, A. (2006). *Network Security Hacks*. O’Reilly.
	4. Santos, O. (2008). *End-to-End Network Security*. Cisco Press.
53. SK-333 – Multimedia and Animation Programming (2 SKS)	
Content	Multimedia foundations; Processing environment; 2D/3D animation; image, text, audio, video processing; computer vision; JavaScript and Android integration.
Reference	Sutopo, H. (2007). *Multimedia Programming*. Jakarta.
54. SK-335 – Geographic Information Systems (3 SKS)	
Content	GIS fundamentals; system components and data models; GIS workflows and analysis; application of GIS in geographical and spatial studies.
Reference	Prahasta, E. (2009). *Geographic Information Systems: Basic Concepts*. Informatika.
55. SK-403 – Modeling and Simulation (2 SKS)	
Content	Modeling and simulation theories; system analysis; discrete event modeling; simulation tools and languages; data analysis; model validation and result interpretation.
Reference	Sridadi, B. (2009). *Modeling and Simulation Systems*. Informatika.
56. SK-405 – Image and Pattern Recognition (3 SKS)	
Content	Principles of image recognition; sound and voice processing; clustering and classification; preprocessing; feature extraction; pattern recognition.
Reference	1. Gonzales & Woods (2002). *Digital Image Processing* (2nd ed.). Prentice Hall.
	2. Duda, Hart & Stork (2000). *Pattern Classification* (2nd ed.). Wiley.
	3. Kadir & Susanto (2013). *Theory and Applications of Image Processing*. Andi.

	4. Ahmad, U. (2005). *Digital Image Processing*. Graha Ilmu.
	5. Acharya & Ray (2005). *Image Processing: Principles and Applications*. Wiley.
57. SK-407 – Digital Forensics (2 SKS)	
Content	IT forensics and methodology; electronic laws in Indonesia; legal evidence procedures; forensic tools; cybersecurity; incident response; forensic analysis and reporting.
Reference	1. Al Azhar, M.N. (2012). *Digital Forensic*. Salemba.
	2. Philipp et al. (2009). *Hacking Exposed Computer Forensics*. McGraw-Hill.
	3. Spreitzenbarth & Uhrmann (2015). *Mastering Python Forensics*. Packt.
58. SK-409 – Decision Support Systems (2 SKS)	
Content	Introduction to decision modeling; DSS architecture; heuristic and data mining approaches; case-based reasoning; optimization for limited choices.
Reference	Kusrini (2007). *Concepts and Applications of DSS*. Andi.
59. SK-413 – Sequential Control Systems (2 SKS)	
Content	PLC addressing and memory; ladder logic; function blocks; variable declaration; real-world programming practice; hands-on project implementation.
Reference	Bryan, L.A. & Bryan, E.A. (1997). *Programmable Controllers* (2nd ed.). Industrial Text Co.
60. SK-302 – Semester Project 2 (2 SKS)	
Content	Individual applied project that builds on Semester Project 1 or introduces a new topic; integrates computer science knowledge into a documented innovation or research output.
Reference	*(Not specified)*
61. SK-304 – Machine Learning (2 SKS)	
Content	Core concepts of machine learning; algorithm types (parametric and non-parametric); support vector machines; unsupervised learning; optimization strategies; real-world ML applications.
Reference	Kelleher, J.D. & Mac Namee, B. (2015). *Fundamentals of Machine Learning for Predictive Data Analytics*. MIT Press.
62. SK-306 – Distributed Systems (3 SKS)	
Content	Fundamentals of distributed systems; hierarchical and horizontal models; risks and strategy in distributed computing; RPC, shared files, distributed OS and databases; security, complexity, compatibility; case studies (Amoeba, Mach, Locus, etc.).
Reference	Tanenbaum, A.S. (2006). *Distributed Systems: Principles and Paradigms*. Pearson.
63. SK-314 – Advanced Logic Design (3 SKS)	
Content	Inverter functions; combinational and sequential logic structures; material electronics; memory and array structures; VHDL and logic simulation.
Reference	1. Brown, S., & Vranesic, Z. (2009). *Fundamentals of Digital Logic with VHDL Design*. McGraw-Hill.
	2. Ashenden, P.J. (2008). *Digital Design: An Embedded Systems Approach Using Verilog*. Morgan Kaufmann.
	3. Vahid, F. (2011). *Digital Design with RTL Design, VHDL, and Verilog*. Wiley.
	4. Yarborough, M. (1997). *Digital Logic Application and Design*. West Publishing.

	5. Givone, D.D. (2002). *Digital Principles and Design*. McGraw-Hill.
64. SK-322 – Network Programming (3 SKS)	
Content	Network fundamentals with Java; I/O and HTTP; socket programming (TCP/UDP); multithreading; RMI and CORBA; servlet development.
Reference	1. Susanto, B. (2003). *Client/Server Programming with Java 2*. Elexmedia.
	2. Harold, E.R. (2004). *Java Network Programming* (3rd ed.). O'Reilly.
	3. Chhabra, V. *A Beginner's Guide to RMI*. Universal Teacher.
	4. Reilly, D. & Reilly, M. (2002). *Java Network Programming and Distributed Computing*. Addison-Wesley.
65. SK-334 – Mobile Information Systems (3 SKS)	
Content	Mobile application architecture; SQLite and content providers; Android components (services, sensors, fragments); MVC pattern; UI/UX design; project-based mobile systems.
Reference	*(Not specified)*
66. SK-340 – Digital Signal Processing (2 SKS)	
Content	DSP concepts and theory; discrete Fourier transform; sampling and digital filtering techniques; spectrum analysis and signal transformations.
Reference	Sianipar, R.H., Wiryajati, I.K., & Irwan, M. (2012). *Digital Signal Processing*. Andi Publishing.
67. SK-402 – Cryptography (2 SKS)	
Content	Cryptographic methods and math foundations; classical and modern encryption; digital signatures; hashing and MAC; secure key management; steganography; cryptographic protocols.
Reference	1. Munir, R. (2004). *Cryptography*. Informatika, Bandung.
	2. Stallings, W. (1999). *Cryptography and Network Security* (2nd ed.). Prentice Hall.
68. SK-404 – Real-Time Systems (2 SKS)	
Content	Real-time system architecture and task handling; scheduling strategies; programming languages and tools; databases and communication; reliability and fault tolerance.
Reference	Bennett, S. (1994). *Real-Time Computer Control* (2nd ed.). Prentice Hall.
69. SK-406 – Artificial Neural Networks (2 SKS)	
Content	Neural network structures; perceptron and activation functions; Hebbian and delta rules; backpropagation; LVQ; hybrid and adaptive learning systems.
Reference	1. Fausett, L. *Fundamentals of Neural Networks*.
	2. Puspaningrum, D. (2006). *Introduction to Artificial Neural Networks*. Andi.
70. SK-408 – Swarm Intelligence (2 SKS)	
Content	Concepts of swarm-based algorithms; self-organizing behavior; genetic algorithms; simulated annealing; ant colony optimization; particle swarm optimization.
Reference	Kennedy, J., & Eberhart, R. (2001). *Swarm Intelligence*. Morgan Kaufmann.
71. SK-472 – Computers and Society (2 SKS)	

Content	This course explores the **social, ethical, and legal dimensions** of computing. Topics include the historical and social context of computer science, professional ethics, intellectual property, piracy, privacy, digital transactions, cybersecurity laws, and watermarking. It also introduces students to legal foundations in Indonesia: definition and objectives of law, types of law, legal systems, contracts, dispute resolution, legal documentation, arbitration, and intellectual property like trademarks.
Reference	Preston, J., Preston, S., & Ferrett, R. (2007). *Computers and Society*. Andi Publisher.

Chapter X
Department/Study Program of Marine Science

X.1 Introduction

West Kalimantan, which is directly adjacent to the Natuna Sea and Karimata Strait, has great potential for globalization. By enhancing the competitiveness of human resources in West Kalimantan, especially in the marine resources sector, it is expected that this potential can be optimized for the welfare of the people of West Kalimantan. Universitas Tanjungpura, as one of the public universities in West Kalimantan, must play an active role in providing and improving the quality of education, ultimately increasing the competitiveness of human resources in the region.

Several achievements have been made by Universitas Tanjungpura, particularly the Faculty of Mathematics and Natural Sciences (FMIPA), which recognizes the intangible potential of West Kalimantan's marine environment and biological resources. As a result, marine exploration research has become an exclusive focus, supported by funding from the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek). Marine exploration research at Universitas Tanjungpura has produced findings that enrich oceanography, bioecology, and the utilization of marine biological resources. This is the foundation for the establishment of the Marine Science Department at FMIPA UNTAN. The Marine Science Department is supported by teaching staff with a minimum qualification of a Master's degree.

Table 10.1 List of Teaching Staff in the Marine Science Department

No.	Name	NIP/NIDK	Expertise	Expertise Group
1	Arie Antasari Kushadiwijayanto, S.Si, M.Si	198609072015041001	Physics, Oceanography	OSE
2	Yusuf Arief Nurrahman, S.Kel., M.Si	198903172018031001	Marine Science, Oceanography	BIO
3	Nora Idiawati, S.Si, M.Si	197510152006042001	Pharmaceutical Chemistry	PRO
4	Warsidah, S.Si, Apt, M.Si	197304122000032001	Pharmacy, Chemistry	PRO
5	Muliadi, S.Si, M.Si	197005101999031003	Physics, Oceanography	OSE
6	Apriansyah, S.Si, M.Si	198604292014041001	Computational Physics, Physical Oceanography	OSE
7	Mega Sari Juane Sofiana, S.Si, M.Sc	198606242019032017	Computational Chemistry	PRO
8	Sukal Minsas, S.Si., M.Si.	198507192019032007	Biology	BIO
9	Dwi Imam Prayitno, S.Kel, M.Si	8876270018	Biology	PRO
10	Sy. Irwan Nurdiansyah, S.Si, M.Si	8827270018	Biology	BIO
11	Ikha Safitri, S.Pi, M.Si	8886270018	Fisheries	BIO
12	Risko, S.Si, M.Si	8896270018	Physics, Marine Science	OSE
13	Shifa Helena, S.Kel, M.Si	8817270018	Marine Science	BIO

OSE = Oceanography,
BIO = Marine Bioecology and Conservation,
PRO = Marine Biological Products

X.2 Program Profile

The Marine Science Study Program (PS-IKA) at the Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Tanjungpura (UNTAN), is an institution focused on developing fundamental sciences aimed at producing high-quality graduates capable of competing in the global era. The learning process in PS-IKA is based on the Decree of the Director General of Higher Education (DIKTI) regarding the Assignment for the Implementation of PS-IKA No. 630/E.E2/DT/2013, dated July 10, 2013 (1 Ramadan 1434 H).

PS-IKA FMIPA UNTAN has three primary expertise groups and one additional field of expertise:

1. **Oceanography** – Studies the physical and dynamic phenomena of seawater, applicable in areas such as engineering, environmental science, fisheries, disaster management, and mitigation (management and prevention).
2. **Marine Bioecology and Conservation** – Focuses on marine ecosystems and conservation efforts to maintain sustainability.
3. **Marine Biological Products** – Explores marine resource utilization for added value.
4. **Marine Information Technology** – A newly developed field as an implementation of the *Merdeka Belajar Kampus Merdeka* (MBKM) program, allowing students to take courses outside PS-IKA within the same university.

X.3 Vision and Mission

Vision:

To become an excellent research center in the exploration and conservation of shallow marine resources and environments.

Mission:

1. Implement a comprehensive undergraduate education system in marine science, referring to national higher education quality standards.
2. Encourage faculty members and students to conduct integrated research with national and international significance.
3. Carry out community service activities in the marine sector to contribute to societal well-being.

X.4 Objectives

The objectives of the Marine Science Study Program at UNTAN are:

- Educate students through a learning process based on the Indonesian National Qualifications Framework (KKNI), integrating cognitive, affective, and psychomotor aspects in marine science, ensuring graduates possess knowledge and skills to compete at the regional, national, and international levels.
- Develop knowledge and skills for effective and efficient planning and management of marine natural resources.
- Provide optimal services to the community through superior teaching facilities and research in marine science.

X.5 Graduate Profile

Graduates of the Marine Science Study Program at UNTAN can pursue careers as:

1. Research assistants specializing in marine organisms, environment, and dynamics
2. Marine educators and instructors
3. Advocates for marine and coastal conservation
4. Marine entrepreneurs
5. Marine analysts
6. Marine surveyors
7. Dive guides

X.6 Learning Outcomes

Table 10.2 Attitude Aspects

SI-1	Demonstrates religious values, discipline, noble character, responsibility, and commitment to the principles stated in the Preamble of the 1945 Constitution.
SI-2	Able to grow and adapt to work conditions and societal changes both individually and in teams, capable of making informed decisions, leading, and organizing resources effectively.

Table 10.3 Knowledge Mastery Aspects

P-1	Mastering concepts and applying Science and Technology (IPTEK) in the field of marine sciences, enabling systematic analysis of issues and formulation of solutions for exploration and conservation of shallow marine resources and environments.

Table 10.4 General Skills Aspects

KU-1	Capable of collaborating and taking responsibility for personal and group work results while evaluating tasks under their responsibility with devotion to God Almighty.
KU-2	Able to communicate, collaborate, think critically and creatively, identify problems, take responsibility, interpret data, use technology, empathize, and understand computational logic, aligning with 21st-century demands. **Literacies and 21st-century skills**: Fostering **high-order thinking skills (HOTS)**, including **Communication, Collaboration, Critical Thinking, Creative Thinking, Computational Logic, Compassion, and Civic Responsibility** through data literacy, technology literacy, and human literacy.

Table 10.5 Specialized Skills Aspects

KK-1	Able to conduct **responsible marine resource exploration** using observation instruments, scientific diving, mapping, marine information systems, marine acoustics, rehabilitation techniques, and biotechnology independently and creatively—demonstrating problem-solving skills.
KK-2	Able to **integrate marine science and technology** to preserve marine ecosystems, particularly shallow waters.

X.7 Curriculum

X.7.1 Curriculum Structure

a. Body of Knowledge

The Marine Science Study Program has formulated **four Bodies of Knowledge** as a framework for achieving the previously defined Learning Outcomes (CPL).

1. **MKWU** (General University Courses) – Mandatory knowledge that must be provided to students as part of Universitas Tanjungpura's academic framework.
2. **Science and Technology (Saintek)** – Knowledge that equips students to adapt to technological advancements and cultivate lifelong independent learning.
3. **Core Marine Science** – Fundamental expertise that every Marine Science student at FMIPA UNTAN must acquire.
4. **Specialized Study Fields & MBKM** – Additional knowledge designed to sharpen and expand students' expertise in selected topics.

Table 10.6 Marine Science Curriculum Body of Knowledge (2021)

No	Body of Knowledge	Credit Units (SKS)	Percentage
1	MKWU (General University Courses)	16	11%
2	Science and Technology (Saintek)	34	24%
3	Core Marine Science	61	42%
4	Specialized Study Fields & MBKM	33	13%

b. Courses

1. Mandatory Courses

Semester I			
No.	**Code**	**Course**	**SKS**
1	MKWU4	Bahasa Indonesia	2
2	UMG-105	English	3
3	MPL-511	Fundamental of Mathematics I	3
4	MPL-512	Fundamental of Physics I	3
5	MPU-105	Introduction to Information Technology	2
6	MPU-109	Fundamental of Chemistry	3
7	MPL-513	Fundamental of Biology	2
8	MPL-514	Nusantara Maritime Concept	2
Total Credits			**20**
Semester II			
No.	**Code**	**Course**	**SKS**
1	MKWU1	Religion	3
2	MPL-521	Marine Statistics	3
3	MPL-522	Marine Biology	3
4	MPL-523	Fundamental of Physics II	3
5	MPL-524	Fundamental of Mathematics II	3
6	MPL-525	Organic Chemistry	3
7	MPL-526	Programming Basics	3
Total Credits			**21**
Semester III			
No.	**Code**	**Course**	**SKS**
1	MPL-531	Programming Algorithm	3
2	MPL-532	Scientific Writing	3
3	MPL-533	Marine Environment	3
4	MPL-534	Oceanography and Climate Change	3
5	MPL-535	Laboratory and Field Work Safety	3
6	MPL-536	Marine Geology and Sedimentology	3
7	MPL-537	Biochemistry	3
Total Credits			**21**
Semester IV			
No.	**Code**	**Course**	**SKS**
1	MPL-541	Diving	4

2	MPL-542	Shallow Waters and Estuary Ecology	3
3	MPL-543	Marine Numerics Method	3
4	MPL-544	Marine Biodiversity	3
5	MPL-545	Marine Natural Product Chemistry	3
6	MPL-546	Marine Law	2
7	MKWU2	Pancasila	2
		Total Credits	**20**
		Semester V	
No.	**Code**	**Course**	**SKS**
1	MKWU4	Citizenship	2
2	MPL-551	Entrepreneurship (mandatory)	3
3	MPL-552	Shallow Waters and Estuary Oceanography	3
4	MPL-553	Marine and Coastal Conservation	3
5	MPL-554	Marine Instrumentation	3
6	MPL-555	Marine GIS and Remote Sensing	3
7	MPL-556	Seminar	2
8	—	Elective Courses (students can take more than 2 if SKS allocation allows)	2
		Total Credits	**21**
		Semester VI	
No.	**Code**	**Course**	**SKS**
1	MPL-561	Research Proposal (GA/GE)	3
2	—	Elective Courses (Max. 21 SKS)	18
		Total Credits	**21**
		Semester VII	
No.	**Code**	**Course**	**SKS**
1	MPL-411	Internship / Practical Work (GA/GE)	2
2	—	Elective Courses	6
3	MPL-412	Final Project / Thesis (GA/GE)	6
		Total Credits	**14**
		Semester VIII	
No.	**Code**	**Course**	**SKS**
1	—	Elective Courses	6
		Total Credits	**6**

2. Elective Courses

a. Elective Courses for Oceanography Specialization				
Odd Semester				
Code	Course	SKS	Semester	Prerequisites
MPL-671	Oceanography Surveys	3	7	Oceanography and Climate Change
MPL-651	Sea Currents	2	5	Oceanography and Climate Change
MPL-652	Sea Tides	2	5	Oceanography and Climate Change
MPL-672	Nusantara’s Oceanography	2	7	Oceanography and Climate Change
MPL-653	Marine Meteorology	2	5	Oceanography and Climate Change
MPL-673	Advanced Marine Modeling	3	7	Basic Marine Modeling
Even Semester				
Code	Course	SKS	Semester	Prerequisites
MPL-661	Sea Waves	2	6	Oceanography and Climate Change
MPL-662	Marine Acoustics	2	6	Fundamental Mathematics I, Fundamental Physics I, Oceanography and Climate Change
MPL-663	Coastal Morphology	2	6	Oceanography and Climate Change
MPL-664	Fisheries Oceanography	2	6	Oceanography and Climate Change
MPL-665	Signal Processing	3	6	Fundamental Mathematics I, Fundamental Physics I, Oceanography and Climate Change
MPL-667	Basic Marine Modeling	3	6	Programming Basics, Algorithm Programming, Oceanography and Climate Change
b. Elective Courses for Marine Bioecology and Conservation Specialization				
Odd Semester				
Code	Course	SKS	Semester	Prerequisites
MPL-771	Marine Ecotoxicology	3	7	Marine Biology, Marine Environment
MPL-751	Planktonology	3	5	Marine Biology
MPL-772	Bioremediation	2	7	Marine Biology
MPL-752	Mangrove Botany	3	5	Marine Biology, Shallow Waters and Estuary Ecology
Even Semester				
Code	Course	SKS	Semester	Prerequisites

MPL-761	Coralogy	3	6	Marine Biology, Shallow Waters and Estuary Ecology
MPL-762	Phycology	3	6	Marine Biology
MPL-763	Ichthyology	3	6	Marine Biology
MPL-764	Marine Pollution	2	6	Marine Biology, Marine Environment
c. Elective Courses for Marine Natural Product Specialization				
Odd Semester				
Code	Course	SKS	Semester	Prerequisites
MPL-851	Marine Microbiology	3	5	Fundamental Biology, Marine Biology, Marine Biodiversity
MPL-852	Cell and Genes	2	5	Fundamental Biology, Marine Biodiversity
MPL-871	Advanced Biotechnology	3	7	Biotechnology
MPL-872	Food Chemistry	3	7	Fundamental Chemistry, Biochemistry, Marine Natural Product Chemistry
MPL-853	Compound Identification	2	5	Fundamental Chemistry, Biochemistry, Marine Natural Product Chemistry
Even Semester				
Code	Course	SKS	Semester	Prerequisites
MPL-861	Biotechnology	3	6	Fundamental Chemistry, Biochemistry, Marine Natural Product Chemistry
MPL-862	Separation and Purification Methods	3	6	Fundamental Chemistry, Biochemistry, Marine Natural Product Chemistry
MPL-863	Marine Pharmacology	3	6	Fundamental Chemistry, Biochemistry, Marine Natural Product Chemistry
MPL-864	Bioassay	2	6	Fundamental Chemistry, Biochemistry, Marine Natural Product Chemistry
d. Elective Courses for General Studies				
Odd Semester				
Code	**Course**	**SKS**	**Semester**	**Type**
MPL-951	Special Topics	3	5	Theory
MPL-952	Marine Disaster Mitigation	2	5	Theory
MPL-971	Basic Environmental Impact Assessment (AMDAL)	2	7	Theory
MPL-972	Coastal Management	2	7	Theory
MPL-953	Carcinology	2	5	Theory
MPL-973	Global Ocean Observation System	2	7	Theory

MPL-974	Marine Radionuclides	2	7	Theory
MPL-954	Marine Natural Product Processing	3	5	Practical
MPL-976	Fermentation Technologies	2	7	Theory
MPL-977	Internship (GA/GE)	2	7	—
MPL-978	Organizational Studies	2	7	—
Even Semester				
Code	**Course**	**SKS**	**Semester**	**Type**
MPL-961	Ecotourism	2	6	Theory
MPL-962	Scientific Diving	3	6	Practical
MPL-963	Coastal Rehabilitation	2	6	Theory
MPL-964	Marine Aquaculture	3	6	Practical
MPL-965	Malacology	2	6	Theory
MPL-966	Ocean Renewable Energy	2	6	Theory
MPL-968	In Vitro Culture Techniques	2	6	Theory
e. **Elective Courses for Marine Information Technology Specialization (MBKM)**				
Odd Semester	**Course**	**SKS**	**Semester**	**Type**
	Web Programming 1	3	5	
	Database Systems	3	7	
	Electronics	3	7	
	Robotics	3	7	
Even Semester	**Course**	**SKS**	**Semester**	**Type**
	Web Programming 2	3	6	
	Artificial Intelligence	2	6	
	Mobile Programming	2	6	
	Embedded Systems	3	6	

Course Equivalency in the 2017 and 2021 Curricula

2017 Curriculum				2021 Curriculum				
Code	**Course**	**SKS**	**Sem**	**Code**	**Course**	**SKS**	**Sem**	**W/P**
MPU-101	Mathematics	3	1	MPL-511	Fundamental Mathematics I	3	1	W
MPU-103	Fundamental Physics (P)	3	1	MPL-512	Fundamental Physics I	3	1	W
MPU-111	Contextual Biology	2	1	MPL-513	Fundamental Biology	3	1	W
MPL-111	Introduction to Marine Science	2	1	MPL-533	Marine Environment	3	3	W
MPL-112	Marine Biology (P)	4	2	MPL-522	Marine Biology	3	2	W
MPL-114	Marine Geology	2	2	MPL-536	Marine Geology and Sedimentology	3	3	W
MPL-116	Marine Meteorology-Climatology (P)	3	2	MPL-653	Marine Meteorology	2	5	W
MPL-118	Organic Chemistry (P)	3	2	MPL-525	Organic Chemistry	3	2	W
MPL-120	Statistics	3	2	MPL-521	Marine Statistics	3	2	W
MPL-122	Marine Pollution	2	2	MPL-764	Marine Pollution	2	6	P
MPL-215	Chemical Oceanography (P)	3	3	MPL-531	Oceanography and Climate Change	3	3	W
MPL-217	Physical Oceanography (P)	3	3	MPL-531	Oceanography and Climate Change	3	3	W
MPL-219	Swimming (P)	2	3	MPL-535	Laboratory and Field Work Safety	3	3	W
MPL-221	Marine Numerical Methods (P)	3	3	MPL-543	Marine Numerical Methods	3	4	W
MPL-223	Marine Microbiology (P)	3	3	MPL-851	Marine Microbiology	3	5	P
MPL-225	Remote Sensing (P)	3	3	MPL-555	Marine GIS and Remote Sensing	3	5	W
MPL-227	Estuary Dynamics (P)	3	3	MPL-542	Shallow Waters and Estuary Oceanography	3	4	W
Code	**Course**	**SKS**	**Sem**	**Code**	**Course**	**SKS**	**Sem**	**W/P**
MPL-216	Diving (P)	2	4	MPL-541	Diving	4	4	W
MPL-218	Tropical Marine Ecology (P)	3	4	MPL-552	Shallow Waters and Estuary Ecology	3	5	W
MPL-220	Marine Sedimentology (P)	3	4	MPL-536	Marine Geology and Sedimentology	3	3	W
MPL-222	Marine Modeling I (P)	3	4	MPL-667	Basic Marine Modeling	3	6	P
MPL-224	Biochemistry (P)	3	4	MPL-537	Biochemistry	3	3	W
MPL-226	Tidal Dynamics (P)	3	4	MPL-652	Sea Tides	2	5	P

MPL-228	Ichthyology (P)	3	4	MPL-763	Ichthyology	3	6	P
MPL-311	Coralogy (P)	3	5	MPL-761	Coralogy	3	6	P
MPL-313	Marine Natural Product Chemistry	3	5	MPL-545	Marine Natural Product Chemistry	3	4	W
MPL-315	Marine Signal Analysis (P)	3	5	MPL-665	Signal Processing	3	6	P
MPL-317	Marine Instrumentation (P)	3	5	MPL-554	Marine Instrumentation	3	5	W
MPL-319	Biotechnology	3	5	MPL-861	Biotechnology	3	6	P
MPL-321	Research Methodology	2	5	MPL-532	Scientific Writing Techniques	3	3	W
MPL-310	Entrepreneurship (P)	2	6	MPL-551	Entrepreneurship	3	5	W
MPL-312	Colloquium (offered in Odd & Even Semesters)	2	6	MPL-561	Research Proposal	3	6	W
MPL-314	Marine GIS	3	6	MPL-555	Marine GIS and Remote Sensing	3	5	W
MPL-318	Marine and Coastal Conservation (P)	3	6	MPL-553	Marine and Coastal Conservation	3	5	W
MPL-320	Marine Law	2	6	MPL-546	Marine Law	2	4	W
MPL-322	Planktonology (P)	3	6	MPL-751	Planktonology	3	5	P
MPL-323	Marine Acoustics	2	5	MPL-662	Marine Acoustics	2	6	P
MPL-325	Sea Current Dynamics	2	5	MPL-651	Sea Current	2	5	P
MPL-324	Wave Dynamics	2	6	MPL-661	Sea Waves	2	6	P
MPL-326	Marine Modeling II	3	6	MPL-673	Advanced Marine Modeling	3	7	P
MPL-331	Marine Botany	2	5	MPL-752	Mangrove Botany	3	5	P
MPL-333	Malacology	2	5	MPL-965	Malacology	2	6	P
MPL-328	Bioremediation	2	6	MPL-772	Bioremediation	2	7	P
MPL-336	Carcinology	3	6	MPL-953	Carcinology	2	5	P
MPL-413	In Vitro Culture Techniques	3	7	MPL-967	In Vitro Culture Techniques	2	6	P
MPL-425	Phycology	2	7	MPL-762	Phycology	3	6	P
MPL-427	Advanced Biotechnology	2	7	MPL-871	Advanced Biotechnology	3	7	P
MPL-329	Marine Radionuclides	2	5	MPL-974	Marine Radionuclides	2	7	P
MPL-330	Marine Ecotoxicology	3	6	MPL-771	Marine Ecotoxicology	3	7	P
MPL-332	Food Chemistry	3	6	MPL-872	Food Chemistry	3	7	P
MPL-338	Separation and Purification Methods	2	6	MPL-862	Separation and Purification Methods	3	6	P

MPL-417	Marine Pharmacology	3	7	MPL-863	Marine Pharmacology	3	6	P
MPL-419	Compound Identification	3	7	MPL-853	Compound Identification	2	5	P
MPL-421	Bioassay	2	7	MPL-864	Bioassay	2	6	P
MPL-327	Environmental Impact Assessment (AMDAL)	2	5	MPL-971	Basic AMDAL	2	7	P
MPL-334	Ecotourism	2	6	MPL-961	Ecotourism	2	6	P
MPL-340	Advanced Diving	3	6	MPL-962	Scientific Diving	3	6	P
MPL-415	Marine Disaster Mitigation	2	5	MPL-952	Marine Disaster Mitigation	2	5	P
MPL-423	Marine Aquaculture	2	7	MPL-964	Marine Aquaculture	3	6	P
MPL-429	Coastal Management	2	7	MPL-972	Coastal Management	2	7	P

Syllabus of Courses in the Marine Science Study Program

a. Mandatory Courses

	Course	Credits	Description
Semester 1	**Bahasa Indonesia** (Indonesian Language)	2	Covers language functions and attitudes, standardized spelling, formal and informal language varieties, sentence structures, paraphrasing, and essay writing.
	Mathematics I	3	Covers fundamental concepts of mathematics, including number systems, inequalities, absolute values, functions, limits, continuity, derivatives, optimization problems, integrals, and their applications in differential equations, with an emphasis on calculation techniques.
	Physics I	3	Covers fundamental physics concepts, unit systems, vector algebra, mechanics (kinematics and dynamics), static and dynamic fluids, thermodynamics, vibrations, and waves.
	Fundamental of Chemistry	3	Covers basic chemistry concepts, atomic structures, electron configurations, periodic systems, stoichiometry, chemical states (solid, liquid, gas), phase changes, chemical bonding, acid-base reactions, and redox reactions.
	Fundamental of Biology	2	Introduces biology, its relationship with other sciences, and biological discoveries. Covers scientific methodology in biology, cell structure, metabolism, biodiversity classification, anatomy and physiology, ecosystems, evolution, genetics (Mendelian laws and inheritance), and interactions within ecosystems.

	Course	Credits	Description
	Introduction to Information Technology	2	Covers history and development of computer systems, components, operations, input and output mechanisms, data and information management. Teaches office applications (document formatting, equations, citations), internet applications (cyber ethics, self-security, email, e-learning, cloud storage), and blog customization.
	English	3	Covers reading comprehension, vocabulary, translation from English to Indonesian, translation of abstracts from Indonesian to English, discussions, and TOEFL-like test preparation.
	Nusantara Maritime Concept	2	Covers maritime cultural history, Indonesia's maritime vision, concepts of Indonesia as an archipelagic state, marine resources, basic maritime principles, and ocean zoning.
Semester 2	**Course**	**Credits**	**Description**
	Religion Studies	3	Covers religious understanding, core teachings of each religion, the history of science and religion, contemporary issues linking science and faith, ethics, and religious devotion.
	Scientific Writing Techniques	3	Covers the fundamentals of academic writing, research problems, objectives, concepts, variables, design, instruments, population sampling, data collection techniques, statistical calculations, analysis methods, presentation techniques, proposal development, and research reporting.
	Mathematics II	3	Content follows Mathematics I, focusing on deeper applications.
	Physics II	3	Content follows Physics I, delving into advanced principles.
	Organic Chemistry	3	Covers alcohols, ethers, aldehydes, ketones, carboxylic acids, and esters.
	Basic Programming	3	Introduces programming fundamentals and techniques.
	Marine Biology	3	Covers concepts of life, cells, genetics, evolution, biodiversity (plankton to marine mammals), and marine organisms.

Semester	Course	Credits	Description
Semester 3	**Course**	**Credits**	**Description**
	Programming Algorithm	3	Covers fundamental programming concepts, structured programming, algorithms, and problem-solving techniques.
	Marine Statistics	3	Introduces statistical basics to help students interpret data and make informed decisions. Topics include elements of statistics, data interpretation, probability concepts, random experiments, Bayes' theorem, discrete and continuous distributions, sampling distributions, hypothesis testing, variance analysis, and simple regression. Statistical software is used as a supporting tool.
	Marine Environment	3	Covers physical, chemical, and biological aspects of the ocean, including marine ecosystems and biotic and abiotic resources.
	Laboratory and Field Safety	3	Covers safety protocols in laboratory activities, marine survey safety techniques, basic swimming skills, survival techniques, and first aid in emergency situations.
	Marine Geology and Sedimentology	3	Covers basic geology concepts, plate tectonics, Earth's surface formations, material properties, stratigraphy applications in marine studies, sediment origins, sediment cycles, sediment transport, sediment texture and structure, and coastal morphology.
	Biochemistry	3	Covers biochemical composition of marine organisms, including carbohydrates, proteins, and lipids, and proximate analysis (carbohydrates, protein, lipids, ash content, and moisture).
Semester 4	**Course**	**Credits**	**Description**
	Pancasila	2	Covers Pancasila in Indonesian history, its urgency as the foundational state ideology, its philosophical system, ethical framework, and role in scientific development.
	Numeric Method	3	Covers Taylor series expansion, numerical errors and truncation, matrices, system of linear equations, interpolation, differentiation, and numerical integration.
	Diving (Widya Selam)	4	Covers swimming basics, surface survival methods, breathing techniques, basic skin and scuba diving, diving environments, dangerous marine creatures, underwater adaptation, diving physics, medical aspects, decompression sickness, and dive tables.

	Course	Credits	Description
	Ecology of Shallow Waters and Estuary	3	Covers productivity in shallow marine and estuarine ecosystems, energy cycles, mangrove ecosystems, seagrass beds, coral reefs, and survey methodologies.
	Ocean Biodiversity	3	Covers biodiversity concepts related to marine ecosystems and species diversity.
	Ocean Natural Product Chemistry	3	Covers biochemical compounds produced by marine organisms (secondary metabolites), isolation and characterization of metabolites, phytochemical screening, and applications.
	Marine Law	2	Covers maritime law principles, marine territory regulations, maritime transport and shipping laws, government policies in marine jurisdiction, resource exploration and exploitation, exclusive economic zones (EEZ), and Indonesia's maritime sovereignty.
Semester 5	**Course**	**Credits**	**Description**
	Citizenship	2	Covers the fundamentals of citizenship, Indonesia's national insight, basic concepts of national resilience, state defense, Indonesian democracy, human rights, and national political and strategic policies.
	Entrepreneurship	2	Covers economic feasibility studies, cash flow management, marketing strategies, business management, credit financing, and entrepreneurial opportunities in the marine sector.
	Oceanography of Shallow Waters and Estuary	3	Covers estuarine dynamics, circulation patterns in estuaries, environmental threats in estuarine areas, and estuary management strategies.
	Marine Instrumentation	3	Covers operation systems, usage, and maintenance of marine instruments for physical, chemical, biological, and geological ocean measurements.
	Sea and Coastal Conservation	3	Covers fundamental conservation concepts, coastal and marine ecosystem conservation, and emerging conservation paradigms.
	Marine GIS and Remote Sensing	3	Covers geographic information system components, GIS functionalities and data processing, digital map editing and transformation, topological operations, map layout design, and marine GIS applications. Introduces remote sensing theories, GEM theories, cartography principles, satellite imagery, and related technologies.

	Course	Credits	Description
	Special Course	2	Covers trending and contemporary issues in marine science, dynamically adjusted to reflect current developments in the field.
	Elective/MBKM	3	Course selection based on personal interests and independent learning opportunities.
Semester 6	**Course**	**Credits**	**Description**
	Research Proposal	3	Covers the definition of colloquium and final project, scientific research concepts, selecting a research topic, conducting literature reviews, summarizing research findings, and structured independent work. Covers research proposal writing techniques, including abstract, introduction, theoretical foundation, methodology, bibliography, and structured seminar presentations.
	Elective/MBKM	18	Allows students to select specialized courses based on individual academic interests and interdisciplinary learning.
Semester 7	**Course**	**Credits**	**Description**
	Internship/Fieldwork (KKN/KP)	2	Covers the meaning, purpose, and objectives of community service programs, government policies at central and local levels, communication techniques, practical skill development for physical and non-physical aspects of regional development, observation methodologies, problem identification, problem-solving, and work program formulation.
			Practical work placement at companies or institutions related to marine science, gaining knowledge and experience outside formal education, comparing theoretical studies with real-world applications, identifying and analyzing problems, and proposing solutions.
Semester 8	**Course**	**Credits**	**Description**
	Final Project (Thesis)	6	Conducting research aligned with the chosen field of specialization, including scientific studies, observations, or experimentation, and compiling a scientific report based on theoretical review and hypothesis formulation. The thesis serves as a formal requirement for program completion.

b. Elective Courses

Elective Courses for Oceanography Specialization				
Odd Semester	**Course**	**CREDITS**	**Semester**	**Short Description**
	Oceanography Surveys	3	7	Covers basic measurement methods, sensors, salinity, temperature, currents, water elevation, waves, and depth.
	Sea Currents	2	5	Covers geostrophic currents, wind-driven currents, density currents, coastal parallel currents, tidal currents, and global circulation patterns.
	Sea Tides	2	5	Covers classical tidal theory, dynamic tidal theory, harmonic analysis, tidal currents, and tidal modeling.
	Nusantara's Oceanography	2	7	Describes oceanographic conditions and water mass circulation across the Indonesian archipelago.
	Marine Meteorology	2	5	Covers climate, weather, seasonal impacts, and natural oceanic conditions.
Even Semester	**Course**	**CREDITS**	**Semester**	**Short Description**
	Sea Waves	2	6	Covers fundamental wave theories, wave transformation, random waves, and wave forecasting.
	Marine Acoustics	2	6	Covers methods influencing target strength, backscattering strength, acoustic data management, and analysis for stock assessments and marine resource surveys.

	Coastal Morphology	2	6	Covers coastal types, changes in coastal morphology due to natural and human activities.
	Fisheries Oceanography	2	6	Examines oceanographic parameters affecting fisheries and interactions between marine fish and their environment.
	Signal Processing	3	6	Covers signal recognition, filters, Fourier series, FFT, wavelet, and Hilbert-Huang Transform (HHT).
Elective Courses for Marine Bioecology and Conservation Specialization				
Odd Semester	**Course**	**CREDITS**	**Semester**	**Short Description**
	Marine Ecotoxicology	3	7	Covers marine pollution and toxic substances affecting ecosystems, including sources, properties, impacts on marine organisms, and pollution control.
	Planktonology	3	5	Covers terminology, sampling methods, phytoplankton, protozoa, zooplankton, migration patterns, and plankton blooming phenomena.
	Bioremediation	3	7	Covers the concept of environmental remediation, benefits, techniques for removing organic and inorganic contaminants using microorganisms, microalgae, and phytoremediation methods.
	Mangrove Botany	3	5	Covers physiological, morphological, taxonomic classification, ecological importance, and conservation value of mangrove plants.

Even Semester	**Course**	**CREDITS**	**Semester**	**Short Description**

	Course	CREDITS	Semester	Short Description
	Coralogy	3	6	Covers coral anatomy, sexual and asexual reproduction, symbiosis with zooxanthellae, settlement and recruitment behavior, feeding, growth, excretion, competition, predation, and coral diseases.
	Phycology	2	6	Covers understanding of algae (micro and macro), biology, classification, processing techniques, benefits, and aquaculture.
	Ichthyology	3	6	Covers fish diversity, habitats, morphology, movement, buoyancy, circulation, gas exchange, osmoregulation, feeding and digestion, reproduction, life stages, communication, sensory systems, nervous system, immunity, and fish behavior.
	Marine Pollution	2	6	Covers classification and characteristics of marine pollutants, nutrient cycles, environmental indicators, biotechnology aspects, and remediation strategies for marine pollution.
Elective Courses for Marine Natural Product Specialization				
Odd Semester	**Course**	**CREDITS**	**Semester**	**Short Description**
	Marine Microbiology	3	5	Covers basic theories of marine microbes, classification, characteristics, degradation functions, nutrient cycles, environmental indicators, biotechnology applications, and marine environmental remediation.
	Cell and Genes	3	7	Covers cell structure and function, membrane transport mechanisms, diffusion, osmosis, active transport, endocytosis, exocytosis, reproduction, protein synthesis, genetic material in the nucleus, mitochondrial and chloroplast DNA, genome structure, and DNA replication processes.
	Advanced Biotechnology	2	7	Covers DNA-RNA applications, sequencing, recombinant DNA techniques, cloning, gene transfer, transgenic organisms, and bioethics.
	Food Chemistry	3	7	Covers physical, chemical, and biological properties of food materials, stability, quality control, processing, safety, nutritional value, environmental influences, and factors affecting food quality before and after processing.
Even Semester	**Course**	**CREDITS**	**Semester**	**Short Description**

	Biotechnology	3	6	Covers definitions and history of biotechnology, cell structure and components, bioprocess applications, genetic material structure and organization, gene expression, recombinant DNA technology, genetic material analysis techniques, and biotechnology applications.
	Separation and Purification Methods	2	6	Covers fundamental separation and purification concepts, phase-based separation, extraction, chromatography, ion exchangers, and electrical field-based separation techniques.
	Marine Pharmacology	3	6	Covers interactions between chemical compounds and biological systems, including active substances, biological mechanisms, pharmaceuticals, toxins, potency, intrinsic activity, and the efficacy of marine bioactive compounds.
	Bioassay	2	6	Covers common testing methods for natural compounds' biological activity through in vitro experiments, including antimalarial, antimicrobial, antioxidant, antidiabetic, and anticancer screenings.

Elective Courses for General Studies

	Course	CREDITS	Short Description
Even Semester	**Ecotourism**	2	Covers marine tourism potential, zoning, environmental sanitation, principles of marine tourism parks, environmental foundations, and resource conservation.
	Scientific Diving	2	Covers underwater survey methods and reef monitoring techniques (Reef Check).
	Coastal Rehabilitation	2	Covers concepts of coastal rehabilitation, planning strategies, rehabilitation methods, monitoring, and evaluation of rehabilitation programs.
	Marine Aquaculture	2	Covers definitions, scope, history, development, and prospects of marine aquaculture, species selection, location assessment, systems and technologies, material construction, farm design, feeding strategies, nutrition, diseases, environmental factors, and aquaculture management.
	Malacology	2	Covers characteristics, evolution, systematics, physiology, and mollusk aquaculture.

	Course	CREDITS	Short Description
	Renewable Ocean Energy	2	Covers various technologies for generating electricity from the ocean, including current energy, wave energy, tidal height differences, temperature gradients, salinity gradients, density gradients, and organic/inorganic ocean-derived materials.
	Compound Identification	2	Covers basic concepts and phenomena leading to the formation of organic and inorganic compound spectra, along with analysis and interpretation techniques to determine compound structures.
	Seafloor Modeling	3	Covers Taylor series, discretization, numerical differentiation, 1D advection, 1D diffusion, combined 1D advection-diffusion, 2D advection-diffusion, and 2D hydrodynamic modeling.
Elective Courses for Marine Disaster Mitigation and Environmental Management			
Odd Semester	**Course**	**CREDITS**	**Short Description**
	Marine Disaster Mitigation	2	Covers basic disaster theory, coastal and marine disaster management strategies.
	Basic Environmental Impact Assessment (AMDAL)	2	Covers principles and implementation of AMDAL in marine and fisheries sectors, impact evaluation, study area assessment, environmental condition analysis, and drafting of Environmental Management and Monitoring Plans (RKL & RPL) for coastal and marine activities.
	Coastal Management	2	Covers scope of coastal management, national and regional marine policies, principles of coastal and small island zoning, and management strategies at both national and local levels.
	Carcinology	2	Covers characteristics, evolution, systematics, physiology, and crustacean aquaculture.
	Global Ocean Observation System	2	Covers ocean observation data sources, data downloading, processing, interpretation, and analysis.
	Marine Radionuclides	2	Covers basics of radioactivity, its properties, distribution, activities, environmental impact, and sources of marine radionuclides.

	Course	CREDITS	Short Description
	Marine Resource Utilization	2	Covers sustainable marine resource utilization for economic activities, including applications in functional food, cosmetics, pharmaceuticals, and other industries.
	Advanced Ocean Modeling	3	Covers marine modeling software, bathymetry digitization, initial values, boundary conditions, stability analysis, hydrodynamic modeling, and transport modeling.
	Food Fermentation Technology	2	Covers introduction to fermentation technology, microbial roles, industrial fermentation microbes, food fermentation microbes, fermentation substrates, enzyme fermentation, and fermentation product technologies.
Elective Courses for Marine Information Technology Specialization (MBKM)			
Odd Semester	**Course**	**CREDITS**	**Short Description**
	Web Programming 1	3	Covers web interface design, HTML5, CSS, JavaScript, JavaScript libraries, UI frameworks, AJAX, and JavaScript frameworks.
	Database Systems	3	Covers database system management, relational databases, data normalization, data independence, database system architecture, data modeling, implementation, security, integrity, and distributed databases.
	Electronics	3	Covers electronic materials, diode circuits, MOS transistors, bipolar transistor logic families, logic interface families, amplifiers, data conversion circuits, current and voltage sources, and electronic design.
Even Semester	**Course**	**CREDITS**	**Short Description**
	Robotics	3	Covers robotic kinematics equations, inverse kinematics solutions, robotic dynamics (Lagrange-Euler, Newton-Euler, D'Alembert), manipulator trajectory planning, control systems for manipulators, and specific case studies in robot design.
	Web Programming 2	3	Covers advanced web programming techniques and interactive website development.

	Artificial Intelligence	2	Covers AI concepts, history, components, AI branches, problem-solving methods, blind and heuristic search techniques, knowledge representation, fuzzy systems, inference systems, neural networks, machine learning, decision support systems, expert systems, and case-based reasoning.
	Mobile Programming	2	Covers mobile application development, frameworks, and implementation techniques.
	Embedded Systems	3	Covers programming environment setup, SDK and emulator exploration, basic control usage, form controls and UI settings, error handling, advanced UI design, and project development.
Total Credits		22	

Chapter XI
Department/Study Program of Information Systems

XI.1 Introduction

Based on Ministerial Decree No. 442/E.E2/DT/2014 dated May 19, 2014, the Department/Study Program of Information Systems has implemented a **Competency-Based Curriculum (KBK)** since its founding. This has now transitioned into the **Higher Education Curriculum (KPT)**, aligned with the **Indonesian National Qualifications Framework (KKNI)**.

This curriculum consists of **101 credits (70%) of theoretical courses** and **43 credits (30%) of practical courses**, totalling **144 credits**. The theoretical and practical components are developed based on expert input, peer reviews, and industry feedback, with a focus on competency development.

The Information Systems program applies a **Student-Centered Learning (SCL) strategy**, encouraging active student engagement through discussions, group assignments, and student seminars. Additionally, **soft skills development** is emphasized, including communication, teamwork, academic writing, creative and innovative thinking, and professional ethics. These competencies are integrated into coursework through group projects, presentations, discussions, and fieldwork.

The Information Systems Study Program provides foundational knowledge and applications of **information technology within organizations**. The curriculum is uniquely built upon **three core fields: Computer Science, Management, and Business**. Throughout their studies, students develop expertise in all three areas to design and implement **effective information systems** tailored to organizational needs.

XI.2 Accreditation

According to the **National Accreditation Board for Higher Education (BAN-PT)** decision **No. 1727/SK/BAN-PT/Akred/S/VII/2018**, the **bachelor's degree in Information Systems** at **Universitas Tanjungpura** has been accredited with a **"B" rating**. This accreditation is valid **for five years**, from **July 9, 2018 – July 9, 2023**.

XI.3 Vision and Mission

Vision:

To become a nationally recognized study program in **high-quality information system applications**, producing graduates who can compete at **regional, national, and international levels**.

Mission:

1. Provide **education** that instils moral values, ethics, and an entrepreneurial mindset, equipping graduates with skills for competitive success at regional, national, and international levels while creating new job opportunities.

2. Conduct **research** that upholds ethical principles and contributes to the advancement of **science and technology**.
3. Disseminate **knowledge in information systems** through **community engagement and service**.
4. Develop **collaborations** with domestic and international institutions to enhance institutional capacity and competencies, empowering communities through **education, research, and public services**.

XI.4 Objectives

The objectives of the **Information Systems Study Program** at **Universitas Tanjungpura** are:

1. **Produce highly skilled and professional Information Systems graduates** who can compete in **technology research and application** at the national level.
2. Conduct **high-quality research** that adheres to ethical principles and contributes to the advancement of **science and technology**, helping society address challenges.
3. Apply **information systems knowledge** in **community service and outreach** initiatives.
4. Establish **research collaborations and community service projects** with external partners to support the **enhancement of institutional resources** and **improve graduate competencies**.

XI.5 Graduate Profile and Competencies

The Information Systems curriculum is **structured based on graduate profiles and competencies**, which are outlined in **competency elements** and developed into **core learning materials** to ensure students acquire the **necessary expertise**.

Graduate Profiles and Competencies

Code	Graduate Profile	Competencies
KU-01	**Information Systems Analyst**	Understand and apply concepts of information systems and their relationship to computer science.
		Understand and apply technology concepts in informatics.
		Comprehend business processes within an information system.
		Possess problem solving expertise.
		Demonstrate strong interpersonal communication skills.
		Understand methodologies for information system development.
KU-02	**Database Administrator**	Understand and plan database systems that translate organizational information needs into corporate level databases.

		Design and implement database systems for strategic and operational organizational purposes.
		Operate and manage database systems, including concepts of distributed and integrated data processing.
		Ensure database security and integrity.
KU-03	**Application Developer**	Possess self-learning and continuous improvement skills (learning society).
		Understand and apply qualitative and quantitative analysis methods in information systems and acknowledge their limitations.
		Think logically and analytically.
KU-04	**IT Entrepreneur**	Understand technopreneurship principles.
		Validate ideas and assess business opportunities.
		Conduct market analysis.
		Develop business plans.
		Design and develop technology products.
		Build marketing strategies.

After defining all graduate competencies, the next step is to assess whether these competencies encompass **attitudes, knowledge, and skills** as outlined in the **Graduate Learning Outcomes (CPL)**, in accordance with the **National Higher Education Standards** (*Permenristekdikti No. 44 of 2015*).
The **Graduate Learning Outcomes (CPL) of the Information Systems Study Program** are based on the **KKNI (Indonesian National Qualifications Framework)**, referring to **Government Regulation No. 8 of 2012**.
The relationship between the **Graduate Learning Outcomes** and **competency elements** is presented in **Table 1**.

Table 1. Matrix of Graduate Learning Outcomes and Competency Elements

Aspect	Code	Graduate Learning Outcomes	Information Systems Analyst	Database Administrator	Application Developer	IT Entrepreneur
Attitudes and Ethical Values	**S1**	Be devoted to God Almighty and demonstrate religious values.	✓	✓	✓	✓
	S2	Uphold humanity in carrying out tasks based on religion, morality, and ethics.	✓	✓	✓	✓
	S3	Contribute to improving the quality of society, nation, and civilization based on Pancasila.	✓	✓	✓	✓
	S4	Act as a proud and patriotic citizen, demonstrating nationalism and	✓	✓	✓	✓

		responsibility towards the country.				
	S5	Respect cultural diversity, perspectives, religions, beliefs, and original discoveries of others.	✓	✓	✓	✓
	S6	Collaborate and show social sensitivity and concern for the community and environment.	✓	✓	✓	✓
	S7	Obey laws and discipline in society and the nation.	✓	✓	✓	✓
	S8	Internalize academic values, norms, and ethics.	✓	✓	✓	✓
	S9	Demonstrate responsibility for professional work independently.	✓	✓	✓	✓
	S10	Internalize the spirit of independence, perseverance, and entrepreneurship.	✓	✓	✓	✓
General Skills	**KU1**	Able to apply logical, critical, systematic, and innovative thinking in knowledge and technology development, while considering humanities values relevant to their field of expertise.	✓	✓	✓	✓
	KU2	Able to demonstrate independent, high-quality, and measurable performance.	✓	✓	✓	✓
	KU3	Able to assess the implications of knowledge and technology development, applying humanities values following scientific ethics to create solutions, ideas, designs, or critiques.	✓	✓	✓	✓
	KU4	Able to compile and upload scientific descriptions of research findings in the form of a thesis or final project report.	✓	✓	✓	✓
	KU5	Able to make informed decisions in problem-solving within their field of expertise, based on analysis of information and data.	✓	✓	✓	✓
	KU6	Able to establish and maintain professional networks with mentors, colleagues, and peers, both within and outside their institution.	✓	✓	✓	✓
	KU7	Able to take responsibility for group work achievements and supervise assigned tasks effectively.	✓	✓	✓	✓
	KU8	Able to evaluate personal and team performance and manage independent learning processes.	✓	✓	✓	✓

Knowledge Mastery	**KU9**	Able to document, store, secure, and retrieve data to ensure validity and prevent plagiarism.	✓	✓	✓	—
	KU10	Able to conduct analysis and design using software engineering principles, hardware design, and algorithms, utilizing tools for optimal business applications.	✓	✓	✓	✓
	KU11	Possess professional competencies in database management, software engineering, computer networks, computer graphics, multimedia applications, research reporting, and information systems project management.	✓	✓	✓	✓
	PP1	Master fundamental computational concepts as the foundation for applying technology and information systems.	✓	✓	✓	✓
	PP2	Able to identify problems in the industry and government sectors and provide appropriate solutions using technology and information systems.	✓	✓	—	—
	PP3	Master principles, methods, and tools for information systems development, translating user requirements into applications.	—	✓	✓	✓
	PP4	Adapt to technological developments in information systems and apply them to solve evolving challenges.	✓	✓	—	—
	PP5	Conduct comprehensive analysis of organizational information system needs, ensuring alignment with strategic goals.	✓	✓	✓	✓
	PP6	Implement information systems efficiently and effectively to support organizational objectives.	✓	✓	✓	—
Special Skills	**PP7**	Able to analyze organizational information needs and translate them into database design.	✓	✓	—	—
	PP8	Conduct studies related to technological and information systems problems.	✓	✓	✓	—
	PP9	Master international standards in technology and information systems.	✓	✓	✓	✓
	KK1	Design database systems for strategic and operational organizational needs.	—	✓	✓	—
	KK2	Develop integrated and distributed data processing	✓	✓	✓	✓

		systems within an organization.				
	KK3	Apply technological advancements in information systems while incorporating business perspectives and entrepreneurial skills.	—	—	—	✓
	KK4	Develop innovative information technology products.	✓	—	—	—
	KK5	Utilize technological advancements in information systems to support entrepreneurship.	—	✓	✓	—
	KK6	Design information systems with comprehensive database processing capabilities.	✓	✓	✓	✓
	KK7	Use scripting-based programming languages to develop software applications.	✓	✓	✓	—
	KK8	Apply technology and information systems knowledge in real-world work environments.	✓	✓	✓	✓
	KK9	Implement internationally standardized technology and information systems.	✓	✓	✓	✓

XI.5 Career Pathways

The **graduate profile** of the Information Systems Study Program offers various **career pathways** within the field. Graduates have opportunities to enter multiple industries, with job titles varying by **organization type, scale, and policies**. Some **relevant job positions** for Information Systems graduates include:

- **Software Application Developer**
- **Business/System Analyst**
- **Database Administrator**
- **Database Analyst**
- **IT Consultant**
- **IT Operations Staff/Manager**
- **Information Systems Project Manager**
- **User Interface Designer**
- **Academic/Educator/Teacher/Trainer**
- **IT Entrepreneur**

XI.6 Faculty Members

No	Name	Educational Background
1	Ilhamsyah, S.Si., M.Cs.	Mathematics and Computer Science
2	Beni Irawan, S.Kom., M.Kom.	Information Systems
3	Nurul Mutiah, S.T., M.T.	Informatics and Information Systems
4	Renny Puspita Sari, S.T., M.T.	Informatics
5	Dian Prawira, S.T., M.Eng	Engineering and Information Technology
6	Syahru Ramayudha, S.Kom., M.Kom.	Information Systems
7	Ferdy Febriyanto, S.Kom., M.Kom	Information Technology
8	Ibnur Rusi, S.Kom., M.M	Information Systems Management

XI.7 Curriculum Structure

Mandatory Courses

Mandatory courses are required for all students. Specific prerequisites may be necessary to enroll in these courses.

Semester I				
No.	**Code**	**Course Name**	**CREDITS**	**Prerequisite**
1	MPU-101	Mathematics	3	—
2	UMG-105	English I	2	—
3	IKS-165	Introduction to Business	3	—
4	IKS-170	Introduction to Information and Communication Technology	3	—
5	MKWU4	Indonesian Language	2	—
6	IKS-112	Linear Algebra	3	—
7	IKS-140	Algorithms and Programming	3	—
Total CREDITS			**19**	
Semester II				
No.	**Code**	**Course Name**	**CREDITS**	**Prerequisite**
1	MKWU1	Religion	3	—
2	MKWU2	Pancasila	2	—
3	IKS-296	English II	2	—
4	IKS-210	Statistics and Probability	3	MPU-101
5	IKS-211	Discrete Mathematics	3	—
6	IKS-241	Data Structures	3	IKS-140
7	IKS-260	Management and Organization	3	—
8	IKS-280	Introduction to Information Systems	3	—
Total CREDITS			**22**	
Semester III				
No.	**Code**	**Course Name**	**CREDITS**	**Prerequisite**
1	MKWU3	Citizenship	2	—
2	IKS-320	Web Programming I	3	IKS-140
3	IKS-350	Network Design and Management	3	—
4	IKS-351	Human-Computer Interaction	3	—

5	IKS-361	Customer Relationship Management Strategy and Technology	3	—
6	IKS-371	Database Systems	3	IKS-241
7	IKS-381	Information Systems Analysis and Design	3	—
		Total CREDITS	**20**	
		Semester IV		
No.	**Code**	**Course Name**	**CREDITS**	**Prerequisite**
1	IKS-490	Professional Ethics	2	—
2	IKS-421	Software Engineering	3	IKS-381
3	IKS-422	Information Systems Project Management	3	—
4	IKS-423	Object-Oriented Programming	3	IKS-140
5	IKS-424	Web Programming II	3	IKS-320
6	IKS-442	Management Science	3	—
7	IKS-452	Enterprise Architecture	3	IKS-260
		Total CREDITS	**20**	
		Semester V		
No.	**Code**	**Course Name**	**CREDITS**	**Prerequisite**
1	IKS-525	Information Systems Development Project	4	IKS-422
2	IKS-562	Supply Chain Management	3	IKS-361
3	IKS-572	Mobile Technology	3	IKS-140, IKS-424
4	IKS-526	Visual Programming	3	IKS-140, IKS-241, IKS-371
5	IKS-591	Research Methodology and Scientific Writing	2	IKS-381
6	—	Elective Course	6	—
		Total CREDITS	**21**	
		Semester VI		
No.	**Code**	**Course Name**	**CREDITS**	**Prerequisite**
1	IKS-630	Data Mining	3	—
2	IKS-676	Data Warehouse	2	IKS-371
3	IKS-673	Geographic Information Systems	3	—
4	IKS-677	Information Security	3	—
5	IKS-682	Strategic Information Systems/IT Planning	3	IKS-452
6	IKS-692	IT Entrepreneurship	3	—
7	—	Elective Course	3	—
		Total CREDITS	**20**	
		Semester VII		
No.	**Code**	**Course Name**	**CREDITS**	**Prerequisite**
1	IKS-763	Business Intelligence	3	IKS-630, IKS-676, IKS-371
2	IKS-783	IT Governance and Audit	3	IKS-682
3	IKS-793	Internship/Community Service (KKN)	2	Min 110 CREDITS
4	IKS-795	Seminar	2	—
5	—	Elective Course	6	—

Total CREDITS			**16**	
Semester VIII				
No.	**Code**	**Course Name**	**CREDITS**	**Prerequisite**
1	IKS-894	Final Project	6	Min 120 CREDITS
Total CREDITS			**6**	

Elective Courses

Students are generally free to choose from the available elective courses each semester. However, it is highly recommended that students select courses aligned with their interests and academic needs to support their final project.

Due to certain considerations, elective courses may shift between even and odd semesters or may temporarily be unavailable.

Semester 5			
No.	**Code**	**Course Name**	**CREDITS**
1	IKS-564	E-Business	3
2	IKS-584	Health Information Systems	3
3	IKS-586	Knowledge Management	3
Total CREDITS: 9			
Semester 6			
No.	**Code**	**Course Name**	**CREDITS**
4	IKS-585	Accounting and Financial Information Systems	3
5	IKS-631	Decision Support Systems	3
6	IKS-675	IT Quality Management	3
7	IKS-678	IT Risk Management	3
8	IKS-626	Open-Source System Administration	3
9	IKS-632	Multimedia	3
Total CREDITS: 18			
Semester 7			
No.	**Code**	**Course Name**	**CREDITS**
10	IKS-743	Advanced Management Science	3
11	IKS-787	Corporate Application Integration	3

12	IKS-777	E-Government	3
13	IKS-775	Advanced Geographic Information Systems (GIS)	3
Total CREDITS: 12			
Grand Total CREDITS: 39			

Course Code System

All courses in the Information Systems Study Program are assigned a six-character code, consisting of three letters followed by three numbers. The coding system follows these rules:

A. The IKS prefix is used for courses within the Information Systems program. The first two letters (IK) represent Computer Science, while the third letter (S) signifies the Information Systems Study Program.

B. The fourth character indicates the semester in which the course is offered.

C. The fifth character categorizes the course into one of the following Information Systems disciplines:

1. Mathematics and Scientific Computing
2. Programming and Software Engineering
3. Intelligent Information Processing
4. Computing and Algorithms
5. Architecture and Infrastructure
6. Enterprise Systems
7. Information Technology
8. Information Systems and Applications
9. Personality and Professional Skills

D. The sixth character represents the course sequence number within its discipline.

XI.8 Course Syllabus

To achieve optimal learning outcomes, a syllabus serves as a guideline outlining the key topics covered in each course. Below is a brief overview of the course materials in the syllabus.

Semester 1
MPU-101. Mathematics (2 CREDITS)
Strategy In-person learning
Course Description
This course covers fundamental mathematical concepts, including number systems, inequalities, absolute values, functions, limits, continuity, derivatives, and applications in optimization problems, as well as integrals and applications in differential equations. Emphasis is placed on computational aspects.
Textbooks / References

Purcell, E. J. & Varberg, D. (1994). Calculus and Analytical Geometry, 4th ed. Translated by I Nyoman Susila, Bana Kartasasmita, Rawuh. Jakarta Erlangga.
Stewart, J. (2001). Calculus, 4th ed. Translated by I Nyoman Susila & Hendra Gunawan. Jakarta Erlangga.
Logic and Calculus Team (2013). Logic and Calculus, Mathematics Study Program, Universitas Tanjungpura.
IKS-165. Introduction to Business (3 CREDITS)
Strategy In-person learning
Course Description
This course covers basic business concepts, including business definitions, business environments, business entities, management principles, entrepreneurship, business management, human resource management, production management, marketing strategies, customer relationship management, financial management, business information systems, and decision-making in business.
Textbooks / References
Madura, Jeff. (2009). Introduction to Business, 4th ed. Thomson Higher Education.
Elbert, J. Ronald & Griffin, W. Ricky. (2015). Business Essentials, 8th ed. New York Pearson.
Kesnadi & Indrayani, Rina. (2019). Introduction to Business, Jambi Landasan Ilmu.
UMG-105. English I (2 CREDITS)
Strategy In-person learning
Course Description
This course focuses on intermediate and pre-advanced English skills, emphasizing scientific reading comprehension, vocabulary expansion, grammar structures for academic reading, pronunciation drills, vocabulary enrichment, and idiomatic expressions. Special attention is given to correcting common errors.
Textbooks / References
(Not listed in provided data)
UMG-101. Indonesian Language (2 CREDITS)
Strategy In-person learning
Course Description
Topics include the history of Indonesian language, its role as a national, scientific, and artistic language, its function in national development, and practical applications such as writing academic papers, book summaries, reviews, scientific articles, and formal speeches.
Textbooks / References
(Not listed in provided data)
IKS-140. Algorithms and Programming (3 CREDITS)
Strategy In-person learning
Course Description
This course explores algorithmic concepts using C++ programming, covering data types, variables, input/output operations, operators, conditional statements, loops, nested loops, functions, and C++ libraries.
Textbooks / References
Brianorman, Yulrio. (2014). Algorithms and Programming Module 1, Computer Systems, Universitas Tanjungpura, Pontianak.
Kadir, A. (2012). Algorithms & Programming with C & C++, Andi Publisher, Yogyakarta.
MPU-105. Introduction to Information and Communication Technology (3 CREDITS)
Strategy In-person learning
Course Description
This course introduces basic IT concepts, IT ethics, IT history, computing devices, data processing systems, input/output devices, external storage media, operating system software, application software, artificial intelligence, communication and networking technologies, internet services (email, social media), database basics, information systems, and multimedia concepts.
Textbooks / References
Kadir, A. & Triwahyuni Terra Ch. (2014). Introduction to Information Technology (Revised Edition), Andi Publisher, Yogyakarta.

Semester 2
UMG-102. Religion (3 CREDITS)
Strategy In-person learning
Course Description
Topics covered include the concept of God, humanity, law, morality, science, technology, art, interfaith harmony, society, culture, and politics.
Textbooks / References
(Not listed in provided data)
IKS-296. English II (2 CREDITS)
Strategy In-person learning
Course Description
This course focuses on academic writing in English, introducing key principles of writing descriptive texts, procedural texts, reports, hortatory exposition, discussions, news articles, reviews, explanations, application letters, and personal letters.
Textbooks / References
Esteras, Santiago Remacha. (2007). Professional English in Use Computer and Internet, Cambridge University Press.
Esteras, Santiago Remacha. (2007). Infotech English for Computer Users (4th Edition), Cambridge University Press.
Walker, Tricia. (1989). English for Academic Purposes Computer Science, Cassell, England.
Fauzi, Imam. (2014). Business English English for Business College, Bandung.
Semester 2 Courses
IKS-210. Statistics and Probability (3 CREDITS)
Strategy In-person learning
Course Description
This course provides a general overview of statistics, focusing on data presentation techniques, frequency distribution, measures of central tendency, dispersion, skewness, and kurtosis. It also covers time series analysis, regression, correlation, and probability concepts, including theoretical distributions (binomial, Poisson, hypergeometric), normal distribution, sampling distribution, hypothesis testing, and chi-square tests.
Textbooks / References
Boediono, DR & Koster Wayan DR. (2005). Theory and Application of Statistics and Probability, PT Remaja Rosdakarya, Bandung.
IKS-211. Discrete Mathematics (3 CREDITS)
Strategy In-person learning
Course Description
This course covers logic, set theory, matrices, relations and functions, mathematical induction, algorithms, integer number theory, sequences and series, group and ring theory, Boolean algebra, combinatorics, discrete probability theory, generating functions, recurrence relations, graph theory (including trees), algorithm complexity, and computational modeling (automata and formal language theory).
Textbooks / References
Munir, R. (2012). Discrete Mathematics (5th Revision), Informatika, Bandung.
Lipschutz, S. & Lipson, Marc L. (2001). Schaum's Outline Series Discrete Mathematics, Salemba Teknik, Jakarta.
IKS-241. Data Structures (3 CREDITS)
Strategy In-person learning
Course Description
This course covers arrays, recursive functions, sorting and searching algorithms, structures, pointers, stacks, queues, linked lists, and tree structures, all implemented using the C++ programming language.
Textbooks / References

Clifford A. Shaffer. (2013). Data Structures and Algorithm Analysis, Virginia Tech, Blacksburg.
Kristanto, Andi. (2009). Data Structures with C++, Graha Ilmu, Yogyakarta.
Utami, E. & Raharjo, S. (2004). Data Structures Using C in GNU/Linux, Andi Publisher, Yogyakarta.
Yatini, I. & Nasution, E. (2005). Algorithms and Data Structures with C++, Graha Ilmu, Yogyakarta.
IKS-260. Management and Organization (3 CREDITS)
Strategy In-person learning
Course Description
This course explores management and organizational theory, covering organizational frameworks, analysis techniques, organizational structure theory, impacts of structure on change, intervention strategies, organizational automation, interdependence, evaluation methods, and management strategies.
Textbooks / References
Timms, J. (2011). Introduction to Business and Management, University of London.
Picot, Arnold et al. (2008). Information, Organization, and Management, Springer.
IKS-280. Introduction to Information Systems (2 CREDITS)
Strategy In-person learning
Course Description
This course introduces fundamental concepts of information systems, including key components, competitive advantages, IT development trends, hardware/software/network infrastructure, data management technologies, business applications, e-business/e-commerce initiatives, strategic planning approaches, and global IT management challenges (security, ethics, and business strategies). The course follows a conceptual framework designed for business students, covering five essential fields of knowledge.
Textbooks / References
O'Brien, A. James. Introduction to Information Systems.
Semester 3 Courses
UMG-203. Citizenship (2 CREDITS)
Strategy In-person learning
Course Description
This course covers the concept of citizenship, the Indonesian archipelago (Nusantara), national resilience, defense and security policies, state security systems, and the philosophical essence of Pancasila. Topics include the Indonesian Constitution (UUD 1945), State Policy Guidelines (GBHN), and the application of Pancasila values in societal issues.
Textbooks / References
(Not listed in provided data)
IKS-112. Linear Algebra (3 CREDITS)
Strategy In-person learning
Course Description
This course explores basic matrix operations, linear equations, matrix inverses, determinants, vector introduction, dot and cross product, and matrix applications in IT. Topics include Cramer's Rule, cofactor expansion, vector arithmetic, and cryptographic applications (Hill Cipher).
Textbooks / References
Anton, H. & Rorres, C. (2004). Linear Algebra and Matrix Applications, Erlangga, Jakarta.
Ayres, F. (1984). Theory and Problems of Matrices, Erlangga, Jakarta.
Hadley, G. (1992). Revised Edition of Linear Algebra, Erlangga, Jakarta.
Leon, S. J. (2001). Linear Algebra and Its Applications, Erlangga, Jakarta.
IKS-320. Web Programming I (3 CREDITS)
Strategy In-person learning
Course Description

This course covers fundamental web interface design, including HTML5, Cascading Style Sheets (CSS), JavaScript, JavaScript libraries, UI frameworks, AJAX, and JavaScript frameworks.
Textbooks / References
Kappel, Gerti, et al. (2006). Web Engineering, John Wiley & Sons, Germany.
Pressman, Roger. (2008). Web Engineering A Practitioner's Approach, McGraw Hill.
Hall, M. (1998). Core Web Programming, Prentice Hall.
Staab, Steffen. (2006). Semantic Web and Peer-to-Peer, Springer-Verlag, Berlin.
Nugroho, Adi. (2011). Visual Web Developer for Dynamic Web Applications, Andi Publisher, Yogyakarta.
Winarno, Edi, et al. (2014). 3-in-1 JavaScript, jQuery, and jQuery Mobile, Andi Publisher, Yogyakarta.
IKS-350. Network Design and Management (3 CREDITS)
Strategy In-person learning
Course Description
This course explores computer network design, management strategies, and infrastructure optimization, focusing on network protocols, configurations, security, and maintenance.
Textbooks / References
Mir, Nader F. (2006). Computer and Communication Networks, Prentice Hall Inc.
Tanenbaum, Andrew S. (2003). Computer Networks, Prentice Hall Inc.
IKS-351. Human-Computer Interaction (3 CREDITS)
Strategy In-person learning
Course Description
This course covers basic human-computer interaction (HCI) concepts, including usability principles, user-centered design process, human cognitive capacities, task analysis techniques, graphic design principles, rapid prototyping, error handling, documentation, evaluation methods, collaborative computing, ubiquitous computing, information visualization, and AI-driven interfaces.
Textbooks / References
Dix, Alan, et al. (1998). Human-Computer Interaction, 2nd Edition, Prentice Hall, Europe.
Galitz, W. O. (1996). The Essential Guide to User Interface Design, John Wiley & Sons, Canada.
Johnson, P. (1992). Human-Computer Interaction Psychology, Task Analysis, and Software Engineering, McGraw-Hill, England.
Newman, W. M. & Lamming, M. G. (1995). Interactive System Design, Addison-Wesley, Cambridge, UK.
Insap Santoso, P. (2004). Human-Computer Interaction Theory and Practice, Andi Publisher, Yogyakarta.
Raskin, J. (2000). The Human Interface, Addison-Wesley.
Shneiderman, B. (1998). Designing the User Interface, 3rd Edition, Addison-Wesley.
Sutcliffe, A. G. (1995). Human-Computer Interface Design, 2nd Edition, MacMillan, London.
IKS-361. Strategy and Technology for Customer Relationship Management (CRM) (3 CREDITS)
Strategy In-person learning
Course Description
CRM is an integrated approach to identifying, acquiring, and retaining customers, enabling organizations to manage and coordinate customer interactions across multiple channels, departments, and geographic locations. This course provides fundamental knowledge of CRM principles, covering customer relationship strategies, CRM project implementation, customer databases, segmentation, value creation, CRM technologies, and the role of social media in CRM.
Textbooks / References
Buttle, Francis. (2009). Customer Relationship Management, 2nd Edition, Elsevier Publishing.
Greenberg, Paul. (2009). Social CRM Comes of Age, Oracle.
Paul, Amitta & Nilsson, Johanna C. (2011). Social CRM for Dummies, John Wiley & Sons.
IKS-371. Database Systems (3 CREDITS)

Strategy In-person learning
Course Description
This course covers database management, relational database models, data normalization, data independence, database system architecture, data modeling, database implementation, denormalization, system architecture, database security and integrity, and an introduction to distributed databases.
Textbooks / References
Fathansyah. (2013). Database Systems, Informatika, Bandung.
Madcoms. (2011). Web Database Applications with Dreamweaver and PHP-MySQL, Andi Publisher, Yogyakarta.
IKS-381. Information Systems Analysis and Design (3 CREDITS)
Strategy In-person learning
Course Description
This course introduces systems analysis and design methodologies, covering stakeholder roles, development approaches, system weaknesses analysis, requirements analysis, feasibility studies, use case analysis, process modeling, data modeling, software development strategies, interface design, hierarchy input-output chart (HIPO), testing, implementation, and system maintenance.
Textbooks / References
Hanif, Al Fatta. (2007). Information Systems Analysis and Design, Andi Publisher, Yogyakarta.
Kristanto, Andri. (2003). Information Systems Design and Applications, Gava Media, Yogyakarta.
Bin Ladjamudin, Al-Bahra. (2005). Information Systems Analysis and Design, Graha Ilmu.
Semester 4 Courses
IKS-490. Professional Ethics (2 CREDITS)
Strategy In-person learning
Course Description
This course covers professional ethics for Information Systems practitioners, including the role of ethics in the profession, ethical implications of information systems, rights to information, regulations, cybercrime, IT certifications, ethical specialization in information systems, and legal considerations.
Textbooks / References
Raymond McLeod, Jr. (1995). Management Information Systems, Vol. I. Translator Hendra Teguh, Jakarta Bhuana Ilmu Populer.
D. Bell et al. (1995). Computers, Ethics, and Social Values, Prentice Hall.
Dr. Robert Ayres. Essence of Professional Issues in Computing, Prentice Hall.
Bynum. Computer Ethics and Professional Introductory Text and Readings, Wiley.
IKS-421. Software Engineering (3 CREDITS)
Strategy In-person learning
Course Description
This course explores software development life cycles, covering planning, analysis, design, programming, testing, and maintenance. Topics include requirements modeling, use case modeling, sequence diagrams, collaboration diagrams, architectural design, design patterns, user interface design, software testing, and software maintenance.
Textbooks / References
Carlo Ghezzy, Mehdi Jazayeri & Dino Mandrioli. (2003). Fundamentals of Software Engineering, Pearson Education Inc.
Ian Sommerville. (2001). Software Engineering, 6th Edition, Pearson Education Inc.
Roger S. Pressman, Ph.D. (2010). Software Engineering A Practitioner’s Approach, McGraw Hill.
Shari Lawrence Peleeger. (2001). Software Engineering Theory and Practice, Prentice Hall.
IKS-422. Information Systems Project Management (3 CREDITS)
Strategy In-person learning
Course Description

This course teaches comprehensive project management principles, focusing on project behavior, functional management, feasibility studies, financial and technical aspects, strategic planning, scheduling techniques, and resource allocation. Topics include project integration management, investment decision-making, market feasibility, and risk analysis.
Textbooks / References
(Not listed in provided data)
IKS-423. Object-Oriented Programming (3 CREDITS)
Strategy In-person learning
Course Description
This course introduces object-oriented programming (OOP) concepts such as class structures, object creation, arithmetic operations, logic structures, loops, inheritance, polymorphism, interface hierarchies, exception handling, and graphical user interfaces (GUI) in Java.
Textbooks / References
Pecinovsky, Rudolf. (2013). Learn Object-Oriented Thinking and Programming, Eva & Thomas Bruckner Publishing.
IKS-424. Web Programming II (3 CREDITS)
Strategy In-person learning
Course Description
This course covers client-server web applications, including basic client-server programming, object-oriented programming for web applications, database access, file handling, MVC frameworks, XML, JSON, Web APIs, and mobile web applications.
Textbooks / References
Luke Welling, et al. PHP and MySQL Web Development (4th Edition), Addison-Wesley Professional.
Robin Nixon. Learning PHP, MySQL & JavaScript With jQuery, CSS & HTML5, O'Reilly Media.
Stendy B. Sakur. PHP 5 Object-Oriented Programming, Andi Publisher.
IKS-442. Management Science (3 CREDITS)
Strategy In-person learning
Course Description
This course explores decision-making models, operations research methodologies, mathematical modeling techniques, transportation models, optimization algorithms, linear programming, queuing systems, and economic inventory models. Topics include network modeling, time management strategies, probability models, game theory, and strategic cost analysis.
Textbooks / References
Bronson, Richard & Govinsami. (1997). Operations Research, 2nd Edition, Schaum's Outline Series, McGraw-Hill.
Gould, F. J., Eppen, G. D. & Schmidt, C. P. (1991). Introductory Management Science, 3rd Edition, Prentice Hall International.
Mathu, Kamlesh & Solow, Daniel. (1994). Management Science The Art of Decision Making, Prentice Hall.
Taha, Hamdy A. (1999). Operations Research An Introduction, 5th Edition, Prentice Hall International.
Taylor III, Benard W. (1999). Introduction to Management Science, 6th Edition, Prentice Hall International.
Levin, Richard et al. (1989). Quantitative Approach to Management, 7th Edition, McGraw-Hill International.
IKS-452. Enterprise Architecture (3 CREDITS)
Strategy In-person learning
Course Description
This course covers enterprise architecture practices, which help organizations manage and control structure, processes, applications, systems, and technology in an integrated manner. More specifically, the course explains methods and techniques for developing integrated architecture descriptions, creating visual models for stakeholders, and analyzing change impacts.
Students will be introduced to key enterprise architecture models, including
Zachman Framework
TOGAF (The Open Group Architecture Framework)

Model-Driven Architecture (MDA)
ISO/IEC 42010 (System and Software Engineering - Architecture Description)
To specify and describe the relationships between components within architectural models, students will learn to use architecture modeling languages, which enable domain-specific modeling understood by both IT professionals and business stakeholders.
Textbooks / References
Lankhorst, Marc et al. (2009). *Enterprise Architecture at Work.* Springer.
Ugavina, Nithiya. (2008). *MDG Technology for Zachman Framework User Guide.* Sparx Systems Pty Ltd.
The Open Group. (2011). *TOGAF Version 9.1.* The Open Group.
ISO. (2011). *ISO/IEC/IEEE 42010 System and Software Engineering – Architecture Description.* ISO.
Semester 5 Courses
IKS-525. Information Systems Development Project (4 CREDITS)
Strategy Group-based medium/large-scale Information Systems project under faculty supervision, following software engineering principles.
Course Description
This course enables students to develop large-scale applications, ensuring software engineering best practices throughout all development stages, including requirements analysis, system design, implementation, testing, and deployment.
Textbooks / References
Dennis, Alan. (2010). System Analysis and Design with UML An Object-Oriented Approach, 3rd Edition, Wiley.
IKS-562. Supply Chain Management (3 CREDITS)
Strategy In-person learning
Course Description
This course covers Supply Chain Management (SCM) concepts, including competitive advantage, strategic lead time management, supply chain optimization, international supply chain issues, business partnerships, IT integration in SCM, corporate information systems, collaboration technologies, inventory management, and performance measurement.
Textbooks / References
Indrajit, R. Eko & Djokopranoto, R. (2003). Concepts of Supply Chain Management A New Perspective on Goods Provisioning Chains, Grasindo, Jakarta.
Indrajit, R. Eko & Djokopranoto, R. (2002). Strategic Management of Supply Chains for Modern Companies in Indonesia, Grasindo, Jakarta.
Pujawan, I. Nyoman. (2005). Supply Chain Management, Guna Widya.
IKS-572. Mobile Technology (3 CREDITS)
Strategy In-person learning
Course Description
This course covers mobile technologies, introducing device architectures, wireless technologies, GPS systems, mobile communication networks, and mobile application development frameworks. Topics include Wireless Application Protocol (WAP), Symbian architecture, .NET Compact Framework, J2ME, Symbian Qt, Android, and iPhone development.
Textbooks / References
Gramlich, Nicolas. (2007). Android Programming Handbook, anddev.org-community.
Reynolds, Baxter M. (2010). Multimobile Development, Apress.
Esposito, Dino. (2012). Architecting Mobile Solutions for the Enterprise, Microsoft Press.
IKS-526. Visual Programming (3 CREDITS)
Strategy In-person learning
Course Description
This course explores interactive program design, including event-driven programming, object-oriented visual components, form creation, multimedia integration, database connectivity, and error handling. Topics include

single-document and multi-document interfaces (SDI & MDI), branching & looping concepts, and GUI-based application development.
Textbooks / References
Horton, Ivor. (2013). Beginning Visual C++, John Wiley & Sons.
IKS-591. Research Methodology and Scientific Writing (2 CREDITS)
Strategy In-person learning
Course Description
This course provides fundamental research principles, covering problem identification, variable classification, hypothesis development, research methods (historical, descriptive, experimental, ex-post facto), population sampling techniques, data collection methods, validity & reliability tests, quantitative data analysis, academic writing standards, proposal development, plagiarism prevention, and paraphrasing techniques.
Textbooks / References
Riduwan. (2009). Research Proposal Methods & Techniques, Alfabeta, Bandung.
Sugiyono. (2010). Quantitative, Qualitative, and R&D Research Methods, Alfabeta, Bandung.
Semester 6 Courses
IKS-630. Data Mining (3 CREDITS)
Strategy In-person learning
Course Description
This course covers data mining techniques for large-scale data collection, analysis, and processing, transforming raw data into valuable insights for decision-making. Topics include data mining objectives, clustering techniques, discriminant analysis, classification using Bayes theorem, artificial neural networks, support vector machines (SVM), regression models, variable selection methods, kernel-based techniques, and association rules.
Textbooks / References
Santoso Budi. (2007). Data Mining Techniques for Business Data Utilization, Graha Ilmu.
IKS-676. Data Warehousing (2 CREDITS)
Strategy In-person learning
Course Description
This course explores data warehouse concepts, including architecture components, star and snowflake schema design, Extraction Transformation & Loading (ETL), Data Transformation Services (DTS), OLAP cubes, and fundamental OLAP components.
Textbooks / References
Paulraj Ponniah. Data Warehousing Fundamentals for IT Professionals, Wiley.
W.H. Inmon. Building the Data Warehouse, Wiley.
Ralph Kimball & Margy Ross. The Data Warehouse Toolkit, Wiley.
IKS-673. Geographic Information Systems (GIS) (3 CREDITS)
Strategy In-person learning
Course Description
This course introduces GIS fundamentals, including history, data modeling, spatial analysis, cartographic functions, digital surface modeling, satellite navigation, and GIS-based web applications. Students will explore geodesy concepts, spatial data management, and GIS system development.
Textbooks / References
Prahasta, Eddy. (2009). Geographic Information Systems Fundamental Concepts (Geodesy & Geomatics Perspective), Revised Edition, Informatika, Bandung.
IKS-674. Information Security (3 CREDITS)
Strategy In-person learning
Course Description
This course covers security aspects in information systems, including security fundamentals, risk assessment, system security models, secure communications, web security, vulnerability exploitation, defense mechanisms, and cybersecurity certifications.

Textbooks / References
David Kim. Fundamentals of Information Systems Security, Jones & Bartlett.
Budi Raharjo. (2005). Information Systems Security, PT Insan Indonesia, Jakarta.
James M. Stewart. CISSP Certified Information Systems Security Professional Study Guide, Sybex.
IKS-682. Strategic Information Systems / IT Planning (3 CREDITS)
Strategy In-person learning
Course Description
This course covers strategic planning for information systems (IS) and information technology (IT), addressing the evolution of IS/IT roles in organizations, business pressures, competitive advantages, governance models, portfolio management, and decision-support techniques. Topics include SWOT analysis, Balanced Scorecard, Porter's Five Forces Model, Value Chain Analysis, BCG Growth Share Matrix, and Strategic Grid McFarlan.
Textbooks / References
Carr, N. G. (2003). IT Doesn't Matter, Harvard Business Review.
Indrajit, R. E. (2000). Information Systems and IT Management, PT. Elex Media Komputindo, Jakarta.
Jogiyanto & Abdillah, W. (2011). IT Governance Systems, Andi Publisher, Yogyakarta.
Jogiyanto, H. (2005). Strategic Information Systems for Competitive Advantage, Andi Publisher, Yogyakarta.
Turban, E., Rainer, J. R. & Potter, R. E. (2005). Introduction to IT, John Wiley & Sons, Inc.
Ward, J. & Peppard, J. (2002). Strategic Planning for Information Systems, John Wiley & Sons, Ltd., England.
IKS-692. IT Entrepreneurship (3 CREDITS)
Strategy In-person learning
Course Description
This course explores business and entrepreneurship principles in IT, including business types, organizational structures, payroll systems, product specifications, market analysis, competitor assessment, promotional strategies, financial budgeting, and project proposal development.
Textbooks / References
Meggison, L. C., Byrd, M. J. & Meggison, W. L. (2005). Small Business Management An Entrepreneur's Guidebook, 4th Edition, Prentice Hall Inc.
Hupalo, P. I. (2005). How to Start and Run Your Own Corporation, HCM Publishing.
Hupalo, P. I. (2005). Thinking Like an Entrepreneur Intelligent Business Decision Making, HCM Publishing.
Semester 7 Courses
IKS-763. Business Intelligence (3 CREDITS)
Strategy In-person learning
Course Description
This course focuses on summarizing data from various sources to help executives make informed decisions. The goal is to develop an understanding of how to use diverse datasets to generate reports for executive decision-making. Topics include
Introduction to Business Intelligence (BI)
BI Process & Tools
Pentaho BI Server & Installation
Pentaho User Console Components
Conceptual Model for Job/Transformation
Report Designer & Toolbar Functions
Pentaho Analysis & Saiku Plugin
OLAP-based Data Analysis

Community Dashboard Framework
Query Usage in Report Designer
Report Designer Parameters & Implementation
Textbooks / References
Matt Casters, Roland Bouman, Jos van Dongen. Pentaho Kettle Solutions, Wiley.
IKS-783. IT Governance and Information Systems Audit (3 CREDITS)
Strategy In-person learning
Course Description
This course explores IT governance concepts and corporate IT audit practices. Topics include
Evaluating & directing IT usage to support organizational goals
Monitoring IT utilization for alignment with business objectives
Delivering business value through IT governance
Mitigating IT-related riCredits
IT governance frameworks (IT Balanced Scorecard, Cobit 5, Val IT, ISO 38500)
Assessing corporate IT governance maturity
IT audit methodologies (Maturity Model & Capability Model in Cobit 4.1)
Textbooks / References
Grembergen, Wim Van & Dehaes, Steven. (2008). Implementing Information Technology Governance Models, Practices, and Cases, IGI Publishing.
Grembergen, Wim Van & Dehaes, Steven. (2009). Enterprise Governance of Information Technology Achieving Strategic Alignment and Value, Springer.
IKS-793. Internship / Community Service Program (KKN) (2 CREDITS)
Strategy Practical Project
Course Description
This course requires students to complete a hands-on project under the guidance of a faculty supervisor. Upon project completion, students must submit a written report and present their findings before an evaluation panel. The final grade is based on the quality of the project, report, and presentation. The internship can be conducted at other universities, government institutions, or private organizations outside Universitas Tanjungpura.
Textbooks / References
(Not listed in provided data)
Elective Courses
IKS-564. E-Business (3 CREDITS)
Strategy In-person learning
Course Description
This course covers fundamental concepts of E-Business, including transactions, security, infrastructure, management, and strategic approaches. Topics include
Definition & Concepts of E-Business
Types & Trends in E-Business
E-Business Information Systems
Online Advertising Strategies
Payment Systems
Web Usability & Value Chain
Mobile Commerce & Legal, Ethical, and Social Impacts
Textbooks / References
E-Business 2.0 Roadmap To Success, Dr. Ravi Kalakota & Marcia Robinson.

Electronic Commerce A Managerial Perspective, Efraim Turban, David King, Jae Lee & Dennis Viehland.
E-Business Perspectives Technical, Managerial, and Strategic Review, Budi Sutedjo Dharma Utomo.
Advertising Strategies in Leading E-Commerce Platforms, Andi Publisher, Yogyakarta.
IKS-584. Health Information Systems (3 CREDITS)
Strategy In-person learning
Course Description
This course covers health informatics concepts, including data acquisition, storage, security, and retrieval in healthcare systems. Topics include
Ethics & Standards in Health Informatics
Legal Aspects of Health Information Security
Electronic Health Records (EHR)
Patient Data Storage & Management
Decision Support Systems in Healthcare
Data Mining & Text Mining Applications in Health Informatics
Telemedicine & Bioinformatics
Textbooks / References
E-Health Care Information Systems An Introduction for Students and Professionals, Joseph Tan, Jossey Bass, 2005.
Information Systems for Healthcare Management, Gerald L. Glandon, Detlev H. Smaltz, Donna J. Slovensky.
Strategic Management of Information Systems in Healthcare, Gordon D. Brown, Tamara Stone, and Timothy Patrick, Health Administration Press, Chicago.
IKS-585. Accounting and Financial Information Systems (3 CREDITS)
Strategy In-person learning
Course Description
This course introduces financial and accounting information systems, covering data security, financial reporting, financial decision-making, and enterprise resource planning (ERP) integration.
Textbooks / References
(The provided description mistakenly repeats the syllabus of Health Information Systems; the actual textbooks may differ.)
IKS-586. Knowledge Management (2 CREDITS)
Strategy In-person learning
Course Description
This course provides an overview of knowledge management principles, technologies, and strategies for capturing, organizing, and applying institutional knowledge. Topics include
Knowledge Discovery Systems
Knowledge Capture Systems
Knowledge Sharing Systems
Knowledge Application Systems
Implementation Case Studies
Textbooks / References
Dalkir, Kamiz. (2005). Knowledge Management in Theory and Practice, Elsevier Butterworth-Heinemann.
Fernandez, Irma Becerra & Sabherwal, Rajiv. (2010). Knowledge Management Systems and Processes, M.E. Sharpe, Inc.
IKS-631. Decision Support Systems (3 CREDITS)
Strategy In-person learning
Course Description
This course introduces decision support system (DSS) concepts, focusing on data-driven decision-making, decision models, and computational techniques. Topics include

Fundamentals of Decision Support Systems
Data, Information & Knowledge in Decision-Making
Decision Maker Roles & Processes
DSS Architecture & Model Management
Group Decision Support Systems (GDSS)
Profile Matching Models
DSS for Performance Evaluation
Association Rule Mining (Apriori Algorithm)
Analytical Hierarchy Process (AHP) Model
Textbooks / References
A.Turban, Efraim; Aronson, Jay E.; Liang, Ting-Peng. Decision Support Systems and Intelligent Systems, Prentice-Hall, 2005.
Irfan Subakti. Decision Support Systems, ITS, Surabaya, 2002.
Kusrini. Concepts and Applications of Decision Support Systems, Andi Publisher, Yogyakarta, 2007.
IKS-675. IT Quality Management (3 CREDITS)
Strategy In-person learning
Course Description
This course covers international IT quality management standards, such as ISO 9000, SEI Capability Maturity Model, Continuous Process Improvement for software, and ISO 9001. Topics include quality measurement strategies and software assessment tools.
Textbooks / References
Kenett, Ron S. & Baker, Emanuel R. (1999). Software Process Quality Management and Control, Marcel Dekker AG.
Hoyle, David. (2009). ISO 9000 Quality Systems Handbook, Elsevier.
IKS-678. IT Risk Management (3 CREDITS)
Strategy In-person learning
Course Description
This course focuses on strategies for identifying, analyzing, mitigating, and controlling riCredits in IT product development. Special attention is given to software development riCredits, including risk prevention techniques and various risk models. Topics include
Software Risk Elements
Risk Prevention Strategies
Risk Management Models (Boehm, SERIM, Riskit, SEI-SRE, SERUM)
Textbooks / References
Karolak, D. (1996). Software Engineering Risk Management, IEEE Computer Society Press.
Kontio, J. (2001). Software Engineering Risk Management A Method, Improvement Framework, and Empirical Evaluation, Ph.D. Thesis, Helsinki University of Technology, Finland.
IKS-632. Multimedia (3 CREDITS)
Strategy In-person learning
Course Description
This course covers multimedia fundamentals, including text, graphics, image manipulation, audio processing, video editing, animations, compression techniques, and multimedia applications. Topics include
Text and Graphic Manipulation
Audio Editing & Processing
Video Editing & Movie Clips
Image, Audio & Video Compression Techniques
Multimedia Applications

Textbooks / References
Sunyoto, A. (2010). Adobe Flash + XML = Rich Multimedia Application, Andi Publisher, Yogyakarta.
Binanto, I. (2010). Multimedia Digital Fundamentals, Theory, and Development, Andi Publisher, Yogyakarta.
IKS-743. Advanced Management Science (3 CREDITS)
Strategy In-person learning
Course Description
This course provides advanced principles of management science, focusing on mathematical modeling for real-world optimization problems in various industries. Topics include
Probability Concepts
Linear Programming
Transportation Models
Assignment Models
Inventory Management
Network Modeling
Textbooks / References
(Not listed in provided data)
Elective Courses
IKS-787. Corporate Application Integration (3 CREDITS)
Strategy In-person learning
Course Description
This course covers concepts, approaches, activities, and technologies for integrating corporate applications, enabling organizations to operate more efficiently and achieve competitive advantages. Topics include
Metadata & Business Logic
User Interfaces & Performance Management
Business Processes & Workflow Automation
Data Processing & Database Integrity
Standard Strategies & Vertical Subsystems
Accountability & Application Design
Middleware Technologies
Enterprise Application Integration (EAI) & Strategic Architecture Design
Textbooks / References
Manouvrier, Bernard & Menard, Laurent. (2008). Application Integration EAI, B2B, BPM, and SOA, ISTE & Wiley.
Linthicum, David S. (2003). Next Generation Application Integration From Simple Information to Web Services, Addison Wesley.
IKS-777. E-Government (3 CREDITS)
Strategy In-person learning
Course Description
This course examines E-Government policies and strategies in developing countries, including successes and failures, implementation models, service planning, website evaluations, and digital governance. Topics include
National E-Government Policies & Strategies in Indonesia
Evaluation of E-Government Websites & Services
Impact Assessments of E-Government Initiatives
Lessons from E-Government in Developed & Developing Countries
Implementation at Central Government & Local Municipalities

Textbooks / References
Pavlichev, A., & Garson, G. D. Digital Government Principles and Best Practices, Hershey IDEA Group Publishing.
Compilation of various academic journal articles and research reports.
IKS-726. Openn-Source Software Development (3 CREDITS)
Strategy In-person learning
Course Description
This course covers open-source software development and administration, including Linux usage, Linux system administration, version control (Subversion), Java Wireless development, Google Apps, managing system implementation, cost evaluation of open-source systems, licensing considerations, and collaborative software development. Topics include
Fundamentals of Open-Source Development
Legal Aspects of Open-Source Software
Development & Distribution Strategies
Support Tools for Open-Source Software Development
Media Platforms for Open-Source Software Distribution
Collaborative Team-Based Development
Textbooks / References
Karl Fogel. Producing Openn-Source Software How to Run a Successful Free Software Project, O'Reilly Media.
Amy Brown. The Architecture of Openn-Source Applications, lulu.com.
Heather Meeker. Open (Source) for Business A Practical Guide to Openn-Source Software Licensing, CreateSpace Independent Publishing.
IKS-775. Advanced Geographic Information Systems (GIS) (3 CREDITS)
Strategy In-person learning
Course Description
This course explores advanced GIS software development, including open-source GIS applications, geospatial data analysis, cartographic principles, spatial database management, geographic modeling, and GIS-based decision-making.
Textbooks / References
Ian Heywood, Sarah Cornelius, Steve Carver. An Introduction to Geographical Information Systems, 4th Edition, Prentice Hall, 2012.

XI.9 Lecture Mechanism

Learning Activities:

1. **In-person Learning** – Face-to-face teaching sessions where lecturers deliver course materials to students.
2. **Practical Sessions** – Hands-on activities (inside or outside the classroom), conducted individually or in groups, guided by lecturers or assistants.
3. **Tutorials** – Classroom discussions led by teaching assistants (tutors) to provide additional learning support.
4. **Assessment System:**
    - **Attendance:** 10%
    - **Assignments:** 20%

- Module Exams: 30%
- **Final Project:** 40%

XI.10 Internship Mechanism

Internship is a **practical training program** conducted in **a real work environment**, aimed at:

- Gaining **practical knowledge** and **professional skills** through **on-site work experience**, linking **theory and practice**.
- Developing the ability to **analyze real-world problems** and propose **technical and non-technical improvements**.

Fields of Internship:

1. **Information Systems Management**
2. **Software Development**
3. **System Design**
4. **Network Management**
5. **Business Intelligence**

Internship Deliverables:

- **Proposal** – A written plan outlining the problem to be studied, including an official internship approval letter.
- **Internship Logbook** – A **weekly progress report** submitted to faculty advisors.
- **Photo & Video Documentation** – Records of internship activities.
- **Preliminary Report** – A draft reviewed and approved by academic supervisors before seminar presentation.
- **Internship Seminar** – A **final evaluation** through report presentation.
- **Final Report** – A **refined version** incorporating feedback from supervisors after the seminar.

Internship Requirements:

- Completion of at least **110 CREDITS (credit hours)**.
- Fulfilment of **departmental administrative requirements**.

Internship Guidelines:

1. Conducted **between the even and odd semesters**.
2. Must be registered through **LIRS with an academic advisor**.
3. Weekly activity reports must be **submitted to supervisors**.
4. **Internship defense** should be conducted **by the semester's end**.
5. Failure to **complete the internship** or **defend the report** results in **project cancellation** and requires a new topic in the next semester.

XI.11 Final Project Mechanism

The **Final Project** is an **independent research initiative** to assess a student’s **competency in planning, designing, and building an information system**.

Final Project Study Areas:

1. **Information Systems Management Analysis and Design:**
    - Workgroup Collaboration Systems
    - IT Strategy Planning
    - Knowledge Management
    - Supply Chain Management
    - Customer Relationship Management
    - Governance & Audit
    - Enterprise Architecture
    - Information Systems Project Management
    - Business Process Engineering
    - Management Science
    - Geographic Information Systems
2. **Database Administration:**
    - Business Intelligence
    - Data Mining & Data Warehousing
    - Decision Support Systems
3. **Application Development:**
    - Desktop Applications
    - Web Applications
    - Mobile Applications

Final Project Timeline (16 Weeks):

- **2 Weeks** – Proposal submission
- **6 Weeks** – Research concept development (after proposal approval)
- **8 Weeks** – Implementation & final product development

Final Project Process:

1. Students **submit an outline** of their project title to the department, verified by a **panel of faculty members**.
2. The department assigns **two faculty advisors** and **two examiners** to each student.
3. **Seminar Presentation** is conducted once **faculty advisors approve the preliminary report**.
4. **Final Defense** occurs after students refine their reports based on feedback from **examiner evaluation during the seminar**.