

PROGRAM SPECIFICATION

S-1 AGRICULTURAL ENGINEERING

DEPARTMENT OF AGRICULTURAL AND
BIOSYSTEMS ENGINEERING
FACULTY OF AGRICULTURAL TECHNOLOGY
UNIVERSITAS GADJAH MADA

2016

Table of Contents

SUMMARY OF STUDY PROGRAMME SPECIFICATION	1
MANAGEMENT	2
VISION, MISSION, OBJECTIVES, AND LEARNING OUTCOME OF STUDY PROGRAMME	3
ACADEMIC STAFF	5
FACILITIES	13
LABORATORIES	13
LIBRARY	16
INFRASTRUCTURES	16
CURRICULUM STRUCTURE (2011 curriculum)	17
SYLLABUS	21

SUMMARY OF STUDY PROGRAMME SPECIFICATION

1.	Awarding Body	:	Universitas Gadjah Mada
2.	Faculty	:	Agricultural Technology
3.	Department	:	Agricultural and Biosystems Engineering
4.	Study Programme	:	Agricultural Engineering
5.	Accreditation	:	A (Excellence)
6.	Accredited by	:	Higher Education – National Accreditation Board (BAN-PT)
7.	Academic degree	:	Sarjana Teknologi Pertanian (STP.)
8.	Year of Operation	:	1963 - now
9.	Admission Criteria and Procedures	:	See website : http://um.ugm.ac.id
10.	Credits requirement	:	144 – 148 SKS (compulsory 132 credits, optional 12-16 credits)
11.	Length of study	:	8 semester, maximum 7 years
12.	Graduation requirements	:	Undergraduate thesis, maximum of D score is 25% of 144-148 credits, no E score, and Grade Point Average of $\geq 2,0$.
13.	Website	:	http://tep.tp.ugm.ac.id
14.	Address	:	Jl. Flora No 1, Bulaksumur, Yogyakarta 55281 Ph/Fax. 0274 563542
15.	Teaching and Learning methods	:	Combination of teacher and student centered learning

MANAGEMENT




DEPARTMENT OF AGRICULTURAL AND BIOSYSTEMS ENGINEERING

		
Head of Department	Secretary of Department	Treasury of Department
Prof. Dr. Bambang Purwantana	Dr. Murtiningrum	Sri Markumningsih, STP., M.Sc.

DEVELOPMENT UNITS

			
Academic development	Research development	National collaboration	International collaboration
Prof. Dr. Sahid Susanto	Dr. Nursigit Bintoro	Prof. Dr. Lilik Sutiarmo	Dr. Rudiati Evi Masithoh

HEAD OF STUDY PROGRAMME

		
Undergraduate Programme	Master Programme	Doctoral Programme
Prof. Dr. Bambang Purwantana	Prof. Dr. Sahid Susanto	Prof. Dr. Sigit Supadmo Arif

VISION, MISSION, OBJECTIVES, AND LEARNING OUTCOME OF STUDY PROGRAMME

VISION

To be an excellent study program in the application of the principles of science and technology in the field of agricultural and biosystems engineering to support the development of sustainable tropical industrial agriculture.

MISSION

Organizing undergraduate program in the application of the principle of science and technology in the field of agricultural and biosystem engineering to support the development of sustainable tropical industrial agriculture.

OBJECTIVES

Students graduate from the Agricultural Engineering Study programme may work or involve in several sectors, such as designer, manager, system analyst, science and technology developer, and entrepreneur. The Agricultural Engineering Study programme has the following educational objectives for its graduates. In two to five years after graduation, graduates should:

1. Have ability to use principles of engineering to design product or technology related to agriculture engineering
2. Show and posses innovative and creative thinking as well as hold engineering professional ethics.
3. Have expertise in managing and utilizing natural resources in optimum and sustainable ways
4. Show professionalism as well as have leadership and effective communication skills
5. Be able to apply biosystem approach to identify, formulate, analyse, and solve agriculture engineering problems
6. Be able to do research, explore, develop, and apply science, technology, and engineering in the field of agriculture and biosystem.
7. Be able to develop entrepreneurship and act as a key player in agribusiness and agroindustry.

LEARNING OUTCOMES

Graduates of the Agricultural Engineering Study Programme should have, at the time of graduation:

- An ability to identify, understand, and explain sustainable tropical industrial agricultural system using principles of agricultural engineering science.
- An ability to design and construct, as well as to manage natural resources, equipment, industrial processes in an environmentally friendly tropical agricultural systems using the principles of agricultural engineering science
- An ability to perform scientific communication effectively and responsive to the application of science and technology in the field of agriculture engineering.

- An ability to perform experiment, as well as to analyze and interpret data to improve the performance of agriculture and biosystems.
- An ability to show a professional and innovative work in the field of agricultural engineering in accordance with ethical norms of public life.
- An ability to evaluate or analyze the sustainable tropical industrial agricultural system using principles of agricultural engineering science
- An ability to apply a competitive technology based on local raw materials and local wisdom in tropical industrial agriculture.

ACADEMIC STAFF

ACADEMIC STAFF INFORMATION	
	<p>Abdul Rozaq, Ir., DAA., Dr.</p> <p>Degree: Doctor, The Institut National Agronomique Paris-Grignon (INA P-G), France. Field of Study: Terramechanics Laboratory : Energy and Agricultural Machinery Subject: Fundamental of Biosystems, Engineering Research</p>
	<p>Bambang Purwantana, Ir., M.Agr. Dr., Prof.</p> <p>Degree: Doctor, Kobe University, Japan. Field of Study: Agricultural Machinery Design, Renewable Energy Laboratory : Energy and Agricultural Machinery Subject: Engineering Mechanics, Renewable Energy</p>
	<p>Budi Rahardjo, Ir., MSAE., Dr., Prof.</p> <p>Degree: Doctor of Agricultural Engineering, Ohio State University, USA. Field of Study : Food Processing Laboratory: Postharvest and Food Engineering Subject : Heat transfer</p>
	<p>Devi Yuni Susanti, STP., M.Sc.</p> <p>Degree: Master, Food Technology, Universitas Gadjah Mada Field of Study: Drying Laboratory: Postharvest and Food Engineering Subject: Engineering Mathematics, Fluid Mechanics</p>

ACADEMIC STAFF INFORMATION



Hanim Zuhrotul Amanah, STP., M.Sc.

Degree: Master, Food Technology, Universitas Gadjah Mada
Field of Study: Drying
Laboratory: Postharvest and Food Engineering
Subject: Heat transfer



Joko Nugroho, Ir. M.Eng., Dr.

Degree: Doctor, Tsukuba University, Japan.
Field of Study: Food Engineering
Laboratory: Postharvest and Food Engineering
Subject : Bio-process Engineering, Industrial Sanitation Engineering



Lilik Sutiarto, Ir., M.Eng., Dr., Prof.

Degree: Doctor, Tsukuba University, Japan.
Field of Study : System Engineering, Agricultural Information Systems
Laboratory : Energy and Agricultural Machinery
Subject: Control System, Information System



Muhjidin Mawardi, Ir., M.Eng., Dr., Prof.

Degree: Doctor, Kyoto University, Japan.
Field of Study : Soil and Water Engineering
Laboratory : Land and Water Resource Engineering
Subject: The Nature of Soil, Plant and Water Relation

ACADEMIC STAFF INFORMATION



Murtiningrum, STP., M.Eng., Dr.(Cand.)

Degree: Universitas Gadjah Mada (Doctoral candidate); Master, Asian Institute of Technology, Thailand
 Field of Study: Irrigation Engineering
 Laboratory : Land and Water Resource Engineering
 Subject: Fluid Mechanics, Irrigation Engineering



Ngadisih, STP., M.Sc., Dr.Eng.

Degree: Doctor, Ehime University, Japan.
 Field of Study : Soil Engineering
 Laboratory : Land and Water Resource Engineering
 Subject : The Natural of Soil, Basic of Geographical Information Systems



Nursigit Bintoro, Ir., M.Sc., Dr.

Degree: Doctor, Tokyo University of Agriculture Technology, Japan.
 Field of Study: Silo, Drying
 Laboratory: Environmental and Agricultural Building Engineering
 Subject: Physical Properties of Agricultural Product, Packaging and Storage Engineering



P. Tamtomo, Ir., M.Eng.

Degree: Master, Asian Institute of Technology, Thailand.
 Field of Study : Agricultural Information Systems
 Laboratory : Energy and Agricultural Machinery
 Subject: Computer Programming and Application

ACADEMIC STAFF INFORMATION



Putu Sudira, Ir., M.Sc., Dr., Prof.

Degree: Doctor, University of the Philippines Los Baños, Philipines.
Field of Study : Watershed Management
Laboratory : Land and Water Resource Engineering
Subject : Watershed Management, Agro-climate



Sahid Susanto, Ir., MS, Dr., Prof.

Degree: Doctor, Kyoto University, Japan.
Field of Study : Hydrology
Laboratory : Land and Water Resource Engineering
Subject : Hydrology, Biosystems Engineering



Saiful Rochdiyanto, Ir., MS, Dr.

Degree: Doctor, Kyoto University, Japan.
Field of Study : Irrigation Management
Laboratory : Land and Water Resource Engineering
Subject : Irrigation Management, Engineering Economics



Sigit Supadmo Arif, Ir., M.Eng., Dr., Prof.

Degree: Doctor, Central Luzon State University, Philippines.
Field of Study : Irrigation Engineering and Management
Laboratory : Land and Water Resource Engineering
Subject : Fundamental of Irrigation Engineering, Fluid Mechanics

ACADEMIC STAFF INFORMATION



Sri Rahayoe, STP., MP., Dr.

Degree: Doctor, Chemical Engineering Department, UGM
 Field of Study : Food Processing
 Laboratory: Postharvest and Food Engineering
 Subject: Fundamental of Biosystem Modelling, Drying Engineering



Sukirno, Ir., MS.

Degree: Master, Universitas Gadjah Mada
 Field of Study: Land and Water Conservation
 Laboratory : Land and Water Resource Engineering
 Subject : Land and Water Conservation Engineering, Land Surveying



R. Handoyo, Ir.,M.Eng.

Degree: Master, Asian Institute of Technology, Thailand.
 Field of Study : Electronics Engineering
 Laboratory : Energy and Agricultural Machinery
 Subject : Electronics and Instrumentations



Rudiati Evi Masithoh, STP., M.Dev.Tech., Dr.

Degree: Doctor, Universitas Gadjah Mada
 Field of Study : Non-destructive Evaluation
 Laboratory : Biophysics
 Subject: Artificial Intelligent, Agricultural Robotics

ACADEMIC STAFF INFORMATION



Widodo, Ir., MS.

Degree: Master, Universitas Gadjah Mada
 Field of Study: Agricultural Machinery
 Laboratory : Energy and Agricultural Machinery
 Subject : Engineering Drawing



Wisnu Wardhana, Ir., MS.

Degree: Master, Universitas Gadjah Mada
 Field of Study: Land Surveying
 Laboratory : Biophysics
 Subject : Land Surveying, Watershed Management



Radi, STP., M.Eng., Dr.

Degree: Doctor, Institut Teknologi Sepuluh November, Surabaya.
 Field of Study : Electronic and Instrumentation
 Laboratory : Energy and Agricultural Machinery
 Subject: Instrumentation



Bayu Dwi Apri Nugroho, STP., M.Agr., Ph.D.

Degree: Doctor, Iwate University, Japan.
 Field of Study: Agro climate
 Laboratory : Land and Water Resource Engineering
 Subject : Agro climate, Basic of Geographical Information System

ACADEMIC STAFF INFORMATION



Sri Markumningsih, STP., M.Sc.

Degree: Master, Universitas Gadjah Mada
Field of Study : Renewable Energy
Laboratory : Energy and Agricultural Machinery
Subject: Management of Energy and Agricultural Machinery



Arifin Dwi Saputro, STP., M.Sc., Ph.D. (Cand.)

Degree: Doctor [on study], Ghent University, Belgia.
Field of Study : Food Engineering
Laboratory: Postharvest and Food Engineering
Subject : Heat Transfer



Chandra Setyawan, STP., M.Eng., Ph.D. (Cand.)

Degree: Doctor [on study], National Pingtung University of Science and Technology, Taiwan.
Field of Study : Soil and Water Conservation Engineering
Laboratory : Land and Water Resource Engineering
Subject : Hydrology



Andri Prima Nugroho, Ph.D.

Degree: Doctor, Kyushu University, Japan.
Field of Study: Agricultural Informatics
Laboratory: Energy and Agricultural Machinery
Subjects : Numerical Computation, Agricultural Information Systems

ACADEMIC STAFF INFORMATION



Bayu Nugraha, STP., M.Sc., Ph.D. (Cand)

Degree: Doctor [on study], Postharvest Lab, Biosystems Department, KU Leuven, Belgium
Field of Study: Postharvest Engineering, Food Engineering
Laboratory: Postharvest and Food Engineering
Subjects : Drying Engineering



Rizki Maftukhah, STP., M.Sc.

Degree: Master of Science, Department of Agricultural and Biosystems Engineering UGM
Field of Study: Agricultural biophysics
Laboratory: Biophysics
Subjects : Mechanical engineering, Mathematical engineering, Biophysics



Yudha Dwi Prasetyatama, ST., M.Eng.

Degree: Master of Engineering, Chemical Engineering Department, Universitas Gadjah Mada
Field of Study: Process Engineering
Laboratory: Environmental and Agricultural Building Engineering
Subjects : Thermodynamics,

FACILITIES

LABORATORIES

1. Energy and Agricultural Machinery

Vision

To be excellent laboratory in applying and developing knowledge in the field of energy and agricultural machinery

Scopes

Formal scopes: the principles of engineering and management

Material scopes: Energy and machinery for production and industrial of biomass

Graduates competency

Able to apply the principle of engineering and management in energy management, design, manufacture, and application of agricultural machinery in a production system and biomass industries

Field of study

- a. Energy Technology
 - Renewable Energy Development
 - Bioconversion Engineering
- b. Agro-industrial Machinery Engineering
 - Power and Energy Management
 - Design & Construction
 - Management of Machinery and Equipment
- c. Control and Automation
 - Measurement and Controls in Biological System
 - Precision & Smart Agriculture

Laboratory facilities

- a. Analysis tools: oven, balance
- b. Agricultural tools: moldboard plow, disk plow, rotary plow, chisel plow, harrow, sprayer
- c. Agricultural machineries: hand tractor, mini tractor, seeder, trans-planter, diesel motor
- d. Control system and optimization: sensor, micro-controller, vision system control, etc.
- e. Energy tools: Gasifer
- f. Unit design tools and agricultural machinery: (soil bin apparatus test, data acquisition test, data logger, amplifier, x-y recorder, etc.)
- g. Unit construction of tool and agricultural machinery: workshop tools, machine tools, roll plat, etc.)
- h. System information: computer and supporting software, internet

2. Post-harvest and Food Engineering

Scopes

Principles of engineering science in the handling of processing, security, and distribution of food and other agricultural products from harvesting to industrial process and consumer

Graduates competency

Able to apply the principle of engineering and management in the handling of processing, security, and distribution of food and other agricultural products from harvesting to industrial process and consumer

Field of study

- a. Heat and mass process
- b. Operation unit
- c. Rheology
- d. Postharvest (drying, storage, packaging)

Laboratory facilities

- a. Analysis tools: analytical balance, digital thermometer, measuring glass, electronic balance, stove, oven, roll meter, centrifuge, stirrer hot plate, vibrator, texture analyzer, vibrator
- b. Postharvest unit: cool storage, deep frying, drying cabinet, grain moisture tester, incubator, grinder, refrigerator and freezer, rotary vacuum evaporator
- c. Calibration laboratory unit for agricultural machinery and post-harvest machinery

3. Land and Water Resource Engineering

Scopes

Principles of engineering science and management in land and water resources engineering to provide suitable environment for agroindustry

Graduates competency

Able to apply the principle of engineering and management in land and water resources engineering to provide suitable environment for agroindustry

Field of study

- a. Land and water management: land evaluation, spatial information system, agricultural land engineering and management, watershed management, development and management of water resources
- b. Land and water conservation engineering: hydro-climate, soil physic for soil and water conservation, erosion control and soil conservation, water resources conservation engineering
- c. Irrigation: irrigation system engineering and design, irrigation system and management, micro irrigation system

Laboratory facilities

- a. Analysis tools: analytical balance, thermometer, measuring glass, electronic balance, stove, oven, roll meter
- b. Irrigation: current meter, flume, mini open-channel irrigation, micro-irrigation tools
- c. Mapping tools: GPS, theodolite, compass, altimeter,
- d. Climate tools: lux meter, anemometer, thermo-hygrometer, ombrometer
- e. Information system: computer, GIS software, cropwat, etc
- f. Soil physic tools: texture and structure analyzer, penetrometer, pH-meter

4. Farm Structure Environment Engineering**Scopes**

Development of science and technology, in perspective of engineering analysis, to control the environment in agricultural structure and environment control for crops growth to achieve the requirement of desired product.

Graduates competency

Able to understand and analyze the environment condition of structure used for agriculture product, able to design farm structure based on environment aspect for desired agricultural product.

Field of study

- a. Environmental Science
- b. Environmental Engineering
- c. Farm Structure Environmental Engineering
- d. Physical properties of Agricultural Product.

Laboratory facilities

- a. Plant Growth Cabinet Chamber
- b. Midget Impinger and Pump.
- c. Analysis tools: Digital Lux Meter, Electric Conductivity and pH-meter, High Volume Air Sampler, Hot Wire Anemometer, Humidity Meter, Laboratory Water Analyzer, Oven, Oxygen Meter.

5. Biophysics**Scopes**

Principles of engineering science and management in the physical properties of plants and animals in response to physical stimulus (heat, force, sound, light, and electricity); the phenomenon of energy transfers, water, gas, and nutrients through physiological activity of plants and animals; and non-destructive analysis of agricultural product

Graduates competency

Able to apply the principle of engineering in the agricultural biophysics and non-destructive analysis of agricultural product quality

Field of study

- a. Environmental biophysics
- b. Plant biophysics
- c. Animal biophysics
- d. Non-destructive evaluation of agricultural product quality

Laboratory facilities

- a. Analysis tools: analytical balance, thermometer, measuring glass, electronic balance, stove, oven, roll meter, digital caliper, microscope
- b. Environmental tools: lux meter, anemometer, thermo-hygrometer, CO₂ meter, digital salt meter, infrared thermometer, leaf area meter, uv-light meter
- c. Non-destructive tools: color-meter, fruit hardness tester, refracto-meter

LIBRARY

1. Study program of Agricultural Engineering library
2. Faculty of Agricultural Technology library
3. University library (<http://lib.ugm.ac.id>)

INFRASTRUCTURES

Infrastructure of Study Program include:

1. Auditorium
2. Canteen
3. Lift
4. Mosque
5. Parking area
6. Sport center

CURRICULUM STRUCTURE (2011 curriculum)

No	Code	Courses	Credits		Status	
			Class	Lab.	C	O
SEMESTER – 1						
1	UNU1000 – UNU1005	Religion	2		C	
2	TPO1001	Introduction to Agricultural Technology	2		C	
3	MKS1101	Basic Chemistry 1 (Inorganic Chemistry)	2		C	
4	BIO1001	Biology	2	1	C	
5	MMS1101	Mathematics I	2		C	
6	MFS1101	Basic Physics I	2		C	
7	MFS1151	Basic Physics I (Laboratory)		1	C	
8	MKS1151	Basic Chemistry 1 (Laboratory)		1	C	
9	TPT1002	Principles of Management	2		C	
10	TPT1004	Environmental Science	2		C	
11	UNU161	Indonesian	2		C	
12	TPT1005	Engineering Drawing	1	2	C	
Total			19	5		
SEMESTER – 2						
1	UNU1100	Pancasila	2		C	
2	TPO1002	English	2		C	
3	TPO1008	Programming and Computer Application	2	1	C	
4	MFS1102	Basic Physics II	2		C	
5	MFS1152	Basic Physics II (Laboratory)		1	C	
6	MKS1102	Basic Chemistry II (Organic Chemistry)	2		C	
7	MMS1102	Mathematic II	2		C	
8	TPT1009	Farming Industrial System	2	1	C	
9	TPT1010	Basics of Biosystem	2		C	
10	UNU3000	Citizenship	2		C	
11	TPT1011	Engineering Profession	1		C	
12	TPT1012	Introduction of Engineering Design	2		C	
Total			21	3		
SEMESTER – 3						
1	MMS2401	Statistic	3		C	
2	TPT2002	Thermodynamics	3		C	

No	Code	Courses	Credits		Status	
			Class	Lab.	C	O
3	TPT2003	Engineering Mathematics	3		C	
4	TPT2004	Mechanical Engineering	3		C	
5	TPT2021	Energy and Agricultural Machinery	2	1	C	
6	TPT2017	Agroclimatology	2	1	C	
7	TPT2022	Soil Properties	2	1	C	
8	TPT2023	Unit Operation	2	1	C	
Total			20	4		
SEMESTER - 4						
1	TPT2006	Heat Transfer	3		C	
2	TPT2010	Management Information System	2		C	
3	TPT2024	General Microbiology	2		C	
4	TPT2013	Fluid Mechanics	3		C	
5	TPT2019	Farm Structure Environment Engineering	2	1	C	
6	TPT2025	Regional Mapping	2	1	C	
7	TPT2026	Electrical and Electronics	2	1	C	
8	TPT1006	Engineering Economics	2		C	
9	TPT2109	Renewable Energy	2	1		O
10	TPT2207	Hydrology	2			O
11	TPT2306	Physical Properties of Agricultural Products	2	1		O
12	TPT2401	Environmental Agriculture Engineering	2	1		O
13	TPT2501	Physiology of Plant and Agricultural Product	2			O
Total			28	6		
SEMESTER - 5						
1	TPT3006	Experimental Engineering Design	2		C	
2	TPT3008	Biophysics	2	1	C	
3	TPT3004	Introduction to Control Systems	2		C	
4	TPT3012	Mass Transfer	3		C	
5	TPT3013	Biosystem Engineering	2		C	
6	TPT3014	Entrepreneurships	2		C	
7	TPT3010	Measurement and Instrumentation Technique	2	1	C	
8	TPT3118	Properties and Strength of Engineering Materials	2			O
9	TPT3119	Industrial Plantation Machinery	2	1		O

No	Code	Courses	Credits		Status	
			Class	Lab.	C	O
10	TPT3120	Automation in Biosystems	2			O
11	TPT3121	Ergonomics	2			O
12	TPT3122	Engineering Computation	2	1		O
13	TPT3201	Irrigation Principle and Technique	2	1		O
14	TPT3204	Soil and Water Conservation Engineering	2	1		O
15	TPT3209	Principle of Natural Resources Development	2			O
16	TPT3319	Food Processing Engineering	2	1		O
17	TPT3313	Cooling and Freezing Engineering	2			O
18	TPT3320	Basic of Food Nutrition	2			O
19	TPT3321	Design of Food Process and Postharvest Equipment	2			O
20	TPT3401	Construction of Farm Building	2			O
21	TPT3402	Waste Management	2			O
22	TPT3501	Chemistry for biosystems	2			O
23	TPT3015	Special Topic	2			O
Total			45	7		
SEMESTER – 6						
1	TPT3009	Research Methodology	2		C	
2	TPT3016	System Analysis and Modelling	3		C	
3	TPT3099	Field Work		3	C	
4	TPT3011	Post-harvest Technology	2	1	C	
5	TPT3017	Industrial Agriculture Sociology	2		C	
6	TPT3110	Microcontroller	2	1		O
7	TPT3123	Design of Agricultural Machinery	2	1		O
8	TPT3116	Artificial Intelligence	2			O
9	TPT3115	Management of Energy and Agricultural Machinery	2			O
10	TPT3212	Principles of Geographical Information Systems	1	1		O
11	TPT3211	Management of Irrigation Systems	2			O
12	TPT3210	Watersheds Management	2			O
14	TPT3310	Packaging and Storage Engineering	2			O
15	TPT3318	Industrial Sanitation Engineering	2			O
16	TPT3316	Design of Industrial Agricultural	1	1		O

No	Code	Courses	Credits		Status	
			Class	Lab.	C	O
17	TPT3322	Bioprocess Engineering	2			O
18	TPT3403	Water, Soil, and Plant Relationship	2			O
19	TPT3502	Agricultural Products Quality Evaluation	2	1		O
20	TPT3503	Basic Modeling of Biological System	2			O
21	TPT3015	Special Topic	2			O
22	TPT3307	Drying Engineering	2			O
Total			37	9		
SEMESTER - 7						
1	TPT4099	Thesis		6	C	
Total			0	6		
SEMESTER - 8						
1	UNU4500	Community Service Program		3	C	
Total			0	3		

SYLLABUS

No	Code	Course name	Credits	C/O	Syllabus
1.	UNU 1000 – UNU 1005	Religion	2/0	C	<p><u>Islam</u> Implementation of Islam; How to increase faith to the God and the Messenger; How to increase Islamic practise; Contextual of Islam in academics</p> <p><u>Christian</u> Self-actualization of Christian; Faith in everyday life; the relationship to the God, other people, and the universe; Contextual of Christian in academics</p> <p><u>Chatolic</u> Knowledge of the man who has faith to God through Jesus Christ, living in Christ and community in order to develop the attitude and mentality of personal life; Understanding of religious values contextually in academics.</p> <p><u>Hindu</u> Religious way to the God (Sang Hyang Widhi Wasa) in order to be able to control our self in thinking, talking, and actuating to the country; Contextual of Hindu in academics</p> <p><u>Buddha</u> History of Buddha and his experience loyalty to the society; Contextual of Buddha in academics</p>
2.	UNU 1100	Pancasila	2/0	C	<p>Phylosophy of <i>Pancasila</i>, <i>Undang-Undang Dasar (UUD) 1945</i> and <i>Garis-garis Besar Haluan Negara (GBHN)</i>; <i>Pedoman Penghayatan dan Pengamalan Pancasila (P4)</i>; discussion of social problem; and application of Pancasila value in the academic field</p>
3.	TPO 1002	English	2/0	C	<p>Introduction to academic writing; structure, word choice on study program of Agricultural and Biosystem Engineering (ABE), and make good sentences. Structure of</p>

No	Code	Course name	Credits	C/O	Syllabus
					paragraph; make a concise paragraph, abstract, tables and figures: types and presentation, paraphrase and summarizing. Ethics; citation and avoid plagiarism. Reading skills for academic purposes; scanning and skimming. Note taking; reading and listening, review and emphasis.
4.	UNU 161	Indonesian	2/0	C	The ability to use Indonesian either verbally in the art of communication, interview, presentation, or in writing. Mastery of grammar and vocabulary correctly in writing scientific papers.
5.	UNU 3000	Citizenship	2/0	C	National security in comprehensive and integrative way covering national insight, national security, politics and security strategy, as well as security and defence of the society; Actualization of national security in academic development.
6.	TPT 4099	Thesis	0/6	C	Specifically stipulated in the Thesis Implementation Guideline – Academic Handbook of Agricultural Engineering Department.
7.	TPT 3099	Field Work	0/3	C	Specifically stipulated in the Thesis Implementation Guideline – Academic Handbook of Agricultural Engineering Department. Prerequisite: EMP: TPT 2021, TPT 2017 TSLA: TPT 2022. TPT 2017 TPP: TPT2023 TLBP: TPT 2019 FH: TPT 2019, TPT 2017
8.	UNU 4500	Community Service Program (<i>Kuliah Kerja Nyata</i>)	0/3	C	Specifically stipulated in the Guideline of Community Service Implementation - <i>Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM) UGM</i>
9.	MMS 1101	Mathematics I	2/0	C	System set and number; Introduction of Probability; Functions and limits; Functions and graphs; Functions and variables; Vectors and matrices; Linear equation.

No	Code	Course name	Credits	C/O	Syllabus
10.	MMS 1102	Mathematic II	2/0	C	Taylor series; differential function, indefinite integral, definite integral, double integral and finite difference.
11.	TPT 2003	Engineering Mathematics	3/0	C	Differential principles; Integration principles; Advanced Differential Equation; Laplace Transform; Engineering mathematics in agricultural engineering application; Prerequisite: MMS1101, MMS1102
12.	MMS 2401	Statistics	3/0	C	Scope and utilization of statistic, frequency list, histogram, diversity modelling, parameter estimation and hypothesis test, simple regression and correlation analysis
13.	BIO 1001	Biology	2/1	C	Definition of life; Organization of life; Cells and molecules; Genetics; Reproduction and growth; Environmental regulation; Ecology; Biosphere; Population growth; Human ecology; Study of ecology in agricultural and biosystem engineering.
14.	MKS 1001	Basic Chemistry 1 (Anorganic Chemistry)	2/0	C	Materials, compounds, elements, and method of measurement; atomic theory and the discovery; chemical calculation; gas law; electron in atom; basic chemical bonds; concept of acids and bases; thermochemical reaction and thermodynamic; reaction kinetics; core chemical and oxidation-reduction reactions.
15.	MKS 1151	Basic Chemistry Laboratory I	0/1	C	In accordance with the respective course syllabus
16.	MKS 1102	Basic Chemistry II (Organic Chemistry)	2/0	C	Reaction and reactivity of organic compounds, chemical introduction of biological and chemical aspects of the environment
17.	MFS 1101	Basic Physics I	2/0	C	Principles of Physics; Unit systems; Kinematics; Dynamics; Newton Laws; Conservation Laws; Vibrations; Flow mechanics; Heat; Thermodynamics; Equation of state; Gas properties; Heat and mass transfer.
18.	MFS 1151	Physics 1 (Laboratory)	0/1	C	In accordance with the respective course syllabus
19.	MFS 1102	Basic Physics II	2/0	C	Electrostatics; Magnetostatics; Geometrical Optics; Physics Optics; Structure of atom; Nuclear process; Nuclear energy utilization; Nuclear for sterilization and food preservation; Wave and vibration (light and sound).

No	Code	Course name	Credits	C/O	Syllabus
20.	MFS 1152	Physics II (Laboratory)	0/1	C	In accordance with the respective course syllabus
21.	TPO 1001	Introduction of Agricultural Technology	2/0	C	Fundamental scientific of agricultural technology faculty development; The concept of the agricultural industry, the role of agricultural technology in the agriculture industry, the development of science and technology, and National Development; Profession and professionalism in agricultural technology; Understanding of Agricultural and Biosystems Engineering; Understanding of Agricultural and Biosystems Engineering competence, work prospect, and niche.
22.	TPT 1004	Environmental science	2/0	C	Definition and scopes, principles, elements, and environmental assessment methodology; human, technology, and environmental compatibility; ethics and environmental law in Indonesia; study of human activities to maintain environmental capacity
23.	TPT 2017	Agroclimatology	2/1	C	Principles and scope; Physical properties and phenomena of atmosphere; Element of climate measurement; Classification of climate; Micro-climate for agriculture; Energy balance; Relationship of climate variables and plant-soil-water; Climate change.
24.	TPT 1009	Farming Industrial System	2/1	C	Principle of agricultural production as a system; sub-system biology, sub-system production, sub-system economy, sub-system socio-economy, and agricultural development. Agricultural characteristic of tropical area; agricultural system as a part of industry; industrial agricultural character; industrial agricultural ecology; models of agricultural development theory; agricultural policy strategy; and sustainable development of agriculture.
25.	TPT 2002	Thermodynamics	3/0	C	Thermodynamics concept; Properties of pure substances; Thermodynamics Laws I and its application; Thermodynamics Laws II and its application; Entropy; Reversible and Irreversibles
26.	TPT 2004	Mechanical Engineering	3/0	C	Principle of static; Force vector; force system; free-body diagram; equilibrium of particle and rigid body; internal force; friction; inertia moment; application to the structure and machinery element.

No	Code	Course name	Credits	C/O	Syllabus
					Principle of dynamic; kinetic and equation of particle motion; rigid body kinematic; energy; momentum; and vibration
27.	TPO 1008	Programming and Computer Application	2/1	C	Basic concepts and programming techniques; programming languages; data types, variables and operators; control program; the functions and procedures; internet programming (web programming); graphics programming; multimedia programming; databases programming; input and display information programming; MATLAB programming; Application in the field of agriculture and biosystems engineering.
28.	TPT 3004	Introduction to control systems	2/0	C	Definition and terminology of control system; laplace transform review; control system elements; block diagram; simplification of block diagram; conversion of block diagram to signal-flow graph; transfer-function with Mason method; system sensitivity; error system order 0, 1, 2; response speed; and stability
29.	TPT 3007	Unit operations	2/1	C	Principles of unit operations; Mass and energy balance; Application of heat transfer and fluid flow; Heat and energy balance in drying and evaporation; Mechanical separation; Filtration; Centrifugation; Sedimentation; Blending; Mixing; Crystallization.
30.	TPT 1006	Engineering economics	2/0	C	Introduction; definition of economics; engineering economics; simple and compound interest; time value of money; P, F, A; gradient; cash flow; Analysis: NPV, EUV, BCR; economic comparison methods; comparison of useful-life; Analysis: IRR, Payback period, Break Even Point, depreciation.
31.	TPT 2010	Management information system	2/0	C	Principles of systems, information, and management; Analysis of management information systems; Design of management information systems; Design of input and output; Database design; Technology design; Model design; Control design; Selection, implementation, and evaluation of management information systems; Application in agricultural engineering
32.	TPT 2006	Heat transfer	3/0	C	Basics of heat transfer by conduction, one dimension, and two dimension; lumped system; heat transfer by convection; flow in pipe by forced and free convections, and radiation; application example in the industrial processes; heat exchanger.

No	Code	Course name	Credits	C/O	Syllabus
33.	TPT 2013	Fluid mechanics	3/0	C	Concept of fluid; Form of fluid; Compressible and non-compressible fluid in adiabatic process and the relationship with agricultural engineering; Principle of fluid; Fluid statics; Fluid dynamics.
34.	TPT 2026	Electrical and electronics	2/1	C	Basic of direct current; circuit laws, energy, and electrical power; basic of alternating current; Fasor diagram; electric motor; 3 phase electricity; conductor and isolator materials, semi-conductors intrinsic and extrinsic; Diode and zener diode; rectification and power supply; transistor; dc and ac current model; analog series; OP-amp; basic of digital electronic; logic gates; and number theory
35.	TPT 3010	Measurement and instrumentation technique	2/1	C	Understanding the terms of measurement, instrumentation, measuring instruments, measurement standards; Instrument callibration and validation; Fuctional chart of measuring instruments; Amplifier; Filter; Measuring instrument model order 0,1,2. Sensor, measuring instruments, and measuring techniques: length, mass, time, temperature, pressure, flow, moisture content of materials and soil, humidity, light intensity, force, twisting and buckling moment, tension. Data display and record.
36.	TPT 3016	System analysis and modelling	3/0	C	Understanding of basic system, model, system analysis and simulation; structure of mathematical model, block diagram, and flow chart; understanding the basic simulation of mathematical model, optimization method, decision analysis, optimization model of linear mathematic, and sensitivity analysis; application of analysis and modeling system in the field of agricultural and biosystem engineering
37.	TPT 1005	Engineering drawing	1/2	C	Sketch drawing; projection; graphs; machine components; irrigation network; application of CAD (<i>computer aided design</i>).
38.	TPT 1010	Basics of biosystem	2/0	C	Basic concept and definition of biosystem; understanding sustainable biological system (biosystem); material study; micro-organism, plants, and animals to the ecosystem; biosystem boundary: atmosphere, lithosphere, and hydrosphere; and aspects of biology interaction, agriculture, and environment
39.	TPT 3006	Experimental engineering design	2/0	C	Introduction to experimental design engineering, quality of measurement, measuring instruments, experimental methods, presentation of experimental results; regression

No	Code	Course name	Credits	C/O	Syllabus
					and correlation analysis, Similitude (similarity) in engineering, introduction of dynamic system, introduction of artificial intelligence.
40.	TPT 1012	Introduction of Engineering design	2/0	C	Definition of needs, problem formulation, gathering information, preparation of alternative solution, analysis and design synthesis; selection of alternative solution, design modeling, design communication, design ethic, and design for construction
41.	TPT 2024	General microbiology	2/0	C	History of microbiology, classification of organisms and microbial taxonomy, cell structure, microbial growth, metabolism, microbial ecology, microbial aspects in food, industry, and environment
42.	TPT 3009	Research methodology	2/0	C	Research design preparation; implementation and research report, oral or written presentation; Purpose and type of research; application of principal statistic in quantitative research; and experimental design
43.	TPT 1002	Principles of management	2/0	C	Understanding the meaning and function of management in an economic system of agriculture production; The discussion and analysis of the management to organize and coordinate the factors of production: land, labor and capital in relation to the decision-making process (DSS). Corporate responsibility towards the environment (social responsibility), business ethics, organizational culture. Instrument for decision-making, for example; AHP.
44.	TPT 3012	Mass transfer	3/0	C	Fundamental of mass transfer; diffusion coefficient for gas, liquid, solid, and multi-component system; formulation model of mass transfer; partial differential equation for diffusion by separation variables method; laplace transform method; graphical analysis; mass transfer coefficient; definition of the mass transfer coefficient, theoretical models of mass transfer in fluid - fluid interface, overall mass transfer coefficient, convective mass transfer, dimensional analysis: methods Buckingham Pi; the analogy between the transfer of mass, momentum, and heat; mass transfer in a cylindrical tube; mass transfer coefficient for the sphere and cylinder, and an example of mass transfer applications in agriculture and biosystem engineering

No	Code	Course name	Credits	C/O	Syllabus
45.	TPT 2025	Regional mapping	2/1	C	Definition and scope; terrestrial, extra-terrestrial, and remote sensing data collection techniques; how to use the equipments; data analysis and presentation of maps; interpretation and use of maps in the field of agriculture and biosystem engineering
46.	TPT 1011	Engineering profession	1/0	C	Engineering or agricultural engineering coverage; profession, duties, responsibilities, and ethics of engineer in professions and occupations; and certification of professional engineers.
47.	TPT 3017	Industrial agriculture sociology	2/0	C	The meaning and scope of industrial farming community. Organizational aspects, social systems, and the type of social structure, culture and institutions, social family, as well as changes and problems in society. The dynamics of the agriculture development, the green revolution, the dynamics of farmers and farm workers, food self-sufficiency, food security and food sovereignty.
48.	TPT 3013	Biosystem Engineering	2/0	C	Application of mathematical and engineering in mass and energy equilibrium of biosystem; emphasis on completion of engineering problems in the field of heat transfer and mass; air and water vapor systems, livestock production systems, whole systems, food systems, water systems and bioprocess; bioconversion and bioenergy; Biosensor development, and agricultural machinery; biological techniques to control the environment-agriculture; processes and food safety; water quality.
49.	TPT 3014	Entrepreneurships	2/0	C	The concept of Entrepreneurship; Motivation and Vision Development; Development of creative, innovative and prospective business; Orientation of Business and Risk Taking; Establishment of new businesses; Business Planning; Business management and leadership; Financial management and financing; Marketing Strategies; Maintaining Customers; Business Ethics; Case study.
50.	TPT 2021	Energy and Agricultural Machinery	2/1	C	Basic principle of energy conversion; motors and fuel systems; mechanical energy production; Scope, benchmark development of agricultural machinery: agricultural tractors, land cultivator, planting, crop maintenance, harvesting; Function, construction, transmission, coupling systems, use and maintenance of agricultural machinery; Setting and calibration; and technical analysis of agricultural machinery.

No	Code	Course name	Credits	C/O	Syllabus
51.	TPT 2022	Soil properties	2/1	C	Definition of land, the process of soil formation; physical, mechanical and chemical properties of soil; status and movement of saturated and unsaturated soil; air and soil aeration; equilibrium of energy; compaction and soil strength
52.	TPT 3011	Post-harvest technology	2/1	C	Basic physiology of agricultural products; post-harvest handling of food products and horticulture, for example; whole grains, fresh fruits and vegetables, also plantation crops, such as: tea, coffee, cocoa and sugar cane, and palm oil.
53.	TPT 2019	Environment and farm structure engineering	2/1	C	The basic concept of the building environmental control; heat and mass transfer in farm buildings; the production of heat and moisture from livestock; the analysis of ventilation air for removal of heat and moisture; the analysis of the air exchange rate in farm buildings; the pattern and control of air flow ventilation; displacement of heat and mass of livestock; the analysis of ventilation in hot weather environments; the principles of environmental control in cultivation buildings.
54.	TPT 3008	Biophysic	2/1	C	Concept of biophysic and its application in agricultural and biosystem engineering; environmental biophysic, plants, and animals; effect of ecological environment on plants and animals; plants and animals response to environmental change (natural and artificial)
55.	TPT 3121	Ergonomics	2/0	O	Definition of ergonomics; anthropometry; basic biomechanics of ergonomics; physical works; planning of work-space; human-machine systems; environmental factors; movement studies; map work; study of measurement and determination of working time; safety and application of ergonomics in designing agricultural engineering and biosystem.
56.	TPT 3110	Microcontroller	2/1	O	Digital devices, number theory, basic working of digital computer, microcontroller architecture review: RAM, ROM, accumulators, registers, I / O, timer and clock. Algorithms establish. Writing microcontroller with assembly language program, compiling assembler. The parallel port and a serial port. Input to the switch, keypad. Output to LED, 7-segment displays, dot matrix, LCD. Application of microcontroller.

No	Code	Course name	Credits	C/O	Syllabus
57.	TPT 3118	Properties and strength of engineering materials	2/0	O	Properties of mechanical, thermal, electrical and magnetic agricultural materials, polymers, metals, alloys; standard testing; The basic principle, method of analysis and theoretical reasoning underlying the calculation of the pull and pressure, certain and uncertain static force system. the thin pressure vessel walls, shear, torsion, shear forces and bending moments, moments of inertia, stress, elastic deflection, plastic deformation, combined forces.
58.	TPT 3116	Artificial intelligence	2/0	O	Principle of artificial intelligence; uncertainty; fuzzy logic; expert systems, neural networks, genetic algorithms; and application in the field of agriculture and biosystem engineering
59.	TPT 3122	Engineering computation	2/0	O	Introduction of computational engineering, computational algorithm engineering, MATLAB programming, matrix operations, creating two and three-dimension charts, interpolation and regression; numerical integral and differential; completion of equations non-linear; optimization by linear programming, and problem resolution using simulations; application in the field of agriculture and biosystem engineering
60.	TPT 3123	Design of agricultural machinery	2/1	O	Application of design principle of problem identification, needs analysis up to blueprint; designing and choosing machine elements size based on analysis of mechanical loads and material strength of machine elements; analysis of stress, shaft & pegs, belts, clutch, brakes, gears, weld joints and rivet connections; and introduction of mechanical technology, machine operation and construction work.
61.	TPT 3120	Automation in biosystems	2/0	O	Introduction of the concept of automation and robotics; Automation and robotics technology development, application in bio-production; Introduction of automation models; Analysis of automation system; the role of automation in agriculture and biosystem engineering; technical, social and economical analysis for optimizing the design and development of the agricultural industry
62.	TPT 2109	Rewenable energy	2/1	O	Sources of renewable energy: sun, biomass, wind, and water; study of conversion and conservation engineering, economy, social, and environment; application and development of renewable energy in the field of agricultural and biosystem engineering

No	Code	Course name	Credits	C/O	Syllabus
63.	TPT 3119	Industrial plantation machinery	2/1	O	Scope, foundation of the development of industrial plantation machinery: tractors and heavy equipment, heavy equipment management (selection, planning). Function, construction, use and maintenance of plantation machinery
64.	TPT 3115	Management of energy and agricultural machinery	2/0	O	Basic planning of energy use and agricultural machinery; Life Cycle Assessment (LCA) and energy audits in the industrial agriculture; determination of requirements, resource considerations, machine tools and capital, in relation to the decision-making process; organizing systems, scheduling, operation and maintenance; replacement of machinery, technical studies, economic, and social
65.	TPT 3212	Principles of Geographical Information Systems	1/1	O	Definition and scope, basic concepts of GIS, hardware and software of GIS, geodesy concept for spatial data, sources of GIS spatial data; presentation of GIS spatial data; application of GIS in Agricultural Engineering
66.	TPT 2207	Hydrologi	2/0	O	Principles in the process of hydrology, meteorology and abstraction of hydrology, runoff (components, relationship rain runoff, hydrograph analysis), hydrology of small, medium, and large watersheds, search the river, frequency analysis, simple model of hydrology, groundwater (occurrence and movement of groundwater, well hydrology, intrusion of sea water).
67.	TPT 3201	Irrigation principle and technique	2/1	O	Definition, meaning and purpose of irrigation, irrigation systems and drainage in wet tropical regions; irrigation systems as part of the hydrological cycle; soil-plant-water relations; water requirements of plants; water irrigation requirement; agricultural drainage systems, ; methods of flow measurement in open channels
68.	TPT 3209	Principle of natural resources development	2/0	O	Definition and scope, agricultural natural resources as an asset, principle of development and role in development, sense of depletion, conservation and supply, industrialization and resource extraction, classification of land management and land evaluation, social costs and problems in the management, policy and environmental management live, sound agricultural development of agro-industry.

No	Code	Course name	Credits	C/O	Syllabus
69.	TPT 3204	Soil and water conservation engineering	2/1	O	Definition and scope; soil and water conservation as part of the hydrological cycle; erosion processes and prediction; design of soil and water conservation building; evaluation of soil and water conservation works; research methods for soil and water conservation
70.	TPT 3210	Watersheds management	2/0	O	Definition and scope, principles of watershed management, integrated management, and resource use within the watershed, institutions and policies, management information systems (MIS), quantitative assessment of the watershed, and watershed issues in Indonesia.
71.	TPT 3211	Management of irrigation systems	2/0	O	Definition and scope; the development of irrigation management in Indonesia; the characteristics of irrigation systems, laws and regulations; functions and processes of management of irrigation; the relationship between design and management; the relationship system operation and maintenance of irrigation networks; irrigation institutions; the value of water and irrigation costs; monitoring and performance evaluation of irrigation systems and management information systems for irrigation
72.	TPT 3319	Food processing engineering	2/1	O	Applications of transport phenomenon in food processing (fluid flow of liquid, gas and solid particles), application of heat and mass transfer in food processing (evaporation, crystallization, sterilization, pasteurization, purification), mixing, filtration, size reduction, mechanical separation.
73.	TPT 3321	Design of food process and postharvest equipment	2/0	O	Analysis of energy balance, mass balance and engineering process requirement in designing food process and postharvest equipment
74.	TPT 3310	Packaging and storage engineering	2/0	O	Type and nature of biological pests and diseases (pests and diseases warehouse), the character of agricultural products during storage (depreciation, damage and deterioration of the product during storage), design of building savings and bulk materials (mass flow and funnel flow), flow of bulk materials in the chute, flow rate of bulk material, transfer of bulk materials, properties of packaging materials and heat and

No	Code	Course name	Credits	C/O	Syllabus
					mass transfer phenomena in packaging materials, packaging techniques and pest and disease control in packaging materials.
75.	TPT 3318	Industrial sanitation engineering	2/0	C	The concept and definition of sanitary industry, the concept of hygiene, and the introduction of general conditions of sanitation industry in Indonesia; Introduction of Good Manufacturing Practices (GMPs), Sanitation Standard Operating Procedure (SSOP); Pest Control, Cleaning and Sanitation Methods; Cleaning and sanitizing equipment and techniques COP and CIP; Selection of the proper techniques and products for cleaning and sanitizing).
76.	TPT 3313	Cooling and freezing engineering	2/0	O	Fundamentals of cooling and freezing engineering, refrigeration and freezing applications in agricultural and food products, engineering analysis of cooling and freezing in agricultural products and foodstuffs.
77.	TPT 3320	Basic of food nutrition	2/0	O	Components of food; Changes of food components due to process treatments, gelatination, and <i>glass transition</i> .
78.	TPT 2306	Physical properties of agricultural products	2/1	O	The dimensions and shape, unit weight and porosity, thermal properties, rheology and viscos meter, aerodynamics, contact stress, friction properties, colors change as a result of physical and chemical treatments.
79.	TPT 3307	Drying technique	2/0	O	Principles of drying technique (water activity and EMC); application of food and agricultural products drying; engineering analysis of drying of food and agricultural products.
80.	TPT 3322	Bioprocess engineering	2/0	O	Reaction kinetics engineering in the form of mathematical analysis for the biological materials processing involving microorganisms, for example: yogurt fermenters (kinetics of acid formation), aeration rate analysis for microbial growth; making the composter.
81.	TPT 3316	Design of industrial agricultural	1/1	O	Industrial location design; process, equipment and machinery, lay out design of industrial facilities; design and investment analysis for agricultural industry.

No	Code	Course name	Credits	C/O	Syllabus
82.	TPT 2401	Environmental agriculture engineering	2/1	O	Introduction and understanding of environmental agriculture engineering, understanding the ecosystem in agriculture, rule of environmental engineering in agriculture, human to obtain energy from agriculture, shape and development of agricultural engineering, solar energy, research methods and environmental analysis, role of surface in agriculture and biosystem engineering
83.	TPT 3401	Construction of farm building	2/0	O	The basic elements of the farm buildings, load on farm buildings, construction of foundation and earth structures, pillar construction, beam construction, floor construction, roof construction, Construction of special building for agriculture: silos, greenhouses, livestock shed, warehouses.
84.	TPT 3402	Waste management	2/1	O	Definition of waste (source, type, and properties of waste); management system or treatment of solid, liquid, gas, and B ₃ (toxic and hazardous substances).
85.	TPT 3403	Water, soil, and plant relationship	2/0	O	The role of water in plant growth, soil moisture, type and status of water in the soil, measurement and regulation of water in the soil, redistribution and water movement in the soil, water absorption by plants, water movement within plant body, evaporation and transpiration, the influence of excess and deficiency (stress) of water on the growth and yield.
86.	TPT 3501	Chemistry for biosystems	2/0	O	Chemical of plants, fruits, and vegetables; Cycle process of biology and environment; Biochemical reactions of plants and crops growth; The influence of environmental change on processes and biochemical reactions of plants and crops.
87.	TPT 2501	Physiology of plant and agricultural product	2/0	O	Plant phenology; Plant physiology and agricultural product (post-harvest): morphology, ecology (related with environment), biochemistry, process and life cycle.
88.	TPT 3502	Agricultural products quality evaluation	2/1	O	Definition and purpose of quality evaluation; methods in quality evaluation; destructive and non-destructive quality evaluation: Machine Vision, NIR spectroscopy, IR, FTIR, NMR/MRI, E-nose.

No	Code	Course name	Credits	C/O	Syllabus
89.	TPT 3503	Basic modeling of biological system	2/0	O	Introduction: basic concepts of modeling. Basic mathematical modeling: kinetic models, etc.; Physical models of environmental control and its influence on the plant growth; Application to determine plant growth, rate of product maturity, rate of damage to agricultural products (natural or external treatment); applications on the relationship of soil moisture at various conditions to evaporation rate, plant uptake, transpiration, osmosis, and capillarity.

Subject	Code	Learning Outcome					
		M1	M2	M3	M4	M5	S1
Religious Education	UNU 1000-1005			3			
Pancasila Education	UNU 1100			3			
Civic Education	UNU 3000			3			
Engineering Profession	TPT 1011			3	2		
Programming and Computer Application	TPO 1008		3			2	
Biology	BIO 1001	3					
Principles of Biosystems	TPT 1010	3					
Physics I	MFS 1101	3					
Chemistry I (Anorganic)	MKS 1101	3					
Mathematics I	MMS 1101	3					
Physics II	MFS 1102	3					
Basic Chemistry II	MKS 1102	3					
Mathematics II	MMS 1102	3					
Laboratory Exercise in Physics I	MFS 1151	3					
Laboratory Exercise in Chemistry II	MKS 1151	3					
Laboratory Exercise in Physics II	MFS 1152	3					
Statistics	MMS 2401	3					
Microbiology	TPT 2024	3					
Fluid Mechanics	TPT 2013	3					
Thermodynamics	TPT 2002	3					
Engineering Mathematics	TPT 2003	3				2	
Engineering Mechanics	TPT 2004	3				2	
Heat Transfer	TPT 2006	3				2	
Mass Transfer	TPT 3012	3				2	
Biosystems Engineering	TPT 3013		3				1
Engineering Drawing	TPT 1005	3	2		2		
Electronics	TPT 2026	3				2	
Knowledge of Foodstuffs	TPT 3320	3					
Chemistry in Biosystems	TPT 3501	3					
Fundamental of Geographical Information S	TPT 3212	3	1				
Soil Water and Plant Relationship	TPT 3403	3					
Principle of Biosystems Modeling	TPT 3503	3				1	
Introduction to Agricultural Technology	TPO 1001	3		2	1		1
English	TPO 1002			1	3		
Bahasa Indonesia	UNU 161			1	3		
Research Methodolgy	TPT 3009			1	2	3	
Engineering Economics	TPT 2027		3	1		2	
Agriculture Industrial Systems	TPT 1009	3					1
Materials Properties	TPT 2005	3					
Experimental Design in Engineering	TPT 3006			1	2	3	
Strength Properties of Materials	TPT 3118	3					
Energy and Agricultural Machinery	TPT 2121		3	2			
Renewable Energy	TPT 2109		3				2
Surveying	TPT 2025	3				2	
Biophysics	TPT 3008	2	3				
Environmental Engineering	TPT 2401	3				1	
Environmental and Structural Engineering	TPT 2019	3					
Introduction of Control Systems	TPT 3004	3					
Introduction to Engineering Design	TPT 1012	3					
Ergonomics	TPT 3121	3	2				
Measurements and Intrumentations	TPT 3010	3				1	

Agricultural Machinery Design	TPT 3123	3	1			
Principles of Irrigation Engineering	TPT 3201	3				
Natural Soil Properties	TPT 2022	3				
Hydrology	TPT 2207	3	1			
Soil and Water Conservation Engineering	TPT 3204	3	1			
Plant and Postharvest Physiology	TPT 2501	3				
Field work	TPT 3099	3	2	2		
Unit Operation	TPT 2023	3	2			
Numerical Computation	TPT 3122	3				1
Agroindustrial Design	TPT 3316	3	1			
Postharvest Technology	TPT 3011	2	3			
Physical Properties of Agricultural Product	TPT 2306	2	3			
Drying Engineering	TPT 3307		3			1
Thesis	TPT 4099		2	1	2	3
Automation in Biosystem	TPT 3120	3	2			1
Management of Energy and Agricultural Ma	TPT 3115		3	2		1
Irrigation System Management	TPT 3211		3	2		
Watershed Management	TPT 3210		3			2
Packaging and Storage Engineering	TPT 3310		3			2
Equipment Design For Food Process and P	TPT 3321		3			2
Cooling and Freezing Engineering	TPT 3313		3			2
Food Processing Engineering	TPT 3319		3			2
Plantation Machinery	TPT 3119		3	2		
Agricultural Building Design	TPT 3401		3	2		
System Analysis and Modelling	TPT 3016	3	2			1
Microcontroller	TPT 3110	3	2			
Artificial Intelligent	TPT 3116	3	2			
Environmental Sanitation Engineering	TPT 3318	3				
Bioprocess Engineering	TPT 3322		3			
Quality Evaluation of Agricultural Materials	TPT 3502	3				
Basic of Management	TPT 1002	3				
Ecology	TPT 1004	3		1		
Sociology for Agroindustry	TPT 3017	3				
Entrepreneurship	TPT 3014			3		2
Management Information System	TPT 2010	3	2			
Principles of Natural Resources Developme	TPT 3209	3		1		
Waste management	TPT 3402	3				
Industrial Sanitation Engineering	TPT 3318	3				
Special Topic	TPT 3015		2	3	1	1
Agroclimatology	TPT 2017	3				
Field Work Experience	UNU 4500		3	2	2	1

Remarks
3 strong
2 medium
1 light