



ACADEMIC GUIDE

FY. 2021 / 2022

FACULTY OF ENGINEERING

UPN "VETERAN" EAST JAVA

PREFACE

Praise be to God for His grace and guidance in creating the Academic Handbook of the Faculty of Engineering at Universitas Pembangunan Nasional (UPN) "Veteran" East Java for the 2021-2022 academic year.

This guidebook provides the history, organization, vision, mission, and goals of the Chemical Engineering Study Program, along with its curriculum and syllabus.

This Guidebook aims to provide clear and accurate information to the academic community regarding the Faculty of Engineering at UPN "Veteran" East Java.

Hopefully, this guidebook will be used and facilitate the implementation of education within the Faculty of Engineering, UPN "Veteran" East Java.

Surabaya, October 2021
Dean
Faculty of Engineering

Prof. Dra. Jariyah, MP
NIP. 19650403199103 2 001

TABLE OF CONTENTS

Preface	1
Table of contents	2
I. Introduction	3
II. Organization Structure	6
III. OrganizING Education	8
IV. Guidelines for the Conduct of Faculty and Students and Rules of Campus Life	14
V. Guidance and Counseling	21
VI. Chemical Engineering Study Program	26
VII. Industrial Engineering Study Program	54
VIII. Food Technology Study Program	64
IX. Environmental Engineering Study Program	91
X. Civil Engineering Study Program	135
XI. Mechanical Engineering Study Program	169
XII. Environmental Science Master Study Program	184

I. INTRODUCTION

A. HISTORY, DEVELOPMENT AND GROWTH OF THE FACULTY OF ENGINEERING

UPN "Veteran" East Java was established on July 5, 1959, initially named as Akademi Administrasi Pembangunan Veteran (AAPV). Subsequently, from July 1959 to 1965, AAPV's Surabaya Branch was renamed as the Perguruan Tinggi Pembangunan Nasional (PTPN). Finally, on May 17, 1968, PTPN's "Veteran" East Java Branch was established with three faculties, including Faculty of Engineering, Faculty of Economics and Faculty of Industrial Technology, originally named the Faculty of Chemical Engineering, were established on May 17, 1968, under the Decree of the Ministry of Transmigration, Veterans Affairs and Demobilization Number 062/Kpts/MENTRANVED/68. In 1989, the Faculty of Chemical Engineering was renamed the Faculty of Industrial Technology, which offers two study programs - the Chemical Engineering Study Program and the Industrial Management Engineering Study Program.

In 1993, the Faculty of Industrial Technology established the Food Technology Study Program, followed by the Informatics Engineering Study Program in 2002, in response to the increasing demands for industry experts in the food sector and information technology.

From its inception in 1968 until A.Y. 1994/1995, the Faculty of Industrial Technology (FIT) operated under the Ministry of Defense and Security. Currently, FIT offers three Study Programs: (1) the Chemical Engineering Study Program was established on May 17, 1968, with the BAN-PT Decree Number of 027/BAN-PT/AK-XII/S1/IX/2009, dated September 11, 2009; (2) the Industrial Engineering Study Program was established on November 29, 1994, with the BAN-PT Decree Number of 032/BAN-PT/AK-XII/S1/XIII/2010; (3) the Food Technology Study Program was also established on November 29, 1994, with the BAN-PT Decree Number. Depdiknas RI No. 08288/AK-IX-SI-028/UPILLA/I/2006. Since November 29, 1994, based on the Joint Decree of the Minister of Education and Culture No.0307/O/1994 and the Minister of Defense and Security No. Kep/10. Since November 29, 1994, UPN "Veteran" East Java underwent a change in status from a National Institution to a Private University by virtue of the Joint Decree of the Minister of Education and Culture No: 0307/O/1994 and the Minister of Defense and Security No. Kep/10/XI/1994, which pertained to the creation of the study program. Additionally, the Informatics Engineering Study Program was established on July 9, 2003, through the BAN-PT Decree Number: 019/BAN-PT/AK-X/S1/VIII/2007.

On October 6, 2014, UPN "Veteran" East Java transitioned from a Private University to a National University under the Education and Housing Welfare Foundation through Presidential Regulation Number 122 of 2014. It comprises 7 faculties with 19 undergraduate study programs and 3 graduate study programs, guided by the Ministry of Research, Technology, and Higher Education of the Republic of Indonesia with national characteristics.

On August 23, 2016, the Faculty of Industrial Technology changed to the Faculty of Engineering in accordance with Regulation No. 38 of 2015 from the Minister of Research, Technology, and Higher Education.

The Faculty of Engineering offers undergraduate programs with six different study options, including Chemical Engineering, Industrial Engineering, Food Technology, Environmental Engineering, Civil Engineering, and Mechanical Engineering. The graduate program, Master of Environmental Science, is also available for advanced study.

1. Chemical Engineering Study Program

The Chemical Engineering Study Program at the Faculty of Engineering at UPN "Veteran" East Java has conducted lectures since 1968 and presently holds an A grade accreditation from 2015. Numerous Chemical Engineering graduates have graduated from the program and hold various positions in government and private institutions.

2. Industrial Engineering Study Program

The Industrial Engineering Study Program at UPN "Veteran" East Java's Faculty of Engineering received a B grade accreditation by BAN-PT in 2010. Established in 1990, the program has produced numerous Industrial Engineering graduates who have been employed in a variety of governmental and private sectors.

3. Food Technology Study Program

Food Technology Study Program was established in 1993. In 2016, the Food Technology Study Program received a B grade in the Accreditation evaluation. Since then, numerous graduates specializing in Food Technology have successfully completed the Program, with growing demand presently and in the coming years, primarily to support advancements in the food industry.

4. Civil Engineering Study Program

The Civil Engineering Study Program at the Faculty of Engineering at UPN "Veteran" East Java was established in 1993 and received a B rating for accreditation in 2015. The Civil Engineering Study Program aims to cultivate skilled graduates in the fields of engineering and design, possessing the ability to defend the country and remain competitive in the global era.

5. Environmental Engineering Study Program

The Environmental Engineering program at the Faculty of Engineering, UPN "Veteran" East Java, was founded in 1993 and is accredited with an A grade since 2013. The objective of the program is to produce competent and skilled graduates in the field of environmental engineering, catering to the requirements of their potential employers.

6. Mechanical Engineering Study Program

The Mechanical Engineering Study Program at the Faculty of Engineering, UPN "Veteran" East Java was established in 2020 and is awaiting accreditation. Its objective is to equip students with advanced proficiency in Mechanical Engineering and the ability to utilize scientific and technological advances to support the industrialization process and Biomedical technology. The program aims to produce graduates who are prepared to face the challenges of the fourth industrial revolution.

7. Master of Environmental Science Study Program

The Master of Environmental Science Study Program at the Faculty of Engineering at UPN "Veteran" East Java was established in 2017 and accredited as good in 2020. Its objective is to produce graduates with primary environmental expertise competencies to manage natural resources wisely and possess interdisciplinary insight.

B. VISION, MISSION AND OBJECTIVES

B.1. Vision

"Becoming an Excellent Faculty of Engineering with National Defense Character".

B.2. Mission

The mission of the Faculty of Engineering UPN "Veteran" East Java, namely :

1. Developing educational programs with a focus on national defense in the fields of engineering and industry is a priority.
2. Conducting research to support advancements in environmentally sustainable engineering and industry.
3. Organizing service to community in engineering and industry.
4. Establishing transparent and effective governance to ensure accountability in budget management.
5. Developing superior human resource quality in attitudes and values, work performance, knowledge mastery and management skills.
6. Improving integrated facilities and infrastructure management system.
7. Establishing institutional cooperation with domestic and foreign stakeholders.

B.3. Objectives

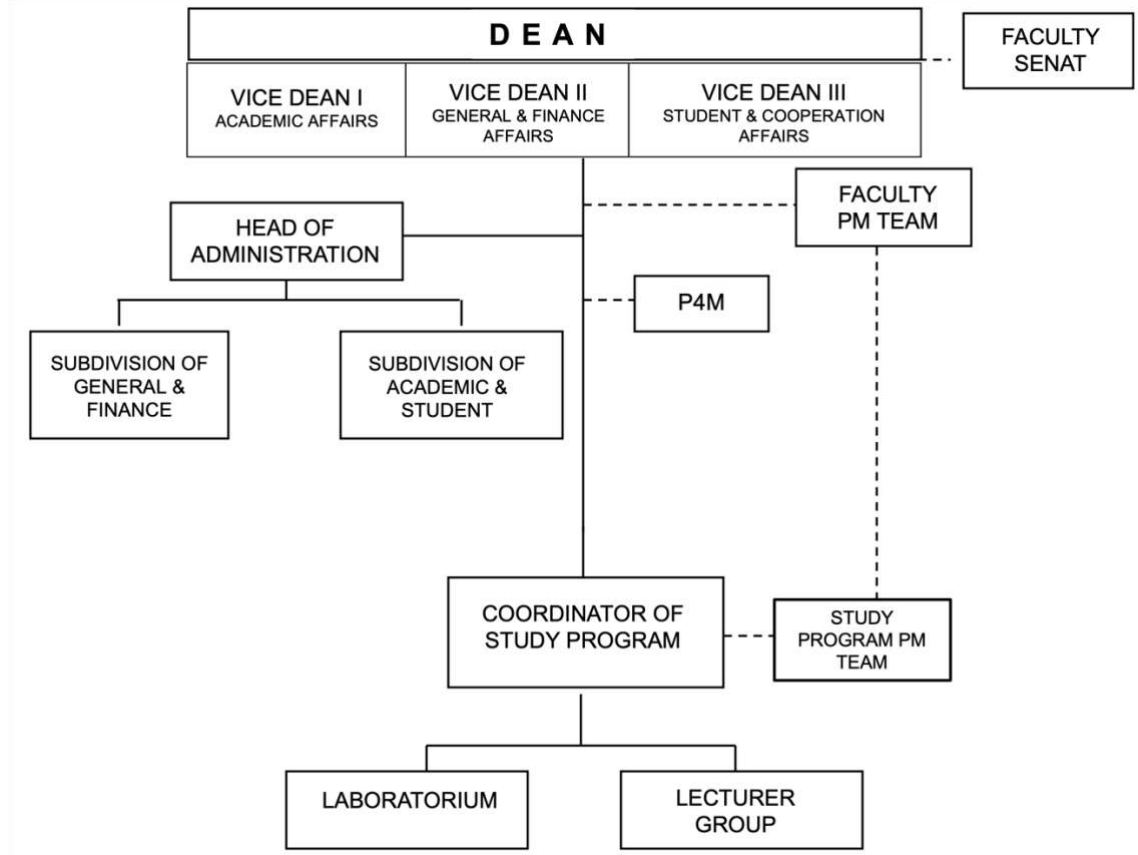
The objectives of the undergraduate program at the Faculty of Engineering, UPN "Veteran" East Java, are as follows:

1. To produce competent graduates with national defense character in the field of engineering and industry.
2. To produce research in the field of engineering and industry to improve the welfare of society.
3. To conduct community service activities needed by the community in the field of engineering and industry.
4. To develop good and clean governance to achieve budget management accountability.
5. To produce superior human resources who are competent and highly competitive.
6. To improve adequate infrastructure with effective and efficient management.
7. To develop institutional cooperation with domestic and foreign stakeholders.

II. ORGANIZATIONAL STRUCTURE

A. FACULTY OF ENGINEERING ORGANIZATIONAL STRUCTURE

The flowchart of the organizational structure of the Faculty of Engineering UPN "Veteran" East Java is presented in Figure 1.



Description: _____ Directors/Command
 - - - - - Coordination/Consultation

Figure 1. Organizational Structure of Faculty of Engineering UPN "Veteran" East Java

B. STRUCTURAL OFFICIALS WITHIN THE FACULTY OF ENGINEERING

The current head of the Faculty of Engineering is :

Dean : Prof. Dr. Dra. Jariyah, MP.
 Vice Dean I : Prof. Euis Nurul Hidayah, ST. MT. Ph.D
 Vice Dean II : Ir. Kindriari Nurma Wahyusi, MT
 Vice Dean III : Dr. Ir. Minto Waluyo, MM.

Coordinator of the Study Program are as follows:

1. Chemical Engineering Study Program
 Study Program Coordinator : Dr.Ir. Sintha Soraya Santi, MT
2. Industrial Engineering Study Program
 Study Program Coordinator : Dr. Dira Ernawati, ST. MT.
3. Food Technology Study Program

- Study Program Coordinator : Dr. Ir. Sri Winarti, MP.
4. Civil Engineering Study Program
Study Program Coordinator : Dr.Ir.Minarni Nur Trilita, MT.
 5. Environmental Engineering Study Program
Study Program Coordinator : Dr. Ir. Novirina Hendrasarie, MT
 6. Mechanical Engineering Study Program
Study Program Coordinator : Dr.T.Ir.Luluk Edahwati, MT
 7. Master of Environmental Science Study Program
Study Program Coordinator : Dr. Farida Pulansari, ST. MT.

C. OFFICEADDRESS

Faculty of Engineering UPN "Veteran" East Java
Jl. Raya Rungkut Madya, Gunung Anyar Surabaya 60294
Tel. (031) 8782179, Fax. (031)8782257
Website: www.upnjatim.ac.id

III. ORGANIZING EDUCATION

A. EDUCATIONAL SYSTEM

The implementation of education at the Faculty of Engineering UPN "Veteran" East Java, using the Semester Credit System. The Semester Credit System regulates the planning, preparation and implementation of educational programs using lecture and practicum credits as a measure of educational load. Each course and internship is weighted according to the need to meet educational objectives. In the credit system, the workload that students must complete at a given level of study is expressed in terms of the number of credit units.

The Competency-Based Curriculum has been implemented in the Faculty of Engineering of the UPN "Veteran" East Java in order to improve the ability and competence of graduates to enter the world of work.

B. SEMESTER CREDIT SYSTEM

Semester Credit System is a system of organizing education by using Semester Credit Units to express student course load, instructor workload, learning experience and program implementation load.

Semester is a unit of effective learning process of at least 15 (sixteen) weeks including midterm examination and final semester examination.

Semester Credit Unit is a measure of the value of learning experiences gained during a semester through scheduled activities per week of 1 hour of lecture or 2 hours of practicum or 4 hours of field work, each accompanied by about 1-2 hours of structured activities and about 1-2 hours of independent activities.

C. SEMESTER CREDIT POLICY

The amount of a student's course load is indicated by the semester credit value of a course.

1. Value of Semester Credit Units for Lectures

The value of a semester credit unit (1 credit) for lectures is determined on the basis of the activity load, which includes 3 kinds of activities per week for one semester, as follows:

a. For Students

1. 50 minutes of scheduled face-to-face interaction with instructors, such as lectures.
2. 60 minutes of structured academic activities, which are study activities that are not scheduled but planned by the instructor, such as homework or problem solving.
3. 60 minutes of independent academic activities, which are activities that students must perform on their own for research, preparation, or other purposes of an academic assignment, such as reading reference books.

b. For Teaching Personnel (Lecturers)

1. 50 minutes of scheduled face-to-face time with students
2. 60-minute structured academic activity planning and evaluation session
3. 60 minutes of lecture material development.

2. Value of Semester Credits for Internship, Research, and Field Work

a. **One credit semester** equals the completion of activities for 4-5 hours per week or 64-80 hours in one semester.

b. Value of semester credit units for practicum and laboratory

For practicum in the laboratory, the value of a semester credit is the task load in the laboratory for 2-3 hours per week for one semester.

c. Value of Semester Credits for Field Work Practices

For field work practices, the value of a semester credit is a task load in the field of 4 - 5 hours per week, or 64 - 80 hours in one semester.

d. The value of semester credit units for research/preparation of theses, dissertations, and the like.

The value of a semester credit is a research workload of 3 to 4 hours per day for 1 month, where a month is considered to be 25 working days.

D. STUDENT WORKLOAD

a. The undergraduate program at Faculty of Engineering UPN "Veteran" East Java has a study load between 144-160 credits with a program length of 7-14 semesters (3.5 - 7 years).

b. Students' study load in one semester = 16 - 24 credits

The amount of study load per semester for students, which is expressed in the number of credits that can be taken in each semester, is based on the grade point average (GPA) of students in the previous semester. The calculation of the GPA is based on the acquisition of final grades for each course programmed in a semester and listed in the Study Plan Card (*Kartu Rencana Studi*, KRS).

c. For semesters I and II, the number of study loads is determined by the Faculty (according to each study program).

d. For the next semester, it is determined by the student's study results in the previous semester (depending on the previous semester/GPA Achievement Index) as follows:

Semester Grade Point	Maximum credit amount that can be taken
≥ 3,00	22 – 24 credits
2,50 – 2,99	19 -24 credits
2,00 – 2,49	16 – 18 credits
< 2,00	< 15 credits

E. COURSECODE

1. UNIVERSITY COURSE CODE

EXAMPLE : UV1411 09

UV : University Code

14 : Year 2014

1 : 0 ; So = D3

1 ; S1 (Undergraduate)

2 ; S2 (Master)

3 ; S3 (Doctoral)

1 : 1 ; Compulsary Course

2 ; Elective Courses (Only available in Study Program)

09 :

- The order of Elective University Courses (Pancasila, National Defense, Civic, Religion, Bahasa Indonesia, Entrepreneurship, English, Leadership, etc).

- The order by University e.g.; National Defense = number 09

2. FACULTY COURSE CODE

EXAMPLE : FT1411 23

FT: Faculty Code

14 : Year 2014

1 : 0 ; So = D3

1 ; S1 (Undergraduate)

2 ; S2 (Master)

3 ; S3 (Doctoral)

1 : 1 ; Compulsary Course

2 ; Elective Courses (Only available in Study Program)

23 :

- The order of courses from Faculty (from semester 1 to 8)
Example: Physics = number 23
- The order by the Faculty agreed by Study program
(Engineering Economics, Engineering Drawing, etc.)

3. a CODE OF COURSE STUDY PROGRAM REQUIRED

EXAMPLE : TK141167

TK: Study Program Code

14 : Year 2014

1 : 0 ; So = D3

1 ; S1 (Undergraduate)

2 ; S2 (Master)

3 ; S3 (Doctoral)

1 : 1 ; Compulsary Course

2 ; Elective Courses (Only available in Study Program)

67 :

- The order of Compulsory courses
(from semester 1 to 8, there is no Practicum, Practicum is included in the course).
Example: Chemistry Analysis = 2 credits
Chemistry Analysis Practicum = 1 credit,
then Chemical Analysis course = 3 credits (2+1)
- Example: Mandatory Factory Design course I = number 67

3.b CODE OF ELECTIVE STUDY PROGRAMS

EXAMPLE : TK141220

TK: Faculty Code

14 : Year 2014

1 : 0 ; So = D3

1 ; S1 (Undergraduate)

2 ; S2 (Master)

3 ; S3 (Doctoral)

2 : 1 ; Compulsary Course

2 ; Elective Courses (Only available in Study Program)

20 : The order of elective course (from semester 1 to 8)

Example: Elective course of Corrosion = number 20

F. ASSESSMENT

1. Eligibility for the Final Examination

An end-of-semester examination is given at the end of each lecture and lab period. This end-of-semester examination is one component of the academic evaluation used to determine the final grade for a course.

The requirements for taking the final examination are as follows:

- b. Students who have registered for specific courses (authorized in KRS).
- c. Student attendance must be $\geq 80\%$ of instructor attendance.
- d. Have paid tuition fee instalments as required.

2. Assessment Composition

- a. Mid-semester Grade (MSG) consists of:
 - Attendance : 10%
 - Attitude : 10%
 - Quiz : 20%
 - Assignment : 20%
 - Mid-semester Exam (MSE) : 40%
- b. Final Semester Grade (FSG) consists of:
 - Attendance : 10%
 - Attitude : 10%
 - Quiz : 20%
 - Assignment : 20%
 - Final Exam : 40%
- c. Final Grade = $(MSG+FSG)/2$

3. Grading system:

Score	LETTER	Grade point
$\geq 80 - 100$	A	4,00
$\geq 76 - < 80$	A -	3,75
$\geq 72 - < 76$	B+	3,50
$\geq 68 - < 72$	B	3,00
$\geq 64 - < 68$	B -	2,75
$\geq 58 - < 64$	C+	2,50
$\geq 54 - < 58$	C	2,00
$\geq 50 - < 54$	C -	1,75
$\geq 46 - < 50$	D+	1,50
$\geq 42 - < 46$	D	1,00
$\geq 00 - < 42$	E	0,00

G. PROVISIONS FOR KKN, PKL AND THESIS

During their studies, students of the Faculty of Engineering are required to do Community Service Program (*Kuliah Kerja Nyata*, KKN), Field Work Practice (*Praktek Kerja Lapangan*, PKL) and Thesis. Students can program these activities when they have accumulated 100 credits for KKN, 110 credits for PKL and 136 credits for Thesis. Detailed provisions on matters related to KKN, PKL and Thesis are contained in the KKN, PKL and Thesis Guidebook.

H. EVALUATION OF STUDY RESULTS

a. How to Calculate the Grade Point Average Index

The evaluation of study results is intended to determine the student's performance in stages, namely every semester, in the first two years and at the end of studies. It is based on the GPA obtained by students during their

participation in academic activities. When determining/calculating the performance index, letter grades must be converted into numbers according to their weight (e.g. grade A has a weight of 4, grade B has a weight of 3, etc.). Using these weighted values, the GPA can be calculated as follows:

$$GPA = \frac{\Sigma (\text{credits} \times \text{Grade point})}{\Sigma \text{credits}}$$

Example:

Course Content	Credits	Grade	Grade Point	Credit x Grade point
Math I	3	A	4	12
Citizenship	2	A-	3,75	7,5
Basic Physics I	3	C+	2,50	7,5
Basic Chemistry Analytical	3	D+	1,50	4,5
Chemistry I	2	B-	2,75	5,5
English	2	C	2	4
Technology Concept	2	B	3	6
Organic Chemistry I	2	B+	3,5	7
Total	19			54

$$GPA = \frac{54}{19} = 2,842$$

b. Study Period Limit and Drop Out (DO)

The study period limit for undergraduate programs (strata-1) is 7 years or 14 semesters.

c. Drop Out (DO)

A student is declared to have dropped out (DO) when he/she fails to meet the academic requirements within the study period/duration according to the applicable regulations, so that he/she is not allowed to continue his/her studies and must leave the faculty or program concerned.

Things that cause DO are :

1. Exceeding the maximum study period limit of more than 7 years (14 semesters)
2. Failure to achieve the minimum number of credits within a specified time period as follows:
 - Failure to accumulate at least 36 credits and a GPA of less than 2.00 at the end of 4th semester. If the number of credits earned is more than 36 credits and the GPA is less than 2.00, the GPA calculation will be based on the lecture period with the best grade of 36 credits.
 - At the end of 8 consecutive semesters have not been able to collect at least 110 credits and GPA less than 2.00. If the number of credits earned is more than 110 credits and the GPA is less than 2.00, the GPA calculation will be based on the semester with the best grade of 110 credits.

d. Evaluation of Student Success at the End of Undergraduate Studies

The final evaluation of a student's studies may be conducted if the following conditions are met

1. Registered as an active student for the academic year in question
2. Have a TOEFL equivalent certificate of English proficiency with a
3. with a minimum score of 450
4. Have taken and passed the Computer Certification Program
5. Have completed KKN and PKL
6. Have completed the minimum number of credits specified in the curriculum
7. Study period is not more than 5 years
8. $GPA \geq 2.00$
9. There is no E score
10. $Grade\ D \leq 25\%$ of total credits

IV. GUIDELINES FOR THE CONDUCT OF FACULTY AND STUDENTS AND RULES OF CAMPUS LIFE

A. Lecturers/Instructors

1. Types of Lecturers.

Lecturers at the Faculty of Engineering UPN "Veteran" East Java consist of permanent lecturers and non-permanent lecturers. Lecturer is someone who is appointed by UPN "Veteran" East Java based on their education and expertise with the main task of teaching.

Permanent lecturers are lecturers who are appointed and placed as permanent staff with the status of civil servants of the Ministry of Defense/Depdiknas and or foundation employees.

Non-permanent lecturers are additional lecturers who are appointed and placed as teaching staff for a certain period of time.

2. Position level

The levels of faculty positions consist of Assistant Lecturer, Lecturer, Senior Lecturer and Professor.

3. Manner

Lecturer manners that aim to:

- 1) To form the image of a lecturer who can serve as a role model for for students entering a modern and professional society.
- 2) To shape the image of the lecturer as a figure who is intellectual and open to all changes.
- 3) To create an ecological image of the academic community who cares about the environment, health and time.
- 4) To shape professional image in the implementation of management of UPN "Veteran" East Java.

4. Requirements

The requirements to become a lecturer are:

- 1) Have faith and devotion to God Almighty
- 2) Pancasila and 1945 Constitution
- 3) Qualified as a teacher
- 4) Have high morals and integrity
- 5) Have a great sense of responsibility for the future of the nation and the national.

5. Responsibilities

The duties of a Lecturer include

- 1) Perform educational and teaching activities in accordance with the authority of their academic functional position level.
- 2) Carry out research activities in the context of education and teaching or in the context of scientific development activities in accordance with the authority of their academic function level.
- 3) Carry out community service activities in the context of education and teaching or in activities that support the implementation of general government and development tasks in accordance with the authority of their academic functional position level.

6. Lecturer Ethics:

- 1) Lecturer Dress Ethics
 - a. In dressing, a lecturer must adapt to the role that is being performed, both in the classroom, laboratory and field, according to the rules that apply in UPN "Veteran" East Java.
 - b. Formal dress and shoes for lecturers shall reflect professionalism and shall be in accordance with the applicable rules within UPN "Veteran" East Java.
 - c. Lecturers' clothes must be kept clean and neat at all times while performing their duties. Lecturers must always maintain personal hygiene to avoid body odor that may disturb the working atmosphere in the office.
- 2) Time Commitments Ethics
 - a. High-time commitment
 - b. Start face-to-face classes in the first week of each semester and end face-to-face classes in the last week of each semester, according to the academic calendar set by UPN "Veteran" East Java.
 - c. Start and end class meetings on time.
 - d. Fulfill the time commitment promised to students, both in providing out-of-class service in the classroom and in thesis supervision.
 - e. Provide 2-4 hours per week outside of class for discussion of course material.
 - f. Appreciate students by showing appreciation in person, by cancelling face-to-face time in class or time promised to students, both in providing services outside of face-to-face class sessions and in thesis advising.
- 3) Lecturer Ethics in Teaching, Research, and Community Service
 - a. Treat students as adults, regardless of their social status, religion and race.
 - b. Plan lecture materials and assignments for students, as well as rules for students attending their lectures, prior to the start of a given semester's lectures. The planning is outlined in the GBPP/SAP and Lecture Contract, which is distributed to students during the first week of the odd/even semester face-to-face.
 - c. Adhere to the teaching method at UPN "Veteran" East Java, which is determined in a semester, namely for face-to-face or tutorial between 14-16 times and practicum or field lectures 8-10 times.
 - d. No smoking during face-to-face meetings in the classroom.
 - e. Open to questions about the subject and willing to explain to students who ask questions in class or elsewhere.
 - f. Be open to different opinions and respect the opinions of others/students, keeping in mind that knowledge is always changing and developing.
 - g. Provide consultation time for students outside of the scheduled time outside of the scheduled face-to-face time in class appointment.
 - h. Keep lecture materials and reference sources used in lecture/practice used in the lecture/practicum experience to meet the ever-changing and evolving changing and evolving needs of life.
 - i. High integrity in the evaluation of the results of examinations and other forms of assignments in fulfilling the obligations as set forth in the curriculum.
 - j. Be committed to the examination questions and the questions to the examination organizer before the examination takes place.

- k. Must publish examination grades and submit final grades to the academic department of the program or faculty.
- l. The average workload of lecturers is set at a minimum of 6 credits and a maximum of 12 credits per week, which includes teaching activities outside of mentoring activities, research and community service.
- m. Be a role model for students as a person with a high concern for the development of science, the environment and health.
- n. Constantly improve the quality of teaching, research and community service as a manifestation of his responsibility to lead the younger generation into a more advanced civilization in the future.

7. Code of Conduct, Awards and Punishments

1) Code of Conduct

Every lecturer of UPN "Veteran" East Java must be:

- a. Be devoted to God Almighty and obedient to the Indonesian National and Government based on Pancasila and the 1945 Constitution.
- b. Uphold the honor of the nation and state and the authority and good name of UPN "Veteran" East Java.
- c. Put the interests of UPN "Veteran" East Java and the community above personal or group interests.
- d. Think, behave, and act as a member of the scientific community, be virtuous, honest, passionate, responsible and avoid misconduct.
- e. Be open and maintain academic honesty, and perform professional duties as to the best of their ability.
- f. Be disciplined, humble, sensitive, conscientious, careful, and respectful of the opinions of others.
- g. Maintain National secrets and official secrets and not to abuse one's position.
- h. Refuse and not accept any gift that is clearly known and reasonably suspected to be directly or indirectly unlawfully related to his profession.
- i. Respect the limits of scientific authority and responsibility in the exercise of academic freedom and not to exceed the authority of peer expertise.
- j. Guide and educate students toward the formation of the personality of an educated person who is independent and responsible.
- k. Behave and act fairly towards students.
- l. Maintain his/her honor and health.
- m. Follow, develop and practice science, technology and art in accordance with their fields.
- n. Comply with all the rules and regulations of UPN "Veteran" East Java.

8. Rewards and punishments

1) Award

- a. In order to encourage and improve performance and foster loyalty to UPN "Veteran" East Java, awards will be given to academicians who have shown loyalty, achievement or have contributed to the institution.
- b. Awards will be given according to achievement, loyalty or services contributed.
- c. The awards mentioned in a). and b). may be in the form of certificates, badges, money or objects and others.

2) **Punishments**

- a. Every lecturer of UPN "Veteran" East Java who violates the code of ethics, discipline, rules and regulations will be subject to punishments.
- b. Punishments imposed on lecturers may be in the form of :
 - (1) Oral reprimand
 - (2) Written reprimand
 - (3) Strong Warning
 - (4) Postponement of periodic salary increases
 - (5) Delay in promotion
 - (6) Exemption from service
 - (7) Dismissal

B. Student

1. General

The implementation of student manners in UPN "Veteran" East Java is in accordance with PP No. 60 of 1999 on Higher Education, namely with the implementation of campus life rules, examination rules, provisions for the selection of student organizations, which in principle regulate student behavior in order to support the achievement of higher education goals as required in PP No. 60 of 1999. In addition, to support the development of reasoning and science, interests and passions, social welfare and community service in UPN "Veteran" East Java, extracurricular activities are held. Through this student development, the function of higher education with its Tri Dharma of Higher Education will lead to the implementation of professional scientific activities in realizing itself as an institution and scientific society to support national development. Therefore, in order to establish a scientific society that is harmonious, harmonious and balanced, students as members of educational institutions of UPN "Veteran" East Java must obey the rules regarding the rights and duties of students and their prohibitions, as well as the provisions regarding student institutions that apply within UPN "Veteran" East Java.

2. Form of Student Organization

The form of student organizations at the Faculty of Engineering UPN "Veteran" East Java is the Student Representative / Executive Organization at the Faculty level and the Department at the Faculty level which consists of :

- 1) Chemical Engineering Student Association (*Himpunan Mahasiswa Teknik Kimia*, HIMATKEKK)
- 2) Industrial Engineering Student Association (*Himpunan Mahasiswa Teknik Industri*, HIMATI)
- 3) Food Technology Student Association (*Himpunan Mahasiswa Teknologi Pangan*, HIMATEPA)
- 4) Environmental Engineering Student Association (*Himpunan Mahasiswa Teknik Lingkungan*, HMTL)
- 5) Civil Engineering Student Association (*Himpunan Mahasiswa Teknik Sipil*, HMTS)
- 6) Mechanical Engineering Student Association (*Himpunan Mahasiswa Teknik Mesin*, HMTM)
- 7) Faculty Student Executive Board

3. Prohibitions for Student Organizations / Students Actions of students or student organizations that are not permitted or not justified at the Faculty of Engineering UPN "Veteran" East Java are as follows:

- 1) Using violence or coercion directly or indirectly, which is contrary to or contrary to or obstructs and interferes with :
 - a. Activities of campus community and guests within UPN "Veteran" East Java, or facilities managed by UPN "Veteran" East Java.
 - b. The authority of officers who are carrying out institutional duties.
- 2) Actions that threaten or substantially interfere with efforts to maintain the implementation of order and discipline in the functions and duties of UPN "Veteran" East Java.
- 3) Any action related to an activity of UPN "Veteran" East Java that violates the rights of others, such as making noise (shouting), disruptive activities that are planned with the intention of disrupting or obstructing the course of a lecture, meeting, meeting or class.
- 4) Persecution of individuals in facilities managed by UPN "Veteran" East Java or those performing their duties.
- 5) Actions that jeopardize or threaten the health or safety of individuals, causing fear and distress.
- 6) Inciting, bullying or helping others to participate in an activity that disrupts or damages the functions and duties of UPN "Veteran" East Java.
- 7) Owning, carrying, storing, trading, distributing, using liquor, drugs, illegal drugs, firearms, explosives both inside and outside the UPN "Veteran" East Java Campus.
- 8) Conducting gambling games that use tools either directly or indirectly used as a medium of betting with money or goods that have value or price and result in loss or gain of one party.
- 9) Committing acts or acts of sexual harassment and violation and other immoral acts that can cause displeasure, pain (physical or mental) and disruption of feelings and honor for those affected by such acts and acts.
- 10) Comply with applicable regulations at the Faculty of Engineering.

4. Punishments

Punishments will be given to students or student organizations that are found to have violated current rules, in order from least to most severe:

- 1) Administrative Punishments:
 - a) Reprimand (oral)
 - b) Warning (written)
 - c) Temporary suspension of organizational activities
 - d) Revocation of activity license
 - e) Withdrawal of facilities and administrative services
 - f) Compensation
 - g) Dissolution of the organization
- 2) Academic Punishments:
 - a) Warning
 - b) Exclusion from teaching
 - c) Demerit
 - d) Cancellation of grades and declared failure
 - e) Probationary student status
 - f) Temporary suspension as a student

- g) Permanent revocation of student status

5. Student Rights and Obligations

1) Student Rights

- a) Use academic freedom responsibly in the pursuit and study of knowledge in accordance with the norms and mores of the academic environment.
- b) Receive the best possible teaching and academic services in accordance with their interests, talents, passions, and abilities.
- c) Use the facilities of UPN "Veteran" East Java to facilitate the learning process.
- d) Receive guidance from lecturers who are responsible for the study program they are following and their learning outcomes.
- e) Receive service information service related to the study program they are following and their learning outcomes.
- f) Complete the study earlier than the set schedule in accordance with the applicable requirements.
- g) Obtain welfare services in accordance with the applicable regulations.
- h) Utilize the resources of UPN "Veteran" East Java through student representatives/organizations to manage and organize the welfare, interests and community life.
- i) Transfer to another university or study program if the requirements are met.
- j) Participate in student organization activities of UPN "Veteran" East Java.
- k) Receive special services if disabled.
- l) Take academic leave in accordance with the provisions of applicable regulations.

2) Student Obligations

- a) Attend lectures and perform other duties within the framework of the Tri Dharma of Higher Education with enthusiasm, discipline, order and a sense of responsibility to God Almighty, Nation and State, Community, Family/Parents and Educational Institutions UPN "Veteran" East Java.
- b) Be of good character.
- c) Appreciate science, technology/art.
- d) Maintain and improve the good name of students and institutions of UPN "Veteran" East Java.
- e) Fulfill tuition payment obligations.
- f) Fulfill the regulations set by UPN "Veteran" East Java.
- g) Maintain the authority and good name of UPN "Veteran" East Java.
- h) Participate in the maintenance of facilities and infrastructure as well as the cleanliness, order and safety of UPN "Veteran" East Java.

6. Campus Life Code of Conduct

1) Code of Conduct

In the context of implementing the Tridharma of Higher Education and organizing the main tasks of the UPN "Veteran" East Java, an orderly atmosphere in campus life is needed. In order to ensure and maintain this atmosphere, it is necessary to establish a campus life order. The rules of campus life that have been established are as follows:

- a) Residents of the Faculty of Engineering, UPN "Veteran" East Java

- (1) Academic staff, namely teachers and researchers.
 - (2) Administrative staff, namely technicians and general administrative staff.
 - (3) Students.
- b) All members of the Faculty of Engineering, UPN "Veteran" East Java are obliged to cooperate in order to achieve the goal.
- c) Norms and Behavior:
- (1) Honest in the process of teaching and learning, research, writing and other actions that involve the name of the Faculty of Engineering, UPN "Veteran" of East Java.
 - (2) Discipline in the performance of duties in the Faculty of Engineering, UPN "Veteran" East Java.
 - (3) Maintain the integrity of the Faculty of Engineering, UPN "Veteran" East Java.
 - (4) Always try to improve my ability to support my duties at the Faculty of Engineering, UPN "Veteran" East Java.
 - (5) Keep the secrets of the office.
 - (6) Be polite in dress and behavior.
- d) Violations:
- The violations in question are the following acts:
- (1) Misusing the name, symbol and all forms of attributes of UPN "Veteran" East Java.
 - (2) Forging or misusing letters or leaking the confidentiality of documents of the Faculty of Engineering, UPN "Veteran" East Java.
 - (3) Obstructing or disrupting the activities of UPN "Veteran" East Java.
 - (4) Defacing or damaging rooms, buildings and other facilities belonging to or under the supervision of the Faculty of Engineering, UPN "Veteran" East Java.
 - (5) Causing or attempting to cause disorganization and disunity in the Faculty of Engineering of the UPN "Veteran" East Java.
 - (6) Using or attempting to use or trade in narcotics/drugs in the environment of UPN "Veteran" East Java.
 - (7) Conducting or attempting to conduct any kind of games that lead to forms of gambling within the Faculty of Engineering of UPN "Veteran" East Java.
 - (8) Committing physical violence in solving a problem within the Faculty of Engineering, UPN "Veteran" East Java.
 - (9) Holding demonstrations, riots and the like within the Faculty of Engineering, UPN "Veteran" East Java, without permission.
 - (10) Staying in the campus between 10 p.m. - 10 a.m. 06:00 a.m. or holidays without permission from the authorized person.
 - (11) Using facilities and funds owned by or under the supervision of the Faculty of Engineering, UPN "Veteran" East Java, for personal purposes.

2) Punishments

Punishments given in the form of

- a) Reprimands and warnings.
- b) Prohibition from participating in academic and other activities for a maximum period of 12 months.
- c) Revocation of his position as a citizen UPN "Veteran" East Java.

V. GUIDANCE AND COUNSELING

A. General Policy

Students need guidance and counseling to facilitate their academic process. This service is useful for students in solving problems they face and can support the smooth process of academic administration. The background of the need for guidance and counseling and its implementation is related to various aspects, including: socio-cultural aspects, psychological aspects (individual development, individual needs, self-adjustment, etc.), and educational aspects in general (educational development, effective learning strategies, barriers to learning, etc.).

B. Function

Guidance and Counseling functions as a service provider to help students develop optimally. In terms of the nature of these services can function as efforts: prevention (preventive), development and repair (curative). While seen from the relationship between students and education as an environment, guidance and counseling has a channeling and adjusting function.

C. Goal

Guidance and counseling services are basically directed to individual students. Guidance and counseling services do not mean individualistic students above all, but have the goal of optimally developing what is in each individual student and then benefiting students, the environment and society. The goals of guidance and counseling are directly related to the implementation of all the functions of guidance and counseling described above. More specifically, the goals of guidance and counseling as a form of personal service to students include stages of skill development, namely:

a. Self-Awareness, Recognition, and Acceptance

An adult personality is stable and well-developed when the individual is fully aware of him or herself. This usually requires the help of other people (experts) or certain tools (intelligence tests, tools to reveal personality traits, etc.). The results of objective self-assessment are a good basis for knowing yourself as you are. If a student recognizes himself as underachieving compared to his friends, he should not be discouraged, inferior, etc., but should instead be more eager to perform better. Conversely, students who feel that they have advantages can control themselves so as not to become arrogant.

b. Disclosure, Recognition, and Acceptance of the Environment

Students not only need to know themselves, but also need to know their environment. Individuals should also be able to accept the environment as it is so that they are able to have a positive attitude towards their environment. A healthy person always tries to have a positive attitude towards himself and his environment so that there is a mutual benefit between the individual and the environment. Guidance and counseling

services are expected to help achieve the right and harmonious combination.

c. Decision Making

Once students are able to recognize and accept themselves and their environment, the next stage is to foster the ability to make decisions. Making decisions about oneself is often difficult, especially when there is still a conflict between one's reality and one's self-acceptance, as well as a conflict between one's self-acceptance and one's environmental acceptance. The role of guidance and counseling at this time is very necessary.

The decision making should be done by the individual himself or at least, if the decision making is initiated by others (e.g. counselor), the decision should be approved by the guided individual. The ultimate goal of guidance and counseling is for the individual to be able to make decisions for himself or herself.

d. Self-direction

Decisions made by individual students must be carried out consistently. A student must be able to direct himself to carry out activities that are necessary for his own interests or to solve the problems he faces. For example, if he is threatened with academic Punishments for failing to meet predetermined requirements, then he must really be persistent in directing himself and concentrating on solving the problems he faces. This self-direction may include diligently studying and practicing, diligently following the response, consulting with teachers/assistants, and so on. The tut wuri handayani principle must be applied in guidance and counseling.

e. Self-realization

Each individual student should be able to realize his or her potential according to his or her talents, interests, basic abilities, and capabilities. Self-realization should occur without coercion or dependence on others. Self-realization must be normative, i.e., in accordance with the norms and values of the society. The ability to realize oneself correctly will support the formation of an independent person, as a person who is free but responsible and stable, in the sense that he/she is not hesitant or afraid to take steps, full of creativity, enthusiasm and sportsmanship.

D. Scope of Guidance and Counseling

The scope of guidance and counseling is quite broad and can be viewed from various aspects, such as: functions, goals, services, and problems.

a. Functionality, including:

- 1) Prevention
- 2) Development
- 3) Distribution
- 4) Adjustments
- 5) Improvements

b. Target Sector

Counseling and guidance at UPN "Veteran" East Java is intended for all students with the aim that individual students are able to achieve optimal development through:

- 1) Self-awareness, recognition and acceptance
- 2) Disclosure, recognition and acceptance of the environment
- 3) Decision-making
- 4) Self-direction
- 5) Self-realization

c. Service Sector

Guidance and counseling activities include services:

- 1) Data collection
Conducted in order to obtain an objective understanding about students in order to help them achieve optimal development.
- 2) Provision of information
Students must have adequate information, both about themselves and about the environment. This information is needed to make informed decisions.
- 3) Placement
In the form of services to help students find a place that matches their potential.
- 4) Counseling and other services
In the form of services to students facing personal problems. This service is provided through counseling and other assistance techniques with the hope that they can solve their own problems.
- 5) Referral
A form of service that is delegated to another more authorized party, e.g. doctor, psychologist, etc.
- 6) Assessment and follow-up
Assessing the success of the counseling efforts that have been provided, as well as serving as feedback to assess the success of the educational program as a whole.

d. Problem Sector

Guidance and counseling in the problem area includes

- 1) Educational Counseling
Help in solving educational problems such as curriculum introduction, choice of major, explanation of effective learning methods, educational planning, etc.
- 2) Vocational guidance
Relates to understanding the world of work, career planning, job selection, etc.
- 3) Social - personal - emotional counseling
Helping students to overcome social-personal-emotional problems such as social problems, conflicts, self-adjustment, etc.

E. Guardian Lecturer/Academic Advisor

One of the important roles of a lecturer is to serve as a Guardian Lecturer/Academic Advisor for students.

a. Guardianship

In the context of guardianship, lecturers also act as academic advisors or guardian lecturers (in the true sense, the role of academic advisor is broader than just an academic advisor). Each lecturer is given the responsibility of advising a number of students as part of the implementation of the semester credit system.

b. Duties of the Supervising Lecturer

In general, the duties of the Guardian/Academic Advisor are:

- 1) Guide each student, who is responsible for being able to manage his or her study load and for choosing the right courses in each semester.
- 2) Help students develop good attitudes and study habits.
- 3) Provide opportunities for students to overcome their study problems.
- 4) The general tasks mentioned above must be broken down into specific tasks that are more operational in nature. For example, the first and very important specific task is the task of providing information. Providing information is very important for students, especially for new students. This information concerns everything that students need in order to complete the educational program appropriately and purposefully.

c. Types of Information

Information needed by students includes

- 1) Complete information about UPN "Veteran" East Java with its faculties and departments.
- 2) Explanation of semester credit system.
- 3) Available educational programs.
- 4) System of organizing teaching and other academic activities.
- 5) Evaluation system.
- 6) Services for students
- 7) Possible scholarships
- 8) Tips on how to study effectively in college.

d. Factors that inhibit student learning

Every lecturer, as a guardian/academic advisor, must know, as far as possible, the various factors that can hinder students' learning activities. There are several inhibiting factors in terms of their sources.

1) Factors that come from the students themselves:

- a) Lack of clear learning goals
- b) Lack of interest in the class.
- c) His health is often compromised.
- d) Less skillful and less diligent in following the lesson.
- e) Inappropriate study strategies.
- f) Poor language skills (e.g. good use of Indonesian and English).

2) Institutional factors

- a) Less interesting way of lecturing.
- b) Lack of references and learning tools.
- c) Inappropriate learning materials (e.g. not relevant to the needs, inappropriate placement in the semester, insufficient number of credits, etc.).
- d) Lectures that are too tiring
- e) Lectures with too many and crowded students
- f) Curriculum that changes too often
- g) Lack of information about universities and their programs
- h) Inadequate campus facilities
- i) The relationship between teachers and students is not close.
- j) Lecturers' styles vary due to different educational backgrounds.
- k) Inadequate academic management and information systems.
- l) Lack of student information needed for student development.

3) Factors originating in the family environment

- a) Family economy
- b) Family divisions
- c) Homesickness

4) Factors coming from the community.

- a) Promiscuity and its excesses
- b) Working while studying
- c) Being too active in organizations
- d) Less peaceful environment, less comfortable life, etc.
- e) Unstable social and political atmosphere.

VI. CHEMICAL ENGINEERING STUDY PROGRAM

VI.1. INTRODUCTION

In order to carry out the main task as a higher education institution, namely the implementation of the Tri Dharma of Higher Education, and related to the mission - vision of the institution, the vision carried out by the Chemical Engineering Study Program is:

Vision of the Chemical Engineering Study Program: To become a superior study program in science and technology in the field of chemical engineering with a national defense character.

To realize this vision, the current mission of the Chemical Engineering Study Program is:

1. Organizing an educational and teaching process that is competent, technopreneur-minded and has a national defense character;
2. Organizing basic and applied research activities, especially in the field of natural resource management, environmentally sound energy;
3. Organizing community service activities through the application of science and technology;
4. Organizing good and clean study program governance in order to achieve budget and management accountability;
5. Developing the quality of teaching staff, education personnel superior in attitude and values, performance, mastery of knowledge, and managerial;
6. Improve the management system of teaching and learning facilities and infrastructure, basic laboratories and professional laboratories.
7. Organizing cooperation with government, industry, educational and research institutions, including overseas.

Based on the mission of the Chemical Engineering program, the objectives to be achieved are:

1. The realization of Outcomes Base Education curriculum and educational services that are relevant to the profile of independent professionals based on national defense and technopreneur spirit;
2. The achievement of research quality and innovation in the context of the development of science and technology in the field of chemical engineering based on natural resources with an environmental perspective;
3. The realization of community service activities by making a real contribution and responding to problems in society through the application of science and technology;
4. The realization of good and clean study program governance and implementation of quality standards to achieve budget management accountability;
5. The realization of superior teaching and educational personnel who are competent and highly competitive;
6. The realization of adequate infrastructure for teaching and learning activities, basic and specialized laboratories with effective and efficient management;
7. The realization of institutional cooperation with domestic and foreign stakeholders that is intensive and mutually beneficial.

Chemical Engineering Graduate Competencies

Graduate competencies, or the skills expected of graduates, are one of the key factors formulated in the development of the Outcomes Base Education (OBE) curriculum.

Chemical Engineering graduates are expected to have the following competencies :

- Ability to apply knowledge of mathematics, science and engineering.
- Ability to design and conduct experiments and analyze and interpret data.
- Ability to design a system, component, or process to meet a need.
- Ability to work as part of a multidisciplinary team.
- Ability to identify, formulate, and solve engineering problems.
- An understanding of professional responsibility and ethics.
- Ability to communicate effectively.
- Ability to use modern engineering techniques, skills, and equipment necessary to perform professional duties.

Independent Professional Profile

Independent Professional Profile of the UPN “Veteran” Jatim Chemical Engineering Study Program, which aims to produce graduates who meet the following criteria:

1. Become a chemical engineering professional who is able to apply engineering and management sciences to design a system, component or process and understand the implications of engineering solutions in the field of chemical engineering.
2. Become an effective individual in job creation or entrepreneurship.
3. Become an effective and resilient individual by demonstrating responsible leadership where he/she works.
4. Become an individual who develops and continues education to a higher level in the field of renewable energy, materials, or food security based on natural resources, as well as readiness for certification or professional training.
5. Become an individual with rich insights related to chemical engineering in the context of health, safety, environmental, social and economic.

Graduate Learning Outcomes

- A. Be able to apply (demonstrate) attitudes, behavior, morals and ethics as a religious believer and uphold tolerance.
- B. Be able to communicate scientifically related ideas, problems and solutions effectively through oral and written to related communities, at local, national, or international scope.
- C. Be able to think innovatively, creatively and critically
- D. Be able to carry out tasks effectively individually and collaboratively in multidisciplinary groups
- E. Be able to follow the development of science and technology in the field of Chemical Engineering

- F. Be able to recognize needs and practice independent and lifelong learning in the broad context of technological and social change.
- G. Be able to apply mathematical knowledge and basic knowledge in the field of chemical engineering and understand the broader context of multidisciplinary science and engineering.
- H. Be able to identify, formulate, and solve engineering problems in the field of Chemical Engineering and choose and apply relevant methods that build on recognized analytical, computational, and experimental methods.
- I. Be able to design and carry out research with the correct methodology and analyze and interpret data appropriately.
- J. Be able to select and use appropriate resources, selection of engineering equipment and modern design applications, including predicting and modeling engineering problems.
- K. Be able to understand the impact of engineering solutions in the field of Chemical Engineering in the context of health, safety, environment, social and economy.
- L. Be able to design a system, component, or process according to needs within realistic boundaries including economic, environmental, social, political, ethical, health and safety, production feasibility and sustainability aspects using consideration of advances in the field of Chemical Engineering.

VI.2. CHEMICAL ENGINEERING STUDY PROGRAM CURRICULUM

The curriculum of the Chemical Engineering study program is competency-based with a total of 146 credits consisting of

1. Basic science group : 20.59
2. Engineering Design and Science Group : 62,32 %
3. Local and institutional content group : 15.07%.

Evaluation curriculum per semester according to the development of science and technology and market / stakeholder demand.

Institutional curriculum:

- 1) National Defense
- 2) Pancasila
- 3) Bahasa Indonesia
- 4) Leadership
- 5) Entrepreneurship
- 6) Citizenship
- 7) English
- 8) Religion

VI.3. STRUCTURAL OFFICIALS OF CHEMICAL ENGINEERING STUDY PROGRAM 2021/2022

STUDY PROGRAM COORDINATOR: Dr. Ir. Sintha Soraya Santi, MT

HEAD OF LABORATORY:

- LAB. INTRODUCTION TO CHEMICAL ENGINEERING: Ir. Caecilia Pujiastuti, MT

- Basic Physics
- Introduction to Chemical Engineering I
- Introduction to Chemical Engineering II
- LAB. CHEMICAL AND COMPUTATIONAL ENGINEERING OPERATIONS: Ir Ketut Sumada, MS
 - Chemical Engineering Operations I
 - Chemical Engineering Operations II
 - Research

VI.4. LECTURERS OF THE CHEMICAL ENGINEERING STUDY PROGRAM:

The Chemical Engineering Study Program has 36 lecturers, with educational qualifications Doctoral: 7 people, Master: 29 people

LIST OF NAMES OF LECTURERS OF CHEMICAL ENGINEERING STUDY PROGRAM

1	Prof. Dr.Ir.Soemargono,SU	19	Ir.C.Pudjiastuti,MT
2	Prof. Dr.Ir.Sri Redjeki, MT	20	Ir. Ketut Sumada, MS
3	Dr. Ir. Ni Ketut Sari, MT	21	Ir. Nurul Widji Triana, MT
4	Dr. Ir. Srie Muljani, MT	22	Ir. Sani, MT
5	Dr.Ir. Sintha Soraya S, MT	23	Ir. Titi Susilowati, MT
6	Dr.T.Ir. Dyah Suci P., MT	24	Ir. Ely Kurniati, MT
7	Erwan Adi S., ST, MTPH.D	25	Nove Kartika E, ST, MT
8	Ir. Mu'tasim Billah, MT	26	Lilik Suprianti, ST, MSc
9	Ir. Retno Dewati, MT	27	Erwin Kusumastuti, S.Th.I.MPd
10	Ir. Suprihatin, MT	28	Racmad Ramadhan Yogaswara, ST.MT
11	Bambang Wahyudi, MS	29	Dr. Silvana Dwi N, S.Si
12	Ir. Isni Utami, MT	30	Atika Nandini, ST.MSc
13	Kindriari Nurma Wahyusi, MT	31	Ika Nawang Puspitawati, ST, MT
14	Ir. Siswanto, MS	32	Ardika Nurmawati, S.T., M.T.
15	Ir. Nana Dyah S., MKes	33	Ar Yelvia Sunarti
16	Ir. Dwi Hery Astuti, MT	34	Renova Panjaitan, S.T., M.T.
17	Ir. L. Urip Widodo, MT	35	Reva Edra Nugraha, S.T., M.T.
18	Lucky Indrati U. MT	36	Dr. Nur Aini Fauziyah, S.Pd., M.Si

VI.5. FINAL EVALUATION OF CHEMICAL ENGINEERING STUDY PROGRAM

The final evaluation of a Chemical Engineering student can be done with a minimum grade of C for all courses and has taken a minimum of 146 credits:

VI.6. INTERNATIONAL CLASS

The International Class of Chemical Engineering Study Program is a class with courses using English as an introduction, including the following:

1. Sugar Technology

2. Food Safety Management
3. Food Innovation and Process Engineering
4. Polymer Technology

VI.7. Course Distribution Per Semester

CHEMICAL ENGINEERING STUDY PROGRAM CURRICULUM

SEMESTER I

No.	CODE	SUBJECT	PREREQUISITES	
			CREDIT	
1	UV141107	PANCASILA		
2	UV141111	ENGLISH		
3	FT141101	CALCULUS I		
4	FT141103	BASIC PHYSICS		
5	FT141104	BASIC CHEMISTRY		
6	FT141105	PROGRAMMING COMPUTER		
7	TK 141144	CHEMISTRY PHYSICS I		
TOTAL CREDITS			20	

SEMESTER II

No.	CODE	SUBJECT	PREREQUISITES	
			CREDIT	
1	UV141101 UV141102 UV141103 UV141104 UV141105 UV141106	RELIGION: ISLAM CHRISTIAN CATHOLIC HINDU BUDHA KONGHUCU	2	0
2	UV141109	INDONESIAN LANGUAGE	2	0
3	UV141108	CIVIC	2	Pancasila
4	FT141102	CALCULUS II	3	Calculus I
5	TK141102	ORGANIC CHEMISTRY I	2	Basic Chemistry
6	TK141103	CHEMICAL ANALYSIS	4(3+1)	Basic Chemistry
7	TK141145	PHYSICAL CHEMISTRY II	3(2+1)	Physical Chemistry I
8	TK141104	TECHNOLOGY CONCEPT	2	0
TOTAL CREDITS			20	

SEMESTER III

No.	CODE	SUBJECT	PREREQUISITES	
			CREDIT	
1	UV141110	STATE DEFENSE	3(2+1)	Civic
2	TK141105	ENGINEERING MATH I	2	Calculus II
3	TK141106	CHEMICAL ENGINEERING PRINCIPLES I	2	0
4	TK141107	CHEMICAL ENGINEERING OPERATIONS I	3	0

5	TK141008	ORGANIC CHEMISTRY II	3(2+1)	Organic Chemistry I
6	TK141109	CHEMICAL INDUSTRY TOOLS	2	0
7	FT411110	MATERIAL CONST. CHEMICAL FACTORY	2	
8	TK141146	STATISTICS	3	Calculus II
		TOTAL CREDITS	20	

SEMESTER IV

No.	CODE	SUBJECT	PREREQUISITES	
			CREDIT	
1	TK141111	CHEMICAL REACTION ENGINEERING I	2	Engineering Math I
2	TK141147	ENGINEERING MATH II	2	Engineering Math I
3	TK141148	ENGINEERING MATH APPLICATION	1	Engineering Math I
4	TK141113	CHEMICAL ENGINEERING PRINCIPLES II	3	Chemical Engineering Principles I
5	TK141150	CHEMICAL ENGINEERING OPERATIONS II	3	Chemical Engineering Operations I, Chemical Engineering Principles I
6	TK141149	CHEMICAL ENGINEERING OPERATIONS I APPLICATION	1	Chemical Engineering Operations I
7	TK141115	THERMODYNAMICS I	2	Physical Chemistry II, Chemical Engineering Principles I
8	TK141116	HEAT TRANSFER	2	Chemical Engineering Principles I,
10	TK141117	CHEMICAL IND PROCESS. + KP	3	Organic Chemistry II, Chemical Industry Tools, Material Const. Chemical Factory
11	TK141152	INDUSTRIAL MICROBIOLOGY	2	0
		TOTAL CREDITS	21	

SEMESTER V

No.	CODE	SUBJECT	PREREQUISITES	
			CREDIT	
1	TK141118	CHEMICAL REACTION ENGINEERING II	2	Chemical Reaction Engineering I

2	TK141119	PROCESS CONTROL	2	Engineering Math II
3	TK141120	FACTORY DESIGN I	2	Chemical Engineering Principles II
4	TK141154	CHEMICAL ENGINEERING OPERATIONS III	3	Chemical Engineering Operations II, Chemical Engineering Principles II
5	TK141151	CHEMICAL ENGINEERING OPERATIONS APPLICATIONS II	1	Chemical Engineering Operations II
6	TK141122	THERMODYNAMICS II	3	THERMO I
7	TK141153	APPLICATION INDUSTRIAL MICROBIOLOGY	1	Industrial Microbiology
8	TK141155	TROUBLESHOOTING METHODOLOGY	2	Total credits ≥ 79
9	UV141114	ENTREPRENEURSHIP(2+1)	3(2+1)	0
		TOTAL CREDITS	19	

SEMESTER VI

No.	CODE	SUBJECT	PREREQUISITES	
			CREDIT	
1	TK141124	CHEMICAL REACTION ENGINEERING III	2	Chemical Reaction Engineering II
2	TK141125	TRANSPORT PHENOMENA	2	Chemical Engineering Principles I
3	TK141126	PLANT DESIGN II	2	FACTORY I
4	TK141127	DESIGN. INDUSTRIAL TOOL K.	3	Chemical Engineering Operations III
5	UV141113	LEADERSHIP	2	0
7	FT141108	FIELD WORK PRACTICE	2	Chemical Ind Process+KP
8	UV141115	COMMUNITY SERVICES	2	Total credits ≥ 100
9	FT141107	ENGINEERING ECONOMICS	2	0
	TK141228 TK141229 TK141230 TK141231 TK141232	OPTIONAL A: ESSENTIAL OIL TECHNOLOGY MEMBRANE TECHNOLOGY POLYMER TECHNOLOGY ELECTROCHEMICAL TECHNOLOGY ADVANCED MATERIAL TECHNOLOGY	2	Organic Chemistry, Physical Chemistry

TOTAL CREDITS	19	
----------------------	-----------	--

SEMESTER VII

No.	CODE	SUBJECT	PREREQUISITES	
			CREDIT	
1	TK141132	CHEMICAL PLANT SAFETY	2	Thermodynamics Process Control
2	TK141133	PROCESS DESIGN	2	Engineering Math I
3	TK141134	UTILITIES	2	Chemical Engineering Principles I Factory Design I
4	TK141236	ENERGY ENGINEERING	2	Chemical Engineering Principles II
5	TK141142	FACTORY WASTE TREATMENT	2	Chemical Engineering Operations I
6	TK141237 TK141238 TK141239 TK141240 TK141241 TK141253	CHOICE B: MINERALOGICAL ENGINEERING ENGINEERING & INNOVATION FOOD BIOTECHNOLOGY SUGAR TECHNOLOGY BIOCHEMICAL TECHNOLOGY SALT TECHNOLOGY	2	0 0 Microbiology Chemical Industry Tools Microbiology
8	TK141143	RESEARCH	4	Problem Solving Methodology
9	TK141150	FACTORY PRE PLAN PROPOSAL	2	Factory Design II
TOTAL CREDITS			18	

SEMESTER VIII

No.	CODE	SUBJECT	PREREQUISITES	
			CREDIT	
1	TK14115	PRE PLAN FACTORY	4	Pre-Proposal Factory Plan, Design. Factory II, Utilities, Engineering Energy, PLP, Safety P.Chemistry

2	TK141244 TK141245 TK141251 TK141254	CHOICE C BIOMASS & BIOFUELS MULTI-SPLITTING COMP. BASED MATERIALS SILICA TECH. PUPILS (SILBASE & STRUVITE)	3	Thermo I, Chemical Engineering Principles II, Chemical Engineering Operations III, Organic Chemistry I, II
3	TK141248 TK141249 TK141250 TK141246 TK141252	CHOICE D MANAGEMENT MK3L BUSINESS MANAGEMENT MANAGEMENT FOOD SECURITY SIMULATION AND OPTIMATION MANAGEMENT CPG WASTE	2	0 0 0 Computer programming, Engineering Math
TOTAL CREDITS			9	

Total credits for undergraduate stage	146
--	-----

SEMESTER I

UV141107: PANCASILA

CREDITS: 2

PREREQUISITES: -

CONTENTS: Understanding the history of the growth of the nation and the state as well as Pancasila and UUD 45, the national legal system and state administration based on Pancasila and UUD 45, the dynamics of the implementation of Pancasila and UUD 45, Pancasila as a philosophy of ethics system, Pancasila as a paradigm in national development, and the actuality of Pancasila in campus life.

OVERVIEW:

1. BPUPKI and PPKI Jakarta, Ministry of State Secretary.
2. Constitution 45 with amendments I-IV
3. APOLA Surabaya 2001 4. MPR Tap 1999-2001
4. Suhadi, Pancasila Education for Higher Education, UGM Jogjakarta

UV141111: ENGLISH

CREDITS: 3

CONTENTS: Listening, structure and written expression, reading comprehension, written English

OVERVIEW

Long Man & Phillips, D., "Preparation Course for the Toefl test II".

FT141101 : CALCULUS I

CREDITS: 3

CONTENTS: Number systems, functions, limits, derivatives (differentiation), applications of derivatives, integrals, Fourier series

OVERVIEW:

1. Ayres J R F, "Calculus" 2ed Schaum's Outline Series. 1981
2. Boyce Di Prima, "Calculus", 1986
3. Leithold, Louis, "The Calculus with Analytic Geometry"
4. Spiegel M.R, "Advanced Calculus", 1ed Schaum's Outline Series, McGrawHill,1981

FT141103 : BASIC PHYSICS

CREDITS: 4 (3+1)

CONTENTS: Particle kinematics, particle dynamics, work & energy, rotational dynamics, elasticity, fluid statics, fluid dynamics, thermometry, calorimetry, heat transfer

BASIC PHYSICS PRACTICUM

CREDITS: 1

CONTENTS: Measurement of surface tension, thermal conductivity, spring rate, liquid viscosity, Boyle's law, speed of sound in air, acceleration, Earth's gravity, mass density of liquid & solid, refractive index of lens and liquid, atwood's plane, ammeter and voltmeter, lens and photometer

OVERVIEW:

1. Sears, Francis Feston and Zemansky Mark V, "University Physics" 1st edition adison - Wesley Publishing Company, Inc.
2. Sears, Francis Feston and Zemansky Mark V, "University Physics" 2nd edition adison - Wesley Publishing Company, Inc.

FT141104 : BASIC CHEMISTRY

CREDITS: 3

CONTENTS : Atomic structure, periodic arrangement of elements, stoichiometry, chemical bonding, substance form, concentration and solution, chemical equilibrium, redox & electrochemistry, core chemistry, applied chemistry

OVERVIEW:

1. Keenan, Kleinfelter, "Chemistry for University I".
2. Sisler, Dresdner, Mooney, "Chemistry A Systematic Approach".
3. Theodore, Brown, Lemay, "Chemical, The Central Science".

FT141105: COMPUTER PROGRAMMING

CREDITS: 3(2+1)

CONTENTS: Introduction to computers, computers and the number system, understanding constants and variables, statements, flowcharts, program creation, pascal program structure, looping, condition selection and arrays.

Programming practice in the lab

PRACTICE. COMPUTER PROGRAMMING

CREDITS: 1

CONTENTS: Introduction to computers, Basic Interpreter Program File Instructions, Basic Programming, SAVE, LOAD, RUN, PRINT statements, LET & REM, READ-DATA statement, INPUT statement, GO TO and IF-THEN control statements, use of FOR-NEXT control statement, use of Nested Variable/DIM statement, Pascal programming language, OUTPUT, INPUT statements, Variable Identifiers & Constants, IF-THEN and IF-THEN-ELSE control statements, Iterative / looping FOR, WHILE & REPEAT statements, ARRAY/LARIC statements.

OVERVIEW:

1. Yogyanto, "Computer Programming"
2. Yogyanto, "Basic"
3. Yogyanto, "Turbo Pascal".

TK141144 :PHYSICAL CHEMISTRY I

CREDITS: 2

PREREQUISITE: 0

CONTENTS: Gases, liquids, solids, basic fundamentals of thermodynamics, thermochemistry, free energy, non electrolyte solutions, electrolyte solutions, electrochemical cells, phase laws, kinetics of homogeneous reactions, adsorption, colloids, macromolecules.

SEMESTER II:

UV14110: RELIGION

CREDITS: 2

UV141101: ISLAMIC RELIGION

CONTENTS: Definition, position and development of Islam, the relationship between human nature and Islam, Islam as a universal teaching and internal aqidah, sharia and morals.

UV141102: CHRISTIANITY

CONTENTS: Definition and development of Protestantism, concept of Protestantism in relation to nature and human beings.

UV141103: CATHOLIC AGE

CONTENTS: Introduction to theology, philosophy, religion as a human phenomenon, units of dogmatics, units of social ethics and social doctrine of the church, the triune mystery of the church and the apostolate of the cloud, the sacred liturgy of the econema church.

UV141104: HINDU AGE

CONTENTS: Understanding and development of Hinduism, Hinduism's relationship with nature and humanity, its conception.

UV141105: BUDDHIST

CONTENTS: Definition and development of Buddhism, Buddhism's relationship with nature and human beings, its conceptions

UV141106: KONGHUCU

CONTENTS: Definition and development of Confucianism, Buddhism's relationship with nature and human beings, its conceptions

V141109 : INDONESIAN LANGUAGE

CREDITS : 2

CONTENTS: Ability to use Indonesian, both verbally (art of communication, interview, presentation), and in writing. Mastery of correct grammar and vocabulary in writing scientific papers. Topics covered: EYD, sentence structure, effective and logical sentences, paragraphs, types of writing, correspondence and scientific papers.

UV141108: CIVIC

CREDITS: 2

CONTENTS: Nation, state, rights and obligations of citizens, national insight. National resilience, basic concepts of Tri gatra and Panca gatra, Polstranas, regional autonomy, implementation of polstranas in the astragatra field.

OVERVIEW

1. Imam Solikin, Soeyarso Subardjo, Pailan, "Civic Education" 2002
2. Dardji Darmodihardjo, "Pancasila A Brief Orientation", 1979

FT141102 : CALCULUS II

CREDITS: 3

PREREQUISITES: Calculus I

CONTENTS: applications of integrals, natural and improper integrals, vector analysis, moments of inertia, double integrals, systems of linear equations, differential equations.

OVERVIEW:

1. Ayres J R F, "Calculus" 2nd ed Schaum's Outline Series.
2. Boyce Di Prima, "Calculus", 1986
3. Leithold, Louis, "The Calculus with Analytic Geometry"
4. Spiegel M.R., "Advanced Calculus", 1ed Schaum's Outline Series, McGrawHill
5. Perlis S, "Theory of Matrices"
6. Finkbeiner D T, "Matrices and Linear Transformation".

TK141145: PHYSICAL CHEMISTRY II

CREDITS: 3(2+1)

PREREQUISITES: Physical Chemistry I, Basic Chemistry, Basic Physics I

CONTENTS: Gases, liquids, solids, basic fundamentals of thermodynamics, thermochemistry, free energy, non-electrolyte solutions, electrolyte solutions, electrochemical cells, phase laws, kinetics of homogeneous reactions, adsorption, colloids, macromolecules.

PHYSICAL CHEMISTRY PRACTICUM

PREREQUISITES: Physical Chemistry

CONTENTS: Crystal systems and density, viscosity measurements to determine molecular radius, equilibrium constant, Rault's law, Arrhenius equation and activation energy, Ferundlich isotherm, solubility reaction speed as a function of temperature, freezing point drop, distribution coefficient, heat of dissolution, calorimeter constant, Nernst equation.

OVERVIEW:

1. Dogra, "Physical Chemistry"

2. Lando & Maron, "Fundamental Physical Chemistry"

TK141102: ORGANIC CHEMISTRY I

CREDITS: 2

CONTENTS: Chemical bonding, isomerization, hydrocarbon compounds, functional groups, alkanes, dienes, alkynes, aromatic hydrocarbons, halogen compounds, alcohols & phenols, ethers & epoxides, aldehydes & ketones.

OVERVIEW:

Jack E Fernandez "Organic Chemistry an Introduction"

TK141103 : CHEMICAL ANALYSIS

CREDITS: 4 (3+1)

PREREQUISITES: -

CONTENTS: Introduction, anion & cation analysis, basic theory of qualitative analysis, volumetric analysis, theory of acid-base reactions, precipitation reactions, complex formation reactions, oxidation-reduction reactions, experimental techniques of qualitative inorganic analysis, various concentrations and stoichiometry, gravimetric analysis, volumetric methods, alkalimetric acid titration, complexometry titration, precipitation titration, redox titration.

ANALYSIS CHEMICAL PRACTICUM

CREDITS: 1

PREREQUISITES: -

CONTENTS: Solution preparation, cation separation, anion separation, assidi alkalimetry, argentometry, permanganometry, iodo-iodimetry, complexometry, gravimetry.

OVERVIEW

1. J.G Dick, "Analytical Chemistry"
2. Day, R A & Underwood, "Qualitative Analytical Chemistry,"
3. Harjadi, "Basic Analytical Chemistry", Gramedia PT, Jakarta
4. Vogel A I. "Text Book of Quantitative Inorganic Analysis", 3rdrd ed, Longman, London
5. Analytical Chemistry Practicum Manual

TK141104: TECHNOLOGICAL CONCEPTS

CREDITS: 2

CONTENTS: Ethics, Logic, early society, humans and environment, humans and trauma, science and technology, technology and culture, science and technology development policy.

OVERVIEW:

1. Mike Martin, Roland S, "Engineering Ethics", 1994
2. Darosono. "Environmental Science", 1995
3. Diktat "Concept of Technology", ITB, 1975

SEMESTER III

UV141110: STATE DEFENSE

CREDITS: 3(2+1)

PREREQUISITES: Pancasila, Civic

CONTENTS: Introduction, Conception of State Defense Education, Integrity of National identity, substance of state defense awareness, State defense in the context of National Development, Factors affecting state defense awareness, Leadership and Entrepreneurship, Anti-corruption education, National vigilance, State Defense Awareness fostering policies, Good, clean and authoritative government, Development of values and State Defense Culture.

OVERVIEW:

1. Agus Surata, et al, 2007, Widya Mwat Yasa, UPN Veteran Yogyakarta
2. Team compiler, 2007, State Defense Awareness Education (Guidelines for Civic Education Lecturers), Director General of Pothan Ministry of Defense of the Republic of Indonesia, Jakarta.
3. Puspito Nanang T, et al, 2011, Anti-Corruption Education for Higher Education, Publisher of the Ministry of Education and Culture of the Republic of Indonesia, Jakarta
4. Soemarsono et al, 2005, Civic Education, PT Gramedia, Jakarta
5. Compilation Team, Basic Level of State Defense, 2006, publisher of the Directorate General of Defense of the Ministry of Defense of the Republic of Indonesia.

COUNTRY DEFENSE TRAINING PROGRAM

CREDITS:1

CONTENTS: Conducting state defense activities, through activeness in campus organizational activities, community organizations, achievements in various fields, involvement in social action and abdimas, transmitting knowledge and skills to juniors on campus, outbound character building leaders held on campus, participating in official flag ceremonies, transmitting the determination, attitudes and behavior of state defense to the community outside the campus, participating in national services organized by the government.

TK141105: ENGINEERING MATH I

CREDITS: 3 (2 +1)

PREREQUISITES: Calculus I and II

CONTENTS: Chemical Engineering mathematics, numerical methods, roots of equations, systems of linear equations, jacobi method, interpolation, linear regression, numerical differential solution, numerical integration, ordinary numerical differential equations, simultaneous differential equations and partial differential equations.

OVERVIEW:

1. Rajaraman, V., "Computer Oriented Numerical Methods"
2. Triatmojo, "Numerical Methods".

ENGINEERING MATHEMATICS PRACTICUM

CREDITS: 1

PREREQUISITES: Engineering Math I

CONTENTS: Square root equation, newton raphson method, secant method, data interpolation method, bisection, gaus seidel method, gaus elimination method, simpson method, trapezoidal, euler and runge kutta methods.

OVERVIEW:

1. R. Soegeng, "Numeric Computing with Turbo Pascal"
2. Rajaraman, V. "Computer Oriented Numerical Methods"

TK141106: CHEMICAL ENGINEERING PRINCIPLES I**CREDITS: 2**

CONTENTS: Unit system and dimensional analysis, chemical equations and stoichiometry, definition of systems and their limits, preparation of mass balance without chemical reaction and by chemical reaction, mass balance of recycling system with by-pass flow.

OVERVIEW:

Hammelblau "Basic Principles Calculation of Chemical Engineering".

TK141107: CHEMICAL ENGINEERING OPERATIONS I**CREDITS: 3****PREREQUISITES: -**

CONTENTS: Pumps and piping, flow velocity measurement, filtration process and equipment, settling process and design, mixing, fluidization.

OVERVIEW:

1. Badger & Banchero, "Introduction to Chemical Engineering".
2. McCabe & Smith "Unit Operation of Chemical Engineering"
3. Foust, A, "Principles of Unit Operation".
4. Marco & Brown, "Unit Operation".

TK141108: ORGANIC CHEMISTRY II**CREDITS: 3 (2+1)****PREREQUISITES: -**

CONTENTS: Introduction, Carboxylic acids and their derivatives, fats and oils, amines and heterocycles, carbohydrates, monosaccharides, polysaccharides and their derivatives, Amino acids, proteins.

OVERVIEW:

Jack E F, "Organic Chemistry an Introduction".

ORGANIC CHEMISTRY PRACTICUM**CREDITS: 1****PREREQUISITES: -**

CONTENTS: Recrystallization and melting point determination, reaction and identification of alcohols, aldehydes and ketones, reaction and identification of carboxylic acids, carbohydrates and amines, Determination of acid number; saponification number; iodine number; fat content; alcohol content; protein content, manufacture of chloroform; iodoform, aspirin.

TK141109 : CHEMICAL INDUSTRY EQUIPMENT**CREDITS: 2**

CONTENTS: Size reduction, solids separator, filtration, centrifuge, evaporator, crystallization, extraction.

OVERVIEW:

1. Badger & Bacher, "Introduction to Chemical Engineering".
2. McCabe & Smith, "Unit Operation of Chemical Engineering"
3. Perry J H, "Chemical Engineering Hand Book"

TK141110: CHEMICAL PLANT CONSTRUCTION MATERIALS**CREDITS: 2**

CONTENTS: Properties of materials, atomic arrangement of solid materials, solid solutions of materials, metals and their alloys, dual phase materials and thermal process dual phase materials, ceramics and polymerization and corrosion and its control.

OVERVIEW:

1. Van Vlack, "Elements of Materials Science"
2. Gachen Buch, "Material Selection for Process Plants"
3. Moore H.T & Moore N.B., "Textbook of Materials of Engineering".

SEMESTER IV

TK141111: CHEMICAL REACTION ENGINEERING I

CREDITS: 2

PREREQUISITE: ENGINEERING MATH I

CONTENTS: Homogeneous reaction kinetics, interpretation of batch reactor data, introduction to reactor design (batch, semi-batch and continuous) single reactors (mixed flow & plug flow), multiple reactors, multiple reaction design.

OVERVIEW:

Octave Levenspiel, "Chemical Reaction Engineering"

TK141112: ENGINEERING MATH II

CREDITS: 2

PREREQUISITES: Chemical Engineering Mathematics I

CONTENTS: Special functions (gamma, beta, error), Laplace transform, second order equations in solving kindergarten problems (bessel, legendre, lisquerre, spherical ordinate PD, cylindrical ordinate PD, introduction to matek II, application of mathematics in the field of kindergarten, fourier series.

OVERVIEW:

1. Mickley, H.S, Sherwood, Reed, "Applied Mathematics in Chemical Engineering".
2. Jensen, V.G., Jeffrey, G.V., "Mathematical Methods in Chemical Engineering"
3. Rice, G. & Do, D.D., "Applied Mathematic and Modeling for Chemical Engineering".

TK141113: CHEMICAL ENGINEERING PRINCIPLES II

CREDITS: 3

PREREQUISITES: Chemical Engineering Operations I

CONTENTS: The concept of energy, the concept of energy balance, heat balance without and with chemical reactions, combined mass and heat balance, mass and heat balance applications

OVERVIEW:

Hammelblau "Basic Principles Calculation of Chemical Engineering"

TK141114: CHEMICAL ENGINEERING OPERATIONS II

CREDITS: 3

PREREQUISITES: Chemical Engineering Operations I

CONTENTS: Evaporation, vaporization, crystallization, drying, liquid-liquid extraction and leaching.

APPLICATION OF CHEMICAL ENGINEERING OPERATIONS

CREDITS: 1

PREREQUISITES: Chemical Engineering Operations I

CONTENTS : Batch distillation operation, Liquid-liquid extraction, Absorption, Leaching, Sedimentation, Fluidization, Condensing Vapour, Heat Exchanger, Wetted Wall Column, Reynold Number, Clarifier, DCGB

OVERVIEW:

1. Foust at al, "Principles of Unit Operation, 2ndnd ed, John Wiley
2. Treybal, "Mass Transfer Operation", 3rdrd ed, McGrawHill, 1980
3. Perry & Chilton, "Chemical Engineering Handbook," 6th ed.
4. Brown at al, "Unit Operation", John Wiley

TK141115: THERMODYNAMICS I

CREDITS: 2

PREREQUISITES: Physical Chemistry I

CONTENTS : Unit conversion, temperature, pressure, work, energy, law of thermodynamics I, state function, PVT relationship, heat effect, law of thermodynamics II, thermodynamic properties of fluids, flow processes and thermal power generation.

OVERVIEW:

Smith Vanness, J.M, "Introduction to Chemical Engineering Thermodynamics"

TK141116: HEAT TRANSFER

CREDITS : 2

PREREQUISITES: Chemical Engineering Principles I

CONTENTS: Fundamentals and mechanisms of heat transfer (conduction, convection and radiation), design of heat transfer devices (Double Pipe Exchangers and Shell & Tube Exchangers), Condensers, Heating/Cooling Jackets, Heating/Cooling Coils etc.

OVERVIEW:

1. Kern, D.Q., 1965. Process Heat Transfer. International Student Edition. McGraw-Hill International Book Company. New York.
2. Mc. Adam, W.H. 1954. Heat transmissin. 3rd ed. McGraw-Hill. Kogakusha, Ltd. Tokyo

TK141117: CHEMICAL INDUSTRY PROCESSES AND PLANT VISITS

CREDITS: 3

PREREQUISITES: Organic Chemistry

CONTENTS : Basic fundamentals of chemical industry processes, development of chemical industry in Indonesia, chemical processes (esterification, halogenation, nitration, oxidation, sulfonation & sulfatation) processes and flowsheets of various chemical industries (cement industry, salt, lime, soda ash, sulfur, sulfuric acid, fertilizer, chlor alkali etc.).

OVERVIEW: Shreve, R.N, "The Chemical Process Industry".

FACTORY VISIT

CONTENT: One day factory observation covering raw materials and products, production process, equipment and utilities and factory management. Report writing assignment. At least 2 factories visited and those that meet the requirements.

SEMESTER V

TK141118 :CHEMICAL REACTION TECHNIQUE II

CREDITS: 2

PREREQUISITES: Chemical Reaction Technique I

CONTENTS: Effect of temperature and pressure on reactor performance for Single and Multiple Reactions, Non Ideal Flow, Fluid Mixing, Introduction to Heterogeneous Reaction Systems, Fluid and Particle reaction models, Application of Reactor Design, Fluid-Fluid reaction models

OVERVIEW

Octave Levenspiel, "Chemical Reaction Engineering"

TK141119: CONTROL PROCESS

CREDITS: 2

PREREQUISITES: Engineering Math I

CONTENTS: Control characteristics of chemical processes, Layout design of process control systems, Hardware for process control systems, Modeling of dynamics and statics of chemical processes, Transfer functions and input-output models, Process dynamics for first-order, second-order and higher-order systems, Analysis and design of feedback control systems & stability of feedback systems, Frequency response analysis of linear processes, Analysis and design of advanced control systems, Design of control systems for multivariable processes and complete equipment, Discrete Response Systems, Design of digital feedback controllers.

TK141120: FACTORY DESIGN I

CREDITS: 2

PREREQUISITES: Chemical Engineering Principles I & II

CONTENTS: Introduction to plant design, Selection and description of processes, Instrumentation and safety, Plant location and layout, Drawing of process flow diagrams, Rules for drawing flow diagrams, Mass Balance, Heat Balance.

OVERVIEW:

1. Ulrich, G.D., "A Guide to Chemical Engineering Process Design and Economics".
2. Backhurst & Harker, J.H., "Process Plant Design".

TK141121 :CHEMICAL ENGINEERING OPERATIONS III

CREDITS: 3

PREREQUISITE: Chemical Engineering Principles I

CONTENTS: Distillation of binary systems, generation of system equilibrium curves, fractionation (rectification), determination of ideal number of plates by McCabeThiele & Ponchon Savarit method in distillation operations, determination of plates in Absorption, Separation process with membranes.

OVERVIEW:

1. Foust et al, "Principles of Unit Operation, 2nd ed, John Wiley, 1980
2. Treybal, "Mass Transfer Operation", 3rd ed, McGrawHill, 1980
3. Perry & Chilton, "Chemical Engineering Handbook," 6th ed.
4. Coulson, J.M, & Richardson, J.F, "Chemical Engineering"
5. Brown et al, "Unit Operation", John Wiley

CHEMICAL ENGINEERING OPERATIONS APPLICATION II

CREDIT: 1

PREREQUISITES: Chemical Engineering Operations I, II, III

CONTENTS: Batch distillation operation, Liquid-liquid extraction, Absorption, Leaching, Sedimentation, Fluidization, Condensing Vapour, Heat Exchanger, Wetted Wall Column, Reynold Number, Clarifier, DCGB

TK141122: THERMODYNAMICS II

CREDITS: 3

PREREQUISITES: Thermodynamics I

CONTENTS: Refrigeration (Carnot refrigerator, vapour-compression cycle), Liquefaction, solution thermodynamics, VLE at low to medium pressure, thermodynamic and VLE properties of the equation of state, equilibrium chemical reactions, process thermodynamic analysis.

OVERVIEW:

Smith Vanness, J.M, "Introduction to Chemical Engineering Thermodynamics"

TK141123: INDUSTRIAL MICROBIOLOGY

CREDITS: 2

CONTENTS: Scope of industrial microbiology, bacteria, fungi, algae, protozoa, viruses, sterilization, utilization of microbes in various industries, fermentation media and processes, isolation and maintenance of cultures, fermentation industry.

OVERVIEW:

1. Pikzar, M and Reid, R.D, "Microbiology".
2. Srikandi F, "Food Microbiology", 1992
3. Prof.Dr.D.Dwidjo Seputro, "Fundamentals of Microbiology".

MICROBIOLOGY PRACTICUM

CREDITS: 1

PREREQUISITES: Industrial Microbiology

CONTENTS: Sterilization, Microscopy, Sacharification, Fermentation, Determination of vinegar content, determination of alcohol content, isolation of microorganisms, decomposition of microorganisms on starch and sucrose, painting, oligonamic substances and the effect of antiseptics & disinfectants.

OVERVIEW:

1. Salle, A.J. "Fundamental Principles of Bacteriology"
2. Drs. Mulyono, "Fundamentals of Microbiology".

FT141106: PROBLEM SOLVING METHODOLOGY

CREDITS: 2

PREREQUISITES: Total credits that have been taken > 79 credits

CONTENTS: Introduction, Research Preparation, Research proposal making, Research implementation, Data collection, Data processing, Report making, Publication (writing in journal or magazine)

OVERVIEW:

1. Prof.Dr.S.Nasution, MA, "Reseach Method";.
2. Drs.M.Zainudin, "Research Methods"
3. Taha, H. A, "Operations Research" 4th ed Collier Macmillan Publisher

SEMESTER VI

FT141107: ECONOMICS ENGINEERING

CREDITS: 2

PREREQUISITES: -

CONTENTS: Understanding cash flow and the concept of the value of money against time, equivalence (interest), equivalence of an alternative, alternative selection, alternative selection, taxes and insurance, rate of return analysis, economic life, depreciation, investment evaluation, sensitivity analysis, break even point analysis (BEP) and replacement analysis.

OVERVIEW:

1. Donald E. Garrett, 1989, "Chemical Engineering Economics" Van Nostrand Reinhold New York.
2. Derek H. Allen 1991, "Economic Evaluation of Projects-aGuide" Printed in England by Stephen Austin & Sons Ltd., Hertford.
3. Giatman, M., 2006, "Engineering Economics," PT.Raja Grafindo Persada, Jakarta, Indonesia.
4. Peters Max S. and Klaus D. Timmerhaus, 1991, "Plant Design and Economics for Chemical Engineers" Mc Graw -Hill International Editions Chemical and petroleum Engineering Series.
5. Ulrich, G.D., "A Guide to Chemical Engineering Process Design and Economics".

TK141124: CHEMICAL REACTION ENGINEERING III

CREDITS: 2

PREREQUISITES: Chemical Reaction Engineering II

CONTENTS: Liquid-liquid heterogeneous reactions, Aerobic fermentation, Enzyme catalysts, Distillation & extraction-reactions, Catalyzed heterogeneous reactors, Design of fixed bed, trickle bed and fluidized bed reactors, Design of suspended bed reactors, Bubble/Slurry reactors.

OVERVIEW:

1. Levenspiel, O., "Chemical Reaction Engineering" 3rd ed, Wiley Int.
2. Smith, J.M, "Chemical Engineering Kinetics" 3rd ed, McGrawHill
3. Orhan Tarhan, M, "Catalytic Reactor Design", McGraw-Hill, 1983.
4. Daily & Ollis, "Biochemical Engineering Fundamentals", McGrawHill

TK141125: TRANSPORT PHENOMENAS

CREDIT: 2

PREREQUISITE: Chemical Engineering Principles I

CONTENTS: Transport phenomena and unit operations, equilibrium and process rates, basic units and variables, intermolecular forces, simple mass and heat balances, molecular transfer mechanisms, general property balances
Flux convection with force convection, convection coordinates, mass diffusion phenomena, transitional and turbulent flow, displacement equations in turbulent conditions, turbulence models, friction factor velocity distribution.

OVERVIEW:

1. Broadly, R.S, "Transport Phenomena".
2. Bird Stewart, L, "Transport Phenomena".

TK141126 :CHEMICAL PLANT DESIGN II

CREDITS: 2**PREREQUISITE:** Chemical Plant Design I**CONTENTS:** Equipment specification, Calculation of main equipment, Economic Analysis (Economic Evaluation of Plant)**OVERVIEW:**

1. Ulrich, G.D., "A Guide to Chemical Engineering Process Design and Economics".
2. Backhurst & Harker, J.H., "Process Plant Design".

TK141127: DESIGN OF CHEMICAL INDUSTRY EQUIPMENT**CREDITS: 3****PREREQUISITES:** Chemical Engineering Operation III**CONTENTS:** Definition of pressure vessels, Functions and types of vessels, Selection of vessel cap types, Design of deep pressure vessels and Vacuum, Design of retaining columns, base plates and vessel foundations, Design of high-pressure vessels, Design of High Vessels, Design of Belt & Chain Conveyors.**OVERVIEW:**

1. Brown L E Young, "Process Equipment Design", Wiley Easton, 1979.
2. Hess & Rouston, "Equipment Design", Van Noestrans, 1945
3. Paul Buthod, "Pressure Vessel Handbook", 6th ed, Eguene, 1983

UV141113: LEADERSHIP**CREDITS: 3****PREREQUISITES:** -**CONTENTS:** Definition, purpose and function of leadership, Management and organization, Leadership characteristics, Management models, Organizational theories, Forms of organization, Organizational structure, Relationship between leadership, management and organization, Manpower needs in every process.**OVERVIEW:**

1. Miftah Thoha. 1995. Leadership & Management. Rajawali Press.
2. Riichard M. Streers. 1985. Organizational Effectiveness. Erlangga Publisher.
3. Refr. Other relevant.

CHOICE A:**TK141228 : TRANSMITTING TECHNOLOGY****CREDITS: 2****PREREQUISITES:** -**CONTENTS:** Basic principles of membrane technology, theoretical fundamentals: displacement events in the membrane, fouling events. System design: module configuration, process design, operating systems, pretreatment, washing and sanitization. Industrial Applications: applications in industrial waste treatment, applications for water purification, applications in separation processes, applications for vapor-liquid separation; applications in the field of food technology, applications in the medical world, applications in the field of biotechnology. Future Industrial Prospects.**OVERVIEW:**

1. Mulder, Basic Principles of Membrane Technology, Kluwer Academic Publisher.
2. Cheryan, M., Ultrafiltration Handbook, Technology Publishing Co.

TK141229 :ESSENTIAL OIL TECHNOLOGY**CREDITS: 2****CONTENTS:**

Essential oils and related matters, quality requirements and issues surrounding essential oil quality, essential oil production process, essential oils from several plants in Indonesia, distillation of essential oils from several plants in Indonesia.

OVERVIEW:

1. Lutony, T.L, Rahmayati, Y, 1994 "Production and Trade of Essential Oils" Penebar Swadaya, Jakarta.
2. Sastrohamidjoyo, H, 2004 "Chemistry of Essential Oils" Gajah Mada University Press, Yogyakarta.

TK141230 : POLYMER TECHNOLOGY**CREDITS: 2****PREREQUISITES:** Organic Chemistry II

CONTENTS: Overview and classification of polymers, stepwise polymerization, radical polymerization, ionic polymerization, coordination polymerization, co-polymerization, polymerization techniques, polymer processing technology, polymer modification.

OVERVIEW:

1. Bill Mayer, F.W., Jr. 1984. Textbook of Polymer Science. John Willey and Sons, Inc.
2. Courd, M.A. 1991. Polymer Chemistry. ITB Publishers
3. Carracher, C.E., Jr. Polymer Chemistry

TK141231: ELECTROCHEMICAL ENGINEERING**CREDITS: 2****PREREQUISITES:** Physical Chemistry II**CONTENTS :**

Electrochemical reactions, electrochemical thermodynamics, electrochemical applications, corrosion, corrosion control, electroplating, galvanizing, anodaizing.

OVERVIEW:

1. Fontana MG, 1987, "Corrosion Engineering Third edition, New York, Mc Graw Hill, International ed.
2. Atlas of Electrochemical equilibria in aqueous solution neural pourhaix

FT141108: FIELD WORK PRACTICE**CREDITS: 2****PREREQUISITES:** CHEMICAL INDUSTRY TOOLS, PIK

CONTENT: Apply theory by carrying out direct practice in the factory including raw materials, products, production processes, utilities, WWTP, maintenance, laboratories, then solve industrial problems and make reports.

UV141115 : COMMUNITY SERVICES**CREDITS: 2****PREREQUISITES:** Total credits that have been taken ≥ 100

CONTENTS: Applying applied chemical engineering (appropriate technology) in areas that are still far from the reach of technology.

SEMESTER: VII

TK141132: CHEMICAL FACTORY SAFETY

CREDITS: 2

PREREQUISITES: -

CONTENT: Introduction to safety and environmental regulations, introduction to safety equipment, understanding hazardous and toxic materials, anatomy of accidents, risks and hazards, lighting systems, ventilation systems, noise

OVERVIEW:

1. Achadi Budi Cahyono, 2004, Chemical Safety in Industry, Gadjah Mada University Press, Yogyakarta.
2. Anizar, 2009. Occupational Safety and Health Techniques in Industry. Graha Ilmu. Yogyakarta.
3. Handley, E., 1980. Industrial Safety Handbook. McGraw-Hill Book Company. England

TK141133: PROCESS DESIGN

CREDITS: 2

PREREQUISITES: -

CONTENTS: Concept of chemical process design, Basic fundamentals of reactor design, Alternative process selection, Separator selection, Reaction & Separation system synthesis, Heat network design, Basis and structure of optimization problem, Model matching with data, Formulation of objective function, Basic concepts of optimization, Linear program and application, Simulation and optimization based on mass balance or heat balance.

OVERVIEW:

1. Robin Smith, "Chemical Process Design"
2. Edgar and D M Himmelbleu, "Optimization of Chemical Process"

TK141134: UTILITAS

CREDITS: 2

PREREQUISITE: Chemical Industry Tool Design

CONTENTS: Introduction to utilities for industry, Provision of industrial water, river water treatment for industrial needs, Provision of process water, cooling water, boiler feed water and sanitary water, Design of Cooling Towers and Ion Exchangers, Refrigerants, Types of Coolants, Determination of High- & Low-Pressure Steam, Design of Boilers, Provision of Fuel, Types and Functions of Fuel, Procurement of Electricity in the industry.

OVERVIEW:

1. Livin G Rich, Unit Processes of Sanitary Engineering, 1963
2. Thom D Reynold, "Unit Operation & Processes in Environment" 1982.
3. Ludwig, "Applied Process Design for Chemical & Petrochemical Plants" Vol I, II & III, 1965
4. Sharma & Mohan, "Fuel and Combustion", 1984
5. Steam, Gas and Power

TK141236: ENERGY ENGINEERING

CREDITS: 2

PREREQUISITES: Chemical Engineering Principles II

CONTENTS: History and development of the petroleum industry, composition and classification. The course covers the properties, evaluation and products of petroleum; alternative energy (biogas, bio ethanol and bio diesel); supplemented by a field study (on the petroleum refining process and specifications of various equipment used in the process).

OVERVIEW:

1. Hardjono, 1987. Petroleum Technology. Department of Chemical Engineering. Gadjah Mada University. Yogyakarta.
2. Nelson, W.L., 1988. Petroleum Refinery Engineering. 4th ed. McGraw-Hill Book Company, Inc, New York.

TK141142 : FACTORY WASTE TREATMENT

CREDITS: 2

PREREQUISITE: Chemical Engineering Operation III

CONTENTS: Introduction to Sewage Treatment Plant, Types of Waste: Gas, Solid and Liquid, Waste Characteristics: Physical, Chemical and Biological, Quality Standard of Factory Waste, Physical, Chemical and Biological Treatment of Liquid Waste, Handling and Processing of Solid Waste, Handling of Gas Waste, Recovery and Reuse System of Industrial Waste.

OVERVIEW

1. Metcalf & Eddy, "Wastewater Engineering Treatment Disposal Reuse". McGrawHill Pub.Comp Ltd NewDelhi
2. Donald W, Herbert E, "Wastewater Treatment".
3. Larry D. B & Clifford W.R, "Biological Process Design for Wastewater Treatment".

CHOICE B:

TK141237: MINERALS TECHNOLOGY

CREDITS: 2

PREREQUISITES: -

CONTENTS: Introduction to mineralogy, introduction to chemical and physical properties of each mineral, mineralogy smoothing model in rocks, introduction to mineral separation methods in rocks, identification, separation efficiency of each mineral, sampling theory of each mineral.

OVERVIEW:

Arthur F. Taggart, "Handbook of Mineral Dressing" John Wiley & Sons, Inc, New York.

TK141238: ENGINEERING & INNOVATION TECHN. FOOD

CREDITS: 2

PREREQUISITE: 0

CONTENTS: background, new products (characteristics, added value, development objectives and stages in new product development), various food processing techniques (thermal and non-thermal) and the effect of various processing treatments on food products, as well as packaging techniques.

OVERVIEW:

1. Fuller, G.W.,. 2005. New Food Product Development. CRC Press. USA
2. Gustavo, V.B., et al., 1997. Non Thermal Preservation of Foods. Marcel dekker Inc., New York.

- Supriadi, 1992. Food Irradiation. PAU Food and Nutrition-UGM. Yogya.

TK141239: BIOTECHNOLOGICAL

CREDITS: 2

PREREQUISITES: Industrial Microbiology

CONTENTS: Introduction, Cell structure, important types of microorganisms, applications of enzyme catalysts, metabolism and energy, displacement events in bioprocessing systems, substrate utilization kinetics, biomass product formation, bioreactor design and analysis, instrumentation and operational control of product recovery.

OVERVIEW:

- Balley, J.E. & Ollis, D.F. "Biochemical Engineering Fundamentals".
- Murray Moo - Young, "Comprehensive Biotechnology".

TK141240: SUGAR TECHNOLOGY

CREDITS: 2

PREREQUISITES: -

CONTENTS: History and development of the sugar industry, various kinds of sugar (types, properties and applications), stages and descriptions of the sugar manufacturing process (from raw materials to products) and calculations, complemented by sugar applications in various industries.

OVERVIEW:

- Peter Honig, 2007. "Principals of Sugar Technology". Vol. 1. Elsevier Publication
- Hugot, P. 1986. Handbook of Cane Sugar Engineering. 3rd ed.

TK141241: BIOCHEMICAL TECHNOLOGY

CREDITS: 2

PREREQUISITES: Microbiology, Organic Chemistry II

CONTENTS: Introduction to enzymes and coenzymes, carbohydrates, amino acids, fats, proteins, protein breakdown and synthesis

OVERVIEW:

Ana Pujiadi and Titin Suprianti. 2009. Fundamentals of Biochemistry. UI Press.
Retno Sri Iswari. 2009. Biochemistry. Graha Science Publisher

TK141143: RESEARCH

CREDITS: 4

PREREQUISITES: Research Methodology

CONTENTS: Preparation of research proposal, literature review, research implementation, data evaluation.

OVERVIEW:

Taha, H. A, "Operations Research" 4th ed Collier Macmillan Publisher

TK141135 : FACTORY PRE-PLAN

CREDITS: 4

PREREQUISITES: Plant Design I and II

CONTENTS: Implements all the knowledge to design a plant including feasibility studies, raw materials, production capacity, plant flow sheet, mass and heat balance calculations, utilities, equipment specifications and economic evaluation.

SEMESTER VIII

UV141114 : ENTREPRENEURSHIP

CREDITS: 3

PREREQUISITES:

CONTENTS: Definition of entrepreneurship, entrepreneurial opportunities and challenges, entrepreneurial group study, entrepreneurial field study

OVERVIEW:

Geoffrey G, "Entrepreneurship"

CHOICE C:

TK41244 : BIOMASS AND BIOFUELS

CREDITS: 3

PREREQUISITES: Thermodynamics I, CHEMICAL ENGINEERING PRINCIPLES II

CONTENTS: Introduction, Biomass composition, Bioconversion of agricultural biomass into organic chemicals, Cellulose and hemicellulose-based chemicals, Lignin based chemicals, Coal gasification, Biomass pyrolysis, Field study (practical).

OVERVIEW:

Irving S, Goldstain, "Organic Chemical from Biomass"

TK141245 : MULTI-COMPONENT SEPARATION

CREDITS: 3

PREREQUISITES: Chemical Engineering Operation III

CONTENTS : Introduction to multicomponent separation systems and design variables, Specification of single flow variables with single stage & multistage systems and complex units, Adiabatic equilibrium stage, Calculation of bubble and dew point, Determination of design variables in multicomponent flash distillation, Empirical methods for solving multicomponent distillation systems, Pinch point system and determination of heavy & light keys, Determination of ideal and actual stage, Multicomponent separation systems in Absorption & Extraction processes.

OVERVIEW:

1. Van Winkle, "Separation Process".
2. Bufort D. Smith, "Defined Equilibrium Stage Processes".
3. Henky & Scader "Equilibrium Stage Aeparation Operation in Chemical Engineering".

TK141246: SIMULATION AND OPTIMIZATION

CREDITS: 3

PREREQUISITES: Computer Programming, Math I

CONTENTS: Mathematical Models, Linear Algebraic Equations and Matrix Analysis, Taylor Expansions, Series Acceleration Techniques, Interpolation, Least Squares Estimation, Nonlinear Algebraic Equations, Optimization, Evaluation on Integrals, Ordinary differential equations, Initial Value, Boundary Value.

OVERVIEW:

Owen T. Hanna/Orville C. Sandall, 1995, "Computational Methods in Chemical Engineering" Department of Chemical Engineering University of California, Santa Barbara, USA.

TK141247: ADVANCED MATERIALTECHNOLOGY**CREDITS: 3****PREREQUISITES:** Organic Chemistry I, II**CONTENTS:** Materials developed to meet specific needs according to new requirements from market changes or other factors as a result of advances in science and technology. Modification of an existing material to obtain superior performance in one or more characteristics.**OVERVIEW:** 1) Handbook of advanced materials Book by James K. Wessel
Advanced Materials Source Book, by J. Binner and Paul Hogg**OPTIONAL D:****TK141248: MANAGEMENT MK3LS****CREDITS: 2****PREREQUISITES:** Management and Leadership**CONTENTS:** History of ISO development, Types of ISO, Role of ISO 9000, ISO 14000, Occupational Safety and Health Management System (SMK3) in Industry, Symbols and Logos of hazardous materials and Material Safety Data Sheets (MSDS), Concept of Application and documentation of ISO 9000, ISO 14000 and SMK3.**OVERVIEW:**

1. W. Lee Kuhren (1995) "Environmental Management", Prehallindo, Jakarta.
2. Soehatman Ramli. 2010. Smart Safety (Guide to Effective SMK3 Implementation)
3. Divya Singhal, Keshaf Ram Singhal, 2009. Implementing ISO9001 2008 Quality Management System. PHI Press. New Delhi.
4. Suzan L. Jackson. 2008. The ISO14001 Implementation Guide.

TK141249 : BUSINESS MANAGEMENT**CREDITS: 2****PREREQUISITES: -****CONTENTS:** Understanding of Business & Production, Forms of incorporation, Modern business, production and productivity, business risks, products, product cycle and product development, product identification and pricing, product identification and pricing, goods distribution models, promotion and advertising media, applications, benefits, costs and the role of information technology.**OVERVIEW:**

1. Ricky W griffin (2002) "Business" Erlangga, Jakarta
2. Boone & Kurts (2002) "Introduction to Business" Erlangga Jakarta
3. Dermawan W, (2002) "Performance Management" Erlangga, Jakarta.
4. Buchari Alma, (1992), "Introduction to Business", Alfabeta, Bandung.

TK141250 :FOOD SAFETY MANAGEMENT**CREDITS: 2****PREREQUISITES:** Management and Leadership**CONTENTS:** Types of food, food processing, HACCP identification, GMP, ISO 22000**OVERVIEW:**

1. Winiati P. Rahayu, et al. Food Safety. IPB Press. Bogor
2. Winarno, F.G. 2004. Food Safety. Embryo Press.
3. Edy S. S. Koto. Hazard Analysis Critical Control Point

4. ISO 22000 Standard Procedures. Bizmanuatz Press.

TK141251 :ENERGY AND WATER MANAGEMENT

CREDITS: 2

PREREQUISITES: Management and Leadership

CONTENT: Types and sources of energy, renewable and non-renewable energy, energy conversion, energy auditing, water sources and utilization, water management, water management techniques and water auditing.

OVERVIEW:

1. Helmi Effendi. Water Quality Assessment.
2. Hanan Nugroho. Energy in Development Planning. IPB Press
3. Ray K. Link Lee, and Joseph B. Zini. 2011. Water Resources Engineering
4. Wyne Turner, and Steve Doty. 2009. Energy Management Handbook. 6th ed.

TK141252 :CPG WASTE MANAGEMENT

CREDITS: 2

PREREQUISITES:

CONTENTS: Definition, management and treatment of liquid, solid and gaseous wastes, explanation of environmental quality standards, impacts of contamination due to waste CPG (with examples of applications of waste-based production processes), and is complemented by field practice at related factories.

OVERVIEW:

1. Brownell, L.E., & Young, E.H. Process Equipment Design. Vessel design
2. Ludwig, 1979. Applied Process Design for Chemical and Petrochemical Plants. Vol III. New York.
3. Hess and Rushton. 1967. Process Equipment Design. Princeton. New Jersey.

VII. INDUSTRIAL ENGINEERING STUDY PROGRAM

1. INTRODUCTION

The Industrial Engineering Study Program of the Faculty of Engineering of UPN "Veteran" East Java was established in 1990 with the status of official state. In 1994, with the joint decision of the Minister of Defense and the Minister of Education and Culture No: Kep/0307/U/1994, its status changed to Private "Equalized". In 2001, Industrial Engineering Study Program applied for accreditation for the first time to BAN-PT Dirjen DIKTI and received the accredited status with grade C (BAN-PT Decree Number: 04662-Ak-V-S1- 002 UPITKI-III-2002). In 2005, it applied for re-accreditation to BAN-PT Dirjen DIKTI and received Accredited Status with a grade of B based on BAN-PT Decree Number: 07251/Ak-IX-S1-015/UPITKIVIII/2005. In 2010, it applied for re-accreditation to BAN-PT Directorate General of Higher Education and obtained Accredited Status with a grade of B. Based on BAN-PT Decree Number: 032/BAN-PT/AK-XIII/S1/XII/2010, dated December 23, 2010. In 2015, applying for re-accreditation to BAN-PT, received an accreditation grade of B, based on BAN-PT Decree Number: 1011/SK/BAN-PT/Akred/S/IX/2015. In 2018, applying for re-accreditation to BAN-PT obtained an accreditation grade of B, based on BAN-PT Decree, number: 1906/SK/BAN-PT/Akred/S/VII/2018.

The discipline of Industrial Engineering is the study and learning of how to design, install, operate and repair integral (integrated) systems that include people, machines, materials, energy and information. What is meant by an integral system is not only an industrial system, but any system that has human, machine, material, energy and information components. The main objective of integral system design and improvement is to achieve integral system performance with high productivity and quality. This shows that the advantages of the discipline of Industrial Engineering are that it has a broad scope, and the perspective and efforts to solve problems are systemic. With these advantages, Industrial Engineering graduates have strong competencies to work in all fields, both in manufacturing and service industries, and also in government.

2. Vision, Mission and Goals of the Industrial Engineering Study Program

Vision of the Industrial Engineering Study Program

To become an excellent industrial engineering program in the application of science and technology in the field of industrial engineering that has the character of national defense in 2026.

Mission of Industrial Engineering Study Program

- a. Organizing quality education in the field of manufacturing system design and industrial management with the character of State Defense
- b. Carrying out research to develop the field of manufacturing system design and environmentally sound industrial management.
- c. Organizing community service, to solve the problems of community life.
- d. Developing cooperation with government and private institutions to support the implementation of the Tri Dharma of Higher Education.

Objectives of the Industrial Engineering Study Program

1. Producing graduates who have competence in the field of manufacturing system design and industrial management with the character of Bela Negara.

2. Produce research to develop the field of manufacturing system design and industrial management.
3. Produce community service products to help real problems in people's lives.
4. Realizing cooperation with government and private institutions to support the implementation of the Tri Dharma of Higher Education.

3. Main Competencies of Industrial Engineering Discipline

The main competencies of the Industrial Engineering Discipline are as follows:

- a. Able to identify, formulate and solve problems of design, operation and repair of integral systems consisting of humans, machines, materials, energy and information creatively by using analytical, computational and or experimental basic tools.
- b. Able to implement design results and be able to control their impact on social and environmental issues, both on a local and global scale.
- c. Able to adapt to the development of new techniques and analytical tools in carrying out their industrial-engineering profession.
- d. Ability to communicate and work effectively.
- e. Understand, realize and carry out professional and ethical responsibilities.

4. Structural Officers of the Industrial Engineering Study Program

1. Coord. Study Program : Dr. Dira Ernawati, ST, MT
2. Head of Production Systems and Ergonomics : Ir. H. Akmal Suryadi, MT
3. Head of Industrial Statistics and Management : Dwi Sukma D., ST., MT

Industrial Engineering Study Program has 22 permanent lecturers with educational qualifications: Doctor 4 people; Master: 18 people (2 people are currently studying Doctoral) and several non-permanent lecturers who come from ITS, Unesa and practitioners.

Permanent Lecturers in Industrial Engineering

NO	NAME	JOB FUNCTIONAL	DESCRIPTION
1	Dr. Ir. Minto Waluyo, MM	Head Lector	Certified lecturer
2	Dr. Dira Ernawati, ST, MT	Lecturer	Certified lecturer
3	Dr. Farida Pulansari, ST.MT.IPM	Lecturer	Certified lecturer
4	Ir. Yustina Ngatilah, MT.	Head Lector	Certified lecturer
5	Ir. Moch. Tutuk Safirin, MT.	Head Lector	Currently studying for a Master's degree
6	Ir. H. Budi Santoso, MMT.	Head Lector	Certified lecturer
7	Ir. Hj Sumiati, MT.	Head Lector	Certified lecturer
8	Ir. Hj. Rr. Rochmoeljati, MMT.	Head Lector	Certified lecturer
9	Ir. H. Handoyo, MT	Lecturer	Certified lecturer
10	H. Didi Samanhudi, MMT.	Lecturer	Certified lecturer
11	Endang Pudji Widjajati, MM. MMT.	Lecturer	Certified lecturer
12	Ir. Iriani, MMT	Lecturer	Certified lecturer
13	Ir. Erlina Purnamawati, MT	Lecturer	Certified lecturer
14	Ir. Rusindiyanto, MT	Lecturer	Certified lecturer
15	Ir. Joumil Aidil SZS. MT	Lecturer	Currently studying for a Master's degree
16	Ir. H. Akmal Suryadi, MT	Lecturer	Certified lecturer

17	Enny Ariyani ST, MT	Lecturer	Certified lecturer
18	Dwi Sukma D, ST. MT.	Expert Assistant	Certified lecturer
19	Kinanti Resmi Hayati, S.Hum., M.A.	Teaching Personnel	-
20	Tranggono, ST, MT.	Teaching Personnel	-
21	Nur Rahmawati, ST, MT.	Teaching Personnel	-
22	Isna Nugraha ST, MT	Teaching Personnel	-
23	Mega Cattleya Prameswari Annissaa Islami, SST, MT	Teaching Personnel	-
24	Rizqi Novita Sari, S.ST., MT.	Teaching Personnel	-
25	Sinta Dewi, ST, MT.	Teaching Personnel	-
26	Yekti Condro Winursito, ST, MSc	Teaching Personnel	-
27	Dr. Nailul Hasan, S.Si.	Teaching Personnel	-

5. Curriculum

SEMESTER I

NO	CODE	SUBJECT	CREDIT	PREREQUISITES
1	TI141108	Engineering Drawing Practical. Engineering Drawing	2 1	-
2	TI141101	Engineering Materials Knowledge	2	-
3	UV21007	Pancasila Education	2	-
4	FT141105	Computer Programming Practice. Programming. Computer	2 1	-
5	FT141111	Calculus I	2	-
6	FT 141104	Physics	2	-
7	TI141102	Introduction to Industrial Engineering	2	-
8	TI141103	Introduction to Economics	2	-
9	TI141165	Linear Algebra	2	-
		Total	20	

SEMESTER II

NO	CODE	SUBJECT	CREDIT	PREREQUISITES
1	TI141166	Optimization Math	2	Linear Algebra
2	TI141112	Cost Analysis	2	Introduction to Industrial Engineering, Introduction to Economics
3	UV21009	Bahasa Indonesia	2	-
4	UV21008	Civic	2	-
5	FT 141112	Calculus II	2	Calculus I
6	TI141104	Manufacturing Process Practical Manufacturing Process	2 1	Knowledge. Engineering Materials
7	TI141105	Industrial Statistics I	2	Introduction to Industrial Engineering

8	FT 141109	Advanced Physics Practical. Advanced Physics	2 1	Physics
9	TI141111	Ergonomics	2	Introduction to Industrial Engineering
		Total	20	

SEMESTER III

NO	CODE	SUBJECT	CREDIT	PREREQUISITES
1	TI141109	Industrial Statistics II Practical. Industry Statistics	2 1	Industrial Statistics I
2	FT141107	Engineering Economics	2	Cost Analysis
3	TI141113	Industrial Psychology	2	-
4	TI141119	Work System Design	2	Manufacturing Process
		Practical. Work System Design	1	
5	TI141115	Operational Research I	3	Optimization Math
6	TI141117	System Modeling	2	Computer Programming
7	TI141104	Engineering Mechanics	2	Advanced Physics
8	TI141123	Planning. Control Production	3	Manufacturing Process
		Total	20	

SEMESTER IV

NO	CODE	SUBJECT	CREDIT	PREREQUISITES
1	TI141129	Layout Design Facilities	3	Work System Design
2	TI141128	Operational Research II Practical. Industry Optimization	2 1	Operational Research I
3	TI141132	Supply Chain System	2	Planning. Control Production
4	TI141121	Control and Quality Assurance	3	Industrial Statistics II
5	TI141125	Management Information System Practical. Driver's license	2 1	System Modeling
6	TI141122	Organization and Management Industrial Company	2	Industrial Psychology
7	FT141113	Research Methodology	2	Bahasa Indonesia
8	TI141127	Computer Simulation Practical. Computer Simulation	2 1	System Modeling
		Total	21	

SEMESTER V

NO	CODE	SUBJECT	CREDIT	PREREQUISITES
1	TI141167	Enterprized Resource Planning	2	Supply Chain System
2	TI141126	Performance Management	2	Organization and Management Industrial

				Company
3	UV21011	State Defense Education	3	-
4	TI141139	Productivity Analysis	2	Cost Analysis
5	TI141137	Value Engineering	2	Industrial Statistics II
6	TI141124	Decision Analysis	2	Operational Research II
7	TI141135	Industrial Environmental System	2	-
8	TI141159	Risk Management	2	Control and Assurance Quality
		Total	17	

SEMESTER VI

NO	CODE	SUBJECT	CREDIT	PREREQUISITES
1	-	Excursion Study	0	-
2	TI141168	Analysis and Design Company	3	Computer Simulation
3	TI141131	Integrated Production System Practical. Integrated Sispro	2 1	Planning. Control Production
4	TI141140	Project Management	2	Operational Research II
5	UV21013	Leadership	2	-
6	TI141138	Maintenance System	2	Decision Analysis
7	UV21001 UV21002 UV21003 UV21004 UV21005 UV21006	Islam Christianity Catholicism Hinduism Buddhism Confucianism	2	-
8	TI141148	Health and Safety Work	2	Industrial Environmental System
9	TI141130	Design and Development of Products	2	Work System Design
		Total	18	

SEMESTER VII

NO	CODE	SUBJECT	CREDIT	PREREQUISITES
1	UV21010	English	3	-
2	FT141108	Fieldwork Practice	2	Research Methodology, 100 CREDITS
3	V141115	Community Services	2	100 CREDITS
4	UV21012	Entrepreneurship Practical. Entrepreneurship	2 1	Analysis and Design Company
Manufacturing Systems Area of Expertise				
5	TI141169	Sustainable Manufacturing	2	
6	TI141147	CAD/CAM	2	
7	TI141145	Dynamic System	2	
8	TI141170	Concurrent Engineering	2	
Industrial Management Area of Expertise				
	TI141143	Strategy Management		
	TI141142	Financial Management		
	TI141141	Marketing Management		
	TI141150	Service Management		
9	Elective Course I		2	
	TI141137	Quality Engineering		
	TI141171	Data Mining		<i>PERMADI Class</i>
	TI141172	Kansei Ergonomics		
	TI141173	Human Factors in Product Design		
	TI141174	Lean Manufacturing		<i>PERMADI Class</i>
	TI141175	Industry Cluster		

	TI141161	Industrial Economy		<i>International Class</i>
	TI141176	Distribution Management		
	TI141177	Demand and Revenue Management		<i>International class</i>
	TI141178	Transportation Management		<i>PERMADI Class</i>
		Total	20	

SEMESTER VIII

NO	CODE	SUBJECT	CREDIT	PREREQUISITES
1	TI141164	DESCRIPTION	6	Research Methodology, 120 CREDITS
2	Elective Course II		2	
	TI141162	E-Business		<i>International Class</i>
	TI141179	Six Sigma		<i>PERMADI Class</i>
	TI141157	Experiment Design		
	TI141180	Cognitive Ergonomics		<i>PERMADI Class</i>
	TI141181	Human Computer Interaction		
	TI141182	Total Ergonomics		
	TI141183	Business Process Engineering		
	TI141184	Material Management and Procurement		<i>PERMADI Class</i>
	TI141185	Big Data Management		
	TI141186	Sustainable Supply Chain Management		<i>International Class</i>
		Total	8	

Total credits of Industrial Engineering Study Program, Faculty of Engineering UPN Veteran East Java: 144 credits

NOTE:

1. During the MBKM Curriculum adjustment period (*1 academic year), all prerequisites in the course are OFF.
2. Students in the 5th and 6th semesters are given the opportunity to participate in study exchanges outside the study program both within through the PERMADI / PERMATA SAKTI / PERMATA 3 UPN program, all of which will be arranged by the Study Program and to follow it must be with the knowledge of the Study Program so that the MK taken can be recognized and converted. The total credits that can be taken are 20 credits so that they can be recognized as MBKM activities.
3. 7th semester students can take part in MBKM programs such as Merdeka Internship, Teaching Campus, KomCad, etc. with a maximum conversion of 20 credits (*adjusted to the total hours of activities and the burden of activities carried out). MKs that can be converted are those in semester 7.
4. All MBKM activities that will be followed MUST be reported to the MBKM Team and Study Program.

**Group of Competency Areas of Industrial Engineering Study Program
Lecturers**

Modeling System Optimization	Ergonomics and Product Design	System and Process Manufacture
Dwi Sukma, ST, MT	Ir. Rusindiyanto, MT	Ir. Endang PW, MMT
Ir. Rr. Rochmoeljati, MMT	Ir. MT. Safirin, MT	Ir. Joumil Aidil, MT
Ir. Handoyo, MT	Ir. Akmal Suryadi, MT	Ir. Erlina P, MT
Ir. Yustina Ngatilah, MT	Tranggono, ST, MT	Yekti Condro Winursito, ST, MT
Ir. Sumiati, MT	Rizqi Novita Sari, S.ST., MT	
Eddy Ariyani, ST, MT	Mega Cattleya Prameswari, S.ST., MT	

Business Management and Entrepreneurship	Logistics and Supply Chain Management
Dr. Ir. Minto Waluyo, MT	Dr. Dira Ernawati, ST, MT
Iriani, MMT	Dr. Farida Pulansari, ST, MT
Ir. Didi Samanhudi, MMT	Nur Rahmawati, ST, MT
Ir. Budi Santoso, MMT	Isna Nugraha, ST, MT
	Sinta Dewi, ST, MT

**COURSE CONVERSION
CURRICULA FY. 2016/2017 AND CURRICULUM TA. 2021/2022 INDUSTRIAL
ENGINEERING STUDY PROGRAM
UPN VETERAN EAST JAVA**

NO	OLD CURRICULUM 2016-2020			NEW CURRICULUM 2021-2022			DESCRIPTION
	Subject name	Credit	SMT	Subject name	Credit	SMT	
1	English I	2	1	English	3	5	Move to 5th semester + become 3 credits
2	Knowledge Engineering Materials	2	1	Knowledge Engineering Materials	2	1	Not changed
3	Pancasila Education	3	1	Pancasila Education	2	1	into 2 credits
4	Programming Computer	3	1	Programming Computer	3	1	Not changed
5	Calculus I	2	1	Calculus I	2	1	Not changed
6	Physics	2	1	Physics	2	1	Not changed
7	Introduction Industrial Engineering	2	1	Introduction Industrial Engineering	2	1	Not changed
8	Introduction to Economics	2	1	Introduction to Economics	2	1	Not changed
9	English II	2	2				Court removed
10	Religion	3	2	Religion	2	6	into 2 credits
11	Mechanics Engineering	2	2	Mechanics Engineering	2	3	Move to semester 3
12	Civic	3	2	Civic	2	2	into 2 credits

OLD CURRICULUM 2016-2020				NEW CURRICULUM 2021-2022			DESCRIPTION
NO	Subject name	Credit	SMT	Subject name	Credit	SMT	
13	Calculus II	2	2	Calculus II	2	2	Not changed
14	Process Manufacturing I	2	2	Process Manufacturing	2	2	Not changed
15	Database	2	2	Optimization Math	2	2	Database course is deleted and replaced with Mathematics course optimization
16	Advanced Physics	3	2	Advanced Physics	3	2	Not changed
17	Machine Elements	2	3	Value Engineering	2	5	Mechanical Elements course deleted and replaced with Value Engineering course. + moved 5th semester
18	Process Manufacturing II	2	3				Court removed
19	Prac. Process Manufacturing	1	3	Prac. Process Manufacturing	1	2	Move to semester 2
20	Engineering Drawing	2	3	Engineering Drawing	3	1	Change into 3 credits and move to 1st semester
21	Statistics Industry I	2	3	Statistics Industry I	2	2	Move to semester 2
22	State Defense	3	3	State Defense	3	5	Move to 5th semester
23	Matrices & Vector Space	2	3	Linear Algebra	2	1	Change name + move to semester 1
24	Ergonomics	2	3	Ergonomics	2	2	Move to semester 2
25	Cost Analysis	2	3	Cost Analysis	2	2	Move to semester 2
26	Psychology Industry	2	3	Psychology Industry	2	3	Not changed
27	Management. Human Resources	2	4	Org & Management Industrial Company	2	4	Name Change
28	Economy Engineering	2	4	Economy Engineering	2	3	Move to semester 3
29	Research Operational I	3	4	Research Operational I	3	3	Move to semester 3
30	Introduction to Business & Management	2	4	Project Management	2	6	Introduction to Business & Management course is deleted and replaced by Project Management course & move to 6th semester
31	Modeling System	2	4	Modeling System	2	3	Move to semester 3
32	Statistics Industry II	3	4	Statistics Industry II	3	3	Move to semester 3
33	Information System Managem	3	4	Information System Managem	3	4	Not changed

OLD CURRICULUM 2016-2020				NEW CURRICULUM 2021-2022			DESCRIPTION
NO	Subject name	Credit	SMT	Subject name	Credit	SMT	
	ent			ent			
34	Measurement & Design. Work	3	4	Work System Design	3	3	Rename & Move to 3rd semester
35	Design	2	4	System	2	6	Design course
	Industrial engineering			care			Industrial engineering deleted and replaced by Maintenance system & moved to the next semester 6
36	Control & Assurance Quality	3	5	Control & Assurance Quality	3	4	Move to 4th semester
37	Organization Design	2	5	Risk Management	2	5	Organizational Design course is deleted and replaced with MK Management Risk
38	Design. Production	3	5	Design. Production	3	3	Move to semester 3
39	Analysis Decision	2	5	Analysis Decision	2	5	Not changed
40	Management Performance	2	5	Management Performance	2	5	Not changed
41	Industry Simulation	3	5	Computer Simulation	3	4	Rename & Move to semester 4
42	Research Operational II	3	5	Research Operational II	3	4	Move to semester 4
43				Analysis Productivity	2	5	New course
44	Layout & Facilities Factory	3	6	Layout Design Facilities	3	4	Move to 4th semester
45	French. Development. Products	3	6	French. Development. Products	2	6	Move to semester 6 & become 2 credits
46	Production System	3	6	Production System Integrated	3	6	Rename
47	Management Supply Chain	2	6	Chain System Supply	2	4	Move to semester 4
48	Analysis Business Feasibility	2	6	Analysis & Company Design	3	6	Rename
49	Methodology Research	2	6	Methodology Research	2	4	Move to semester 4
50	Management Environment	2	6	System Environment	2	5	Rename & Move to semester 5
				Industry			
51	Bahasa Indonesia	3	6	Bahasa Indonesia	2	2	Move to semester 2 & become 2 credits
52	Excursion Study	0	6	Excursion Study	0	6	Not changed
53				Safety & Occupational Health	2	6	New course

OLD CURRICULUM 2016-2020				NEW CURRICULUM 2021-2022			DESCRIPTION
NO	Subject name	Credit	SMT	Subject name	Credit	SMT	
54	Fieldwork Practice	2	7	Fieldwork Practice	2	7	Not changed
55	Community services	2	7	Community services	2	7	Not changed
56	Elective Subjects Required I	2	7	Elective Subjects Required I	2	7	Not changed
57	Elective Subjects Mandatory II	2	7	Elective Subjects Mandatory II	2	7	Not changed
58	Elective Subjects Mandatory III	2	7	Elective Subjects Mandatory III	2	7	Not changed
59	Elective Subjects Mandatory IV	2	7	Elective Subjects Mandatory IV	2	7	Not changed
60	Elective Subjects I	2	7	Elective Subjects I	2	7	Not changed
61				Enterprized Resource Planning	2	7	New course
62	Elective Subjects II	2	8	Elective Subjects II	2	8	Not changed
63	Thesis	5	8	Final Project	6	8	Rename & to 6 credits
64	Entrepreneurs hip	3	8	Entrepreneurship	3	6	Move to Semester 6
65	Leadership	3	8	Leadership	2	6	Move to Semester 6 & to 2 credits
	Total credits	144		Total credits	144		

Description

 : Conversion course

 : New courses

**INDEPENDENT LEARNING CAMPUS (*Merdeka Belajar Kampus Merdeka*, MBKM)
CURRICULUM TREE INDUSTRIAL ENGINEERING STUDY PROGRAM TA. 2021/2022**



VIII. FOOD TECHNOLOGY STUDY PROGRAM

VIII.1. INTRODUCTION

The Food Technology study program is under the Faculty of Engineering - UPN "Veteran" East Java. The basis of establishment is based on the Rector's Decree No. SKEP/254/VII/1993 and ratified by the Joint Decree of the Indonesian Minister of Education and Culture and the Indonesian Minister of Defense and Security No. Kep/0307/U/1994 - 10/XI/1994 dated November 29, 1994.

In 1995, the Food Technology Study Program obtained registered status based on the Decree of the Director General of Higher Education of the Ministry of Education and Culture No. 024/Dikti/Kep/1995 and based on the Decree of BAN-PT of the Ministry of Education and Culture No. 0444/AK-I-III- 033/UPNPA/XI/2000 dated November 23, 2000, the Food Technology Study Program was accredited (B). Since January 26, 2006, based on the Decree of BAN-PT Depdiknas RI No. 028/BAN-PT/Ak-IX/S1/I/2006, the Food Technology Study Program has been accredited (A) for 5 years from the date of determination. Since January 21, 2008 with No. 355/D/T/2008 the Food Technology Study Program has obtained an extension of the operational permit under the Faculty of Industrial Technology. In 2011 it has obtained an operational permit from BAN PT, in 2016 the Food Technology Study Program with an Accreditation score of B. In 2018 re-accreditation was carried out, with an accreditation score of B.

The Food Technology Study Program has a cumulative study load of at least 145 credits with a standard cumulative length of study, 8 to 14 semesters. The scientific specifications provided include an understanding of agricultural products as biological materials, knowledge of the main types of processes in converting biological materials into commodities, knowledge of processing tools and machinery, the ability to discuss problems in commodity processing aspects, the ability to carry out process engineering for new products and how to operate processing units as systems and optimization.

VIII.2. VISION AND MISSION

1. Vision

To achieve excellence in the field of food technology and industry by utilizing local resources, gaining national and international recognition, and fulfilling the role of State Defense by 2029.

2. Mission

1. Organize education and develop skilled human resources in the field of food technology and industry with entrepreneurial aspirations, while prioritizing the values of state defense.
2. Conduct research, development, and implementation of food technology innovations using local resources that adhere to national and international standards for health and food safety.
3. Carry out community service by teaching, training, and disseminating research results in the field of food technology science that utilizes local resources as much as possible.
4. Enhancing strategic cooperation among academia, society, government, and national and international food industry sectors.

VIII.3. OBJECTIVES

- a. Producing graduates who are competent in the field of food technology and industry, possess an entrepreneurial spirit, and uphold the values of state defense.
- b. Producing graduates who possess the necessary skills to conduct research, develop, and apply innovative food technologies that satisfy local resources' health and food safety aspects, alongside adhering to national and international quality standards.
- c. Producing graduates capable of providing community service through teaching, training, and the sharing of research findings utilizing food science technology that maximizes the use of local resources.
- d. Producing graduates who can effectively communicate and establish cooperation within the community, government, as well as the national and international food industry sectors to build partnerships in the field of food technology.

VIII.4. PROFILE OF GRADUATES

The profile of graduates of the Food Technology Study Program is a food technology scholar with noble character and high integrity who is competent in the field of food technology based on local food ingredients of the archipelago.

VIII.5. STUDY PROGRAM LEARNING OUTCOMES

The Graduates Learning Outcomes of Food Technology Study Program of the UPN "Veteran" East Java meet 4 (four) aspects of competence, namely (1) attitudinal aspects, (2) knowledge aspects, (3) general skills aspects and (4) special skills aspects. Learning outcomes of the Food Technology Study Program are as follows:

LEARNING OUTCOMES

1) Attitude Aspect

1. Be devout to God Almighty and be able to show a religious attitude.
2. Uphold human values in the performance of duties based on religion, morality and ethics.
3. Contribute to the improvement of the quality of life in society, nation, state, and the progress of civilization based on Pancasila.
4. Play a role as a citizen who is proud and loves the country, has nationalism, and is responsible to the state and the nation.
5. Respect the diversity of cultures, views, religions and beliefs, and the original opinions or insights of others.
6. Cooperate and have social sensitivity and concern for society and the environment.
7. Be law abiding and disciplined in social and governmental life.
8. Internalize academic values, norms and ethics.
9. Demonstrate an attitude of responsibility for independent work in the field of food.
10. Internalize the spirit of independence, struggle and entrepreneurship.

2) Knowledge Aspect

1. Basic properties of various food ingredients
2. Control in the food processing process.
3. Food based on characteristics ingredients raw materials, ingredients, food additives and their effect on product characteristics food produced.
4. Explain the principles of food biochemistry as it relates to metabolism in the body.
5. Explain the basic concepts of nutrition science, the relationship between food consumption and nutritional and health status, and the differences between nutrients and functional foods for health.
6. Explain various principles of applied food science, including sensory analysis, packaging techniques, quality assurance and food safety, and current food issues.
7. Explain the principles of management science and industrial engineering to maintain food quality.

3) General Skills Aspect

1. Able to apply logical, critical, systematic, and innovative thinking in the context of developing or implementing science and/or technology in accordance with their field of expertise;
2. Able to perform independent, quality, and measurable performance;
3. Able to think critically, identify the root of problems and their solutions comprehensively, and make appropriate decisions based on analysis of information and data in accordance with their field of expertise;
4. Able to examine the implications of the development or implementation of science and technology in accordance with their expertise based on scientific principles, procedures and ethics in order to produce solutions, ideas, designs, compile scientific descriptions of the results of their studies in scientific work reports.
5. Able to maintain and develop work networks with lecturers, colleagues, peers both inside and outside the institution;
6. Able to convey scientific ideas in an academic environment and scientific forums.
7. Able to communicate Indonesian and international languages orally and in writing properly.

4) Specific Skills Aspect

1. Have the ability to select, characterize, and perform various chemical analysis techniques on foods as needed.
2. Have the ability to identify and analyze biological and microbiological processes in foods and processing materials to maintain food quality and safety.
3. Have the ability to design food processing processes based on the characteristics of ingredients, use of tools, and operating principles in each process.

4. Possess skills in laboratory techniques and commonly applied food evaluation according to the principles of food biology, microbiology, chemistry and biochemistry.
5. Have the ability to analyze food components, nutritional values, active ingredients, and changes due to processing and storage, as well as their functions as functional foods for health.
6. Have the ability to apply food science principles to practice and real-world conditions in the food industry and develop them into innovative products.
7. Apply food safety principles and analyze critical points in raw materials and food processing.
8. Ability to identify and utilize business opportunities and apply process engineering in the agricultural product processing industry, utilize sources of information, and be professional and committed to ethical values.
9. Ability to apply the principles of management and business planning and management and environmental management in the food industry.
10. Apply the principles of statistics and computers in the food industry.

VIII.6. FIELD OF WORK FOR FOOD TECHNOLOGY GRADUATES

General job opportunities for Food Technology graduates in:

1. Government Agencies:
 - Department of Commerce,
 - Department of Agriculture,
 - Department of Health,
 - Food Security Agency,
 - Food and Drug Monitoring Agency,
 - LG.
2. In the Food Industry:
 - Inds. Oils and Flour,
 - Inds. Food Processing,
 - Inds. Infant and Child Feeding,
 - Inds. Catering,
 - Inds. Canning,
 - Inds. Food Freezing,
 - Inds. Bakery,
 - Inds. Beverage.
3. Others:
 - Consultant, Teacher & Researcher,
 - Nutritionist,
 - Entrepreneurship,
 - Banking.

Fields handled in the world of work:

Research and Development (R&D), Waste Management, Quality Control (QC) and Quality Assurance (QA), Food analyst, Production, Planning, Inventory Control, Food Processing, Packaging and Storage, Food Marketing.

VIII.7. LECTURERS OF FOOD TECHNOLOGY STUDY PROGRAM

No.	N A M A	JOB
1	Dr. Dra. Jariyah, MP	Dean of the Faculty of Engineering
2	Dr. Ir. Sri Winarti, MP	Study Program Coordinator
3	Dr. Dedin F. Rosida, STP. MKes.	Head of LPPM
4	Dr. Rosida, STP. MP.	Lab Head. Food Engineering
5	Ir. Ulya Sarofa, MM	Lab Head. Basic Food
6	Dr. Drh. Ratna Yulistiani, MP	Lecturer
7	Anugerah Dany P. S.TP, MP, M.Sc	Lecturer
8	Riski Ayu Anggreini, S.TP, M.Sc	Lecturer
9	Luqman Agung Wicaksono, S.TP, MP	Lecturer
10	Andre Yusuf Trisna Putra, S.TP., M.Sc	Lecturer
11	Dr. Yunita Satya Pratiwi, SP, MKes.	Lecturer
12	Ahmad Suyuti, SPd, MSi.	Lecturer
13	Dina Mustika Rini, S.TP., M.Sc.	Lecturer
14	Hadi Munarko, S.TP., M.Sc.	Lecturer
15	Dr. Yushinta Aristina Sanjaya, SPi., MP.	Lecturer
16	Ifwarisan Defri, S.TP., M.Si	Lecturer
17	Rahmawati	Lecturer
18	Muhammad Alfid Kurnianti SPi.MSi	Lecturer
19	Pardi Sampe Tola, S.Si., M.Si., Ph.D.	Lecturer

STUDY COMPLETION REQUIREMENTS

Number of credits to be taken	: 145 CREDIT
Grade	: $\geq 2,0$
Duration of study	: Maximum 7 years, possible less than 4 years
Miscellaneous	: D grade maximum 25%, no E grade

FOOD TECHNOLOGY PROGRAM CURRICULUM

The curriculum, as a reference in the field of education in the Food Technology Study Program, continues to improve its quality through curriculum review based on input from alumni and stakeholders. Since the 2018/2019 academic year, the Food Technology Study Program has implemented the "KKNI-Based Curriculum" (with a total of 145 credits), which refers to the Regulation of the Minister of Education and Culture of the Republic of Indonesia No. 49 of 2014 on National Higher Education Standards. The Indonesian National Qualification Framework, hereinafter abbreviated as KKNI, is a competency qualification framework that can juxtapose, balance, and integrate between the fields of education and the fields of job training and work experience in order to provide recognition of work competencies in accordance with the structure of work in various sectors.

COURSE DISTRIBUTION

SEMESTER I

NO.	COD E	SUBJECT	CREDIT
1.	UV141111	Basic English	2
2.	UV141107	Pancasila Education	2 + 1
3.	UV141101 UV141102 UV141103 UV141104 UV141105 UV141106	Islamic religion Christianity Catholicism Hinduism Buddhism Khong Hu Cu religion	2 + 1
4.	FT141101	Calculus 1	3
5.	FT141103	Physics	3
6.	FT141104	Basic Chemistry	2+1
7.	TP141101	Biology	2+1
TOTAL			20

SEMESTER II

NO.	CODE	SUBJECT	CREDIT
1.	UV141109	Bahasa Indonesia	2 + 1
2.	UV141108	Civic	2 + 1
3.	FT141102	Calculus II	3
4.	TP141102	General Microbiology	3
5.	TP141103	Introduction to food technology	2
6.	TP141104	Advanced Chemistry	2
7.	TP141105	Food Ingredient Knowledge	3 + 1
8.	UV141112	Advanced English	2
TOTAL			22

SEMESTER III

NO.	CODE	SUBJECT	CREDIT
1.	TP141106	Food Biochemistry	3 + 1
2.	TP141107	Chemical Analysis	2
3.	TP141108	Food & Processing Microbiology	3 + 1
4.	TP141109	Physical Chemistry and Colloids	2
5.	TP141110	Food Industry Management	3
6.	UV141110	State Defense	2 + 1
7.	TP141118	Principles of Food Engineering	2
8.	TP141115	Food Industry Operations Unit I	3
TOTAL			23

SEMESTER IV

NO.	CODE	SUBJECT	CREDIT
1	TP141114	Nutrition Science	3
2	TP141126	Food Industry Operations Unit II	3 + 1
3	TP141116	Food Chemistry	3
4	TP141117	Food Analysis	3 + 1
5	FT141106	Research Methodology	2
6	TP141123	Statistics	3
7	TP141211 TP141212 TP141213	ELECTIVE I: - Coffee, Tea and Cocoa Processing Technology 1 - Food Service Industry - Marketing Management	2
8	TP191245 TP191246	ELECTIVE II: - Waste Utilization and Handling Technology - Food Additives and Toxicology	2

	TP191247	- Machine and Tool Design	
TOTAL			23

SEMESTER V

NO.	CODE	SUBJECT	CREDIT
1.	TP141147	Food Safety and Sanitation	2
2.	TP141124	Thermal Food Process	3
3.	FT141107	Engineering Economics	2
4.	TP141135	Food Quality Management and Control	3
5.	TP191137	Trial Design	3
6.	TP141119	Food Legislation	2
7.	TP141228 TP141230 TP191249	ELECTIVE III: - Carbohydrate Technology - Fats/Oil Technology - Archipelago Food Processing	2
8.	TP141232 TP141233 TP141234	ELECTIVE IV: - Dairy Technology - Meat and Fish Technology - Fruit and Vegetable Technology	2
9.	TP141148	Packaging and storage	3
TOTAL			22

SEMESTER VI

NO.	CODE	SUBJECT	CREDIT
1.	TP141145	Food Product Development	2
2.	TP141146	Sensory Evaluation	2 + 1
3.	UV141114	Entrepreneurship	2 + 1
4.	TP141137	Food Fermentation Technology	2
5.	TP141127	Food Processing Technology	3 + 1
6.	TP141149	Processing Industry Design	2
7.	TP141238 TP141239 TP141240	ELECTIVE V: - Food Nutrition Evaluation and Processing. - Operational Research - Functional Food	2
8.	TP141242 TP141243 TP191250	ELECTIVE VI: - Food Biotechnology - Flavoring Technology - <u>Spice and Seasoning Technology</u>	2
9.	TP191251 TP191252 TP191253	ELECTIVE VII: - <u>Bakery Technology</u> - <u>Sugarcane Processing Technology</u> - <u>Legume, Cereal and Tuber Technology</u>	2
TOTAL			22

SEMESTER VII

NO.	CODE	SUBJECT	CREDIT
1.	UV141115	Community service	2
2.	FT141108	Fieldwork Practice	2
3.	UV141113	Leadership Management	3
Total			7

SEMESTER VIII

NO.	CODE	SUBJECT	CREDIT
1.	TP141150	Thesis	6
TOTAL			6

***Total of all courses = 145 credits**

COURSE SYLLABUS

SEMESTER I

UV141111 BASIC ENGLISH

English for students is designed to develop the ability to read quickly and comprehend reading, to listen and understand, to write concisely, and to speak clearly. Introduction to vocabulary or terms commonly encountered in the field of food science and technology.

Reference:

English Specific Purpose Toefl Preparation, Longman

UV141107 PANCASILA EDUCATION

Understanding Pancasila as the fundamental value of the state, the constitutional system of the Republic of Indonesia through historical, legal, philosophical, ideological studies and understanding Pancasila as an actualization paradigm in the life of society, nation, state. Understanding of nation, state, rights and duties of citizens, state defense, democratization, archipelago concept, human rights, regional autonomy, environment, national resilience and national strategic policy.

Reference:

Fauzi A., 1981. Pancasila in historical, legal and constitutional terms.
Philosophical, UNIBRAW

Ali, et al, 1996. Pancasila Lecture Manual in Higher Education. IKAPI, Bandung
Dardji Darmodihardjo, 1991. Santiaji Pancasila National Enterprise, Surabaya

UV141109 INDONESIAN LANGUAGE

Ability to use the Indonesian language both orally (art of communication, interview, presentation) and in writing. Mastery of correct grammar and vocabulary in writing scientific papers. Topics covered: EYD; sentence structure; effective and logical sentences; paragraphs; types of writing; correspondence and scientific papers.

Reference:

M. E. Suhendar-Pien S. MKDU Indonesian Language

E. Zaenal Arifin. Speak Indonesian Correctly Drs. Soekono Wirjosoedarmo.
Indonesian grammar

FT141101 CALCULUS I

Functions, limits, derivatives of functions, continuity, differential calculus, applications of differential calculus, extreme values of functions, infinite series, limits of certain forms, indefinite integrals, integrals of rational/irrational squares, partial integrals, integral reduction formulas of rational functions, integrals and substitution methods, integral product of two trigonometric functions.

Reference:

Stroud. 1995. Mathematics. Erlangga
Schaum's series. Calculus.

FT141103 BASIC PHYSICS

Basic concepts of physics, unit system, kinematics, dynamics, Newton's laws, conservation laws, vibration, fluid mechanics, materials (heat), thermodynamics, equation of state, properties of gases, heat transfer (materials), and mass. The presentation will explain the basic concepts of physics in a simple form, followed by

examples of problems and their applications in various fields, so that it is expected to prepare students to be able to use physics in their profession and daily life.

Reference:

Giancolli, 2001, Physics, Volume 1, 5th edition, Erlangga, Jakarta. Haliday & Resnick " Physic ". John Wiley & Son Inc. Sears & Zemansky. Physics for University
Tipler, 1998, Physics for Science and Engineering, Erlangga, Jakarta.

FT141104 BASIC CHEMISTRY

Discusses stoichiometry, atomic structure, periodic table, chemical bonding and molecular structure, acid and base theory, H-ion concentration and pH, hydrolysis and anchoring mixtures, redox reactions, colligative properties of a solution, rate of reaction.

Reference:

Keenan, Kleinfelter, Wood. A. Handyana Pudjaatmaka Ph.D, 1986, Chemistry for Universities Volume 1, 6th ed, Erlangga, Jakarta
Keenan, Kleinfelter, Wood. A. Handyana Pudjaatmaka Ph.D, 1986, Chemistry for Universities Volume 2, 6th ed, Erlangga, Jakarta

BASIC CHEMISTRY PRACTICUM

Preparation of concentration, dilution, standard solution, titration, standardization, acid-alkalimetry.

Reference:

----- . 1990. Basic Chemistry. IPB
Syukri, S. 1999 "Basic Chemistry I" ITB

TP141101 BIOLOGY

Knowledge of the classification of living things, knowledge of cells and organisms, life as a whole and life at the cellular level. Function of cell organelles. Cell growth and proliferation: population growth cycle, individual (cell) growth cycle.

Reference: -

J.W. Kimball. 1987 Biology. Erlangga. Jakarta W. Yatim. Modern Biology
M. Yasin. 1989. General Biology. Bina Pustaka Tama. Surabaya

BIOLOGY PRACTICUM

Introducing the parts of a microscope and their functions and how to use them. Studying plant cell tissues, animal cells and microorganisms with preparations.

SEMESTER II

UV141101 ISLAMIC RELIGION

The study and understanding of human nature, which requires guidance in life, both individually and socially, in order to achieve happiness in this world and the hereafter. By understanding himself and the universe, which has been given rules by its Creator, the rules are called verses kauniyah and tanziliyah. These verses are explained in detail in the discussion of aqidah, shari'ah, akhlaq, and Islamic history. Emphasis is placed on the application of these teachings to daily behavior, both from the Qur'an and the Sunnah of the Prophet Muhammad SAW.

UV141108 CIVIC

Civic Education aims to develop knowledge and understanding as well as awareness of National Security Defense (HANKAMNAS) in the student environment within the framework of National Resilience (TANNAS), in addition to

helping to promote and increase awareness of National Discipline. For this reason, students are given an understanding and appreciation of introductory Civic, insight into the archipelago, national and political security defense strategies as a basis for understanding the universal people's security defense system.

FT141102 CALCULUS II

Polar coordinate system, definite integrals, indefinite integrals, applications of definite integrals, vector analysis, multiple integrals, differential equations and solving with the D operator.

Prerequisite: Calculus I

Reference:

Boyce. 1986. Calculus.

Leithold. Calculus with Analytic Geometry. Thomas Calculus and Analytic Geometry

TP141102 GENERAL MICROBIOLOGY

A study of the nature and activities of microorganisms and all their aspects, including: taxonomy, cell structure, growth, metabolism, ecology, aspects of microbes in food and industry, and an introduction to microbial genetics.

Prerequisite: Biology

Reference:

Bibek Ray. 1996. Fundamentals of Food Microbiology James M. Jay. 1986. Modern Food Microbiology.

Srikandi Fardiaz. 1992. Food Microbiology, PT Gramedia. Jakarta. Pelczar, M.J. and Reid R.D.. Microbiology

TP141103 INTRODUCTION TO FOOD TECHNOLOGY

Discusses the constituent properties of food ingredients, factors and causes of food damage, ways of preserving food ingredients, factors and methods of processing food ingredients, and their applications in the food field.

Reference:

Winarno, F.G. Fardiaz, S. Fardiaz, D. 1982. Introduction to food technology. Gramedia.

Desrosier, N.W. Food Preservation.

Winarno, F.G. Betty, S.L. Food damage and how to prevent it. Gramedia

TP141104 ADVANCED CHEMISTRY

Fundamentals of chemical-physical properties of solid, liquid, and gaseous compounds, relationship of spectra to atomic and molecular structures, chemical thermodynamics, redox reactions, hydrocarbons, functional groups and their properties. Reactions and reactivity of organic compounds, introduction to biochemistry, and aspects of environmental chemistry.

Prerequisite: Basic Chemistry I

Reference:

Fessenden & Fessenden. 1997. Organic Chemistry. Eerlangga Petrucci, R.H. and Suminar. 1993. Basic Chemistry. Erlangga

TP141105 FOOD INGREDIENT KNOWLEDGE

Understand the characteristics of food commodities including plant and animal food. Plant-based food commodities include cereals, beans, tubers, fruits, vegetables, spices, herbs, and plantation commodities.

Animal food commodities include red meat, poultry meat, milk, eggs and fishery commodities. The discussion covers the physical and chemical characteristics of food ingredients, the quality of ingredients, how to handle them, and the suitability of their application in food processing based on their characteristics.

Reference:

Syarif, R. & Irawati. 1986. Knowledge of Materials for the Agricultural Industry. IPB. Bogor.

Muchtodi Sugiyono. 1992. Science of Food Ingredients. PAU-IPB. Bogor.

Tranggono & Sutadi. 1989. Biochemistry & Post-harvest Technology. PAU- UGM

Suyitno. 1988. Testing Physical Properties of Food Ingredients. PAU- UGM

Food Ingredient Knowledge Practicum

Knowledge of fruit and vegetable foods, cereals, nuts and tubers, peeling methods, the effect of ethylene on fruit ripening, knowledge of animal foods (milk, eggs, meat and fish), testing the physical properties of food materials and products.

Prerequisite: Food Ingredient Knowledge Course

UV141112 ADVANCED ENGLISH

English for Specific Purpose Prerequisite: English I Reference:

Toefl Preparation, Longman.

SEMESTER III

TP141106 FOOD BIOCHEMISTRY

Biochemical aspects that discuss the cycle of processes experienced by living organisms, various structures and biomolecules (proteins, carbohydrates, and lipids); and their interactions in water, acid-base. Concepts about metabolism and bioenergetics that explain how organisms obtain energy through glycolysis, Krebs cycle, electron transfer, photosynthesis, pentose phosphate pathway, urea cycle, biological oxidation of fatty acids and synthesis of macromolecules (carbohydrates and lipids).

Prerequisite : General Biology

Reference:

Lehninger I & II, 1992. Harper's Fundamentals of Biochemistry, Biochemistry

David Page. Fundamentals of Biochemistry

FOOD BIOCHEMISTRY PRACTICUM

Qualitative tests and properties of food ingredients (carbohydrates, oils and fats, proteins, enzymes and starch digestion), as well as respiration and fermentation; identification of functional properties of food components (carbohydrates, proteins, fats, and micro components);

Prerequisite: Food Biochemistry Course

Reference:

TP141107 ANALYTICAL CHEMISTRY

Able to explain the general description of analytical chemistry, the basic needs of analytical equipment and its use techniques (both qualitative and quantitative), how to analyze gravimetry, volumetry, acidimetry, alkalimetry, Argentometry, permanganometry, yodometry, yodimetry. Theory of Error and Accuracy in Chemical Analysis.

Reference:

Vogel's. Text Book of Macro and Semimicro Qualitative Inorganic Analysis. Longman. NY

Vogel's. Text Book of Quantitative Inorganic Analysis. Longman. NY Day, R.A. Ir. Qualitative Analysis. Prentice Hall. ND

TP141108 FOOD MICROBIOLOGY AND PROCESSING

Microbial growth, intrinsic and extrinsic factors affecting microbial growth in food, principles of microbial counting in food; principles of fermentation processes and the role of beneficial microbes for food; the role of microbes in microbiological damage to various types of food and processed products, as well as pathogenic microbes in food and diseases caused by pathogens and principles for controlling these microbes.

Prerequisite: General Microbiology

Reference:

FOOD MICROBIOLOGY PRACTICUM

Media sterilization and aseptic techniques, microbial growth medium, isolation and culture transfer techniques, microbial identification and characterization, microscopic observations (cell morphology of yeast, bacteria, fungi), microbial calculations (cup count, MPN, haemocytometer, spectroscopy), microbial growth factors, growth curves, sanitation and personal hygiene tests. environmental influences on microbes, nata de coco, tempe and tape fermentation.

Prerequisite: Food Microbiology & Processing Microbiology Courses

Reference:

Bibek Ray. 1996. Fundamental Food Microbiology James M. Jay. 1986. Modern Food Microbiology.

Srikandi Fardiaz. 1992. Food Microbiology, PT Gramedia. Jakarta. Pelczar, M.J. and Reid R.D.. Microbiology

TP141109 PHYSICAL CHEMISTRY AND COLLOIDS

Understand about the form of an object, the laws of thermodynamics, solutions and colligative properties of solutions, colloidal systems, emulsions, froth, interfacial tension, diffusion phenomena, osmosis, aggregate formation, nucleation, crystallization and rheological properties, especially food ingredients.

Prerequisite: Physics, Basic Chemistry

Reference:

Athius. P. W. Physical Chemistry. EBSOU

Fenema, O. R, 1999. Food Chemistry. Marcell Dekker.

Maron, S. H. and Lando, J.B. Fundamentals of Physical Chemistry. Macmilan Bird, Tony. Physical Chemistry for University. Gramedia, Jakarta

TP141110 FOOD INDUSTRY MANAGEMENT

Understand the concept and application of MIP, SOP, food industry management approach, quality control management, application of HACCP, CPM and PERT, food product quality, strategic planning, marketing and marketing mix.

UV141108 STATE DEFENSE

Understanding of the values, norms, ethics, moral character and national identity, as well as having the character of defending the State, among others: belief in the supremacy of Pancasila, love for the country, aware of rights and obligations, willing to sacrifice and have the initial ability to defend the State. Know and understand the factors that affect the awareness of State defense, national vigilance originating from within and outside the country, policies for fostering awareness of State defense, national vigilance originating from within and outside the country.

State defense awareness development policy, understanding good, clean and authoritative government and governance.

Prerequisite: Pancasila Education, Citizenship.

Reference:

Agus Surata, et al, 2007. Widya Mwat Yasa, UPN Veteran Yogyakarta. Compilation team, 2007. State Defense Awareness Education (Guidelines for Lecturer of Citizenship Education). Director General of Pothan Ministry of Defense, Jakarta.

Puspito Nanang T. et al, et al, 2011. Anti-Corruption Education for Higher Education, Publisher of the Ministry of Education and Culture of the Republic of Indonesia, Jakarta.

Soemarsono et al, 2005. Citizenship Education. PT. Gramedia, Jakarta. Compilation Team. Basic State Defense, 2006. Publisher of Directorate General of Defense

Ministry of Defense

TP141212 FOOD SERVICE INDUSTRY

Understand and apply the planning of a food service business in terms of quality, nutrition, and economics, including menu planning, provision of ingredients, processing, and preparation for serving, computerization of service systems, and sanitation of the processing process of provision / mass production.

Reference:

Anonimous, 1997. Food Product. UPN "Veteran".

Bagus. PS. 1996. Kitchen Planning. Indonesian Tourism Management.

Bagus. PS. 1997. Culinary Knowledge. Indonesian Tourism Management.

Ministry of Health. RI. 1995.

Regulation Minister of Health RI No. 304/MENKES/PER/IV/1989 on Health Requirements for Restaurants and Eateries and its Implementation Guidelines. Ministry of Health.

June PP and monica. 1997. West & Wood's. Introduction to Food service. Upper Saddle, River. New Jersey. Colombus Ohio

Marsum, WA. 1999. Restaurants and their problems. Andi Ofset Yogy.

TP141211 FOOD INDUSTRY CROP TECHNOLOGY

Discusses chocolate (basic processing and further processing), tea picking system, tea processing, factors affecting tea quality, sugarcane harvesting criteria, how to calculate sugarcane yield, sugarcane processing, stages of processing coffee, oil palm nutmeg, coconut, pepper, candlenut, cloves, ginger, rosella cinnamon and vanilli.

Reference:

Tumpal HS, 2010. Cacao cultivation, self- help, Indonesian coffee and kako research center Haryadi,s 2017. Chocolate technology, UGM press

TP141213 MARKETING MANAGEMENT

Understand the principles, elements and factors that influence marketing, planning, and marketing strategies.

Reference:

Philip Kotler, 1993, Marketing Management Volume I & II, Erlamngga Jakarta David

J. Scaffner et al, 1998, Food Marketing Mc. Growhill

SEMESTER IV

TP141114 NUTRITION SCIENCE

Studying the relationship between nutrition and health, which includes the function of food intake in meeting nutritional needs for growth, maintenance and maintaining optimal health. The materials studied include: digestive system, physiology of

nutrients (carbohydrates, fiber, fat, protein, vitamins, minerals, and water); energy, nutritional adequacy number (RDA), and malnutrition.

Prerequisite: Food Biochemistry

Reference:

Sediaoetama, A.D. 1991. Nutrition Science. Dian Rakyat. Linder, M.C. Biochemistry of Nutrition & Metabolism. UI Press Zuheid Noor, 1990. Biochemistry of Nutrition. PAU-UGM Suhardjo, et al. Principles of Nutritional Science. PAU-IPB Bogor. Poerwoto, S. and A. Djaeni. 1985. Nutrition Science. Dian Rakyat. Winarno F.G. 1988. Food Chemistry and Nutrition. Gramedia.

TP141115 FOOD INDUSTRY OPERATIONS UNIT I

Discusses fluid flow systems (both compressible and non-compressible), fluid flow measurement (various measuring instruments, applications and calculations), mixing and emulsification, material size reduction and mechanical separation (sedimentation, centrifugation and filtration).

Reference:

Earle, RR. 1983. Unit Operation and food processing. Pergamon. Oxford, New york. Toronto
Boma Wikantoso. 1983. Unit of Operation in Food Process. PAU-UGM Early, R.L. 1983. Unit Operation in Food Processing. Pergamon Press Suyitno. 1989. Food Engineering. PAU-UGM
Boma Wikantoso. 1983. Unit of Operation in Food Process. PAU-UGM
Early, R.L. 1983. Unit Operation in Food Processing. Pergamon Press Suyitno. 1989. Food Engineering. PAU-UGM

TP141116 FOOD CHEMISTRY

Understanding includes chemical structure, physico-chemical properties, chemical reactions, role/function of chemical components in food ingredients and products including water, carbohydrates, fats, proteins, enzymes, and pigments. Changes in the physico-chemical characteristics of food (molecules, granules and processed products) due to processing in relation to chemical changes in these food components. Interactions between components in food products are also discussed.

Prerequisite: Advanced Chemistry

Reference:

Winarno, F.G. 1991. Food Chemistry and Nutrition. Gramedia.
Belitz HD and Grosch W. 1996. Food Chemistry. 2ndnd ed. Springer-Berlin Branen AL, Davidson PM and salminen S. 1990. Food Additives. Marcel Dekker Inc. New York.
Fennema OR. 1996. Food Chemistry. Marcel Dekker, Inc. New York
Heath HB and Reineccius G. 1986. Flavor Chemistry and Technology. An Avi Book. New York.
Fish R. 1996. The Maillard Reaction. New York: J. Wiley & Sons Nakai S and Modler W. 1996. Food Protein. VCH Publ. New York.

TP141117 FOOD ANALYSIS

The use of chemical and physical analysis techniques for the characterization of food ingredients and products; chemical analysis includes analysis of the composition of food ingredients including analysis of water, ash, carbohydrates, protein, fat, and crude fiber/fiber, as well as the principles of chromatographic and spectroscopic analysis methods; physical analysis includes methods of physical analysis of food, such as rheological properties, texture, color, and other physical parameters.

Prerequisite: Chemical Analysis

Reference:

AOAC. 1984. Official Methods of Analysis of the Association of Official Analytical Chemist. 14thth ed. Arlington. Virginia.

Jacob, M.B. 1973. The Chemical Analysis of Food and Food Products 3rdrd ed. IPB-Press.

Bollag DM and Edelstein SJ. 1991. Protein Methods. Wiley-Liss Publ. New York

Chaplin MF and Kennedy JF. Carbohydrat Analysis. IRL Press. washington Fardiaz

D. 1989. Gas chromatography in food analysis. IPB. Bogor

Nielsen SS. 1994. Introduction to the Chemical Analysis of Foods. Jones and Bartlett Publ. London

Nur MA. 1989. Spectroscopy. IPB. Bogor

Nur MA and Adjuwana H. 1989. Separation Techniques in Biological Analysis.

IPB. Bogor

Sudarmadji S, Haryono B and Suhardi. 1997. Analytical Procedures for Food and Agricultural Materials. Liberty. Yogyakarta

FOOD ANALYSIS PRACTICUM

Analysis of proximate and food additives, gravimetric and volumetric methods, use of chromatographic and spectrophotometric methods for qualitative and quantitative determination of food components.

TP141118 FOOD ENGINEERING PRINCIPLES

Application of engineering principles in quantitative analysis of food processing systems including unit and dimension systems, mass balance, thermodynamic principles, energy balance, transport phenomena (including rheology and fluid flow, heat transfer, and mass transfer); as well as engineering and physical principles for food processing and preservation processes including dehydration, evaporation, refrigeration, freezing and heat processing principles. Reference:

Brrown, G.G. 1978. Unit Operation. John Wiley & Son. NY.

Early, R.L. 1983. Unit Operation in Food Processing. Pregamon Press. NY. Smith, J. & Van Nees, H.C. 19 .Intrduction to Chemical Engineering Thermodynamics. McGraw. NY.

TP141119 FOOD LEGISLATION

Discusses the relationship between food and health, government responsibilities towards businesses and consumers, food law regulations, packaging regulations, food quality standards.

Reference:

Law No. 7 of 1996. on Food

Law No. 9 of 1996 on Consumer Protection

SKEP Menkes RI. No. 23/MENKES/SK/VI/79 on Guidelines for Good Food Production Methods for Food.

Rees and Watson. 2000. International Standards for Food Safety. An ABPEN Publs.

TP141220 WASTE UTILIZATION TECHNOLOGY

Understanding the concept of the environment and its damage by industrial waste pollution. Understanding the concept of the types and parameters of (liquid) waste. Understanding the concept of waste management (waste minimization, waste utilization, and handling). Understanding of the concept or system waste treatment includes coagulation and sedimentation, biogas production, composting, activated sludge process, trickling filter and lagoon.

Reference:

Kasmidjo, R.B. 1991. Waste Management in Agriculture, Plantation and Food Industry. PAU Food and Nutrition. UGM Yogyakarta.

TP141221 FOOD ADDITIVES

Types and functions of food additives; the ins and outs of how to use them; product development; and an overview of regulations on the use of food additives. Also discussed are the development of flavor technology and its application in the food industry; as well as the types and functions of food processing aids.

Reference:

Food Additive By Smit, New York Publ.

F. G. Winarno and Titi S., Rahayu, 1994. Food Additives & Contaminants. Tranggono et al, 1989. Food Additives.

TP141222 MACHINERY AND EQUIPMENT

Discussion of the specifications and working principles of processing equipment and machinery for food which includes: power generation equipment/machinery, material handling/movement, pretreatment and process equipment, including washing, cleaning, size reduction, solid transportation, drying, evaporation, crystallization, centrifugation, extrusion, distillation, filtration, irradiation and some other food industry equipment.

Reference:

Brennan, J.G. Butter, J.R. Cowell, N.D. Food Engineering Operations". Coulson, J.M. Richardson, J.F. Chemical Engineering. Pregamon Press. Early, R.L. 1983. Unit Operation in Food Processing. Pregamon Press. NY.

SEMESTER V**TP141123 STATISTICS**

Introduction to basic statistical techniques and their applications for experimental design, data collection, and data analysis as well as communicating them orally and in writing. Variability modeling and parameter estimation and hypothesis testing. Simple regression and correlation analysis

Prerequisite: Calculus I and II

Reference:

Sudjana. 1994. Statistical Methods. Tarsito. Bandung Suparmono & Sugiarto. Statistics. Andi Offset. Yogyakarta Andi Hakim Nasution & Barizi. Statistical Methods. Gramedia

Gramedia

Steel, R.G.D. & J.H. Torrie. Principles and Procedures of Statistics. Gramedia. Jakarta.

TP141124 FOOD THERMAL PROCESS

Application of engineering aspects in thermal processes to obtain processed products that are microbiologically and nutritionally safe, and have acceptable sensory properties. Basic principles of thermal use in processing, including blanching, pasteurization and sterilization. Requirements in food canning, especially for low acid food and acidified food products. Stages in the food canning process including discussion and control of critical points. Principles of retort operation, understanding the concept of commercial sterilization, calculation of safe temperatures and times, evaluation of thermal processes.

FT141106 RESEARCH METHODOLOGY

Research methodology discusses limitations, research stages, hypothesis preparation, types and determination of variables, data collection methods, data analysis, scientific presentation techniques.

Prerequisite: Experiment Design

Reference:

Nazir, M. 1988. Research Methods. Ghalia Indonesia. Indonesia. Dedi, F. and Srikandi, F. 1994. Guidelines for Scientific Writing and Presentation. IPB. Yogi Sugito. 1990. Agronomy Research Methodology. Unibraw. Malang

TP141125 FOOD QUALITY MANAGEMENT SYSTEM

Basic concepts and all aspects of quality as well as technological applications in standards and specifications, food quality control and assurance; introduction to the concept of quality assurance systems with emphasis on Quality Management Systems (TQM and ISO 22000) and halal assurance systems.

TP141126 FOOD INDUSTRY OPERATIONS UNIT II

Application of process fundamentals including: raw material preparation, mixing and homogenization, basic knowledge of the drying process, physical separation (distillation and extraction), heat treatment (sterilization, pasteurization, dehydration, evaporation and crystallization); cooling and freezing; roasting, frying and extrusion.

Prerequisite: Food Industry Operations Unit I

UNIT OF OPERATION PRACTICUM

Train skills in the application of heat and mass transfer theory in processing. Size reduction/grinding, meat emulsion making, microwave popcorn making, mechanical extraction, solvent extraction, sedimentation, centrifugation, filtration, crystallization, cooling and freezing.

Prerequisite: Unit of Operation Course

Reference:

Boma Wikantyoso. 1983. Unit of Operation in Food Process. PAU-UGM Early, R.L. 1983. Unit Operation in Food Processing. Pergamon Press Suyitno. 1989. Food Engineering. PAU-UGM.

TP141127 FOOD PROCESSING TECHNOLOGY

Apply chemical, microbiological and engineering principles in the processing and preservation of food using high temperature, low temperature, dehydration, microwave applications, chemical additives and irradiation by considering quality factors.

Prerequisite: Introduction to Food Technology

Reference:

Winarno, F.G., S. Fardiaz, D. Fardiaz. 1982. Introduction to Food Technology. Gramedia
Desrosier, N.W. 1988. Food Preservation Technology. UI-Press. Tien R. Mucthadi. 1997. Food Processing Technology. PAU-IPB
Tri Susanto & Budi Susanto. 1994. Agricultural Product Processing Technology. Bina Ilmu Surabaya.

FOOD PROCESSING TECHNOLOGY PRACTICUM

The practicum covers the basics of processing such as drying technology, bakery technology, meat and fish processing technology, dairy and soybean processing technology, egg processing technology, technology with smoking, processing

technology with sugar, salt, and acid and other preservatives, and medium moisture food technology (IMF: (fruit leather, jam, jelly); candy).

Prerequisite: Food Processing Technology Course

Reference:

Winarno, F.G., S. Fardiaz, D. Fardiaz. 1982. Introduction to Food Technology. Gramedia

Desrosier, N.W. 1988. Preservation Technology t. UI-Press. Tien R. Muchtadi. 1997. Food Processing Technology. PAU-IPB

Tri Susanto & Budi Susanto.1994. Agricultural Product Processing Technology. Bina Ilmu Surabaya

TP141228 CARBOHYDRATE TECHNOLOGY

Discusses basic knowledge of physical and chemical properties, natural sources, component structure, handling methods and applications in the food sector. The materials discussed include pectin, chitosan, food fiber, resistant starch, hydrocolloids and their applications.

Reference:

Soebiyanto, T. 1986. HFS and the Cassava Industry. Gramedia Suyitno. 1991.

Processing of Dietary Fiber Powder from Fruits. UGM Moerdokusumo, A. 1993. Sugar Technology. ITB

Tien Muchtadi. 1987. Extraction Technology. IPB Maulay. Baking Technology

TP141229 PROTEIN TECHNOLOGY

Basic knowledge of plant and animal protein sources including: structure, composition, chemical properties, functional during processing. Development of processed products based on animal and vegetable protein sources. Protein isolation and purification and its application for food products

Reference:

Suhardi. 1988 Protein Chemistry and Technology. PAU UGM

Yogyakarta Fennema. 1996. Food Protein. AVI Publ. Koeswara. Catfish Processing Technology

Astrawan, M. & Mita, W.A. 1991. Vegetable Food Processing Technology. Appropriate

TP141230 FATS/OILS TECHNOLOGY

Definition of oil fats, their physical and chemical properties, reactions that occur in oil fats, sources of oil fats, extraction and refining processes, the function of oil fats in food processing and fat-derived products that play a role in food processing.

Reference:

Anderson A.J. 1959. Margarine. Pregamon Press. Oxford. Fennema, O.R. 1976. Principle of Food Science. Marcel Dekker.

Gunstone D., F.A. Norris. 1983. Lipids in Food Chemistry and Technology. Pregamon Press.

Hamilton, R.J. and Batjiri. 1980. Fats and Oil, Chemistry and Technology, Applied Science Publ.

TP141231 ENZYME TECHNOLOGY

Studying the characteristics of enzymes as biocatalysts, introduction to enzyme kinetics, extraction, purification, immobilization of enzymes and their applications, the characteristics of bioprocessing reactors (enzymes), and characteristics of enzymes that play a role in the food and agricultural products processing industry.

TP141232 DAIRY TECHNOLOGY

Understanding the concept of applying technology to milk processing. Chemical composition and properties of each component. Processing of milk into several products such as condensed milk, milk powder, butter, cheese, fermented milk-yogurt and kefir and others.

TP141233 MEAT AND FISH TECHNOLOGY

Studying the biochemical changes of carcass and skeletal muscle after post mortem. Control of spoilage and pathogenic microbial contamination in the production chain of fresh and processed meat and fish. Application of preservation principles and value-added processing technology. Current topics relevant to the industry and trade of meat and fish products.

TP141234 FRUIT AND VEGETABLE TECHNOLOGY

This course studies the characteristics of vegetables and fruits, classification of climacteric and non-climacteric fruits, nutritional stability of fruits and vegetables during processing, principles and methods of processing fruits and vegetables into dried fruits, fruit candy, fruit leather, velva, fruit / vegetable chips, jam (jam), jelly, pickles, pickles, juice, wet and dry sweets, and canned fruits / vegetables.

SEMESTER VI

TP141135 FOOD QUALITY CONTROL

Understand and explain the elements of quality, quality control methods, quality assurance, GMP and HACCP applied to the food industry.

Reference: Soewarno T. Soekarto.1990. Basics of Food Quality Supervision and Standardization...

Merle D.P. and D.A. Corlett .1992. HACCP, Principles and Applications. NHS R.I.. 1996. HACCP General Guidelines

TP141136 EXPERIMENTAL DESIGN AND COMPUTATION

In this course, we learn how to conduct scientific research including determining the problem, identifying experimental research variables and being able to carry out scientific research. Design experiments with various types of experimental designs such as RAL, RAK, Factorial, Randomized Nested and able to conduct experimental tests with non-parametric (Friedman Test, Wilson, and different tests: t test, BNT and DMRT) and non-experimental designs, observation and data collection, interpretation of experimental analysis results.

Prerequisite: Statistics

Reference:

Gatsperz, V. 1994. Methods of Experiment Design. Armico. Jakarta. Kusrieningrum, R.. 2008. Design of Experiments. Airlangga University. Suntoyo,

Y. 1996. Experiment, Design, Analysis and Interpretation. Sugiarto, 1994. Regression Analysis.

Sutrisno Hadi, 1994. Regression Analysis

FT141107 ENGINEERING ECONOMICS

Calculating known interest, selecting alternatives based on least investment, depreciation and tax, economic life, replacement, costing analysis, break event point, inflation and sensitivity analysis.

Reference:

Grant.L.E. Principles of Engineering Economy.

Pieters and Timmerhaus, 2008, Plant Design and Economic Engineering, McGraw-Hill Kogakusha,

Taylor, G.A.. Managerial and Engineering Economy Thuesen, Principles of Engineering Economy

UV141114 ENTREPRENEURSHIP

Perspectives on entrepreneurship (nature and importance of entrepreneurship, entrepreneurial mindset, entrepreneurial intentions and corporate entrepreneurship, international entrepreneurship opportunities, case studies), creating and starting a food enterprise (analysis of creativity, business ideas and opportunities, intellectual property and other legal issues for entrepreneurs, business plan, marketing plan, organizational plan, financial plan, cases), financing a new food enterprise (sources of capital, share offerings, cases), managing, growing and winding up a food enterprise (entrepreneurial strategies, strategies for growth, entering global markets, obtaining external resources, winding up a n enterprise, cases), leadership (definitions, types of leadership, strategies), communication (communication theories, presentation techniques, conflict management).

ENTREPRENEURSHIP PRACTICUM

Practice development products new with considering and involving socio-cultural aspects in society, consumer behavior, new product development management, new product design, technology selection and engineering in new product development, quality testing, sensory, economic feasibility analysis, and marketing trials

Reference:

Asfahani, Salim Siagian, Entrepreneurship Indonesia Buchari, Alma Entrepreneurship CV. Alfa Beta Bandung Ocoffrey & Miredith, Entrepreneurship, Theory and Practice.

TP141137 FOOD FERMENTATION TECHNOLOGY

Studying the concepts, methods and techniques of industrial-scale fermentation and all its aspects, including the scope of the fermentation process, fermentation kinetics, substrate and starter preparation, sterilization, fermenter functions and requirements, fermentation process control, aeration and agitation, scale-up, and separation and purification of fermentation products.

Prerequisite: Food Microbiology

Reference:

Djudoamidjojo, Rachman Fermentation Technology, Fardiaz Fermentation Technology, Fermentation Technology.

TP141138 FOOD NUTRITION EVALUATION AND PROCESSING

Studying changes in nutrients and their effects on health during post-harvest handling, food processing and storage, with chemical and bio-assay evaluation.

Reference:

Buckle, et al (1987). Food Science

Deddy Muchtadi (1989). Evaluation of Food Nutritional Value

Harris & Karmas (1989). Nutritional Evaluation of Food Processing Sri Anna Marliyati (1992). Household Level Food Processing

N. W. Desrosier (1988). Food Preservation Technology

TP141139 OPERATIONAL RESEARCH

Introduction and understanding of operations research methods to optimize various uses of resources with linear programming and integer programming using the

simplex method and its application in special forms: factory problems, transportation, break even points, game theory and forecasting.

Reference:

Moctar Bozarod. Linear Programs and Networks Flows

UV141113 LEADERSHIP MANAGEMENT

Definition, purpose of leadership function, Management and Organization, Characteristics of Leadership, Management models, Theories of Organization, Forms of Organization, Organizational Structure, Manpower Needs in Every Process.

Reference:

Miftah Thoha, 1995. Leadership & Management. Rajawali Press. Riichard M. Streers, 1985. Organizational Effectiveness. Erlangga Publisher. Refr. Other relevant

TP141240 FUNCTIONAL FOOD

The health benefits of various foods and beverages, both fresh and processed. The aspects to be covered include: the relationship between food, nutrition and health, the efficacy of food components (nutrients and bioactive components) and how they prevent health problems; food and beverage products as functional foods; principles of processing and analysis of functional food products; and functional food development technologies including food fortification and supplementation technologies.

Reference:

Goldberg, I., 1994. Fungtional Foods. Chapman & Hall.
Marsono, Y., 1996. Dietary Fiber in Functional Foods. In Functional Food Work Shop Paper Collection. PAU Food and Nutrition, UGM. Yogyakarta.
Muchtadi, D., 1996. Functional Food Formulation. In Functional Food Work Shop Paper Collection. PAU Food and Nutrition, UGM. Yogyakarta.
Raharjo, S. Antioxidants. In Functional Food Work Shop Paper Collection. PAU Food and Nutrition, UGM. Yogyakarta

TP141241 FOOD INDUSTRY EQUIPMENT DESIGN

Application of the principles of design and problem identification, needs analysis to blueprints, introduction to mechanical technology, operation of working machines and construction.

TP141242 TOXICOLOGY

Types, characteristics, detection of toxic substances in food and their effects on human body, as well as basic concepts related to dose-response relationship. Understanding of naturally occurring toxic compounds in food, those produced by microbes and those coming from outside.

TP141243 FOOD BIOTECHNOLOGY

Studying the process of utilizing organisms (enzymes) to produce a product (both conventionally and modernly); understanding DNA recombination techniques (genetic engineering) to produce new strains that are beneficial to human interests; understanding the application of DNA recombination technology and analyzing the existence of these products.

TP141244 FLAVORING TECHNOLOGY

Definition, classification, and regulation of the use of flavors, as well as production and storage technology of flavors in food products

TP141145 FOOD PRODUCT DEVELOPMENT

Changes in the business environment that require new product development, socio-cultural aspects in society, consumer behavior studies, consumer research, new product development management principles, new product design, technology and engineering in new product development, business aspects of new product development which includes financial forecasting and market opportunities for new product development, the final part of the lecture discussed several case studies and the course discussion was closed with a review.

Prerequisite: Food Processing Technology

Reference:

Mary Earle and Richard Earle, Food Product Development, , Massey University, New Zealand

TP141146 SENSORY EVALUATION

Understand about sensory quality, sensory properties of food ingredients, selection of panelists, laboratory preparation, data analysis and decision making, and selection of appropriate sensory tests to be applied in the food industry.

Prerequisite: Experiment Design

SENSORY TEST PRACTICUM

Organoleptic test preparation, panelist selection, sample preparation, stimulus threshold test, pair-wise discrimination test, triangle, duotrio, description test, ranking test, scoring test, pair-wise comparison test, plural comparison test, hedonic test.

Reference:

Susrini Idris, 1984. Methods of Sensory Testing of Food Ingredients. Bambang Kartika. 1984. Quality Control and Sensory Test. PAU-UGM Watts. 1996. Basic Sensory Methods for Food Evaluation

TP141147 FOOD SAFETY AND SANITATION

Understand about sanitation and contamination, transportation and storage of food, types and methods of water treatment, how to clean tools, sanitation, food safety issues, foodborne diseases, consumer protection, HACCP and ISO 9000 as a reference for food safety management.

Reference:

Kartika, B. 1986. Sanitation in the Food Industry. PAU-UGM Saksono, L. 1986. Introduction to Food Sanitation. Alumni Bandung
Kasmidjo, R.B., 1980, "Handling of Agricultural Waste", Plantation and Food Industry PAU Food and Nutrition, UGM.

TP141148 PACKAGING AND STORAGE

explain the types of packaging, the interaction of food and packaging, the principles of determining the shelf life of food and the role of food storage, post-harvest pests, integrated pest control and various food storage techniques.

Reference:

Directorate of Food Product Standardization. 2004. General Guidelines for Food Product Labeling. Deputy for Food Safety and Hazardous Materials Supervision. BPOM RI, Jakarta.
Syarief, R and H. Halid. 1991. Food Storage Technology. Cooperation with PAU Food and Nutrition IPB. Arcan Publisher, Jakarta.
Syarief, R., Sassya S. and St. Isyana B. 1989. Food Packaging Technology. PAU Food and Nutrition, IPB, Bogor.

TP141149 PROCESSING INDUSTRY DESIGN

Processing industry design discusses market research, process outline and equipment, space and layout.

Reference:

Layout Design in the Food Industry" Machfud, Yudha Agung. 1990 "Plant Design" viebrand 1980

"Factory Layout Design" Muhammad Arif ST, MT. 2017 "Chemical plant design" Kusnarjo. 2010.

"Plant Layout and Material Handling". Apple, J.M. 1983. Thirt edition. John Wiley and Sons, Inc.

INTEGRATED PRACTICUM

Food product design which includes basic concepts about the final product to be made, specifications of suitable raw materials including material suppliers, procurement and testing processes, technology along with processes and parameters, and supporting facilities; formation of work teams as a simulation of organization in the company, practice of production processes (including final product testing, and implementation of HACCP principles), calculation of production costs and pricing, and marketing plans. In its implementation, the integrated practicum activities will be divided into 4 different process/product groups, namely (1) Canning technology, (2) Drying technology, (3) Fermentation technology, and (4) Roasting technology.

UV141115 COMMUNITY SERVICES

The implementation of KKN is intended to train students' ability to recognize real problems in the community, organize and work in groups, develop activity plans, manage the provision and use of resources, and work for the community.

FT141108 FIELD WORK PRACTICE

Train students' ability to learn directly in production units or processing of food and agricultural products. Students witness firsthand the application of processing technology in commercial business units, interact with various parties at the practical work location, critically observe the overall operation of the processing unit, recognize technical problems that arise, and compile implementation reports systematically and thoroughly.

SEMESTER VIII

TP141150 THESIS

The implementation of the thesis is intended to sharpen the ability to think critically and analytically in formulating problems related to the application of food science and technology, challenge creativity in determining alternative problem solving, practice a scientific approach to strengthen self-learning skills from various sources.

TP141151 SEMINAR

Oral dissemination learning includes knowledge and training in the ability to conduct seminars with the provision of using media in the form of power points written in English and formal presentations in class in Indonesian or English. Every week students have the opportunity to conduct or evaluate their friend's presentation. After each presentation, the performance is discussed, both about the quality of the

media, presentation, language used and the formal scope of the proposal submitted.

MINIMUM STANDARD OF FOOD TECHNOLOGY LABORATORY (KOPERTIS 2010)

1. Lab. Food Ingredient Knowledge
2. Lab. Food Processing Technology
3. Lab. Product Development / Entrepreneurship
4. Lab. Sensory evaluation/sensory testing
5. Lab. Food Biochemistry
6. Lab. Food Microbiology
7. Lab. Quality Assurance

STUDENT FINAL PROJECT

A. INTRODUCTION

The final project which is an obligation for students at the undergraduate level is one of the requirements for completing the undergraduate program. Food Technology study program, there are two final projects that must be taken by students, namely Field Work Practice and Thesis. The final project report is a scientific work that must be accounted for in front of the examiner. The resulting product is generally in the form of a REPORT which is compiled according to a set standard rule.

B. FINAL PROJECT PROGRAM REQUIREMENTS

The final project that will be taken / programmed by students in the current semester is regulated by the terms and conditions that apply both at the University and Faculty and Study Program levels. This is enforced in order to achieve administrative order.

A. Terms and Conditions

1. General

In general, students who take the final project must fulfill the requirements:

- a. Registered as an active student of the Food Technology Study Program of FTI UPN "Veteran" East Java in the current academic year with proof of a legalized Student Identity Card.
- b. Recorded in KRS in the current academic year with administrative requirements that have been determined either by the University, Faculty, and / or study program.
- c. Under the guidance of academic staff appointed by the study program (authorized by the Faculty) in accordance with the field of science and knowledge, and meet the academic requirements as a supervisor.

2. Special

In addition to the general terms and conditions, specific terms and conditions are required for each final project.

a. Fieldwork Practice

1. PKL can be programmed after students have taken at least 100 credits with a cumulative grade point average (GPA) ≥ 2.50 with a maximum D grade of 25% and no E grades.

2. Students apply for a place for PKL by filling out the form provided in the education and teaching section (Dikjar) approved by the Head of the study program (Kajur) and submitted to the Administration (TU) c.q personal handling to complete administrative completeness.

b. Research/Thesis

1. Students who program the final project/thesis/research must have taken at least 120 credits with a cumulative grade point average (GPA) ≥ 2.50 with a maximum D grade of 25% and no E grades.
2. ≥ 2.50 with a maximum D grade of 25% and no E grades.
3. Have taken/passed the Scientific Method course with a minimum grade of C
4. Have carried out and passed KKN & PKL
5. Submit a proposal that cites relevant literature and/or scientific journals.

B. Final project programming process/flow

Students who will carry out the final project are required to go through bureaucracy for the sake of academic and administrative smoothness and order. It is regulated as in the section below.

1. FIELD WORK PRACTICE

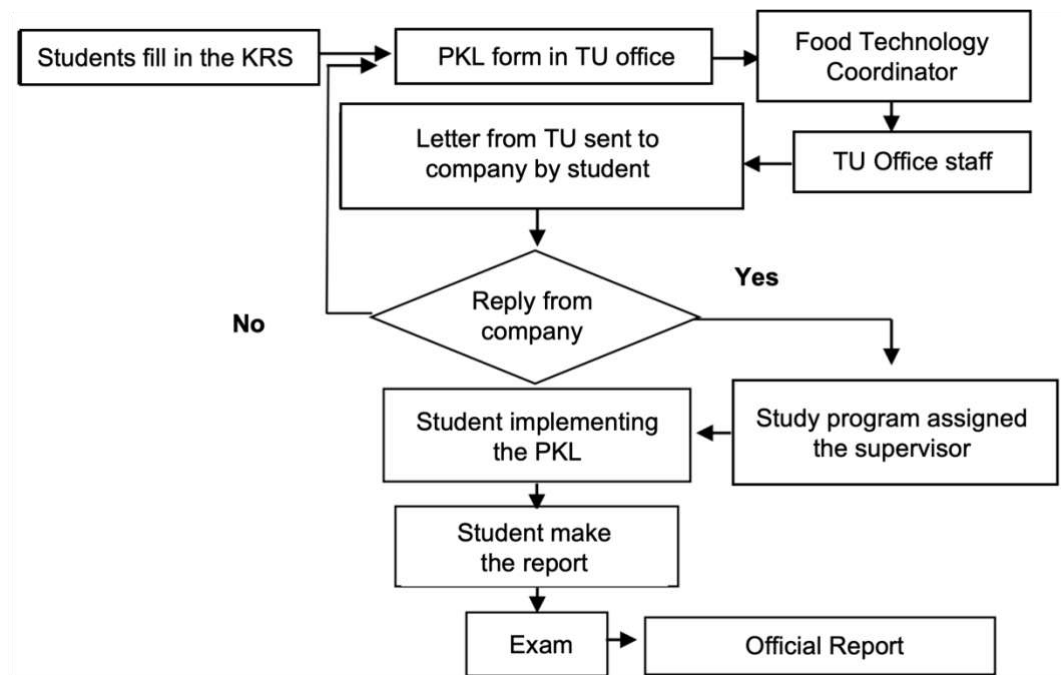


Figure 1. Flow of the PKL assignment programming process

2. RESEARCH/THESIS

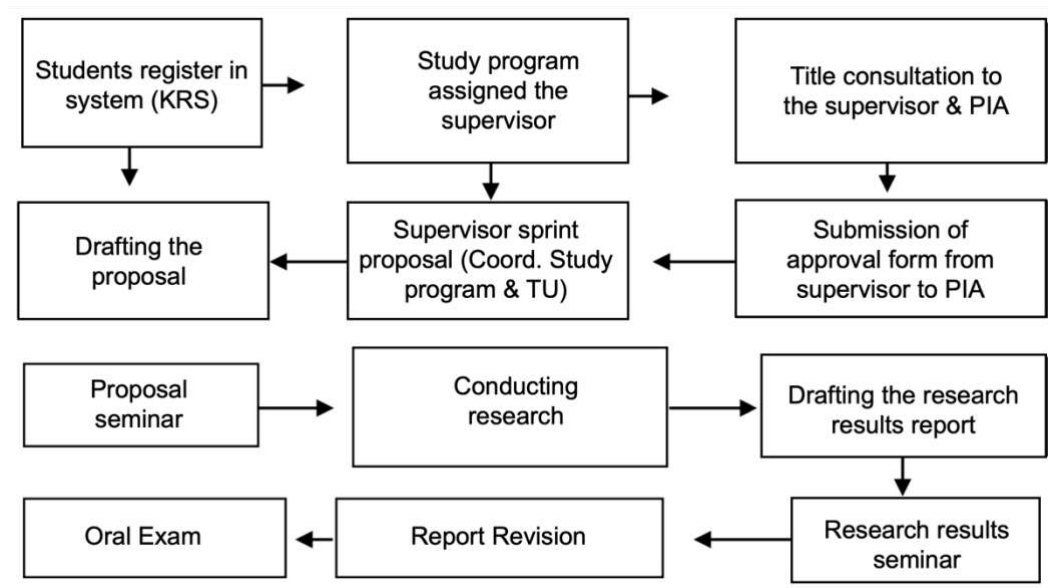


Figure 2. Flow of the Process for Taking Research / Thesis Assignments

3. Thesis Guidance

- a. A "Thesis Guidance Sheet" must be completed by the student and signed by both supervisors each time guidance is provided in order to demonstrate that guidance has been provided.
- c. Thesis supervision will be conducted for one semester.
- d. Students who cannot complete the thesis in one semester will:
 - Students are entitled to one more semester to complete the thesis by re-registering KRS (same title and supervisor).
 - In order not to be included in the GPA calculation in that semester, the supervisor I gave a blank grade.
 - The semester will still be counted towards the maximum time limit for graduate study.
- e. If the student is unable to complete the thesis in two consecutive semesters, the student will be given the opportunity to complete the thesis in the next two semesters or to repeat the procedure from the beginning with a different title and supervisor, taking into account the time limit of the study.
- f. If the thesis cannot be completed in 4 consecutive semesters, taking into account the study time limit, the preparation of the thesis starts again from the initial proposal.

4. PKL Seminar, Research Proposal and Research Results Seminar

- a. The PKL Report, Research Proposal, and Research Report that have been approved by the advisor will be requested for ratification by the director of the program, and then programmed into the Proposal Seminar schedule.
- b. Requirements to register for PKL seminars, proposals and research results

- Show the guidance card signed by the supervisor at least 10 times.
 - Show an active card as a seminar participant (at least 5 attendances).
 - Collect 4 copies of the research proposal / research report manuscripts with revision sheets.
 - Submit the Research Proposal / Research Report manuscript to the Examining Lecturer and Supervisor at least 1 (one) week before the seminar.
 - Post the invitation to the seminar on the notice board of the Food Technology program.
 - After the seminar, sign the seminar book in the program.
- c. The proposal seminar and research results seminar were attended by:
1. Supervisor as moderator
 2. Other faculty as examiners/reviewers
 3. The student as presenter
 4. Other students as seminar participants
- d. Once the research results have been disseminated, revised and approved by the supervisor and approved by the director of the program, the student is eligible to take the thesis/oral examination.

IX. ENVIRONMENTAL ENGINEERING PROGRAM

The 2021-2022 Environmental Engineering Academic Handbook is a revision of the previous Academic Handbook. The curriculum used in this Academic Handbook is the 2021-2022 Curriculum. The curriculum is based on Outcome Basic Education (OBE or KKN) and Merdeka Belajar Kampus Merdeka (MBKM).

This Academic Handbook contains significant changes, namely the competency-based curriculum changes that came into effect in the 2002-2003 academic year. In addition to following the policy of the Minister of Education Decree No. 323 of 2002, Regulation of the Minister of Education and Culture of the Republic of Indonesia No. 49 of 2014, it is also to respond to the challenges of the times that always demand change. The essence of curriculum change this time is based on the shift in educational curriculum paradigm from knowledge-based curriculum to competency-based curriculum (OBE), with this new curriculum it is expected that the quality of graduates will be able to meet the demands of the labor market and the demands of the times.

This Academic Handbook is also intended to be a medium of communication between the academic community and a guide, both for faculty in providing academic guidance and for students in preparing study plans and determining attitudes and behaviors on campus.

Finally, on behalf of the leadership of the Environmental Engineering Program, we would like to thank all those who have participated in the preparation of this Academic Handbook.

IX.1. INTRODUCTION

1. ENVIRONMENTAL ENGINEERING BACKGROUND

With the rapid industrialization and regional development to create a just and prosperous society, environmental problems will also increase. The increase of environmental problems, both in intensity and magnitude, requires treatment that is not sufficiently addressed by practitioners. Such conditions require a more specific and higher-level scientific approach. Therefore, it is necessary to develop study programs in universities that have specialized programs in the field of environmental engineering. In essence, the prevention of environmental damage can be approached with an engineering approach to environmental control and environmental management.

Both fields are currently being developed at the UPN "Veteran" East Java. Department of Engineering UPN "Veteran" East Java was established in 1993 with the status of KEDINASAN NEGERI under the management of the Ministry of Defense and Security. In its development based on the joint decree of the Minister of Education and Culture No: Kep/0307/X/1994 and Menhankam No : Kep/10/XI/1994, the status of Environmental Engineering Department was privatized and changed to a study program in 2009. In 2002 and 2007 on the basis of the decision letter BAN-PT. Director General of Higher Education of the Ministry of Education and Culture number: 04663/Ak-V-S1- 002/UPITPL/III/2002 and number: 016/ BAN-PT/Ak-.X/S1/VIII/2007, received an accreditation score of B while in 2013 based on the decree of BAN-PT. Director General of Higher Education of the Ministry of Education and Technology Number: 010/BAN-PT/Ak- XV/S/II/2013 Environmental Engineering Study Program successfully obtained an accreditation score of A. In 2017 it obtained again A accreditation on the basis of SK BAN-PT number 3167/SK/BAN-PT/Akred/S/IX/2017.

2. INDEPENDENT PROFESSIONAL PROFILE

1. To become individuals with noble personalities who are able to work professionally in the field of environmental management and engineering.
2. To become individuals who are able to work independently and to cooperate in groups that can bring benefits to the community in the field of environmental engineering both nationally and internationally.
3. To become an individual who has a spirit of lifelong learning to develop his or her potential.

3. VISION, MISSION AND GOALS OF ENVIRONMENTAL ENGINEERING

VISION

To become a superior environmental engineering program capable of mastering, applying and developing science and technology in the field of environmental engineering and management with a national defense character in Southeast Asia.

MISSION

1. To organize educational programs to produce graduates who are professional in their fields according to the needs of the users of the graduates.
2. To conduct research to advance the sciences of environmental engineering and management.
3. To conduct community service programs in the field of environmental management.
4. To organize cooperation with government and private parties to support the Tri Dharma of higher education.
5. To build a healthy organization to strengthen governance, transparency and accountability towards a competent and professional Environmental Engineering Study Program.

OBJECTIVES

To produce graduates who can have a professional career in the field of environmental engineering with the character of national defense, able to compete in the global era. Includes:

1. Mastering knowledge in the field of environmental engineering and management and being able to apply it to solve problems at work.
2. Individuals who are characterized by the desire to learn throughout life, to improve their skills through further study, research, community service, and professional activities at home and abroad.
3. Have social and national sensitivity and sensitivity to the environment in general.
4. Have the ability and responsibility to communicate their ideas both orally and in writing, scientifically, able to take appropriate initiatives and lead working groups in relevant areas.

4. FACILITIES IN THE ENVIRONMENTAL ENGINEERING PROGRAM

1. Basic Laboratory
 - a) Environmental Chemistry
 - b) Environmental Microbiology
 - c) Mapping
 - d) Engineering Drawings
 - e) Applied Physics
2. Applied & Alliance
 - a) Environmental Statistics
 - b) Operations Unit
 - c) Water Environment Pollutant Analysis
 - d) Air and Soil Laboratory
 - e) Research Laboratory
 - f) LPT (Integrated Testing Laboratory)

IX.2. ENVIRONMENTAL ENGINEERING ORGANIZATIONAL STRUCTURE

The Environmental Engineering Study Program currently has 15 active teaching staff, lecturers, 2 laboratory assistants and 1 administrative staff. In the period 2019-2024, the Environmental Engineering Program was headed by Dr. Ir. Novirina Hendrasarie, MT, the person in charge of the basic laboratory was M. Mirwan, ST. MT, and the person in charge of the Research and Applied Laboratory is Firra Rosariawari, ST. MT. The following is a list of faculty, laboratories and administration of Environmental Engineering UPN "Veteran" East Java period 2019-2024:

No.	Name	JOB
1	Dr. Ir. Novirina Hendrasarie, MT	COORDINATOR OF STUDY PROGRAM
2	Dr. Ir. Munawar Ali, MT	VICE RECTOR II
3	Euis Nurul Hidayah, ST, MT, Ph.D.	VICE DEAN I
4	M. Mirwan, ST, MT.	HEAD OF LABORATORY
5	Firra Rosariawari, ST, MT	HEAD OF LABORATORY
6	Ir. Naniek Ratni Juliardi AR, MKes	LECTURER
7	Ir. Tuhu Agung R., MT	LECTURER
8	Ir. Yayok Suryo P., MS	LECTURER
9	Drs. Imam Ghozali MM.	LECTURER
10	Ir. Yuliatin Ali S., MM	LECTURER
11	Okik Hendrianto C., ST, MT	LECTURER
12	Aulia Ulfa Farahdiba, ST, MSc.	LECTURER
13	Aussie Amalia, ST, MSc	LECTURER
14	Raden Kokoh H. P., ST, MT	LECTURER
15	Rizka Novembrianto, ST, MT	LECTURER
16	M. Abdus Jawwad, ST, MSc.	LECTURER
17	Restu Hikmah Ayu Murti, ST, MSc.	LECTURER
18	Kabul Fadilah, S.Si., M.Eng.	LECTURER
19	Praditya Sigit Ardisty Sitogasa, S.T., M.T.	LECTURER

20	Syadzadhiya Qothrunada Zakiyayasin Nisa, ST.MT.	LECTURER
21	Syahrul Munir, S.T., M.T.	LECTURER
22	Juli Winarti, ST	TECHNICIAN
23	Hexza Septivinanda Mayangsari, ST	ADMIN
24	Toni Ika Aritosa, ST. MT.	TECHNICIAN

IX.3. COMPLETION OF ENVIRONMENTAL ENGINEERING STUDIES

1. GRADUATE COMPETENCIES IN ENVIRONMENTAL ENGINEERING

Graduate competencies or expected abilities of graduates are one of the main factors formulated in the preparation of the curriculum.

Environmental Engineering graduates are expected to have the following competencies:

- CPL-01 Ability to apply and analyze innovative technologies and knowledge of relevant current issues in the field of environmental engineering.
- LO-01 Ability to apply and analyze innovative technology and knowledge of current relevant issues in the field of environmental engineering.
- CPL-02 Apply technical approaches based on digital technology in the field of environmental engineering.
- LO-02 Apply technical approaches based on digital technology in the field of environmental engineering.
- CPL-03 Design and analyse components or processes in engineering systems related to environmental engineering.
- LO-03 Design components or processes in engineering systems related to environmental engineering
- CPL-04 Able to identify, apply and analyze in environmental management systems in global, economic and social contexts
- LO-04 Able to identify, apply and analyze the environmental management system in a global, economic and social context.
- CPL-05 Able to apply knowledge of mathematics, physics, chemistry and biology in the field of Environmental Engineering
- LO-05 Able to apply knowledge of mathematics, physics, chemistry and biology in the field of environmental engineering
- CPL-06 Able to design and carry out experiments with the correct methodology and analyze and interpret data appropriately
- LO-06 Able to design and implement experiments with correct methodology and analyze and interpret data appropriately
- CPL-07 Have professional responsibility and ethics, based on Pancasila
- LO-07 Have professional responsibility and ethics, based on Pancasila
- CPL-08 Able to think creatively and lifelong learning
- CPL-09 Able to identify, analyze and solve engineering problems, in the field of Environmental Engineering
- LO-09 Able to identify, analyze and solve engineering problems, in the field of Environmental Engineering
- CPL-10 Able to communicate verbally actively, effectively and able to write scientific reports in an appropriate writing format
- LO-10 Able to communicate orally actively, effectively and able to write scientific reports in an appropriate writing format.
- CPL-11 Able to cooperate in individual and group work

LO-11 Able to cooperate in individual and group work

2. GRADUATE LEARNING OUTCOME STANDARDS

Several things in the learning system that need to be considered by students in relation to program policies. Students will be declared PASSED if:

- Have completed 147 credits with a minimum grade of C
- Declared PASS in specific courses if grades in Sub CPMK (Sub Course Learning Outcomes), CPMK (Course Learning Outcomes), and CPL (*Capaian Pembelajaran Lulusan*, Graduate Learning Outcomes) receive a minimum grade of C.
- Standard Graduate Learning Outcomes attainment is at least 56%.

MBKM PROGRAM	
1. Student Exchange = 21 credits, (CP 3 or 4, 5, 10) = total of 3 CPL.	
2. Internship/Field Work Practice= 12-18 credits, (CP 3 or 4, 7, 8, 9, 10, 11) = Total of 6 CPL	
3. Teaching Assistance in Education Unit= 10-14 credits, (CP 5, 7, 8, 9, 10, 11) = Total CPL 6 pieces	
4. Research/Research = 12-20 credits, (CP 1, 5, 7, 8, 9, 10, 11) = Total of 7 CPL	
5. Humanitarian Project = 10-14 credits, (CP 7, 8, 9, 10, 11) = Total of 5 CPL	
6. Entrepreneurship= 11-17 credits, (CP 3 or 4, 7, 8, 9, 10, 11) = Total of 6 CPL	
6* Wira Desa = 13 credits (CP 3 or 4, 7, 8, 9, 10, 11) = Total of 6 SLOs	
7. Independent Study/Project =10-14 credits, (CP 3 or 4, 7, 8, 9, 10, 11) = Total 6 CPL	
8. Village Building/KKNT = 10-14 credits, (CP 3 or 4, 7, 8, 9, 10, 11) = Total of 6 CPL	
9. Reserve Component (COMCAD) = 11 credits, (7, 8, 9, 10, 11) = Total 5 CPL.	

ELECTIVE COURSES

1. Management			
<i>Management</i>			
Sem	Subject Code	Course Content	CRE DIT
V	TL2112M56	Environmental Law	2
V	TL2112M43	Coastal and Marine Ecology	2
VI	TL2112M50	Noise Control	2
VI	TL2112M42	Environmental Economics	2
VI	TL2112M61	Manj. Local Wisdom-Based Environments	2
VII	TL2112M44	Geographic Information System	2
VII	TL2112M51	Tech. Management. Public Health	2
VII	TL2112M63	Environmental Conservation Technology	2
VII	TL2112M54	Environmental Quality Biomonitoring	2
VII	TL2112M55	Environmental Management System	2
VII	TL2112M46	Environmental Toxicology	2
2. Engineering			
<i>Engineering</i>			
V	TL2112M60	Electrochemical Technology	2
V	TL2112M52	Plumbing and Pumps	2
VI	TL2112M48	Tech. Management. Naturally	2
VI	TL2112M45	Landfil and energy conversion technology	2
VII	TL2112M49	Water building	2
VII	TL2112M53	Leachate Treatment	2
VII	TL2112M57	Environmental Biotechnology	2

VII	TL2112M58	Sludge Treatment	2
VII	TL2112M62	Bioenergy Technology	2

COURSE SYLLABUS

SEMESTER I

COURSE: ISLAMIC RELIGION

CODE: UV21001

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Fostering students who have faith and devotion to God Almighty, have noble character, think philosophically, be rational and dynamic, have a broad view, participate in interfaith cooperation in the context of development and utilization of science and technology and art for human and national interests.

SUBJECT MATTER:

- Man and Religion
- Source of Islamic teachings
- Basic framework of Islamic teachings
- Islamic Aqidah
- Sharia, worship and muamalah
- Akhlaq
- Taqwa
- Knowledge in Islam
- Disciplines in Islam

PREREQUISITE:No

REFERENCES:

1. A Hanfi, 1984, "Islamic Theology, BB, Jakarta".
2. AM. Syaifuddin, 1997. "Islam for the Discipline of Economics".
3. Soemiyati, 1994, "Islamic Law on Marriage and the Marriage Law".
4. As-Shauwy "Miracles; Qur'an and As-Saunnah" on IPTK.
5. Endang Saifudin A, 1977 "Lectures on Islam.
6. Endang Saifudin A, 1987, "Islamic Insight".
7. Hasbi As-Shiddiqy, 1990, "Ilmu Tafsir and Ilmu Hadith".
8. Kamal Mukhtar; 1980, "Islamic Law on Marriage"
9. Yusuf Qordhawi, 1995, "Characteristics of Islam An Analytical Study".
10. Muhammad Abduh, 1990, "Risalah Tauhid".
11. Zakiyah Darajat et al, "Basic PAI in Higher Education 1985

COURSE: PROTESTANT CHRISTIANITY

CODE: UV21002

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Students are able to carry out and place themselves as a whole person as a new creation in Jesus Christ, towards God, fellow human beings and the environment.

SUBJECT MATTER:

Religious awareness in human life, the meaning of faith, the phenomenology of religion, religion and Pancasila, humans as a map of God, the relationship between

faith and science, the meaning of God's law and the duty of human vocation for life in society, state and nation.

PREREQUISITE :None.

REFERENCES:

1. Indonesian Bible Institute, The Bible.
2. Dr. Honig, Science of Religion
3. Dr. H. Hadiwijano, Christian Faith
4. SularsoSopater, Christian Faith and Knowledge

COURSE: CATHOLIC CHRISTIAN RELIGION

CODE: UV21003

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Students are able to explain the concept of faith in the church, church life and society in order to develop the attitude and mentalize the person of a Catholic scholar, who can dedicate himself to the interests of Indonesian society as an expression of his faith.

SUBJECT MATTER:

Church faith, Church as a sacrament of salvation, church sincerity, human responsibility as a church member, church service, leadership in the church.

PREREQUISITE :None.

REFERENCES:

1. R. Hardiwiyo Sy, "Membina Jemaat Beriman, Jakarta, Dokpen MAWI
2. Y.Riberu, Inspiration for Inspirers, Jakarta, Luseat Publisher
3. ThomYacobs, Church Dynamics, Yogyakarta, Kanisius Foundation.
4. P. Budiyo, Exploring Scripture in Groups of 30, Yogyakarta, Kanisius Foundation.

COURSE: HINDU AGE

CODE: UV21004

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Students can explain and carry out religion, strengthen the belief, faith and devotion of a Hindu to Sang Hyang Widi Wasa so that they are able to control themselves in thinking, speaking and acting in their service to Nusa, Nation and State in order to support National development and the achievement of human life goals.

SUBJECT MATTER:

The source of Hinduism, scope, Mawa Darsana, Tlantrayaman, Panca Siada Tattwa, Catur Marga Yoga, Social Order, Kala Dharma, Budhisatwa and the concept of religious diversity.

PREREQUISITES: None.

REFERENCES:

1. Hindu Dharma Sociology
2. Introduction to Jilidi Hinduism
3. Introduction to Hinduism Volume II
4. P4 and Hinduism

COURSE: BUDDHIST RELIGION
CODE: UV21005
CREDITS: 2
METHODS: LECTURE

OBJECTIVES:

Students are able to explain and implement the Precepts of God Almighty, Dharma and devotion to strengthen faith in safeguarding the environment.

survival of religion, nation and state based on Pancasila and the 1945 Constitution

SUBJECT MATTER:

The nature of God Almighty, the conception of religious harmony, Buddhism and Buddhism

PREREQUISITES: None.

REFERENCES:

Oka Diputera, The Image of Buddhism in the Philosophy of Pancasila

Ministry of Religious Affairs of the Republic of Indonesia, Guidelines for the Implementation of P-4 for Buddhists

Scripture Procurement Project, Dhammapada

BhikuKemiyo, Pancasila and Pancadharma

COURSE: KONGHUCU RELIGION

CODE: UV21006

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Students can explain and implement the Precepts of God Almighty, to strengthen faith in maintaining the survival of religion, nation and state based on Pancasila and the 1945 Constitution.

SUBJECT MATTER:

The nature of God Almighty, the conception of religious harmony, Confucianism, Tian, Xing.Ren.Five Ethics (Wu Lun) and Confucius

PREREQUISITE :None

REFERENCES:

PTITD/Central Java Matriska, 2007. General knowledge of Tri Dharma, First Edition. Semarang: Bersema Seeds

COURSE: PANCASILA

CODE: UV21007

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

1. Explain and implement the values of Pancasila in the life of society, nation and state.
2. Explain the concept of Pancasila state
3. Explain the nature of the nation and nationality in general, especially based on Pancasila
4. national personality, integralism.

5. Implementing the historical values of the struggle and culture of the Indonesian nation
6. Formulate the constitutional system of the Republic of Indonesia based on Pancasila and the 1945 Constitution.
7. Assist in realizing the ideals of the Indonesian nation and national goals.

SUBJECT MATTER:

1. Studying the importance of Pancasila as the view of life of the Indonesian nation and studying the position and role of Pancasila in the Republic of Indonesia.
2. Study the concept of Pancasila state.
3. Studying the main ideas of the nation and nationality by studying the meaning of the proclamation of independence on August 17, 1945
4. Studying the ultimate meaning of divinity Monotheist state compared to secular atheist state, religious state relationship
5. Studying the state of the Indonesian nation during the national glory period
 - Studying the struggle of the Indonesian people against colonialism.
 - Studying the history of the proclamation of independence on August 17, 1945
 - Learning the meaning of the proclamation of independence on August 17, 1945
6. Studying the meaning, position of the Preamble of the 1945 Constitution as a fundamental principle of the Republic of Indonesia.
 - Analyze the position of the preamble of the 1945 Constitution as the main fundamental rule of the Republic of Indonesia.
 - Studying the government system of the Republic of Indonesia
 - Study the implementation of the 1945 Constitution
 - Examine efforts to preserve the 1945 Constitution.
7. Study position history and development GBHN in the constitutional life of the Republic of Indonesia based on the 1945 Constitution.
 - Study the main points of the current GBHN material.
 - Study the direction and policy of national development.
 - Review steps implementation examples national development programs

PREREQUISITES: None

REFERENCES:

1. "P-4 upgrading material"
2. "Pancasila Education in Higher Education", ibid Ps, 1993
3. M Kaelan, 1993 "juridical constitutionalism
4. Darmadjidarmodihardjo; "Santiaji Ps", 1995
5. Noto Negoro, Ps, dsIFal 1974
6. Dardji Darmodihardjo. "Ideology - State Ideology"
7. BP-7 ps, as an ideology.
8. Oetoyo Usman et al 1993.
9. Murdiono, "Love the State of Unity.
10. Prof. Dr. Hans Kohn, 1983, "Nationalism, Meaning and History, paubanjkr
11. Drs. Ahmad Fauzi DH, et al, 1981, "Pancasila in terms of historical, juridical, counseling, philosophical aspects" Unibraw Malang.
12. M. Kaelan, 1999, "Juridical Statehood",

COURSE: CALCULUS I

CODE: TL2111R01

CREDITS: 3

METHODS: LECTURE, QUIZ

OBJECTIVES:

Explain the basics of function calculation, limit, differential, integral, the basics of integral calculation.

SUBJECT MATTER:

- Basic concepts of matrix algebra: matrices, determinants, elementary row operations and systems of linear equations, Eigen values, Eigen vectors.
- Basic concepts of real number system: definition of real number system, decimal form of real numbers, real coordinates, order properties, definition of absolute value, inequality, plane coordinates, line, distance between two points, circle, parabola.
- Basic concepts of complex numbers: addition, multiplication, quotient, polar form of complex numbers and their algebraic operations and derivation of roots of equations in complex number systems.
- Function and limit concepts: domain, range, function operations, function graphs (linear, quadratic, transcendent), limit and continuity of functions, limit and continuity of trigonometric functions.
- Differential/derivative: definition of derivative, differentiation rules (for polynomial, rational, transcendent and trigonometric functions), chain rule and implicit function derivative.
- Derivative Applications: related rates, increasing/decreasing intervals, steepness, graph drawing with asymptotes and peaks, extrema values and applications to optimization problems, L'hospital theorem and Taylor/Maclaurin series.
- Indeterminate integrals: derivative and anti-derivative, indeterminate integrals, linear properties of indeterminate integrals, basic formulas of indeterminate integrals

PREREQUISITES: None

REFERENCES:

1. Anton, H., 1995, Calculus with Analytic Geometry, 5/ed, John Wiley & Sons, Inc, Singapore.
2. Purcell and Verberg, 1992, Calculus and Analytic Geometry, Fifth Edition Erlangga, Jakarta,

COURSE: ECOLOGY AND ENVIRONMENTAL SCIENCE

CODE: TL2111R02

CREDITS: 3

OBJECTIVES:

Students explain the basics of ecology, the definition and scope of Ecology, biological metabolism of living things and environmental knowledge, ecosystems, sources of pollution and their impact on ecosystems, the role of science and technology and the concept of technology.

SUBJECT MATTER:

Ecology and ecosystems, biotic and abiotic components, humans and the environment, energy flow and nutrient cycling, science and technology in ecosystems, natural aquatic, terrestrial and atmospheric ecosystems, disturbed

ecosystems (the influence of pollution), sources of pollution, degradation and restoration of environmental quality, transformation processes, ecological interactions, and technological concepts (dialectical phenomena, the concept of discovery in environmental engineering).

PREREQUISITES: None

REFERENCES:

1. Ecological Planning for Sustainable Development, 1988. Report of a Training Programme, organized by the Belgian Agency for Development Cooperation and the Institut Teknologi Nopember, Surabaya.
2. Odum, "Fundamental Ecology
3. Suryani et al, "Introduction to Ecology".

COURSE: ENVIRONMENTAL CHEMISTRY I AND PRACTICUM

CODE: TL2111R02

CREDITS: 3

METHODS: LECTURE, PRACTICUM

OBJECTIVES:

Students are able to explain the basic concepts of chemistry and analytical chemistry as well as qualitative-quantitative analysis methods in the laboratory.

SUBJECT MATTER:

Basic laws of stoichiometry, solubility, chemical reactions, acid-base, electrochemistry, theories of atoms, molecules and compounds, molecular formulas and shapes of organic & inorganic compounds that have the potential to damage the environment. Introduction to the types of organic compounds that affect environmental quality (water, air and soil) based on the cations and anions that form them. Formulas and molecules of hydrocarbon compounds, carbohydrates, proteins, fats and functional group compounds. Qualitative analysis of organic compounds based on sensitivity, selectivity, specificity, separation chart, solubility product and multilevel precipitation. Analysis of inorganic compounds including, titration, acidometry, gravimetry, iodometry, argentometry, redox complexometry, electrometric analysis, organic contaminant analysis methods consisting of concentration, separation and identification methods. Chemical reaction kinetics. The role of organic pollutants commonly found in the industrial field. With practicum.

PREREQUISITES: None

REFERENCES:

1. Brady, J.E., and Holum, J.R., 1978. Fundamental Chemistry. Third edition, John Wiley & sons, New York.
2. Mahan, 1975. University Chemistry. Third edition, Wesley Addition.
3. Sienko, Plane. 1974. Chemistry Principles and Properties. Second edition, McgrawHil.
4. Service Chemistry Team. Basic Chemistry Diktat. ITS Chemistry.

COURSE: BASIC PHYSICS I

CODE: TL2111R04

CREDITS: 3

METHODS: LECTURE, PRACTICUM

OBJECTIVES:

Students can explain the basic concepts of the Laws of Physics through descriptions and solutions using mathematical methods.

SUBJECT MATTER:

Units, Kinematics Dimensions and Vectors, Motion and Forces, Static fluids, Dynamic fluids, Working Principles and Energy concepts, Circular Motion, Rotational Motion, Temperature and Kinetic Theory.

PREREQUISITES: None

REFERENCES:

1. Giancoli, D.C. 1995. Physics. Principles with applications. Fourth Edition. Prentice Hall, New Jersey
2. Giancoli, D. 1998. Physics Volume 1. Fifth edition. Prentice-Hall.
3. Tipler, P.A. 1991. Physics for Science and Engineering. Volume 1. Third Edition. Erlangga. Jakarta
4. Sears and Semansky, University Physics
5. Halliday-Resnick, "Fundamentals of Physics"
6. Alonso-Finn, "Fundamental University Physics", Volume II.
7. Lecturer in Physics FMIPA-ITS, Physics Diktat

COURSE: INDONESIAN

CODE: UV21009

CREDITS: 2

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students are able to explain terms, sentences and varieties of Indonesian language properly and correctly. Students are able to express their thoughts properly and correctly. Students understand how to compose scientific essays, papers and reports.

SUBJECT MATTER:

Language problems, vocabulary terms, effective sentences and language varieties. Reasoning / expressing thoughts; sentence formation, theme, topic and purpose of scientific composition general layout, other mechanical sources in the form of EYD and PUPU.

PREREQUISITE :None

REFERENCES:

1. Keraf, Gorys, Diction and Language Style
2. Mukayat, B., Scientific Writing
3. Pusat Pembinaan dan Pengembangan Bahasa Depdikbud, Politik Bahasa Nasional, Volume I and II

COURSE: INTRODUCTION TO INFORMATION

CODE: TL141120

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Students are able to explain and practice programming languages on computer tools as a problem-solving tool in the field of environmental engineering.

SUBJECT MATTER:

General Introduction to Computers, Introduction and Writing of BASIC/PASCAL Language, Constants and Variables, Counting Operations, Flowchart, OUTPUT Statement and INPUT STATEMENTS, Structure Control Structure, Statement Control Iterative / Loop Statements, Functions and Subprograms, Indexed Variables, Data File Management Excel Applications (Tables, Graphs, Data Calculations), MS Word Applications (Creating Figures, Formulas, Importing Graphs, Importing Images), Physio Applications, Internet, Power Point, Introduction to AutoCAD Basics

PREREQUISITE: None

REFERENCES:

1. Santosa P.I., et al., 1993, "Basic Programming", Andy Offset, Yokyakarta
2. Mulyadi B.A. and Sarwono, 1990, "Programming with Basic", Elex Media Komputindo, Jakarta.
3. Jogianto H.M., 1986, Theory and Application of Computer Programs in Basic Language", Adi Offset. Yogyakarta
4. Santosa P.I., et al., 1986 Fundamentals of Pascal Programming theon and applied Andy Offset. Yogyakarta
5. Mulyadi B.A. et al, 1988, Programming with Turbo Pascal 4.0" Elex Media Komputindo, Jakarta.

SEMESTER II

COURSE: BASIC PHYSICS 2

CODE: TL2111R06

CREDITS: 3

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students can explain the basic concepts of the Laws of Physics through descriptions and solutions using mathematical methods.

SUBJECT MATTER:

Heat, Humidity and air pressure, laws of Thermodynamics, Electric charge and electric field lines, Electric potential, electric energy and capacitance, Electric Current, Ohm's Law, DC Barriers and Circuits, electromagnetic induction and alternating current.

PREREQUISITES: None

REFERENCES:

1. Giancoli, D.C. 1995. Physics. Principles with applications. Fourth Edition. Prentice Hall, New Jersey
2. Giancoli, D. 1998. Physics Volume 2. Fifth edition. Prentice-Hall.
3. Tipler, P.A. 1991. Physics for Science and Engineering. Volume 2. Third Edition. Erlangga. Jakarta
4. Sears and Semansky, University Phisycs
5. Halliday-Resnick, "Fundamentals of Phisic"
6. Alonso-Finn, "Fundamental University Physics", Volume II.
7. Lecturer in Physics FMIPA-ITS, Physics Diktat

COURSE: CIVIC EDUCATION

CODE: UV21008

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Students are able to implement and live Hankamnas and use an integral competence way of thinking to strengthen the spirit in maintaining the survival of the nation and State.

SUBJECT MATTER:

1. Learn the basics of Civic Education
2. Study the conception of Archipelago Concept
3. Learning the basic conception of National Resilience
4. Practice using approach comprehensive integral in responding to National Resilience issues.
5. Review the process of drafting polstranas
6. Studying the foundations for the preparation of Hankamnas Polstra
7. Learn the concept of State Defense Dwi Fungsi ABRI.
8. Studying the Hankamrata System.

PREREQUISITE :No

REFERENCES:

1. National Defense Institute, 1972. "Manuscript of Archipelago Concept", Jakarta: Lemhanas
2. National Defense Institute, 1978 "National Resilience", Jakarta: Lemhanas.
3. National Defense Institute, 1978, "National Politics and Strategy", Jakarta: Lemhanas.
4. National Defense Institute, 1978, "Politics and Strategy of National Security Defense", Jakarta Lemhanas.
5. National Defense Institute, 1982, "Universal People's Security Defense System", Lemhanas.
6. Institutions Defense National Defense Institute, 1982," BungaRampai Wawasan Nusantara, Volume 1, Jakarta.
7. Institutions Defense National Defense Institute, 1982," BungaRampai Wawasan Nusantara, Volume II, Jakarta.
8. Institutions Defense National Defense Institute, 1979," BungaRampai Wawasan Nusantara", Volume I, Jakarta.
9. Stratification Team of Lemhanas, 1980, "National Policy Stratification", Jakarta.
10. Tokroamidjojo, Bintoro, 1982, "Basic Theory of National Development", Jakarta: Gunung Agung.
11. National Defense Institute, 2000, "Civic Education",

COURSE: CALCULUS II

CODE: TL2111R07

CREDITS: 3

METHODS: LECTURE, PRACTICUM

OBJECTIVES:

Students learn integral and differential calculations, the concept of integration techniques, the concept of certain integrals, improper integrals, integral applications, polar coordinates and parametric equations along with their applications to calculate flat area and arc length, infinite series and series. These

basic calculations can later be applied to solve design problems in Environmental Engineering.

SUBJECT MATTER:

- Concept of integration techniques: partial integrals, integrals of rational functions (linear factors, quadratic factors), integration of trigonometric functions, reduction formula, integrals with trigonometric substitution (root form).
- Certain Integral Concepts: area problems and certain integrals, calculating certain integrals, fundamental theorem of calculus I, certain integrals by substitution, functions expressed as certain integrals, fundamental theorem of calculus II and improper integrals.
- Applications of certain integrals: area of a flat plane, volume of a rotating body (disc, ring method), fluid force and pressure, work (effort), point of weight (center of mass) and Guldin's theorem.
- Polar coordinates and parametric equations: functions and their graphs in polar coordinates, area and arc length in polar coordinates, functions in parametric form, area and arc length of parametric functions.
- Infinite series and ranks: ranks, convergence of ranks, infinite series, test for convergence and counting the number of convergent infinite series, notion of power series, Taylor series and Maclaurin series.
- Application of differential equations to physical, chemical processes, followed by PUPD, applied numerical analysis, mass balance.

PREREQUISITES: Calculus

REFERENCES:

1. ITS Mathematics Department Lecturer Team. 2012. Textbook of Calculus 2, 4th Edition, ITS Mathematics Department. - Anton, H. et al., 2012. Calculus, 10th edition, John Wiley & Sons, New York.
2. Krezig, "Advanced Engineering Mathematics
3. Osterg, Perkins, An introduction to Linear Analysis, Additional-Wesley
4. Frank Ayres, Jr, PhD, Theory and Problems of Differential Equations", Schaum Series.

COURSE: DRAWING TECHNIQUES AND TASKS

CODE: TL2111R08

CREDITS: 3

METHODS: LECTURE, PRACTICUM

OBJECTIVES:

Able to explain the basics of engineering drawing symbols and describe them manually or using software (AutoCad)

Able to describe a simple 1-story healthy house building in accordance with the rules and procedures of technical drawings including opening drawings (plans and views) and section views (cut images); including dimensions / sizes; foundation drawings, beam and column structural drawings, house drawings, electrical and plumbing installations.

SUBJECT MATTER:

Introduction and use of drawing tools, technical drawing standards, drawing techniques, paper sizes, placement of drawing objects, drawing notation, types of lines, shading and notation, letters and numbers, projections, drawing scales, plans, views and pieces of buildings, foundations, roofs, and trusses, ceilings, gutters,

various kinds of wood and steel connections. Drawings of foundations and walls, floors, frames, shutters, and doors.

General introduction to the drawings required in the drawings of drinking water treatment plants, waste water which include lay-out, longitudinal cut, cross section, detail, geometric construction; pictorial projection; orthogonal projection; cross-sectional and building cut drawings; building detail drawings; wood and light steel roof construction drawings; beam, column and river stone foundation construction drawings; plumbing drawings. Introduction to general, building environmental engineering

PREREQUISITES:

Introduction to Information Technology

REFERENCES:

1. Seelye, E.E. Design. John Wiley & Son, 2nd Edition.
2. Metcalf and Eddy. 1979. Wastewater Engineering. McGraw Hill Book Company

COURSE: ENVIRONMENTAL CHEMISTRY 2 AND PRACTICUM

CODE: TL2111R09

CREDITS: 3

METHODS: LECTURE, PRACTICUM

OBJECTIVES:

Students are able to explain the basic concepts of chemistry and analytical chemistry as well as qualitative-quantitative analysis methods in the laboratory.

SUBJECT MATTER:

Basic laws of stoichiometry, solubility, chemical reactions, acid-base, electrochemistry, theories of atoms, molecules and compounds, molecular formulas and shapes of organic & inorganic compounds that have the potential to damage the environment. Introduction to the types of organic compounds that affect environmental quality (water, air and soil) based on the cations and anions that form them. Formulas and molecules of hydrocarbon compounds, carbohydrates, proteins, fats and functional group compounds. Qualitative analysis of organic compounds based on sensitivity, selectivity, specificity, separation chart, solubility product and multilevel precipitation. Analysis of inorganic compounds including, titration, acidometry, gravimetry, iodometry, argentometry, redox complexometry, electrometric analysis, organic contaminant analysis methods consisting of concentration, separation and identification methods. Reaction kinetics Chemistry. The role of organic pollutants commonly encountered in the industrial field. With practicum.

PREREQUISITES: None

REFERENCES:

1. Brady, J.E., and Holum, J.R., 1978. Fundamental Chemistry. Third edition, John Wiley & Sons, New York.
2. Mahan, 1975. University Chemistry. Third edition, Wesley Addition.
3. Sienko, Plane. 1974. Chemistry Principles and Properties. Second edition, McGrawHil.
4. Service Chemistry Team. Basic Chemistry Diktat. ITS Chemistry.

COURSE: STRUCTURE KNOWLEDGE

CODE: TL2111R10

CREDITS: 3

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students are able to learn the basics of structural systems, the basis of structural analysis, calculate certain static structures and their applications in simple buildings, water tanks, manholes.

SUBJECT MATTER:

- The basics of introducing a structural system commonly used in environmental engineering, types or kinds of materials from structures (wood, steel and concrete materials) and their uses, the basis of structural analysis namely statics analysis and calculation of certain static structures with centralized loads, evenly divided loads and combinations of centralized and evenly divided loads.
- Properties of concrete, characteristics of reinforced concrete, calculation of slabs, beams, columns, foundations in simple buildings, application of reinforced concrete construction in water tank buildings, pump houses, manholes, simple water towers, characteristics of steel, types of steel profiles, calculation of tank bars, compressive strength, beams and columns in simple buildings,

PREREQUISITES:

Calculus I

OVERVIEW:

1. Popov, E.P. 1976. Mechanics of soft materials. 2nd edition, Prentice Hall.
2. Soewarno. Engineering Mechanics of Certain Static. UGM.
3. Norris, Wilbur and Utku. 1976. Elementary Structural Analysis. Mc Grawhill Co.
4. Ferdinand L. Singer and Adrew Pytel. 1985. Strength of Materials. 3rdrd edition, harper and RowInc.

COURSE: ENGLISH

CODE: UV21010

CREDITS: 3

METHODS: LECTURE, QUIZ

OBJECTIVES:

1. Students are able to explain and summarize the content of written discourse in English in the field of science and technology.
2. Students can identify the difference between general English and specialized English.
3. Students are able to identify and show word forms and affixes, phrase forms, clause forms, sentence forms
4. Explain specialized English structures.
5. Explain the main idea of written discourse and data supporting the main idea of written discourse.

SUBJECT MATTER:

- Special English characteristics
- Word forms, affixes, phrases, clause forms, sentence forms
- Topic-specific and written forms of English structures

- The main idea of written discourse and data supporting the main idea of written discourse.

PREREQUISITE :None

REFERENCES:

1. ITS English Teaching Team, "English for ITS", 1997, Chapter 1 p. 1-4
2. ITS English Teaching Team, "Readers on Engineering Studies", 1998, pp. 1-35
3. ITS English Teaching Team, "Readers on Engineering Studies", 1998, pp. 27-49.
4. ITS English Teaching Team, "Readers on Engineering Studies", 1998, p. 30
5. ITS English Teaching Team, Readers on Engineering Studies, 1998, p. 4
6. ITS English Teaching Team, "Readers on Engineering Studies", 1998, pp. 1-92.

SEMESTER III

COURSE: STATE DEFENSE

CODE: UV21011

CREDITS: 3

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students are able to explain the understanding of the rationale, aims and objectives, scope of State Defense Education and the definition, principles, objectives and spectrum of state defense.

SUBJECT MATTER:

Conception of State Defense Education, Integrity of National Identity, Substance of State Defense Awareness, State Defense in the Context of National Development, Factors Affecting State Defense Awareness, Leadership and Entrepreneurship, the Nature of Military Threats, the Nature of Non-Military Threats, National Vigilance, State Defense Awareness Development Policy, Good, Clean and Authoritative Government and Governance, Definition of Corruption, Anti-Corruption Values and Principles Development of State Defense Values and Culture.

PREREQUISITES: None

REFERENCES:

1. Team of Lecturers of MPK Dik Bela Negara, 2012. Textbook of State Defense Education, UPN "Veteran" East Java Surabaya
2. Directorate General of Defense Team, 2007, State Defense Education, Guidelines for Civic Education Lecturers, Directorate General of Defense, Ministry of Defense of the Republic of Indonesia, Jakarta
3. UPN Yogyakarta, 2007, Widya Mwat Yasa, UPN "Veteran" Yogyakarta, Yogyakarta
4. Directorate General of Defense Team, 2006, Basic Level of State Defense, Directorate General of Defense, Ministry of Defense of the Republic of Indonesia, Jakarta
5. As'ad Said Ali et al, 2010. Nationalism and National Character Building. PSP press. Yogyakarta
6. Sutaryo, et al., 2011 National Education System to build Indonesian Civilization imbued with Pancasila Values. Revised Edition, Gadjah Mada University press. Yogyakarta

COURSE: FLUID MECHANICS

CODE: TL2111R11

CREDITS: 3

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students are able to explain, the basics of fluid mechanics, and its applications needed in supporting expertise courses, especially those related to designs involving fluid flow, especially water

SUBJECT MATTERS:

Fundamentals of fluid mechanics, which include: Physical properties of fluids, energy equation, momentum equation, Bernaulli's law, types of flow, critical, sub critical and super critical flow, Reynold's number, Froud's number, optimum dimensions in open channels, flow profiles, flow in tanks. Formulas in pressurized and unpressurized flow and gas transfer laws.

Applications of fluid mechanics in piping include: discharge measuring instruments in pressurized flow, calculation of pressurized pipe diameter dimensions, flow in branch pipes, flow in loop pipes, flow with pumping, calculation of channel dimensions and water buildings, open channel discharge measuring instruments, flow in grained media, determination of gas and liquid spaces, fluids in gas transfer

PREREQUISITES: Calculus

REFERENCES:

1. Chow, V.T. 1975. Open Channel Hydraulics, McGraw Hill Co., New York.
2. GilesRanald V. 1962. Fluid Mechanics and Hydraulics. Schaum's series, McGraw Hill.

COURSE: ENVIRONMENTAL MICROBIOLOGY

CODE: TL2111R12

CREDITS: 3

METHODS: LECTURE, PRACTICUM

OBJECTIVES:

Students are able to explain the relationship between microbiology and the field of environmental engineering, especially the basic principles related to sanitation, public health, corrosion, bioprocessing basics for the treatment of liquid waste and solid waste.

SUBJECT MATTER:

Definition of microbiology, evolution of environmental microbiology and sanitary microbiology, microorganisms, classification of microorganisms (prokaryotes and eukaryotes) and their distribution, production patterns, enzyme kinetics, nutrient requirements, bioenergetics of fermentation, environmental factors that affect growth, control of microorganisms, aquatic microbiology, basic principles microbiology in waste treatment and its effect on corrosion, determining the level of environmental pollution of microorganisms with Practicum. Practical materials include: sterilization techniques, techniques for making liquid media and solid media, microorganism identification techniques, metabolic product identification techniques, techniques for determining the level of water pollution: Most Probable Number method, the effect of temperature and chemicals on the growth of microorganisms.

PREREQUISITE :None

REFERENCES:

1. Betty Sri Laksmi, et al, 1993, "Food Industry Waste Handling", Kanisius Publishers, Yogyakarta
2. Can, R.J. and J.S. Colone, 1983, "Microbiology", WaetPublishing Company, New York.
3. Cappuccino, J.G. and Sherman, N., 1983, "Microbiology, a Laboratory Manual", Addison Wesley Publishing Co. Reading
4. Dwidjoseputro D., 1998, "Fundamentals of Microbiology, Djakarta Publishers, Jakarta
5. Gaudy and Gaudy, 1980, "Microbiology for Environmental Scientist and Engineer, McGraw Hill.
6. Decree of the Governor of East Java 1996, Secretariat of East Java No. 40 and 41 of 1996
7. Ratna Sri Hadiotame, 1993, Basic Microbiology and Practice, Basic Laboratory Techniques and Procedures PT.Gramedia, Jakarta.
8. Sterrit, R.M., Lester, J.N., 1988, Microbiology for Environmental Engineers, St. Edindensburg Press Ltd, New York.
9. Selley, H.W, and Demark, P.J., 1975. Microbes in action. A laboratory manual of microbiology. Second edition D.B. taraporevala Sons & Co Private Ltd, Bombay.
10. Trihadiningrum, Y. 1996. Environmental Microbiology. Lecture Handbook. Sepuluh Nopember Institute of Technology.
11. Unus Suriawira, 1993, Microbiology and the Basics of Biological Sewage Treatment, Alumni Bandung.

COURSE: SOIL MECHANICS AND GEOHIDROLOGY

CODE: TL2111M13

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Provides a basic ability to use soil and groundwater data. soil and rock classification, soil and groundwater parameters, soil bearing capacity, lateral soil pressure, groundwater flow, pumping tests, and basic groundwater modeling.

SUBJECT MATTER:

- Soil mechanics and geohydrology in environmental engineering, soil particles, soil composition and properties, and moisture content
- Soil content weight, soil specific gravity and Alterberg limit pore number
- Soil percolation, percolation force and percolation coefficient measurements at fixed and varying stresses
- Parallel and perpendicular water flow, determination of field infiltration capacity
- Critical hydraulic gradients and capillary events
- Weather and climate, temperature and humidity, wind and pressure
- Rainfall rate and schedule, definition of infiltration and percolation, and equipment for measuring infiltration and percolation
- Definition of groundwater, types of soil layers, factors affecting groundwater flow, hydrological events
- Stress theory and effective stress principle; effective stress response due to change in total stress in fully saturated soil. Soil shear strength theory; consolidation theory and consolidation tests;

- Soil bearing capacity: limit bearing capacity and allowable bearing capacity due to tilting, eccentric loads;
- Elastic settlement and one-dimensional consolidation settlement;
- Lateral earth pressure: Rankine theory and Coulomb theory;
- Design of retaining wall structure

PREREQUISITES:

- Structure Knowledge
- Engineering Math

OVERVIEW:

1. Das, B.M. 1985. Principles of Geotechnical Engineering. PWS Engineering.
2. Holtz, R.D., and Covacs, W.D. An introduction to Geotechnical Engineering. Prentice Hall Inc.
3. Wesley, L.D 1973. Soil Mechanics. Board of Public Works, Jakarta.
4. Bowles, Y.E. 1982. Foundation Analysis and Design. 3rd edition, McGraw Hill Co.

COURSE: MAPPING AND PRACTICUM

CODE: TL2111R14

CREDITS: 3

METHODS: LECTURE, PRACTICUM

OBJECTIVES:

Students can explain the basics of land measurement, waterpass measurement, distance and height difference measurement, hydraulic profile, theodolite measurement techniques, coordinates and contours.

SUBJECT MATTER:

Definition of land measurement science, types of measurement work, mathematical calculation of unit system, horizontal angle and angle of direction, repetition and reiteration, binding forward, binding backward, working principle of theodolite, types of theodolite measuring instruments, parts of theodolite measuring instruments, how to measure distance and height difference, azimuth, drawing contour lines, working principle of waterpass, elevation going and returning, horizontal & vertical scales, determination of datum, hydraulic profile

PREREQUISITE:

Engineering Drawing

REFERENCES:

1. Jacub Rais. 1978. Land Measurement I and II. Jakarta.
2. Lukman Aziz. Topographic Mapping. Department of Geodetic Engineering ITB, Bandung.
3. Villanueva, K.J. Cartography. Department of Geodetic Engineering ITB, Bandung.

COURSE: ENGINEERING ECONOMICS

CODE: TL2111M15

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Students are able to compare financially and economically profitable alternatives. Able to compile the economic and financial feasibility of a project

SUBJECT MATTER:

Purpose and objectives, understanding of project costs consisting of investment, OM, interest, NPV, inflation. Time value of money, flow of funds, equivalence, interest formula, effective interest rate, equivalence method, rate of return, cost ratio benefit, capital budgeting, depreciation, tax effect, replacement, break even, payback and sensitivity analysis.

PREREQUISITES:

Engineering math

OVERVIEW:

1. Blank, L.T., Tarquin, A.J., 1983, 'Engineering Economy', 2nd edition, McGraw Hill Co, New York.
2. DeGramo, P.E, Sullivan, W.G.Canda. J.R., 1984, Engineering Economy, 7th edition, McMillan Publishers, New York,.

COURSE: STATISTICS AND PRACTICUM**CODE:** TL2111R16**CREDITS:** 3**METHODS:** LECTURE, PRACTICUM**OBJECTIVES:**

Students are able to explain the basic concepts in applying the principles of parametric statistics and probability theory in the field of Environmental Engineering so that students are able to present, process and conclude data.

SUBJECT MATTER:

Descriptive analysis: data presentation, distribution, frequency, central value and dispersion, moments and cartesian. Probability: elements of set theory, random variables, probability distributions, empirical distribution models. Estimation and hypothesis: methods of estimation, hypothesis testing, variance test, normality test. Time-series regression and correlation, basic linear regression formulation, analysis of variance, coefficient of determination. Population rate and ratio analysis, cohort table files, mortality and morbidity With practicum.

PREREQUISITES:

Engineering Math

REFERENCES

1. A.H.S. Ang et al, 1988, Probability Concepts in Engineering Planning and Design translated by Dr. Binsar Hariandja", IT Erlangga.
2. G.W. Barclay, 1980, "Technique of Population Analysis", McGraww Hill, NY
3. Prof. Dr. Sujana, 1990, "Statistical Methods", Tarsito Publisher Bandung.
4. Anto Dayan, 1972, "Introduction to Descriptive Statistical Methods", LP3ES, Jakarta

COURSE: PROJECT MANAGEMENT**CODE:** TL2111M17**CREDITS:** 2**METHODS:** LECTURE**OBJECTIVES:**

- Students can have basic knowledge of general management as an important supplement to the ability of students in the field of engineering.
- Students are able to explain and organize the scope of implementation

- techniques and Project Management in its stages of development.

SUBJECT MATTER:

Basic principles of management and leadership. Management techniques: Resource allocation optimization. Decision-making techniques Management information systems. Project development process and feasibility study, tender documents, contract and project price estimation, tender procedures and process, project implementation in the field, procurement, recycling planning, project scheduling and control, bar chart, CPM, arrow diagram, network, precedence and time schedule diagram, network compression method analysis, resource allocation and project control.

PREREQUISITES:

Environmental Health and OHS

REFERENCES:

1. Ali Basyah Siregar and TMA Ari Samandhi, 1988, "Management" ITB.
2. Handi Toha, "Intro to Operation Research".
3. Nuaraha P., Natahn I, and R. Sucipto, 1985, "Construction Project Management I and II", Kartika Yudha.

SEMESTER IV

COURSE: DRINKING WATER TREATMENT PROCESS

CODE: TL2111R13

CREDITS: 3

METHODS: LECTURE

OBJECTIVES:

Students are able to explain the basics in the drinking water treatment process, including basic chemistry and physics. In addition, they can apply pollutant parameters in existing clean water, with drinking water treatment processes correctly.

SUBJECT MATTER:

Basic drinking water treatment process, which includes chemical processes (water properties: Oxygen CO₂, acids, bases and salts, pH etc.) and physical processes (Bernoulli equation, open, closed and depressed flow fluid equations). Water consumption and drinking water quality standards, water sources, making flow diagrams of treatment alternatives. Principles of treatment: physically (coarse filters, settling, fast and slow sand filters), chemically (coagulation- flocculation, disinfection to reduce iron and manganese levels, reduce water hardness), biologically (nitrification and denitrification).

PREREQUISITES:

Environmental Chemistry

REFERENCES:

1. Al-Layla, M. A. et al, 1978, 'Water Supply Engineering Design', Ann Arbor Science
2. Clark, J. W. et al, 1977, "Water Supply and Pollution Control", Harper and Row.
3. Shulz. C.R., Okun. D.A., 1984, "Surface Water Treatment for Communities in Developing Countries John Willey & Sons. Inc.

COURSE: ENVIRONMENTAL POLLUTANT ANALYSIS AND PRACTICUM

CODE: TL2111R19

CREDITS: 3

METHODS: LECTURE

OBJECTIVES:

Students are able to apply physico-chemical analysis methods and analyze laboratory examination data on clean water quality, waste water, air quality and waste correctly.

SUBJECT MATTER:

Includes: analysis of pH measurement, electrical conductivity, turbidity, color, taste and odor, acidity and alkalinity analysis, aggressive CO₂ analysis, hardness analysis, jar-test, chloride analysis, iron and manganese analysis, chlorine binding capacity, chlorine residual, break point chlorination, fluorine analysis, water solids analysis, dissolved oxygen analysis, BOD analysis, COD analysis, organic matter analysis (PV and TOC), nitrogen analysis, phosphate analysis, sulfate analysis, heavy metal analysis

PREREQUISITE:

Environmental Chemistry

REFERENCES:

1. Alaerts, G., and Sumentri, S., 1984, "Water Research Methods", National Business Publishers, Surabaya, Indonesia.
2. Brady, J.E., and Holum, J.R., 1978, "Fundamental Chemistry", Third Edition, John Wiley and Sons, New York.
3. Sienko, Plane, 1974, "Chemistry Principles and Property", Second Edition, Mc Graw Hill.
4. Sawyer, C.M., and Mc. Carty,, P.L., 1967, "Chemistry of Sanitary Engineer", 2nd edition, International student Edition, Mc GrawHill, Kogakusha, Ltd, Tokyo.
5. APHA, AWWA, 1995, "Standard Methods for the Examination of Water and Wastewater", WPCF, 15th edition, Washington, D.C..

COURSE: WATER QUALITY AND RESOURCE MANAGEMENT

CODE: TL2111R20

CREDITS: 3

METHODS: LECTURE

OBJECTIVES:

Students plan the management of water quality and resources and supporting buildings

SUBJECT MATTER:

The theory of river water quality models, quality and quantity of water sources and factors affecting them, the effect of wastewater on rivers and lakes, the impact of waste pollution from domestic activities. Industry and agriculture on the water quality of rivers and lakes, self purification ability of water bodies, water use, water quality standards covering water bodies and activities that utilize river and lake water, water quality index, socio-economic aspects in water resources management engineering objectives, concepts in water resources management planning (flood frequency, drought, flood forecast formula, synthetic river flow), legal aspects, land management and flood prevention, water source development planning, raw water reservoir construction planning.

PREREQUISITES:

- Environmental Pollutant Analysis
- Fluid Mechanics

REFERENCES:

1. Eckenfelder, William Wesley, "Principles of water quality management, Krieger, Malabar, 1991.
2. Lohani, 1981, "Environmental Quality Management, AIT
3. Mc Gauhey, P.H., 1990, "Water Quality Management", Mc Graw Hill.
4. OTT, Wayne R, 1992, "Environmental Fudices-Theory and Practice", Ann Arbor Science
5. Philip B. Bedient & Wayne C. Huber, "Hydrology and flood plain analysis", 2nd edition, Addison Wesley New York, 1998.
6. Tchcbanoglous, George & Edward D. Schrceder, modification", Water quality characteristics, modeling, Addison Wesley, Reading, 1995.
7. Suripin, 'Preservation of soil and water resources', Andi, Yogyakarta, 2002.

COURSE: DRINKING WATER DISTRIBUTION SYSTEM AND TASKS

CODE: TL2111R21

CREDITS: 3

METHODS: LECTURE

OBJECTIVES:

Students are able to explain and design drinking water distribution systems and can evaluate drinking water distribution systems.

SUBJECT MATTER:

Water demand projections, raw water sources, intakes, transmission pipes, pressure release basin buildings, air valves, washouts, pipe bridges, principles of distribution and transmission system planning consisting of service areas, pipelines and dimensions, as well as accessories and equipment, reservoirs, establishment of leakage control zones. Distribution and transmission system planning which includes population projections, facility projections, service blocks, determination of water demand, determination of pipe dimensions (Hardy Cross), determination of reservoirs and pumps, technical specifications, junction details, bill of quantities and drawings supporting drinking water distribution.

Planning task materials, including:

Introduction, Literature Review, Planning Criteria and Calculations on population projections, facility projections, service blocks, determination of water demand, determination of pipe dimensions (Hardy Cross), determination of reservoirs and pumps, technical specifications, junction details, bill of quantities and drawings supporting drinking water distribution.

PREREQUISITES:

- Engineering Drawing
- Engineering Drawing Assignment
- Plumbing
- Plumbing Tasks
- Water Resources Quality Management

REFERENCES:

1. Al-Layla, M.A. etal. 1978, "Water Supply Engineering Design", Ann ArborScience
2. Clark, J.W. etal, 1977, "Water Supply and Pollution Control", Harper and Row
3. Tamboo N, 1990, "Water Distribution System", McGraw

COURSE: ENVIRONMENTAL HEALTH AND SAFETY

CODE: TL2111R21

CREDITS: 3

METHODS: LECTURE

OBJECTIVES:

Students are able to explain the basics and problems of public environmental health and environmental sanitation, which include the spread of infectious diseases and prevention efforts. Students are able to explain the basic principles of occupational health, about aspects in the work environment / industry that have the potential to cause interference with occupational health and safety.

SUBJECT MATTER:

Environmental sanitation in terms of: drinking water supply, waste water and feces management, waste management, housing sanitation, food sanitation, vector and rodent control, and control of air and noise pollution, radiation and its effects on health, measurement of health and disease, causes of disease, epidemiology and prevention, epidemiology and infectious diseases. Aims and objectives of occupational health and safety, legislation, chemical, physical, biological and ergonomic factors, sampling, substitution, isolation, ventilation, personal safety equipment.

PREREQUISITES:

- Ecology and Peng. Environment
- Environmental Chemistry

REFERENCES:

1. Amsyari Fuad, 1989, Low Dose Radiation and its Effect on Health, Airlangga University Press, Surabaya.
2. Azwar A., 1988, Introduction to Epidemiology, PT. Bina rupa Aksara, Surabaya
3. Cairncross, S., Feachem, R.G. 1983. Environmental Health Engineering in the Tropics, An Introduction Text; John Wiley & Sons, Chichester.
4. Fox, Hall, Elveback. 1970. Epidemiology: Man and Disease. Mc.Millan Co.
5. Kusnoputranto, Haryoto, 1986, Environmental Health, UI, Jakarta.
6. Mukono, 2002, Epidemiology Environment, Airlangga University Press, Surabaya
7. Ollishifski, J.B. 1971. Fundamentals of Industrial Hygiene, Chicago Nat. Safety Council
8. Powell, C.H., 1961, "The Industrial Environment, Its Evaluation and Control", Washington DC. USPHS
9. Salvato, J.A. 1982. Environmental Engineering and Sanitation. Wiley-Interscience, New York.
10. Soemirat Slamet, Juli, 1994, Environmental Health, Gajah Mada University Press, Yogyakarta.
11. Suma'mur, PK. 1989, "Corporate Hygiene and Occupational Health", Haji Masagung, Jakarta.
12. Suma'mur, P.K., 1989, "Safety and Accident Prevention", Haji Masagung, Jakarta.
13. Thomas, J.A., 1979, Occupational Safety and Health Management, McGraww Hill Booak Company, New York.
14. WHO. 1990. Environmental and Occupational Epidemiology". WHO, Geneva

COURSE: WASTE WATER TREATMENT PROCESS

CODE: TL2111R23

CREDITS: 3

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students are able to explain the basic process of wastewater treatment, including chemical processes and biological process kinetics constants. Calculate the dimensions of the bioreactor in wastewater treatment and its modeling appropriately.

SUBJECT MATTER:

Sources and characteristics of wastewater, primary, secondary and tertiary treatment, basic process kinetics and reactor models. Advanced mass balance. Biological processes: kinetics of biomass growth, principles of biological oxidation (aerobic - anaerobic - facultative processes), reactor kinetics of suspended growth (activated sludge process and its modifications) and attached growth (biofilm and its modifications). Calculate bioreactor dimensions.

PREREQUISITES:

- Environmental Microbiology
- Fluid Mechanics

REFERENCES:

1. Reynold, T.D, 1982, Unit Operation and Processes in Environmental Engineering, Brookscole Engineering Division, Monterey, California.
2. Larry D. Benefield. Etal, 1985, Process Chemistry for Water and Wastewater Treatment, Prentice-Hall, Englewood Cliffs, New Jersey.
3. Rich, L.G., 1961, "Unit Processes of Sanitary Engineering, John Wiley & Sons Inc.

COURSE: AIR POLLUTION CONTROL TECHNOLOGY

CODE: TL2111R29

CREDITS: 3

METHODS: LECTURE

OBJECTIVES:

Students can plan air quality management and air pollution control techniques

SUBJECT MATTER:

Air pollutant dispersion, source, distribution, particulate matter collection method, collection technology. Control of gaseous pollutants; (SO_x, CO_x, NO_x, odor). Thermodynamics and kinetics of gaseous pollutants, Air pollution control technology (Cyclone, Gravity settling chamber, Scrubber, Fabricfilter, Electrostatic precipitator, Adsorption, Absorption, etc.), Environmental engineering modeling with similarity principle.

PREREQUISITES:

Ecology and Environmental Science

REFERENCES:

1. Wark K., Warner. C.F, 1981, Air Pollution, Its Origin and Control", Harper &Row, Publisher, New York.
2. Center L.W., 1979, "Air Pollution McGraw Hill Book Co, New York.

SEMESTER V

COURSE: COMMUNITY SERVICES

CODE: UV2111M24

CREDITS: 2

OBJECTIVES:

Improve students' ability to provide information and motivation in development and community life directly, especially village community development.

SUBJECT MATTER:

Visits and real scientific implementation in disadvantaged areas.

COURSE: WASTE MANAGEMENT TECHNOLOGY

CODE: TL2111R25

CREDITS: 3

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students are able to explain the definition, generation, chemical properties of waste processes, characteristics, collection routes, volume reduction, operational technical aspects, chemical waste contaminants (solids and leachate) processing systems as well as recycling and waste disposal.

SUBJECT MATTER:

Definition of waste, sources of waste, classification and characteristics of waste, and waste composition. Basic chemical processes of composting, bioethanol and biogas. Planning waste management from waste generation estimation, waste collection, transfer depot, transportation and final disposal (sanitary landfill). Processing, sorting, recycling, incineration, biological treatment (composting, worm farming), incineration, biogas utilization. Basics of pollution control by odor, methane gas, leachate and incinerator exhaust gas. Environmental engineering modeling with similarity principle and queuing system.

PREREQUISITES:

Environmental Pollutant Analysis

REFERENCES:

1. Baum, Parker, 1973, 'Solid Waste Disposal Volume 1', Ann Arbor Science, Michigan,
2. Flintoff, 1976, 'Management of Solid Waste in Developing Countries', WITO,
3. Tchobanoglous, G., Thiesen, H., Eliassen, R, 199 "Solid Waste Engineering Principles and Management Issues", McGraw Hill Book Co, New York,
4. Wilson, D.C., 1981, "Waste Management", Clarencon Press. Oxford.

COURSE: WASTEWATER DISTRIBUTION SYSTEM AND TASKS

CODE: TL2111R26

CREDITS: 3

METHODS: LECTURE

OBJECTIVES:

Students are able to explain the wastewater distribution system, design construction and analyze factors that cause operating problems and countermeasures.

SUBJECT MATTER:

Purpose and objectives of wastewater distribution system, population projection and calculation of wastewater quantity, systems/alternative wastewater distribution systems (shallow sewer, small bore sewer conventional sewer) and their applications. System planning consisting of: determination of services, system selection, dimensions and hydraulic planning, equipment / complementary buildings.

System planning consisting of population projections, facility projections, division of service blocks, calculation of wastewater quantity, determination of ground level slope, pipe loading, determination of pipe dimensions, pipe planting, calculation and drawings of complementary buildings (manhole, sump- pump, house connection), hydraulic profile.

Planning task materials that include:

Introduction, Literature Review, Planning Criteria and Calculations on population projections, facility projections, division of service blocks, calculation of wastewater quantity, determination of ground slope, pipe loading, determination of pipe dimensions, pipe planting, calculation and drawings of complementary buildings (manhole, sump-pump, house connection), hydraulic profile

PREREQUISITE:

- Drinking Water Distribution System
- Water Distribution System Tasks
- Wastewater Treatment Process
- Mapping

REFERENCES:

1. Metcalf and Eddy, 1981, "Wastewater Engineering, Collection and Pumping of Wastewater", McGraw Hill Book Company.

COURSE: CITY DRAINAGE AND TASKS

CODE: TL2111R27

CREDITS: 3

METHODS: LECTURE, ASSIGNMENT

OBJECTIVES:

Students are able to explain the handling of urban drainage systems, able to plan and explain the management aspects.

SUBJECT MATTER:

Purpose and objectives of drainage planning, application of hydrology to planning, system planning consisting of: service area determination, system selection, channel dimensions and building planning hydraulic, pumping boozem/ retention pond, spillway, manhole. Planning task materials include:

Introduction, Literature Review, Planning Criteria, Rainfall calculations, plan discharge, channel dimensions, hydraulic structures, detention structures, hydraulic profiles.

PREREQUISITES:

- Drinking Water Distribution System
- Water Distribution System Tasks
- Mapping

REFERENCES:

1. Fair, G.M., Geyer, Y.C., Okun, D.A, 1966, "Water and Wastewater Engineering. Volume, Willey International Edition, Singapore.

2. WPCF, 1969, and Construction and Storm Sewer Washington DC.

COURSE: UNIT OF OPERATION AND PRACTICUM

CODE: TL141141

CREDITS: 3

METHODS: LECTURE, PRACTICUM

OBJECTIVES:

Students can calculate the dimensions of operating units in drinking water treatment, waste water treatment and air pollution control correctly.

SUBJECT MATTER:

Fast stirring and slow stirring, settling I, and II, flotation, filtration in graded media, aeration and gas transfer, dewatering technology (vacuum hydration, drying), ion exchange and membrane technology and Practicum.

PREREQUISITES:

- Fluid Mechanics
- Wastewater Treatment Process

REFERENCES:

1. Rich, L.G, 1974, "Unit Operation of Sanitary Engineering, Photo Offset L.G, New York.
2. Reynold, T.D., 1998, "Unit Operations and Processes in Environmental Engineering", Brookscole Engineering Division, Monterey, California.
3. Fair, Geyer, Okun, 1978, "Water Purification and Wastewater Treatment and Disposal", John Willey and Sons, Inc.

COURSE: ENTERPRENEURSHIP

CODE: UV21012

CREDITS: 3

METHODS: LECTURE, ASSIGNMENT

OBJECTIVES:

Students can open up insights and form an entrepreneurial mindset in the field of traditional and modern businesses.

SUBJECT MATTER:

Knowing the entrepreneurial person i.e. leadership, entrepreneurial spirit, risk taking, decision making, business planning, time management. Financial planning and control and use of resources i.e. human resources, assessing market opportunities, liaison with government agencies. Familiarity with traditional business, for-profit and telemarketing.

PREREQUISITES:

- Engineering Economics

REFERENCES:

1. Kiyosaki, Robert, 2002, Rich Kid Smart Kid, Gramedia Pustaka Utama, Jakarta.
2. Kiyosaki, T. Robert, 2002, Cash Flow Cuacrant, Gramedia Pusat Utama, Jakarta
3. Geoffry, G. Merdith, 2002, Entrepreneurship Theory and Practice, Victory Jaya Abadi, Jakarta.

COURSE: INDUSTRIAL DISCHARGE MANAGEMENT

CODE: TL2111M30

CREDITS: 2

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students apply engineering management for industrial discharges correctly.

SUBJECT MATTER:

The concept of technical management for industrial discharges, the concept of pollution prevention, waste minimization, 4R, pollution control), determination of sampling points, industrial wastewater treatment according to the type of industry (organic and inorganic discharges) physically, chemically, and biologically.

PREREQUISITES:

- Wastewater Treatment Process
- Analysis of Environmental Design

REFERENCES:

1. Azad, H, S., 1976, "Industrial Wastewater Management Handbook, McGraw Hill Book Co,
2. Besselièvre, B., and Schwartz, M., 1976, "The Treatment of Industrial Waste, 2nd ed. International Student Edition, McGraw Hill Kogakusha Ltd.
3. Eckenfender, W.W.Jr., 1886. "Industrial Water Pollution Control", McGraw Hill Book Co.
4. Freeman H, 1880, Hazardous Waste Minimization, editor, McGraw Hill Publishing Company. Singapore
5. Johansson, Allan, 'Clean technology,' Lewis, Boca Raton, 1992
6. Patterson, J.W., 1980, "Industrial Wastewater Treatment Technology", McGraw Hill Book
7. Nemerow, Nelson Leonard, "Zero pollution for industry, waste minimization through industrial complexes", John Wiley, New York, 1995.
8. Randall, Paul M (ed), "Engineers guide to cleaner production technologies", Technomic, Basel, (s.a).

COURSE: ELECTROCHEMICAL

CODE: TL2112M60

CREDITS: 2

METHODS: LECTURE, QUIZ

OBJECTIVES:

Provides an understanding of corrosion and corrosion control techniques, especially in piping systems and water and wastewater treatment plants.

SUBJECT MATTER:

Fundamentals of corrosion theory; measurement of soil resistivity, corrosion in soil, corrosion in air environment, corrosion countermeasures with paint protection or wrapping cathodic protection with carbon anode (Sacrificial Anode) and Impressed Current methods.

PREREQUISITES:

Industrial Discharge Management

REFERENCES:

1. Kenneth R, Trethewey, John Camberlain "Corrosion for Students of Science and Engineering" Longman Corp, 1988.
2. Marshall, E.P., Edward, G.P, Pipeline Corrosion and Cathodic Protection", Gulf Publishing Co, Texas, 1984

COURSE: PLUMBING AND PUMPS

CODE: TL2111M52

CREDITS: 2

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students are able to explain and connect the piping system and its equipment required by a multi-storey building, so that the system can work perfectly.

SUBJECT MATTER:

Definition of plumbing and its elements, provision of fixtures, quantity of clean and dirty water, types of materials, fittings and equipment and their installation, basic hydraulics that support plumbing calculations, layouts, fixture loads and determination of pipe dimensions for clean water, for dirty water and vents, for hot water, for fire, for rainwater, reservoirs (roof tanks and hydrophore) and stability of water pressure in pipes. With planning tasks. Determination of water demand, determination of cold clean water, determination of hot clean water, determination of dirty water and used water, determination of vents, fire hydrants, gutters, ground reservoirs, roof tanks, pumps and septic tanks.

Planning task materials, including:

Introduction, Literature Review, Planning Criteria and calculations regarding the determination of water demand, determination of cold clean water, determination of hot clean water, determination of dirty water, determination of vent, Firehydran, gutter, ground reservoir, roof tank, pump and septic tank.

PREREQUISITES:

- Engineering Drawing
- Installation and Instrumentation Equipment

REFERENCES:

1. Babbit, H.E, 1960, "Plumbing", McGraw Hill Book Company.
2. Morimura, S, 1986, "Design and Maintenance of Plumbing Systems", PT Pradnya Paramita Bandung.

SEMESTER VI

COURSE: LEADERSHIP

CODE: UV21013

CREDITS: 2

METHODS: LECTURE, QUIZ

OBJECTIVES:

Acquire and understand and apply the science of environmental control leadership in the field of education comprehensively.

SUBJECT MATTER:

Basic concepts of leaders and leadership, Theories of leadership emergence. Conditions of leadership. Leadership styles, conflict management by leaders, value-based leadership, situational leadership, vision art leadership, transformation a leadership and principal ships.

PREREQUISITES: None

REFERENCES:

1. Barnes, Tany, (1998), Kaizen Strategies for Successful Leadership, (Translated by Martin Widjokangko; Successful Leadership, How to Take Your Organization into the Future), Batam: Interaksara.
2. Bender, Peter, Urs., (2001), Leadership From Within, New York: Niagara Falls.

3. Cohen, William, A., (2002), The New Art of the Leader, (Translated by Hendrikus Leko, The New Art of the Leader, Leading with Integrity and Honor), Jakarta: PT Prenhallindo
4. Jacobson, Paul B., et.al., (1977), The principalship: New Perspective, New Jersey: PrenticeHall, Inc.

COURSE: DRINKING WATER BUILDING DESIGN-WASTE WATER

CODE: TL2111R31

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Students are able to design wastewater treatment plants, operation and maintenance systems, cost estimates and expansion plans for drinking water and wastewater treatment plants.

SUBJECT MATTER:

Data on the quality of treated wastewater, determination of the installation used, planning criteria and calculations of intake buildings, prasedimentation, coagulation, flocculation, biological treatment (activated sludge systems, oxidation ponds, trickling filters, uasb, etc.), sedimentation, filtration, chlorination, reservoirs, hydraulic profiles, cost budget plans, drawings of the installations used.

Design Materials include:

Introduction, Literature Review, Design Criteria and Calculations on intake building, prasedimentation, coagulation, flocculation, biological treatment (activated sludge system, oxidation pond, trickling filter, uasb, dl), sedimentation, filtration, chlorination, reservoir, hydraulic profile, cost budget plan, installation drawings used.

PREREQUISITES:

- Sewage Treatment Building Planning
- Planning of Drinking Water Treatment Building
- Practical Work

REFERENCES:

1. Benefield, Randal., 1965, "Biological Treatment of Wastewater", McGraw Hill Book Co. NY.
2. Metcalf & Eddy, 1991, "Wastewater Engineering Treatment, Disposal, Reuse". McGraw Hill Book. Co.
3. WPCF, 1972, "Sewage Treatment Plant Design", Fifth Printing.
4. Oasim, Syed A, 1991, Wastewater Treatment Plant Design", McGraw Hill Book Co, NY.

COURSE: DRINKING WATER TREATMENT BUILDING PLAN

CODE: TL2111R32

CREDITS: 3

METHODS: LECTURE

OBJECTIVES:

Students are able to design the construction of drinking water treatment plants, operation and maintenance systems, cost estimates and expansion plans for drinking water treatment plants.

SUBJECT MATTER:

Masterplan: treatment discharge, production discharge, phasing, planning period. Pre-design of treatment process selection, flow diagram, layout. Design: design calculations, treatment building, hydraulic profile, technical specifications, treatment equipment, cost estimates. Operation and maintenance and expansion plans and funding.

PREREQUISITES:

- Water Resources Quality Management
- Operations Unit
- Drinking Water Distribution System
- Mapping

REFERENCES:

1. Kawamura S., 1991 "Integrated Design of Water Treatment facilities, John Wiley and Sons inc,
2. Fair, G.M, Geyer, Y.C., Okun, D.A., 1971, "Water and Wastewater Engineering", Vol II John Wiley & Sons.
3. ASCE AWWA, CSSE, 1969, "Water Treatment Plant Design". AWWA Inc. New York.
4. Sanks R. L. (editor), 1980, "Water Treatment Plant Design, For the Practicing Engineer, Ann Arbor Science, Ann Arbor Michigan USA.
5. Degremont, 1979, "Water Treatment Handbook, Fifth Edition, A Halsted Press Book John Wiley & Sons, New York.

COURSE: PROCESSING BUILDING PLANNING WASTE WATER

CODE: TL2111M13

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Students are able to design the wastewater treatment plant, operation and maintenance systems, cost estimates and expansion plans for the wastewater treatment plant.

SUBJECT MATTER:

Masterplan: treatment discharge, production discharge, phasing, planning period. Pre-design: treatment process selection, flow diagram, layout. Design: design calculations, treatment building, hydraulic profile, technical specifications, treatment equipment, cost estimates. Operation and maintenance and expansion plans and funding.

PREREQUISITES:

- Industrial Discharge Management
- Engineering Economics
- Sewerage System

OVERVIEW:

1. Benefield, Randal., 1965, "Biological Treatment of Wastewater", McGraw Hill Book Co. NY
2. Metcalf & Eddy, 1991, "Wastewater Engineering Treatment, Disposal, Reuse". McGraw Hill Book. Co.
3. WPCF, 1972, "Sewage Treatment Plant Design", Fifth Printing,

4. Qasim, Syed A, 1991, "Wastewater Treatment Plant Design", McGraw Hill Book Co. NY

COURSE: B-3 WASTE WATER TREATMENT TECHNOLOGY

CODE: TL2111R34

CREDITS: 3

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students are able to understand and identify the types and characteristics of hazardous and toxic waste and are able to plan their management system.

SUBJECT MATTER:

Definition of sources, classification, characteristics, legal aspects (laws and regulations) of toxic and hazardous materials. Storage techniques, collection, transportation, handling, preliminary, chemical, physical and biological treatment. Separation of hazardous waste from liquid waste, stabilization, fixation and solidification. Hazardous waste incineration techniques (general conception of design, air pollution control), secure landfill (site selection, general conception of design, leachate handling and monitoring)

PREREQUISITE:

Industrial Effluent Treatment

REFERENCES:

1. BAPEDAL publication on LB3
2. Lecture notes : Hazard Assessment of CES SUG Belgiumchemicals
3. C.A. Wents: Hazardous Waste Management, McGraw Hill
4. E.J. Martin: Hazardous Waste Management Engineering, Van Nostrand

COURSE: RESEARCH METHODOLOGY

CODE: TL2111R35

CREDITS: 3

METHODS: LECTURE

OBJECTIVES:

Students are able to explain the basics of knowledge of planning, conducting and reporting research so that they can organize research for the field of environmental engineering.

SUBJECT MATTER:

The meaning, benefits and relevance of research, determination of research ideas, formulation of problems and objectives of research variables. Preparation of a research plan, literature study (techniques for searching scientific literature, techniques for extracting literature content, ethics of adaptation), determination of research variables, aspects of accuracy and accuracy of data), data processing, writing research results, presentation techniques of research results, follow-up of a study.

PREREQUISITES:

- Students have done their pre-final project.
- Environmental Statistics

REFERENCES:

1. Aergeerls, R., Trihadiningrum, Y., 1987, "A Guide for Thesis Researching Environmental Sciences Planning, Implementation and Reporting, ABOS- ITS, Surabaya.

2. Nursuhud, Dj. Handogo, R., 1994, Research Administration Policy for ITS Research Institute Lecturers", ITS Research Institute, Surabaya.
3. Taha. HA, 1982, "Operation Research, an Introduction, Third Edition, Mc Millan Publishing Co. Inc, New York.

COURSE: NOISE CONTROL

CODE: TL2111M50

CREDITS: 2

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students can analyze the economic aspects of environmental benefits so that the function/role of the environment can be maintained and even increased.

SUBJECT MATTER:

Definition of environmental economics, economic system and environmental degradation environmental quality economics, environmental protection economics, environmental value determinants, environmental treatment financing.

PREREQUISITES:

Industrial Discharge Management

REFERENCES:

1. Charles W. Home," Natural Resource Economes, johnwiley New York, 1979.
2. JacobsMichael, The Green Economy, Plus Press London, 1993
3. Suparmoko, M, Maria "Environmental Economics ed 1, BPFE yogyakarta, 2000

COURSE: NATURAL MANAGEMENT TECHNOLOGY

CODE: TL2112M48

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Students are able to analyze soil / rock as a waste processing medium, analyze waste disposal to the ground for local sanitation technology and centralized sanitation technology and waste disposal to various types of land (agriculture, plantations, forests, fisheries, swamps, etc.). Students are able to design waste treatment processes and design waste disposal systems.

SUBJECT MATTER:

Analysis of rock soil as waste processing media: physics of water unsaturated zone soil, chemistry of water unsaturated zone soil, biology of water unsaturated zone soil.

Analysis of sewage discharge to land for local sanitation technology and centralized sanitation technology and to various types of land: irrigation process and conveyance method, infiltration process and conveyance method, surface flow process and conveyance method, wetland process and conveyance method, subsurface process and conveyance method, aquaculture process and conveyance method.

PREREQUISITES:

Industrial Discharge Management

COURSE: NOISE CONTROL

CODE: TL2112M50

CREDITS: 2

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students plan for noise control

SUBJECT MATTER:

Sources of noise, its impact on the environment and health, noise quality standards, factors affecting noise, ventilation systems in buildings and houses, noise control

PREREQUISITES:

Industrial Discharge Management

REFERENCES:

1. Powell C.H., The Industrial Environment, its evaluation and control, Washington DC, 1951
2. Rettinger, M., "Acoustic Design and Noise Control", Vol 1 & 1, Chemical Publishing Co., New York, 1977.

COURSE: ENVIRONMENTAL ECONOMICS

CODE: TL212M42

CREDITS: 2

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students can analyze the economic aspects of environmental benefits so that the function/role of the environment can be maintained and even increased.

SUBJECT MATTER:

Definition of environmental economics, economic system and environmental degradation environmental quality economics, environmental protection economics, environmental value determinants, environmental treatment financing.

PREREQUISITES:

Industrial Discharge Management

REFERENCES:

1. Charles W. Home, "Natural Resource Economics, John Wiley New York, 1979.
2. Jacobs Michael, The Green Economy, Plus Press London, 1993
3. Suparmoko, M, Maria "Environmental Economics ed 1, BPFE Yogyakarta, 2000

COURSE: NATURAL MANAGEMENT TECHNOLOGY

CODE: TL2112M48

CREDITS: 2

METHODS: LECTURE

OBJECTIVES:

Students are able to analyze soil / rock as a waste processing medium, analyze waste disposal to the ground for local sanitation technology and centralized sanitation technology and waste disposal to various types of land (agriculture, plantations, forests, fisheries, swamps, etc.). Students are able to design waste treatment processes and design waste disposal systems.

SUBJECT MATTER:

Analysis of rock soil as waste processing media: physics of water unsaturated zone soil, chemistry of water unsaturated zone soil, biology of water unsaturated zone soil.

Analysis of sewage discharge to land for local sanitation technology and centralized sanitation technology and to various types of land: irrigation process and conveyance method, infiltration process and conveyance method, surface flow process and conveyance method, wetland process and conveyance method, subsurface process and conveyance method, aquaculture process and conveyance method.

PREREQUISITES:

Industrial Discharge Management

REFERENCES:

1. Metcalf and Eddy, 1991. Wastewater Engineering Treatment, Disposal, Reuse. McGraw Hill International Editions.

SEMESTER VII

COURSE: SOIL QUALITY AND RESOURCE MANAGEMENT

CODE: TL2111M36

CREDITS: 3

METHODS: LECTURE

OBJECTIVES:

Students are able to explain the problems, causes and ways to improve polluted soil sites and pollution treatment methods using existing alternative technologies correctly.

SUBJECT MATTER:

Remediation treatment objectives, microbiological and biodegradation engineering, characterization of common and B-3 contaminants, groundwater and geohydrological models, groundwater remediation technologies (immobilization, separation, destruction, in-situ), soil remediation technologies (immobilization, separation, destruction, in-situ), aerobic and anaerobic bioremediation technologies (surface and subsurface soils, freshwater and saltwater).

PREREQUISITES:

Hazardous Waste Treatment Technology

REFERENCES:

1. Mangkoediharjo, S. 2010. Applied phytotechnology. Surabaya

COURSE: EIA AND ENVIRONMENTAL AUDITING

CODE: TL2111R37

CREDITS: 3

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students have the ability to work in the Environmental Impact Assessment preparation team, are able to make / compile EIA reports, can evaluate EIA documents, especially parts related to the field of Environmental Engineering based on knowledge and applied and applicable legal aspects. Students recognize the implementation of environmental audits based on ISO 14000 Series.

SUBJECT MATTER:

History of the development of EIA, various environmental aspects related to EIA, from interdisciplinary science. Legal aspects underlying EIA, including Law No. 23 of 1997 on "Basic Provisions for Environmental Management" and Government Regulation No. 51 of 1993 on "Environmental Impact Assessment". Review of projects that need to be carried out EIA Studies in connection with the impacts they cause. EIA implementation procedures are adjusted to the existing technical guidelines. Learn various ways for initial collection, predicting impacts either mathematically or analogously including methods: checklist, matrix, overlay. Steps in preparing an EIA document consisting of: Description of Project Activities, Identification of Potential Impacts & Important Impacts; Scoping; Initial Environmental Assessment which is commonly grouped into chemical physical assessment, biological assessment and socio-economic and cultural assessment; Impact prediction Impact Evaluation Preparation of EIA documents with Case Studies. Complete with environmental audit aspects due to the impact of environmental management

infrastructure development with flow diagrams, material / energy balance, efficiency and cost benefits.

PREREQUISITES:

- Environmental Statistics
- Manufacturing Technology. Penc. Air
- Project Management

REFERENCES:

1. Anonimous, "Law of the Republic of Indonesia No. 23 1997 on Environmental Management
2. Anonimous, "Government Regulation of the Republic of Indonesia No. 1986 on Environmental Analysis
3. Canter. LW, 'Environmental Assessment, McGraw Hill Book Company Canter, L.W., Hill, LG. "Handbook of Variables for Environmental impact Assessment", Ann Arbor Science Publisher Inc.
4. Suratmo, Gunawan F, 1990, "Environmental Impact Analysis", Gajah Mada University Press.
5. UNESCO / ITS/ABOS, 1988, "Training Course Microcomputer Methods for Environmental Studies Surabaya.

COURSE: MARINE POLLUTION TREATMENT TECHNOLOGY

CODE: TL2111M38

CREDITS: 2

OBJECTIVES:

Students are able to plan marine and coastal pollution control systems.

SUBJECT MATTER:

Introduction to marine environment, movement, physical, chemical and biological characteristics of the ocean, productivity, intertidal environment, estuaries, seabed, and tropical coastal environment. Sources and types of marine pollutants, effects of pollution, transport and transformation of pollutants, methods of marine pollution control, design of wastewater outfalls to estuaries and the ocean based on dilution, dispersion and decay. Seawater intrusion, reclamation, accretion, coastal management methods, coastal protection structures, mangroves, biostructure, coastal natural resource management.

PREREQUISITES:

Water Resources Quality Management

OVERVIEW:

1. Gunnerson, Charles G, ed, "Wastewater Management for Coastal Cities", The Ocean Disposal Option World Bank Technical Paper No. 77.
2. Meadows P.S & J.I Campbell, 1988, "An Introduction to Marine Science", University of Glasgow.
3. Metcalf & Eddy, 1991, "Wastewater Engineering, Treatment, Disposal, Reuse", McGraw Hill Book Co.
4. Williams, Jerome, 1979, "Introduction to Marine Control", John Wiley & Sons, NY,

COURSE: PRACTICAL WORK

CODE: TL2111M39

CREDITS: 2

METHODS: LECTURE, QUIZ, PRACTICUM

OBJECTIVES:

Students are able to compile the formation, work systematics and work organization structure. Students are able to apply science, social, economic and technical aspects in planning, implementing, and operating a project or building/processing process in the field of environmental engineering.

SUBJECT MATTER:

In accordance with practical work activities in the field of planning, implementation or management of waste water installations, drinking water, waste and work environment.

PREREQUISITES:

- Have taken all advanced courses.
- Remaining undergraduate credits are a maximum of 25 credits

OVERVIEW:

1. M.M. Purbohadiwijoyo, "Compiling Engineering Reports", Publisher of ITB, Bandung, 1979
2. Data from the place of practical work

COURSE: PUBLIC HEALTH MANAGEMENT TECHNOLOGY

CODE: TL2112M51

CREDITS: 2

OBJECTIVES:

Students understand public health management, methods of measuring and analyzing the level of public health, socio-cultural approaches, environmental health infrastructure, environmental quality monitoring, public health monitoring, economic aspects, legal aspects.

SUBJECT MATTER:

Aims and objectives of public health management, methods of measuring and analyzing the level of public health, socio-cultural approaches, technological approaches (environmental health infrastructure, environmental quality monitoring, public health stabilization), economic aspects in public health, legal aspects

PREREQUISITES:

- Fluid Mechanics
- Water Resources Quality Management

OVERVIEW:

1. AL, Slamet Riyadi, 1986, "Introduction to Environmental Health, Your Works, Surabaya.
2. Eric, P.E., 1985, "Health Problems", PT Gramedia, Jakarta.

COURSE: ENVIRONMENTAL CONSERVATION TECHNOLOGY

CODE: TL2112M63

CREDITS: 2

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students apply conservation planning of natural resources in the form of surface water, groundwater, air and beaches

SUBJECT MATTER:

Definition of conservation and the need for technological efforts, conservation techniques of surface water, groundwater, air and coastal resources, forest and agricultural resources

PREREQUISITES:

- Fluid Mechanics

- Water Resources Quality Management

REFERENCES:

1. Arsyad, Sitanala, Soil and water conservation, IPB, Bogor, 1989
2. Chanlett, Emil T., "Environmental Protection", McGraw-Hill, New York, 1980.
3. Dadhich, L.K. and AP. Sharma (ed), "Biodiversity-strategies for conservation", ApH Publishing, New Delhi, 2002
4. Schwab, Glenn O., "Soil and water conservation engineering, 4th ed., JonnWiley, New York, 1993.

COURSE: ENVIRONMENTAL TOXICOLOGY

CODE: TL2112M46

CREDITS: 3

METHODS: LECTURE, QUIZ

OBJECTIVES:

Students are able to analyze the exposure of waste substances in the environment, analyze the effects of substances/waste/polluted environment for biota. Students are able to design acute effect tests and interpret the results of acute effect tests.

SUBJECT MATTER:

Movement tendency of substances in water, air, soil and biota media. Biological chemical reactions. Analysis of substance/waste exposure in the environment, based on intrinsic properties of substances and environment and ecosystem modeling. Analysis of effects of substances/wastes in polluted environment for biota, differentiation of E(L)C and E(L)D, acute and chronic effects and biota effect criteria, toxicity test techniques and interpretation of effect test results. Acute toxicity test exercise and its interpretation.

PREREQUISITES:

- Environmental Chemistry
- K-4
- Environmental Pollutant Analysis

REFERENCES:

1. Mangkoediharjo, S. 2010. Applied phytotechnology. Surabaya

COURSE: ENVIRONMENTAL QUALITY BIOMONITORING

CODE: TL2112M54

CREDITS: 2

OBJECTIVES:

Students are able to understand the basics of biomonitoring theory and master its application techniques for water quality monitoring. Students are able to determine appropriate methods and use them in water quality monitoring.

SUBJECT MATTER:

Concept of biomonitoring, benefits in water environment quality management, definition of early warning system, advantages and disadvantages compared to conventional water quality monitoring methods, development/evolution of biomonitoring techniques, linkages with environmental quality standards. Basic biomonitoring criteria of indicator organisms, internal and external factors that determine the characteristics of indicator organisms. Biomonitoring techniques: use of species and populations for determination of air and water environmental quality (diversity, biotic indices, organism prediction systems and environmental quality classification), biomonitoring selection, field application for environmental quality.

PREREQUISITES:

Water Resources Quality Management

REFERENCES:

1. Metcalf, J. L., 1989, "Biological water quality assessment of running waters based on macro invertebrate communities, history and present status in Europe", Environmental Pollution 60 101-139.
2. Philip, D.J.H., 1980. Quantitative aquatic biological indicators. Applied Sciences Publishers, London.
3. Rosenberg, D.M. and V.H. Resh, 1991. Freshwater Biomonitoring and Benthic Macroinvertebrates.
4. Tonkes, M., 1994. Monitoring water quality in the future. Strategies for complex mixtures. Institute for inland water management and wastewater treatment, Lelystad, the Netherlands.

COURSE: ENVIRONMENTAL BIOTECHNOLOGY**CODE: TL2112M57****CREDITS: 2****METHODS: LECTURE, QUIZ****OBJECTIVES:**

Provide students with applicative skills in understanding the use of biotechnology to overcome environmental pollution problems, which include water, solid and gas media.

SUBJECT MATTER:

Biotechnology in the production process of clean water treatment and waste treatment. Anaerobic (biomethanation), aerobic (composting) and leachate depollution, biological treatment of waste gas, single cell protein (SCP) for NH₄ recovery. Use of biotechnology for other things, for example as energy, oil processing. Introduction of genetic engineering

PREREQUISITES:

- PBPAB
- PBPAM
- Operations Unit
- Waste Management Technology

REFERENCES:

1. Verstraete, W. 1990-1991. Biotechnological Processes in Environmental Technology. Part I, University of Gent, Belgium.
2. Verstraete, W. 1990-1991. Biotechnological Processes in Environmental Technology. Part II, University of Gent, Belgium.
3. Verstraete, W. 1990-1991. Exercise Environmental Biotechnology, University of Gent, Belgium

SEMESTER VIII**COURSE: FINAL THESIS****CODE: TL141154****CREDITS: 6****METHODS: LECTURE, QUIZ****OBJECTIVES:**

Students can develop their ability independently (personal/team), to apply their expertise in the discipline of environmental engineering, with products that can be applied in the development process.

SUBJECT MATTER:

Field of choice: management, engineering and planning.

PREREQUISITES:

- Have passed the advanced stage of the course
- Have passed the elective courses in accordance with the chosen final project.

REFERENCES:

1. In accordance with the chosen final project
2. M.M Purbohadiwijoyo, 'Compiling Engineering Reports", ITB Publisher, Bandung, 1979

X. CIVIL ENGINEERING STUDY PROGRAM

1. **Degree Granting Institution** : Universitas Pembangunan Nasional "Veteran" East Java
2. **Faculty** : Faculty of Engineering
3. **Accredited by** : Agency Accreditation National Higher Education (BAN-PT)
4. **Graduate Degree** : Bachelor of Engineering in Civil Engineering
5. **Name of Study Program** : Civil Engineering
6. **Accreditation** : B (BAN-PT) BAN - PT Certificate No. 1620/SK BAN-PT/Akred/S/VI/2018
7. **Education Vision** :
"TO BECOME A SUPERIOR CIVIL ENGINEERING STUDY PROGRAM WITH THE CHARACTER OF STATE DEFENSE"

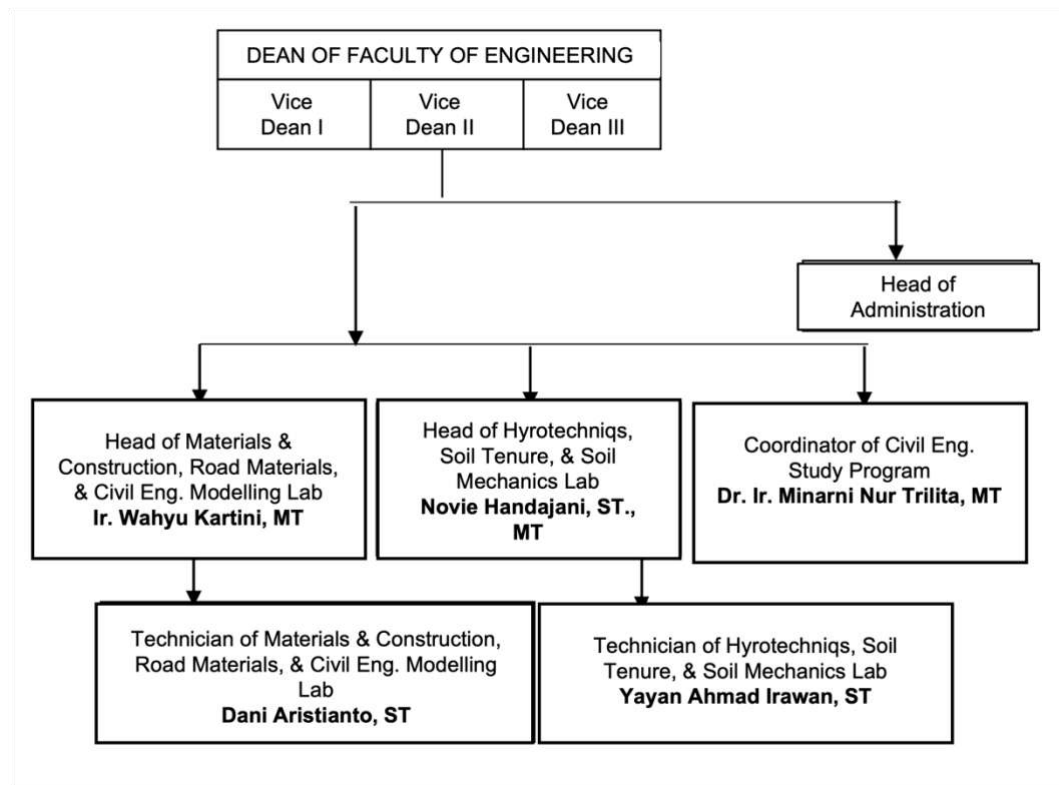
8. Education Mission

1. Organizing and developing education with the character of state defense.
2. Improving research culture in the development of science and technology that is useful for the welfare of society.
3. Organizing research-based community service and local wisdom.
4. Organizing good and clean governance in order to achieve budget management accountability.
- ↓ 5. Develop superior human resource quality in attitude & values, work performance, knowledge mastery, and managerial.
6. Improve facilities and infrastructure management system.
7. Increase institutional cooperation with stakeholders both at home and abroad.

9. Education Objectives

1. The realization of curriculum and educational services that are relevant to the Indonesian National Qualifications Framework (KKNI) based on state defense.
2. Achieving the quality and innovation of useful iris for the improvement of community welfare.
3. The realization of research-based community service activities and local wisdom.
4. The realization of good and clean governance to achieve budget management accountability.
5. The realization of superior human resources who are competent and highly competitive.
6. The realization of adequate infrastructure with effective and efficient management.
7. The realization of institutional cooperation with domestic and foreign stakeholders that is intensive and beneficial to both parties.

10. Organizational Structure of Civil Engineering Study Program



11. Teaching Staff

1. Dra. Anna Rumintang, MT
2. Siti Zainab, MT
3. Ir. Hendrata Wibisana, MT
4. Ibnu Solichin, ST, MT
5. Dr. I Nyoman Dita P Putra, ST, MT
6. Nugroho Utomo, ST, MT
7. Sumaidi, ST, MT
8. Cintantya Budi Casita, ST, MT.
9. Zetta Rasullia Kamandang, ST., M. Sc.
10. Dian Purnamawati Solin, ST, M.Eng.
11. Iwan Wahyudianto, ST, MT
12. Fithri Estikhamah, ST, MT.
13. Dr. Ir. Made Dharma Astawa, MT
14. Yerry Kahaditu Firmansyah, ST, MT
15. Mik Wanul Khosiin, ST, MT, MSc
16. Bagas Aryaseta, ST, MS
17. Himatul Farichah, S.T., M.Sc.
18. Nia Dwi Puspitasari, S.T., M.T.
19. Primasari Cahya Wardhani, S.Si, M.Sc.
20. Aulia Dewi Fatikasari, S.T., M.T.
21. Achmad Dzulfiqar Alfiansyah, S.T., M.T.

12. Education Personnel

1. Yayan Ahmad Irawan, S.T. (Laboran) 2. Dani Aristianto, S.T. (Laboran)
2. Bryan Alvira Putra Permana, ST. (Administration)

SEMESTER I

CURRICULUM

NO	CODE	SUBJECT	CREDIT			
			K	P	TB	T
1	UV 21001	Islamic religion	2			2
	UV 21002	Christianity				
	UV 21003	Catholicism				
	UV 21004	Hinduism				
	UV 21005	Buddhism				
	UV 21006	Confucianism				
2	TS 211119	Math I	3			3
3	TS 211116	Computer Programming	3			3
4	UV 21010	English	3			2
5	UV 21007	Pancasila	2			2
6	TS 211127	Static Specific Engineering Mechanics	3			3
7	TS 211118	Statistics	3			3
			20	0	0	20

SEMESTER II

NO	CODE	SUBJECT	CREDIT			
			K	P	TB	T
1	TS 211122	Materials Technology	2	1		3
2	TS 211120	Math II	4			4
3	TS 211123	Building Structure	3		1	4
4	UV 21008	Civic	2			2
5	TS 211117	Engineering Physics	2			2
6	TS 211128	Mechanics of Materials	3			3
7	TS 211141	Hydrology	2			2
			18	1	1	20

SEMESTER III

NO	CODE	SUBJECT	CREDIT			
			K	P	TB	T
1	TS 211146	Highway Geometry	2			2
2	TS 211147	Transportation Engineering and Modeling	2			2
3	TS 211124	Land Measuring Science	3	1		4
4	TS 211121	Math III	3			3
5	TS 211129	Static Indeterminate Engineering Mechanics	3			3
6	UV 21011	State Defense	2	1		3
7	TS 211151	Building Construction Estimation and Investment	2			2
8	TS 211126	Research Methodology	2			2

			19	2	0	21
--	--	--	----	---	---	----

SEMESTER IV

NO	CODE	SUBJECT	CREDIT			
			K	P	TB	T
1	TS 211148	Highway Pavement	2	1		3
2	TS 211130	Soil Mechanics	3	1		4
3	TS 211133	Reinforced Concrete Structures I	3			3
4	TS 211142	Fluid Mechanics & Hydraulics	3	1		4
5	TS 211138	Structure Dynamics	2			2
6	TS 211136	Steel Structure I	3			3
			16	3	0	19

SEMESTER V

NO	CODE	SUBJECT	CREDIT			
			K	P	TB	T
1	TS 211131	Foundation Engineering I	2			2
2	UV 21009	Entrepreneurship	3			3
3	TS 211134	Reinforced Concrete Structures II	2			2
4	TS 211152	Project Management	2			2
5	TS 211137	Steel Structure II	2		1	3
6	TS 211143	Irrigation & Water Building Engineering	3		1	4
7	TS 211125	Environmental Engineering	2			2
8	TS 211144	Urban Drainage	2			2
			18	0	2	20

SEMESTER VI

NO	CODE	SUBJECT	CREDIT			
			K	P	TB	T
1	TS 211132	Foundation Engineering II	2			2
2	TS 211145	Beach Engineering	2			2
3	TS 211135	Reinforced Concrete Structures III	2		1	3
4	TS 211153	Project Planning & Control	2		1	3
5	TS 211139	Prestressed Concrete Structure	2			2
6	TS 211149	Traffic Engineering	2			2
7	UV 21013	Leadership	2			2
		Option I	2			2
		Option II	2			2
			18	0	2	20

SEMESTER VII

NO	CODE	MATERIALS	CREDIT			
			K	P	TB	T
1	UV 21012	Bahasa Indonesia	2			2
2	TS 211154	Construction Implementation Method	2			2
3	TS 211140	Bridge Construction Design	2		1	3
4	TS 211150	Transportation Infrastructure	4			4

5		Option III	2			2
6		Option IV	2			2
7		Option V	2			2
			16	0	1	17

SEMESTER VIII

NO	CODE	MATERIALS	CREDIT			
1	UV 141115	Community service	2			2
2	TS 211155	Practical Work	2			2
3	TS 211156	Final Project	6			6
			10	0	0	10

ELECTIVE COURSES

NO	CODE	MATERIALS	CREDIT			
			K	P	R	T
1	TS 141257	Real Estate Management	2			2
2	TS 141258	Post Investigation and Mitigation Disaster	2			2
3	TS 141259	Project Administration	2			2
4	TS 141260	Heavy Equipment Management	2			2
5	TS 141261	Legal and Labor Aspects	2			2
6	TS 141262	Reservoir	2			2
7	TS 141263	HYDROPOWER	2			2
8	TS 141264	Water Resources Development	2			2
9	TS 141265	River Engineering	2			2
10	TS 141266	Coastal Building Planning	2			2
11	TS 141267	Advanced Steel Structure	2			2
12	TS 141268	Wood Structure	2			2
13	TS 141269	Matrix Method Structure Analysis	2			2
14	TS 141270	Tall Building Frame Structure	2			2
15	TS 141271	Long Span Bridge Structure	2			2
16	TS 141272	Advanced Traffic Engineering	2			2
17	TS 141273	Mass Transportation and Facilities	2			2
18	TS 141274	Airport System	2			2
19	TS 141275	Transportation Safety App	2			2
20	TS 141276	Road-based Transportation Network Rel	2			2
21	TS 141277	Remote Sensing	2			2
22	TS 141278	Geographic Information System	2			2
23	TS 141279	Photogrammetry and Image Processing	2			2
24	TS 141280	Cartography	2			2
25	TS 141281	Engineering Geology	2			2
26	TS 141282	Soil Improvement Technology	2			2
27	TS 141283	Soil Dynamics	2			2
28	TS 141284	Advanced Foundation Engineering	2			2
29	as per course code permadi/permata that was taken	Permadi/Permata Course	2			2

30	as per course code permadi/permata which is taken	Permadi/Permata Course	2			2
			60			

Total credits = 146 credits, including:
 Personality courses = 19
 credits Required courses = 117 credits
 Elective Course =10 credits

CIVIL ENGINEERING STUDY PROGRAM SYLLABUS

SEMESTER I

Course Title : **Islamic Religion**

Code Number / CREDIT : UV 21001 / 2 credits

Short Description : To help cultivate students who have faith and devotion to God Almighty, noble character, philosophical thinking and attitude. philosophical, rational and dynamic, broad-minded, and in interfaith cooperation in the context of the development and utilization of science and technology as well as for human and national interests. Students are expected to strengthen their faith and piety to Allah SWT.

Develop noble character, be sensitive to the environment and understand the truth of Islamic Aqidah.

Bibliography:

1. Ali Muhammad Daud, 1998, Islamic Religious Education, Raja wali Press, first printing.
2. Ministry of Religious Affairs of the Republic of Indonesia, Religious Education
3. Islam in Higher Education
4. Abdul Manan, A. Syifaul Qulub, 2010. Islamic Religious Education in Higher Education, Laros Publisher.
5. Ministry of Religious Affairs of the Republic of Indonesia, Al- Quran and Translation.

Prerequisite: -

Course Title : **Christian Religion**

Code Number/CREDIT : UV 21002 / 2 credits

Short Description: Religious awareness in human life, what is the meaning of faith, the phenomenology of religion, religion and Pancasila, man as a map of God, the relationship between faith and science, the meaning of God's law and the duty of human vocation for the life of society, state and nation.

Bibliography:

1. Indonesian Bible Institute, "The Bible", 1982.
2. Dahler Frans, Dr., "Problems of Religion", Kanisius, Yogyakarta.

Prerequisite : -

Course Title : **Catholic Religion**

Code Number/CREDIT : UV 21003 / 2 credits

Short Description : Church faith, church as a sacrament of salvation, church decisions, human responsibility as church members, church ministry, leadership in the church.

Bibliography:

1. Th. Huber, Sy., "The Direction of Catechesis in Indonesia", Dokpen MAWI, Jakarta.
2. Pope Joh, Paul II, Berketesele, Dokpen MAWI, Jakarta. Prerequisite: -

Course Title : **Hinduism**

Code Number / CREDIT : UV 21004 / 2 credits

Brief Description : History of Hinduism, sources of Hinduism, scope, Mawa Darsana, Tatrayaman, Panca Siada Tattwa, Catur Marga Yoga, Social Institutions, Kala Harma, Dharmada, Budhisatwa and the concept of religious harmony.

Bibliography :

1. Catur Veda, Reg. Veda, Sama Veda, Weda Parikrama, Manawa Dharma Sastra, Bhagwadgitha, Sarasamucchaya, Silakrama.

Prerequisite: -

Course Title : **Buddhism**

Code Number / CREDIT : UV 21005 / 2 credits

Brief Description : The nature of God, the conception of religious harmony, Bodhisattva and Buddha.

Bibliography:

Tripitaka

Prerequisite: -

Course Title : **ConfucianismCod**

e Number / CREDIT : UV 21006 / 2 credits

Brief Description :

Bibliography:

Prerequisite: -

Course Title : **Mathematics I**

Code Number / CREDIT : TS 211119 / 3 credits

Short Description : This course provides an explanation of the basics of function calculation, limits, differentials, integrals, differential calculation applications, practical applications of integrals (the use of integral calculations in physics calculations, namely fluid mechanics and kinematics), indefinite integrals in civil engineering and can be used to analyze calculations in the field of civil engineering.

Bibliography:

1. Soehardjo, Mathematics 1,
2. K.A.Stroud, Engineering Mathematics, Fifth Edition, Airlangga Publisher.
3. Schaum's Outlines Series. Advanced Mathematics For Engineers & Scientists

Prerequisites : -

Course Title : **Computer Programming**

Code Number / CREDIT : TS 211116 / 3 credits

Short Description : This course provides basic computer knowledge and basic programming in general with various programming software, number systems and algebraic operations of Binary numbers, introduction to flowcharts and their applications, programming logic and introduction to programming with Excel, Fortran, MathCAD and Scilab, creating simple programs with Fortran software for problems in civil engineering and programming database with Excel and numerical basis of polynomial functions with MathCAD and Scilab.

Bibliography :

1. Byron S.G., "Programming with Pascal".
2. Elliot B.K., "Pacsal 5th ed".
3. Byron S.G., "Programming with Fortran-77", 1980.
4. Elliot B.K., "Fortran Compilers", 1977
5. Catherine S.K., "Flowchart v.3.2", 1990
6. Jogiyanto H.M., "Theory and Application of Fortran Language", Andi Offset, 1989.

Prerequisites : -

Course Title : **English**

Code Number / CREDIT : UV 21010 / 3 credits

Short Description : Introduction and use of vocabulary, especially those related to the fields of art and technology; structure and grammar that support the understanding of English for science and technology; Understanding the content of discourse and practicum in the language laboratory for Listening Comprehension and reproduction exercises. Language Practicum (Lab. Work) is held 6 times in 1 semester, each implementation lasts 75 minutes.

Bibliography:

1. Balitho, AR & Sandler, PL., "Study English for Science".
2. Brasnett, Clive, "Inglish for Engineers".
3. Ewer, JR and Lattore, GA, "Gourse in basic Scientific English".
4. Hawkey, M., "English for Engineers".
5. Hall, E.J., "The Language of Mechanical Engineering in English".
6. Ditto, "The Language of Electrical and Electronic Engineering".
7. Keegel, J.C., "The Language of Computer Programming in English".
8. Quirk, Randolp & Greebaum, "University English Grammar", Sidney.
9. Graver, B.D., "Advanced English Practice".
10. Dra. B.M.G. Endang Sri Wulandari, "A Reading Program, (Pre- ESP)", Kanisius, 1993.
11. Dra. R. AG Kamil Dipl. T.F.F.L., "Texbook Reading and Translation Techniques Kanisius, 1990.
12. Leech, Geoffrey and Svartvik, Jan, "A Comunicative Grammar of English".
13. Blakey, T.N., "English for Maritime Studies".
14. Grellat, Francoise, "Developing Reading Skills".
15. Brieger, Nick and Comfort, Jeremy, "Technical Contasts".

Prerequisite : -

Course Title : **Pancasila**
Code Number / CREDIT : UV21007 / 2 credits
Short Description :
Bibliography :
Prerequisite: -

Course Title : **Static Engineering Mechanics**
Code Number / CREDIT : TS 211127/3 credits
Short description : Basic science skills that must be understood and can be applied by students so that they can follow and apply to the next science skills that include the understanding of force, balance and understanding of certain static constructions, portals with lines of influence and truss construction.
Bibliography:
1. Suwarno, "Engineering Mechanics of Certain Static", UGM
2. Soemono, "Statistics I", ITB
3. Quarterly, Teaching Materials "Engineering Mechanics I".
4. Wahyu Kartini, "Teaching Materials for Certain Static Structures", UPN
Prerequisites : -

Course Title : Statistics
Code Number / CREDIT : TS 211118 / 3 credits
Short Description : Statistics is the science that underlies data processing techniques that are widely used in research or research. so that it can provide thorough and accurate conclusions. Definition of statistics, probability, chance theory, set diagrams, permutations and combinations, normal distribution, binomial theory, descriptive statistics, depiction of histogram curves, pie charts, kurtosis.
Bibliography:
1. Prof. Drs. Sutrisno Hadi, MA. Statistics, Andi Publisher
2. Sudjana, Statistical Methods
3. Schaum's outlines, Murrays R Spiegel larry j. Stephens, Statistics
4. Drs. Djarwanto PS. Pangestu Subagyo, M.B.A. Inductive Statistics
5. Dr.Ir. Harinaldi, M.Eng.Principles of Statistics for Engineering and Science. Erlangga Publisher
Prerequisites : -

SEMESTER II

Course Title : **Materials Technology**
Code Number / CREDIT : TS 211122 / 3 credits
Short Description : The uses and benefits of concrete, properties of ingredients; cement, aggregates, water, additives and admixtures. Concrete mix design, concrete execution, properties of fresh and hardened concrete and testing methods. Evaluation of concrete quality and performance of lightweight concrete, high strength concrete, concreting in hot and cold regions. Damage and repair of

concrete. Practicum on the manufacture of concrete for specific grades and environments. Compulsory Materials Technology Practicum.

Bibliography:

1. A.M. Neville, "Concrete Technology", 1990. 2. ACI, 1999.
2. ASTM
3. "Concrete Technology Practicum Manual" 5. SNI 2002.

Prerequisites: -

Course Title : **Mathematics II**

Code Number / CREDIT : TS 211120 / 4 credits

Short description : This course provides an explanation of the basics of the calculation of Certain Integrals, Application of Integral Calculation I (Calculating the area bounded by the curve of the equation $y = f(x)$ and the x-axis, calculating the volume of a rotating object, calculating the arc length of the curve of the equation $y = f(x)$ and the surface area of the volume of a rotating object), Application of Integral Calculation II (Determining the weight point of the area bounded by the curve of the equation $y = f(x)$ and the x-axis, determining the weight point of the volume of a rotating object). Guldin's Rules I and II, Unreasonable Integral, Partial Integral and Folded Integral in civil engineering and can be used to analyze calculations in the field of civil engineering.

Bibliography:

1. Howard Anton, "Calculus", fifth edition, John Wiley & Sons Inc, Singapore, 1995.
2. Edwin J. Purcell and Dale Varberg, "Calculus and Geometry of Analysis," fifth edition, Erlangga, Jakarta, 1991.
3. Louis Leithold, 'Calculus and Analytical Measurement', fifth edition, Erlangga, Jakarta, 1991.
4. Baisuni, Hasyim, "Calculus", First Edition, UI - Press, Jakarta, 1986.
5. Purcell, Edwin J., and Varberg, Dale, "Calculus and Analytical Geometry Volume 2", Fifth Edition, Erlangga Publishers, Jakarta, 1986.
6. Soehardjo, "Calculus II", First Edition, Publisher FMIPA - ITS, Surabaya, 1984.
7. Stewart, James, "Calculus Volume 2", Fourth Edition, Erlangga Publishers, Jakarta, 2001.

Prerequisite: Math I

Course Title : **Building Structure**

Code Number / CREDIT : TS 211123 / 4 credits

Short Description : Technical drawing standards, drawing equipment, types of lines, shading & notations, letters & numbers, projections, design of a 2-story residential house and bestek drawing assignments with 2D CAD applications.

Introduction and basic drawing techniques, paper formats and drawing tools, various lines and measurements, scales and symbols, projections and assignments. Foundation and wall drawings. Floors, frames, shutters and doors. Ceiling, roof, concrete slab, truss, stairs. Application of projections with an explanation of simple buildings / water buildings, including: plans, views, pieces and details. (2 Dimensional CAD Practicum)

Bibliography:

1. HR Sugihardjo, "Basic Building Science Drawings, volumes I, II".
2. Kardun, "The Science of Projection".

3. "Architectural Drawing Techniques".
4. Pijl, 1990, Summary of Building Science volume I, Erlangga Publishers
5. Pijl, 1990, Summary of Building Science volume II, Erlangga Publishers

Prerequisite : -

Course Title : Civic
 Code Number / CREDIT : UV 21008 / 2 credits
 Short description : Understand and understand history the process of establishing a nation or state Indonesia.
 Understand and carry out the rights and obligations as citizens in a polite, honest, democratic manner in the effort to defend the country whose implementation changes according to the development of situations and conditions.
 Understand several theories of state defense in several countries and can distinguish our theory (Wasantara and National Resilience).
 Bibliography :
 1. The 1945 Constitution which has been amended to IV & GBHN in 1999.
 2. Civic Education, (National Defense Institute, Directorate General of Higher Education, Ministry of Education and Culture).
 3. Kapita selekta Pendidikan Kewarganegaraan I & II (Depdiknas 2002).
 4. Law No. 20/2003 on National Education System Prerequisites : -

Course Title : **Engineering Physics**
 Code Number / Credits : TS 211117 / 2 CREDITS
 Short description : Magnitudes, unit systems, vectors, Particle Kinematics, Particle Dynamics, Work and Energy, Vibrations & waves, statics, fluid dynamics, notions of heat, calorimetry, expansion, heat transfer.
 Bibliography:
 1. Pollack, H.W., "Applied Physics".
 2. Weber, "College Physics".
 3. Sears. Zemansky. Physics for University 1 Mechanics.Heat. Sound, Bina Cipta Publisher
 4. Lecturer in Physics, Faculty of Mathematics and Natural Sciences ITS. Physics I, July 1, 2012 edition
 5. Giancoli, Physics I.
 6. Zainab, Siti. Basic Physics Teaching Dictates, 2004 Prerequisites

Course Title : **Mechanics of Materials**
 Code Number / CREDIT : TS 211128 / 3 credits
 Short Description : About weight point, inertia, stress (axial, shear and moment), strain and deflection in a given static beam.
 Bibliography:
 1. E.P. Popov, "Mechanics of Materials".
 2. Wang, Chu Kia, "Statically Indeterminate Structures", Mc Graw Hill Co. 1978.
 3. Gunawan T, Ir. and Margaret S,Ir. Diktat Teori Soal dan Penyelesaian Mekanika Teknik I Delta Teknik Group. Jakarta. 1991.

Prerequisite: Specific Static Engineering Mechanics

Course Title : **Hydrology**

Code Number / CREDIT : TS 211141 / 2 credits

Short Description: The Hydrology course contains knowledge that underlies water science in the field of civil engineering with material: hydrological cycle; rain, evaporation, infiltration, groundwater; hydrometry; surface flow; hydrographs, unit hydrographs, flood planning and flood tracking.

Bibliography:

1. Chow V.T., "Hand Book of Applied hydrology", McGraw-Hill, New York, 1964.
2. Haan, Charles T, "Statistical Methods in Hydrology", The Iowa State University Press, 1977.
3. Linsley, R. Ketal, et al, "Hydrology for Engineers", McGraw-Hill Kogakhusa, Ltd, Tokyo, 1975.
4. Sosrodarsono S, "Hydrology for Irrigation", Pradya Paramita, Jakarta, 1978.
5. Subramanya, K, "Engineering Hydrology", Tata McGraw-Hill Publishing Company Limited, 1984.
6. Viessman Warren, Jr. et al, "Intoduction to Hydrology", IEP A dun- Donnelley Publishers, New York, 1977.
7. Wilson, E.M, "Engineering Hydrology", Mac Milan Education, Ltd, 1990.

Prerequisites : -

SEMESTER III

Course Title : **Highway Geometry**

Code number / CREDIT : TS 211146 / 2

Short description : This course studies, among others: Main and supporting components on the road, Road geometric planning parameters (plan vehicle, plan speed, traffic volume, road level of service, safe visibility), Horizontal alignment planning, vertical alignment planning, Coordination of horizontal alignment and vertical alignment, and Stationing.

Bibliography:

1. Saodang, Hamirhan, "Highway Construction - Road Geometrics", 2010, Second Edition, Nova Publishers, Bandung.
2. Sukirman, Silvia, "Fundamentals of Road Geometric Planning", 1999, Third Printing, Nova Publishers, Bandung.
3. Directorate General of Highways, "Geometric Planning Procedures for Intercity Roads", 1997, Ministry of Public Works, Jakarta.
4. Hendarsin, Shirley, "Highway Planning Engineering", 2005, Third Edition, Nova Publishers, Bandung.
5. Department of Transportation, "Government Regulation No.43 on Road Infrastructure", Jakarta, 1993.
6. Wright, Paul H., "Highway Engineering", First Edition, John Wiley & Sons Inc, New Jersey, 2004.

Prerequisites : -

Course Title : **Transportation Engineering and Modeling**

Code Number / CREDIT : TS 211147 / 2 credits

Short description : This course will describe the basics of transportation techniques for both goods and passengers in urban and regional

scope, transportation history, average speed of vehicles, traffic flow, transportation modeling based on traffic characteristics, transportation modes

Bibliography:

1. Edward K. Morlock, "PTT and PT". 2. HCH, 1985
2. IHCH
3. James L. Pline, "Traffic Engineering Handbook".
4. John Black, "Urban Transport Planning".
5. Ogyar Z. Tamim, "Transportation Planning and Modeling".

Prerequisite : -

Course Title : **Land Measuring Science**

Code Number / CREDIT : TS 211124 / 4 credits

Short description : Straight line and right angle construction, height, azimuth and coordinate measurement and horizontal positioning.

Coordinate determination, horizontal positioning, area, volume, horizontal curves, vertical curves, teristic mapping, civil engineering surveying, photogrammetric mapping, hydrogrametric mapping, least squares method and introduction to modern tools.

Required to take Land Measuring Practicum.

Bibliography:

1. Kissam C.E., Phillip, "Surveying for Civil Engineer", McGraw-Hill Book Company.
2. Wongsotjitro, Soetomo, "Science of Land Measurement", SWADA.
3. Wolf, Paul R. & Charles D. Ghilani, Pearson, "Elementary Surveying", Prentice Hall.
4. Slamet Basuki, "Land Measurement Science", Gadajh Mada University Press.

Prerequisite : -

Course Title : **Mathematics III**

Code Number / CREDIT : TS 211121 / 3 credits

Short description : Matrix and vector spaces, properties of matrices, matrix inverse, linear transformations, multivariable functions, differential calculus of scalar fields and vector fields, two- and threefold integrals, line integrals, surface integrals, Green's theorem, Stokes and Gauss, Cramers rule, Gauss elimination, simultaneous linear equations, applications of matrices in heat conductivity of solids.

Bibliography:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 7thth edition, John Willey & Sons Inc., Singapore, 1993.
2. Howard Anton, "Calculus", fifth edition, John Wiley & Sons Inc, Singapore, 1995.
3. Peter V. O'Neil, "Advanced Engineering Mathematics", fourth edition, ITP, Singapore, 1995.
4. Steven J. Leon, "Linear Algebra with Application", third edition, MacMilan Publication Company, 1990.

Prerequisite : Math II

Course Title : **Static Indeterminate Engineering Mechanics**

Code Number / CREDIT : TS 211129 / 3 credits

Short description : Engineering Mechanics II contains the construction of certain static trusses, methods for certain static structures, methods for indeterminate static structures, namely the "Consisted Deformation", "Three Moments Equation" and "Slope Deflection" methods.

Bibliography :

1. SP. Timoshenko and D.H. Young, "Theory of Structures".
2. Suwarno, "Engineering Mechanics of Certain Static", UGM.
3. Soemono, "Statistics", ITB.
4. Wang, C.K. "Statically Indeterminate Structures" International Student Ed. Mc Graw-Hill.
5. Djoko Irawan, Djoko Untung, Isdarmanu, Textbook "Mechanical Engineering II".

Prerequisite: Mechanics of Materials

Course Title : **State Defense**
Code Number / CREDIT : UV21011/ 3 credits
Brief Description :
Bibliography:
Prerequisite: -

Course Title : **Construction Building Estimation and Investment**

Code Number / CREDIT : TS 211151 / 2 credits

Short description : Capital is a limited resource, therefore its use for a project must be carefully scrutinized by ranking which projects are more economically profitable. The decisive economic benchmark is money. Money has a time value while the entry and exit of money occurs at very different times for different projects. Therefore, criteria for the equivalence of the flow of funds are needed so that the assessment of which project is more profitable can be done objectively. Engineering economics studies how to select the more profitable project by comparing the equivalence of fund flows. Thus, investment in a project can be economically justified.

Bibliography:

1. Grant, 1996
2. Pudjawan, Nyoman, "Engineering Economics", Guna Widya, Jakarta, 1993.
3. Soeharto, Imam, "Project Management: From Conceptual to Operational", Erlangga. pp. 418 - 421, Jakarta, 1997.
4. Sullivan, William, et.al, "Engineering Economy", 2nd Edition, Prentice Hall, New Jersey, 2000.

Prerequisite : Math I

Course Title : **Research Methodology**

Code Number / CREDIT : TS 211126 / 2 credits

Short Description: In this course, we learn about science, research, types of research, scientific methods and scientific truth, research steps, problem formulation techniques, literature review, experimental design, several sampling techniques, several statistical techniques in analysis, techniques for writing proposals and research reports.

Bibliography:

1. Moh. Nazir, Ph.D, "Research Methods", Ghalia Indonesia, Bogor, 2005.

2. Montgomery, D.C., and Runger, G.C., "Applied Statistics and probability for engineers", Third Edition, John Wiley & Son's, New York, 2003.
3. Lecturer Team of Philosophy of Science, Faculty of Philosophy UGM, "Philosophy of Science", Liberty, Yogyakarta, 1996.
4. Montgomery, D.C., "Design and Analysis of Experiments", Fifth Edition, John Wiley & Son's, New York, 2001.

Prerequisite: -

SEMESTER IV

Course Title : **Highway Pavement**

Code number / CREDIT : TS 211148 / 3 credits

Short description : This course studies among others:

History of the development of road structures, Models of pavement structures (Telford, Mac Adam), Types of pavement structures, Parts of pavement structures, Planning of road foundation structures (base course, sub-base course and sub-grade), Types of materials for road foundation layers and road surface layers, Calculation of CBR, calculation of flexible pavement thickness using the AASHTO Method, calculation of pavement thickness using the AASHTO Method, calculation of pavement thickness using the AASHTO Method Flexural pavement thickness with Component Analysis Method SNI 1732-1989-F and rigid pavement thickness planning

Bibliography :

1. Saodang, Hamirhan, "Highway Construction - Highway Pavement", 2010, Second Edition, Nova Publishers, Bandung.
2. Sukirman, Silvia, "Thickness Planning of Flexural Pavement Structures", 2010, First Print, Nova Publishers, Bandung.
3. Alamsyah, Alik Ansyari, "Highway Engineering", 2001, UMM Publisher, Malang.

Prerequisite: Highway Geometry

Course Title : **Soil Mechanics**

Code Number / Credits : TS 211130 / 4 CREDITS

Short Description : This course contains an understanding of soil particles, soil composition, soil properties, the concept of stress and stress distribution, laboratory and field experiments.

This course contains basic knowledge and calculations about stress distribution in soil, consolidation, collapse theory, soil lateral pressure, soil shear strength and its measurement in the laboratory, shallow foundations, slope stability and compaction.

Required to take Soil Mechanics Practicum.

Bibliography:

1. Braja M. Das (translated by Noor Endah and Indrasurya B. Mochtar), "Soil Mechanics, Principles of Geotechnical Engineering", Volumes 1 and 2.
2. Bowels J.E, 1977 Foundation Analysis and design
3. Wesley L.D. Soil Mechanics I and II
4. "Soil Mechanics Laboratory Practicum Guidelines", Department of Civil Engineering UPN "Veteran" East Java.
5. Bowles J.E., "Foundation Analysis and Design", 1982.

6. Costet J and Sanglerat G., "Cours Pratique de Mecanique des Sols, Tome 1 and", 1981.
7. Alkhalfajand Andeersland, Geotechnical Engineering and Soil Testing, Sounders College, 1992.
8. "Practicum Guidelines" Laboratory of Soil Mechanics, Civil Engineering Department of UPN "Veteran" East Java.

Prerequisites :-

Course Title : **Reinforced Concrete Structure I**
 Code Number / CREDIT : TS 211133 / 3 credits
 Short Description : This course presents the design of cross-sections of reinforced concrete structural elements due to internal forces in the form of pure bending, bending with axial, flexural shear, flexural shear with torsion, ponds shear, channeling length and foundations.

Bibliography:

1. Edward G. Nawy, "Reinforced Concrete a Fundamental Approach", 1996.
2. Chu-Kia Wang, Charles G. Salmon, "Reinforced Concrete Design", sixth Edition, 1998.
3. SNI-03-2847-1992, "Procedure for Calculation of Concrete Structures for Building".
4. Indonesian Loading Regulations for Buildings, 1983.
5. Kurdian Suprpto, Imam Wimbadi, "Reinforced Concrete Construction Notes".

Prerequisite: Mechanics of Materials, Engineering Mechanics II

Course Title : **Fluid Mechanics and Hydraulics**
 Code Number / Credits : TS 211142 / 4 CREDITS
 Short Description : Fluid Mechanics is one of the branches of engineering that is the basis for engineering not only civil engineering but other engineering sciences such as mechanical engineering, environmental engineering and other engineering.

This branch of science consists of the statics, kinematics and dynamics of fluids consisting of liquids and gases, since the motion of a fluid is caused by the imbalance of the forces acting on it. The available methods of analysis are derived from the application of Newton's Law, the first and second laws of thermodynamics, the principle of mass constancy, equations related to channel properties, Newton's law for viscosity, the concept of mixing distance and resistance due to the roughness of the channel walls through which it passes.

Hydraulics is one of the branches of science that studies the behavior of water in a state of rest and movement / flow.

The science of hydraulics which is the basis of hydraulic engineering is included in the scope of civil engineering, therefore in the civil engineering curriculum hydraulics is placed as a basic skill course. The material of this course includes the criteria and basic principles of water flow, the definition and basic principles of open channel hydraulic flow, the equations of energy, continuity, and momentum, the principles of uniform steady flow and gradually changing steady flow, and rapidly changing steady flow.

Fluid Mechanics and Hydraulics Practicum is required.

Bibliography:

1. Anggrahini, Ir., MSc., "Hydraulics", ITS, 1983
2. Bambang Triatmojo, DR.Ing., Ir., et al, "Hydraulics I&ii", Beta Offset, Yogyakarta, 1993.

3. Herman Widodo Soemitro, Ir, "Fluid Mechanics and Hydraulics", Erlangga Publisher, Jakarta, 1984.
4. Gunawan, Ir., "Problems and Solutions", Delta Teknik Group, Jakarta, 2000.

Prerequisite : Engineering Physics, Math III

Course Title : **Structure Dynamics**
 Code Number / Credits : TS 211138 / 2 CREDITS
 Short description : Fundamental objectives of Structure Dynamics analysis, types of loading, principal characteristics of Dynamics problems, lumped mass procedure, generalized displacement, finite element concept, equations of motion, Harmonic motion, periodic motion, undamped single degree of freedom system, damped single degree of freedom system, response to dynamic loading, non-linear structural response, response spectrum, multiple degree of freedom system, plane frame dynamic analysis, dynamic analysis of multi-storey portals.

Bibliography :

1. Farzad Naeim, "Seismic Design Handbook" 1989.
2. Gunawan.T & Margaret.S, "Earthquake Resistant Structure Planning Volume 1
3. Mario Paz, "The Dynamics of Structure" 1987
4. Ray.W Clough, Yeseph Penzien, "Structure Dynamics" volume 1, 1997
5. Wiliam T. Thomson, "Vibration Theory with Applications", 1998

Prerequisites : Static Indeterminate Engineering Mechanics

Course Title : **Steel Structure I**
 Code Number / CREDIT : TS 211136 / 3 credits
 Brief description : Introduction to steel as a building material, knowledge of mechanical properties of steel, steel building planning methods, planning of tensile bars, compression bars, beams, column beams, bolted and welded connections.

Bibliography:

1. Mc Cormack, Jack C, "Structural Steel Design - LRFD Method, 2nd Edition, Harper Collins College Publishers, New York.
2. "AISC", Manual of Steel Construction, LRFD, 2nd edition, AISC.
3. "Procedure for Planning Steel Structures for Building", with LRFD [SNI 03-1729-2002].

Prerequisite : Indeterminate Static Engineering Mechanics

SEMESTER V

Course Title : **Foundation Engineering I**
 Code Number / CREDIT : TS 211131 / 2 credits
 Short Description : This course will provide an introduction to foundation requirements, functions and uses, shallow foundations.

Bibliography:

1. Bowles J.E., "Foundation Analysis and Design", 1982.
2. Braja M. Das (translated by Noor Endah and Indrasurya B. Mochtar), "Soil Mechanics, Principles of Geotechnical Engineering, volumes 1 and 2".

3. Costet J and Sanglerat G., "Cours Practique de Necanique des Sols, Tome 1 and", 1981.
4. Herman Wahyudi, "Deep Foundation Support Capacity (diktat)", 1999.
5. Herman Wahyudi, "Shallow Foundation Support (diktat)", 1999. Prerequisite: Soil Mechanics.

Course Title : **Entrepreneurship**
 Code Number / CREDIT : UV21009 / 3 credits
 Brief Description :
 Bibliography:
 Prerequisite: -

Course Title : **Reinforced Concrete Structures II**
 Code Number / CREDIT : TS 211134 / 2 credits
 Short Description : Design of shear and shear reinforcement in beam structural elements consisting of flexural shear bending with torsion, frictional shear, ponds shear in slabs and foundations, bending with axial force (columns), short columns, slender columns and foundations.

Bibliography:

1. Edward G. Nawy, "Reinforced Concrete a Fundamental Approach", 1996.
2. Chu-Kia Wang, Charles G. Salmon, "Reinforced Concrete Design", sixth Edition, 1998.
3. SNI-03-2847-2002, "Procedure for Calculation of Concrete Structures for Building".
4. 4Indonesian Loading Regulations for Buildings, 1983.
5. ITS Concrete Book Compilation Team, "Calculation of Reinforced Concrete Construction".
6. Istimawan Dipohusodo "Reinforced Concrete Construction", 1995.
7. Cur Book 1, "Reinforced Concrete Construction"
8. Lab. ITS Concrete and Materials, "Interaction tables for reinforced concrete columns", 2003.

Prerequisite: Reinforced Concrete Structures I.

Course Title : **Project Management**
 Code Number / CREDIT : TS 211152 / 2 credits
 Short description : Understand the project development process, Feasibility Study, Cost Estimation, Project Documents, Bidding Process, Project Implementation and Supervision and able to create Bidding Documents.

Bibliography:

1. Nugraha, Paulus, Ishak Nathanm R Sutjipto, "Construction Management 1", Kartika Yudha, Surabaya, 1986.
2. Nugraha, Paulus, Ishak Nathanm R Sutjipto, "Construction Management 2", Kartika Yudha, Surabaya, 1986.
3. Husnan, Suad, Suwarsono, "Project Feasibility Study", UPP AMP YKPN, Jogjakarta, 1994.
4. Soeharto, Iman, "Project Management: From Conceptual to Operational", Erlangga, Jakarta, 1997.

Prerequisite: Project Planning and Control

Course Title : **Steel Structure II**
 Code Number / CREDIT : TS 211137 / 3 credits

Brief description : Taught how to design steel warehouse buildings, plate girders, composite members and other structures multi-storey buildings with LRFD. Steel Structure II response required.

Bibliography :

1. J.C. Smith, "Structural Steel Design-LRFD Approach", second edition John Wiley & Sons, Inc, 1996.
2. Jack C. McCormac, "Structural Steel Design-LRFD Method", second edition Harper Collins College Publishers, 1995.
3. Ir. A.P. Potma and Ir. J.E. De Vries, "Steel Construction".
4. Latest edition of AISC Prerequisite: Steel Structure I.

Course Title : **Irrigation and Water Building Engineering**

Code Number / CREDIT : TS 211143 / 4 credits

Brief description : This course contains irrigation water needs, irrigation water management, arrangement of irrigation areas, tertiary plot networks, cropping pattern rotations, dimensions of irrigation channels and dimensions of auxiliary buildings and buildings used in irrigation network systems. This course contains reading pictures of topographic maps to be served, making irrigation networks, auxiliary buildings, water level elevations, dividing buildings, weir lighthouse shapes, weir stability and informing the results with pictures. Students are required to take Irrigation and Water Building Engineering assignments.

Bibliography:

1. "Irrigation Planning Standards, Supporting Book, KP.01, KP.02, KP.04 & KP.05", Director General of Irrigation Dep. Public Works, 1986.
 2. USBR, "Design of Small Dams", 1973.
 3. Mawardi, Erman, "Hydraulic Design of Irrigation Buildings", Alfabeta Bandung, 2007.
 4. Mawardi Erman, "Hydraulic Design of Fixed Weirs", Alfabeta Bandung, 2004.
- Prerequisite: Hydrology, Fluid Mechanics & Hydraulics

Course Title : **Environmental Engineering**

Code Number / Credits : TS 211125 / 2 CREDITS

Short Description : This Environmental Engineering course provides knowledge about the provision of clean water and the development of domestic waste and solid waste in Indonesia.

link to public health efforts and prevent disease transmission.

Bibliography:

1. "Environmental Engineering", Gunadarma Publishers, 1997.
2. Suripin, Dr., Ir., M.Eng., "Sustainable Urban Drainage System", Andi Publisher, Yogyakarta, 2003.
3. Soufyan Moh Noer Bambang, "Design and Maintenance of Plumbing Systems", PT.Pradnya Paramita, Jakarta, 1993.
4. WisnuArya Wardhana, "Impact of Pollution Environment", Andi Publisher, Yogyakarta, 2004.
5. Otto Soemarwoto, "Analysis Regarding Impact Environment", Andi Publisher, Yogyakarta, 2003.

Prerequisite : -

Course Title : **Urban Drainage**
Code Number / CREDIT : TS 211144 / 2 credits
Short Description : This course deals with the history of drainage development, hydrological aspects, water control efforts, discharge calculations, surveys for drainage planning, drainage systems, planning steps and special drainage.

Bibliography:

1. Suripin "Sustainable Urban Drainage System" Andi, Yogyakarta 2004.
2. Lazaro, Urban Hydrology & Multidisciplinary Perspective, Ann Arbor Science, Publ 1979
3. S. Hindarko "Urban Drainage" Esha, Jakarta. Prerequisite: Hydrology, Fluid Mechanics & Hydraulics

SEMESTER VI

Course Title : **Foundation Engineering II**
Code Number / CREDIT : TS 211132 / 2 credits
Short Description : This course will explain about foundations, functions and uses, deep foundations, retaining walls, single and group pile foundations.

Bibliography:

1. Bowles J.E., "Foundation Analysis and Design", 1982.
2. Braja M. Das (translated by Noor Endah and Indrasurya B. Mochtar), "Soil Mechanics, Principles of Geotechnical Engineering, volumes 1 and 2".
3. Costet J and Sanglerat G., "Cours Pratique de Mecanique des Sols, Tome 1 and", 1981.
4. Herman Wahyudi, "Deep Foundation Support Capacity (diktat)", 1999.
5. Herman Wahyudi, "Shallow Foundation Support Capacity (diktat)", 1999.

Prerequisite : Foundation Engineering I

Course Title : **Coastal Engineering**
Code Number / Credits : TS 211145 / 2 CREDITS
Short Description : This course contains the meaning and scope of coastal engineering, wave properties, diffraction, wind waves, longshore transport and breakwaters.

Bibliography :

1. W.W. Masie, P.E., Coastal Engineering Volume I, II, III Breakwater Design, TU Delft, 1986.
2. Van der Velden, E.T.J.M., Coastal Engineering Volume II, TU Delft, 1989.
3. Shore Protection Manual Volume I, II, Coastal Engineering Research Center, Dept. of the Army, Vicksburg, Mississippi, 1984.
4. Triatmodjo, B., "Coastal Engineering", Beta Offset, Yogyakarta, 1999.
Prerequisite: Fluid Mechanics and Hydraulics

Course Title : **Reinforced Concrete Structures III**
Code Number / CREDIT : TS 211135 / 3 credits
Short description : Material: Performance of Earthquake Resisting Reinforced Concrete (RCC) Structures, Determination of Earthquake Loads, Digest of Earthquake Resisting RCC Structures, Modified Elastic Analysis Method (MEL), Principle of capacity design, Principle of weak beam strong column design,

Design of Moment Resisting Frame Capacity, planning of beam and column connections. Major project to plan earthquake resistant reinforced concrete structure multi-storey building. (Response to Reinforced Concrete Structure III)

Bibliography:

1. Muto, Kiyoshi, "Seismic Analysis of Reinforced Concrete Buildings".
2. Park, Robert and Thomas Pauly, "Reinforced Structures", 1975.
3. Paulay, T. & Priestly, "Seismic Design of Reinforced and Masonry Buildings" 4.
4. SNI 03-2847 Year 2003 "Procedures for Calculation of Concrete Structures for Building".
5. Old SNI: SK-SNI T-15-1991-03 (SNI-03-2847-1992), "Tata Cara Calculation of Concrete Structures for Buildings".
6. SNI: 03-1726-2002: SNI "Procedure for Planning Earthquake Resistance for Buildings". (BSN)
7. "Structural Engineering Design Provision", Uniform Building Code, Volume 2, 1977.
8. Rahmat Purwono, "Earthquake Resistant Reinforced Concrete Structures". 2003.
9. CUR. Book series 3, "Design of Reinforced Concrete Frame Structures in Earthquake Prone Areas"
10. Suwandojo Siddiq, "Ductile Concrete Structures for Earthquake Regions".

Prerequisite: Reinforced Concrete Structure II

Course Title : **Project Planning & Control**

Code Number / CREDIT : TS 211153 / 3 credits

Brief Description: Project objectives, project scope and constraints (cost, quality, and time), Project Supervision & Control, Mechanical earthmoving and introduction to the use of heavy equipment.

Bibliography:

1. Badiru, B. Adedaji, "Comprehensive Project Management", Prentice Hall PTR, Englewood Cliffs, New Jersey, 1994.
2. Gray, Clifford F, "Project Management: The Managerial Process", McGraw-Hill, 2000.
3. Kerzner, Harold D, "Project Management: A systems approach to planning, scheduling & control", Van Nostrand Reinhold, 1995.
4. Sulistiono, Djoko. "Mechanical Earth Moving". ITS Surabaya. 1996.
5. Rochmanhadi. "Capacity and Production" Tools Heavy Equipment". Department of Public Works. 1983.

Prerequisite : Construction Building Estimating and Investment

Course Title : **Prestressed Concrete Structures**

Code Number / Credits : TS 211139 / 2 CREDITS

Brief description : Prestressed Concrete Structures course is a directly applicable course, the material in this course: development of prestressed concrete, knowledge of concrete and steel materials, prestressing force loss, analysis and design of flexural sections, calculation of shear and splitting force, deflection and limit cables, continuous beams, piles, and at the end of the lecture was given a large assignment to design a prestressed concrete bridge.

Bibliography:

1. "ACI", 1997.
2. "Bridge Management System" (BMS), 1992.
3. Edward G. Nawy, "Prestressed Concrete", Prestice-Hill, Inc, Third Edition, New Jersey, 2000.
4. Naaman, A.E, "Prestressed Concrete Analysis and Design Fundamentals".
5. PCI Journal
6. SK-SNI T-15-1991-03
7. T.Y. Lin, and Ned.H. Burns, "Design of Prestressed Concrete Structures", John Wiley & Sons, Berkeley, 1982.

Prerequisite : Reinforced Concrete Structures II

Course Title : **Traffic Engineering**

Code number / CREDIT : TS 211149 / 2 credits

Short description : This course studies among others:

Components of traffic engineering, traffic characteristics, traffic engineering surveys, traffic engineering survey data analysis, road capacity, intersection planning and arrangement, evaluation of unsignalized and signalized intersections, traffic signs and road user behavior in traffic safety aspects and traffic impact analysis.

Bibliography:

1. Directorate General of Highways, "1997 Indonesian Road Capacity Manual", First Edition, Department of Public Works, Jakarta, 1997.
2. Department of Transportation, "Road Traffic and Transportation Law No. 14 of 1992", Jakarta, 1992.
3. Alamsyah, Alik Ansyori, "Traffic Engineering", Revised Edition, UMM Press, Malang, 2008.
4. Pignataro, Louis J., "Traffic Engineering - Theory and Practice", First Edition, Prentice Hall Inc, New Jersey, 1973.
5. Roess, Roger P., "Traffic Engineering", Third Edition, Pearson Education Inc, New Jersey, 2004.
6. Warpani, Suwardjoko P., "Road Traffic and Transportation Management", First Edition, ITB Publisher, Bandung, 2002.

Prerequisite : Transportation Engineering and Modeling

Course Title : **Leadership Code**

Number / CREDIT : UV21013 / 2 credits

Short Description :

Bibliography:

Prerequisite: -

SEMESTER VII

Course Title : **Indonesian Language**

Code Number / CREDIT : UV 21012

/ 2 credits Brief Description :

Bibliography :

Prerequisite: -

Course Title : **Construction Implementation Method**

Code Number / CREDIT : TS 211154 / 2 credits

Short description : A skill course that contains knowledge about the types of equipment and their use in civil engineering work, analysis of tool production, time and cost analysis and implementation methods.

Bibliography:

1. Peurifoy, R.L., "Construction Planning Equipment and Methods".
2. Rochmanhadi, "Heavy Equipment & Its Use".
3. Rchundly, "Construction Technology".
4. M.K. Hard, "Form work for concrete", ACI.
5. Edward. R. Strum, "Design ang Typical Details of Connections for Precast and Prefabricated", PCI.
6. John Breen, Antoine Noaman, "External prestressing in bridges".
7. Patrick J. Dawling, "Constructional Steel Design".
8. "Manual of Concrete Practice", ACI.
9. M.S.Troitsky, "Prestressed Steel Briges".
10. Rene Walter, "Cable Stayed Bridge".
11. "Guidelines Planning Bridge", SNI & SKBI about Bridges.
12. "Ground water Handbook".
13. "Rock Mechanics".
14. William W. Hang, "Railroad Engineering", 1982.
15. Coenraad Esveld, "Modern Railway Track", MRT. Production, 1989.
16. Herman Wahyudi, "Advanced Railroad. Railroad System and Utility", Lecture Dictate of Civil Engineering Department, FTSP- ITS, 1993.

Prerequisite : Soil Mechanics, Soil Measuring Science

Course Title : **Bridge Construction Design**

Code number / credits : TS 211140 / 3 credits

Short description : This course studies among others: The development of bridge construction in Europe and in Indonesia, early studies of the initial study in planning construction bridge construction planning (preliminary study), Types of bridges, Selection and investigation of b r i d g e construction sites, Introduction to the main parts of bridge construction and their functions (bridge structural system - upper and lower bridge structures), Selection of construction materials and lay out design based on bridge spans, Calculation of bridge superstructure, Planning of main and transverse girders of bridge, Planning of shear connectors, Planning of connections, Placement planning of bridge construction, Planning of abutment buildings and bridge foundations, Maintenance of bridge construction.

Bibliography :

1. Supriyadi, Bambang, and Muntohar, Agus S., "Bridges", Fourth Edition, Beta Offset, Yogyakarta, 2007.
2. Department of Public Works, "Guidelines for Loading Planning of Highway Bridges", PU Publishing Agency Foundation, Jakarta, 1987.
3. ' ', "Bridge Construction Planning Standard of concrete material", Indonesian National Standard, 2010
4. ' ', "Bridge Construction Planning Standard of steel material", Indonesian National Standard, 2010
5. ' ', "Bridge Engineering Regulations - Bridge Management System", Ministry of Public Works, Directorate General of Highways, 1992

6. ' ', "Guidelines for Loading Planning of Bridges and Highways", SNI No. 1725-1989 F

Prerequisite : Steel Structures II, Reinforced Concrete Structures III, Indeterminate Static Engineering Mechanics.

Subject : **Transportation Infrastructure**

Code number / credits : TS 211150 / 4 CREDITS

Short description : This course studies among others:

Water transportation infrastructure: ports and docks, characteristics of water transportation facilities, basic planning of ports and docks, components and structures of ports and docks, Land transportation infrastructure: terminals and railway stations, basic planning of terminals and railway stations, characteristics of land transportation facilities (buses and trains), components and structures of railways, Air transportation infrastructure: airports, characteristics of air transportation facilities (aircraft), components and facilities at airports.

Bibliography:

1. Adisasmita, Sakti Adji, "Transportation Development Planning", First Edition, Graha Ilmu Publisher, Yogyakarta, 2011
2. Alamsyah, Alik Ansyori, "Railroad Engineering", First Edition, Bayumedia Publishing, Malang, 2003.
3. Basuki, Heru Ir., "Designing, Planning an Airfield"
4. , Alumni Publisher, Bandung, 1993.
5. Tri Utomo, Suryo Hapsoro, "Rail Roads", Revised Edition, Beta Offset, Yogyakarta, 2002.
6. Horonjeff, Robert and McKelvey, Francis X., "Airport Planning and Design - Volume 1", Erlangga Publishers, Jakarta, 1993.
7. Horonjeff, Robert and McKelvey, Francis X., "Airport Planning and Design - Volume 2", Erlangga Publishers, Jakarta, 1993.
8. Munawar, Ahmad, "Fundamentals of Transportation Engineering", First Edition, Beta Offset Publisher, Yogyakarta, 2005.
9. Nasution, M. Nur, "Transportation Management", Second Edition, Ghalia Indonesia Publisher, Jakarta, 2003.
10. Sartono, Wardhani, "Airport Engineering", Civil Engineering Bureau Publisher, Yogyakarta, 2005.

Prerequisite: Transportation Engineering and Modeling

SEMESTER VIII

Course Title : **Community service**

Code Number / CREDIT : UV 141115 / 2 credits

Short description : Visits and implementation of real science in disadvantaged areas.

Prerequisite Have taken 100 credits

Course Title : **Practical Work**

Code Number / CREDIT : TS 211155 / 2 credits

Short description : Implementation of science in construction projects.

Prerequisite 110 credits, Steel Structure Assignment, Assignment Reinforced Concrete Structures (parallel).

Course Title : **Final Project**
Code Number / CREDIT : TS 211156 / 6 credits
Short description : Preparation of a Full Research Paper Report consisting of Chapter I, Chapter II, Chapter II, Chapter II, and Chapter III, III, Chapter IV (discussion) and Chapter V (conclusion).
Prerequisite: All courses including assignments and practicum.

ELECTIVE COURSES

Course Title : **Real Estate Management**
Code Number / CREDIT : TS 211257 / 2 credits
Short Description: Real estate management, feasibility from engineering, social, cultural and economic perspectives.

Bibliography:

1. Miles. Mike E, Haney. Richard L Jr and Barens. Gayle. "Real Estate Development: Principles and Process." Second Edition. Urban Land Institute. 1996.
2. Smith. Halbert C and Corgel. John B. "Real Estate Perspectives: An Introduction to Real Estate. Second edition. Irwin. 1992.
3. Floyd. Charles F. "Real Estate Principles. Third Edition. 1990.
4. Santoso. Budi. "Real Estate: A Concept of Science and Problems of Indonesian Developers. 1st Printing. CAUS-School of Real Estate and
5. IMARI. 2000.

Prerequisite : Construction Building Estimating and Investment

Course Title : **Reservoirs**
Code Number / CREDIT : TS 211262 / 2 credits

Short Description: This course studies among others,

1. Understanding of the maximum utilization of topographic maps in order to obtain a comprehensive picture of multipurpose reservoirs in one region.
2. Hydraulic aspects relating to the magnitude and direction of flow and the effect of sedimentation on the reservoir that may occur in order to be limited to a non-destructive state.
3. Aspects of the ability of the selected structure to be able to accommodate and withstand working loads so as not to damage the structure.

Bibliography :

1. Sudibyo, "Dam Engineering", PT Pradya Paramita, 1993.
2. Suyono, "Urugan Type Dam", PT.Daenippon Gita Karya Printing, 1976.
3. USBR, "Design of Small Dam's", 1973.

Prerequisite: Hydrology, Fluid Mechanics and Hydraulics, Irrigation Engineering and Waterworks

Course Title : **HYDROPOWER**
Code Number / CREDIT : TS 211263 / 2 credits

Short Description: This course studies among others,

1. How to utilize water sources for hydropower and the necessary buildings and their functions
2. How to utilize reservoirs for hydropower with the necessary data and determination of the mainstay discharge and energy obtained.
3. Daily reservoirs, their function and how to determine their capacity

4. Economic theory associated with hydropower

Bibliography :

1. USBR, "Design of Small Dam's", 1973.
2. Patty, "Hydropower".
3. Ven Te Chow "Open Chanel" Prerequisite: Fluid Mechanics and Hydraulics

Course Title : Water Resources Development

Code Number / CREDIT : TS 211264 / 2 credits

Short Description: This course studies the understanding of water resources, water potential, hydrological cycle, water resources problems, water resources infrastructure system, flood control system, land flow system and water resources conservation management, clean water system, integrated water resources management, water resources management according to the water resources law.

Bibliography :

1. Ray K. Linsley and Joseph B. Franzini (Djoko Sasongko), "Water Resources Engineering I and II", 1985.
2. Robert J.K., "Integrated Water Resources Management", 2005.
3. David Keith Todd, "Groundwater Hydrology", New Jersey: John Wiley
4. Soedibyo, "Dam Engineering", Pradnya Paramita, Jakarta, 1993.
5. Suripin, "Preservation of Land and Water Resources", Andi Offset, Jakarta, 2004.

Prerequisite: Irrigation & Waterworks Engineering, Urban Drainage

Course Title : River Engineering

Code Number / CREDIT : TS211265 / 2 credits

Short Description: This course studies the understanding of rivers, river characteristics, watersheds, river morphology, geometry, cross-sectional capacity, river confluence and branching, erosion and sedimentation, local erosion, flow regulation, discharge regulation, flood control, sediment control, sediment transport contains the hydraulic foundation of the sediment transport process, the basic formulation of transport velocity, empirical sediment transport formulas.

Bibliography:

1. Anggrahini, "Open Channel Hydraulics", Citra Media, 1997.
2. Breusers, "Lecture note on Sediment Transport", International Course in Hydraulic Eng., TU Delft, Netherlands, 1991.
3. Chang, Howard H., "Fluvial Processes in River Engineering", John Wiley & Sons, 1987.
4. Jansen P.Ph (editor), "Principles of River Engineering-The non tidal alluvial River", Delftse Flitgevers Maatschappij, 1979.
5. Kinori B.Z and Mevorach, J, "Manual of Surface Drainage Engineering", Volume III-Stream Flow Engineering and Flood Protection, Elsevier, Amsterdam, 1981.
6. Sosrodarsono, Suyono and Tominaga, Nasateru, "River Improvement and Regulation", Pradnya Paramita, Jakarta, 1985.
7. Sofia, Fifi, Diktat "River", 2004
8. Sujadi, B.B., "Sediment Transport", Lecture Dictate, 1983.

9. Van Rijn, Leo C., "Handbook of Sediment Transport by Current and Waves", Report H 461, Delft Hydraulic, Delft, Netherlands.

Prerequisite: Hydrology, Fluid Mechanics and Hydraulics

Course Title : **Coastal Building Planning**

Code Number / CREDIT : TS 211266 / 2 credits

Short Description: This course studies among others,

1. There are several ways to protect the coast
2. Natural conditions such as wind, tides, waves, topography and bathymetry, and environmental conditions are very influential in planning coastal buildings.
3. Shore building structure design
4. Waves at coastal building sites
5. Estuary management strategy Bibliography:
6. W.W. Masie, P.E., Coastal Engineering Volume I, II, III Breakwater Design, TU Delft, 1986.
7. Van der Velden, E.T.J.M., Coastal Engineering Volume II, TU Delft, 1989.
8. Shore Protection Manual Volume I, II, Coastal Engineering Research Center, Dept. of the Army, Vicksburg, Mississippi, 1984.
9. Triatmodjo, B., "Coastal Building Planning", Beta Offset, Yogyakarta, January 2012.

Prerequisite: Beach Engineering

Course Title : **Advanced Steel Structure**

Code Number / CREDIT : TS 211267 / 2 CREDITS

Brief description : This course teaches how to design earthquake-resistant steel buildings and plastic steel structures.

Bibliography :

1. AISC - LRFD - 1994.
2. Englekirk, R., "Structures - Controlling Behavior Through Design", John Wiley & Sons, 1994.
3. Mc Cormack, J.C., "Structural Steel Design - LRFD Method", 2nd Edition, Harper Collins College Publisher, 1995.
4. Smith, J.C., "Structural Steel Design - LRFD Approach, 2nd Edition, John Wiley & Sons, 1996.
5. SNI 03-1729-2002, "Steel Planning Procedure for Building", National Standardization Agency.

Prerequisite: Steel Structure II

Course Title : **Wood Structure**

Code number / CREDIT : TS 211268 / 2 credits

Short description : This course studies, among others:

Wood as a construction material, Properties and characteristics of wood (strength class and durability class of wood), Dimensional planning of wood due to bending load, Dimensional planning of wood due to tensile and compressive load, Connections and connecting devices in wood construction, Application of calculations in wood construction (truss calculation and truss construction).

Bibliography :

1. Yap, Felix, "Wood Construction", Eighth Edition, Binacipta Publisher, Jakarta, 1997.
2. Department of Public Works, "Indonesian Timber Construction Regulations NI-5 of 1961", PU Publishing Agency Foundation, Jakarta, 1990.
3. Frick, Heinz. and Moediartianto, "Science of Wood Building Construction - Introduction to Wood Construction", Third Edition, Kanisius Publishers, Yogyakarta, 2004.

Prerequisite: Materials Technology, Static Engineering Mechanics Specified

Course Title : **Matric Method Structure Analysis**

Code Number / Credits : TS 211269 / 2 CREDITS

Short Description: In this ASMM lecture, a method of analyzing structures using the matrix method will be taught so that it is more rational & more general and can be automated.

Bibliography:

1. Darly L Logan, "A first Course in the Finite Element Method".
2. El Wilson, "Numerical Methods of Finite Element Analysis".
3. Iain A Maclead, "Analytical Modeling of Structural System
4. RD Cook, "Concept & Application of Finite Element Analysis".

Prerequisite: Engineering Mechanics II, Numerical Analysis Practicum

Course Title : **Long Span Bridge Structure**

Code Number / CREDIT : TS 211271 / 2 credits

Brief Description : This course teaches how to design earthquake-resistant steel buildings and plastic steel structures.

Bibliography:

1. AISC - LRFD - 1994.
2. Englekirk, R., "Structures - Controlling Behavior Through Design", John Wiley & Sons, 1994.
3. Mc Cormack, J.C., "Structural Steel Design - LRFD Method", 2nd Edition, Harper Collins College Publisher, 1995.
4. Smith, J.C., "Structural Steel Design - LRFD Approach, 2nd Edition, John Wiley & Sons, 1996.
5. SNI 03-1729-2002, "Steel Planning Procedure for Building", National Standardization Agency.

Prerequisite: Prestressed Concrete Structures, Reinforced Concrete Structures III

Course Content : **Advanced Traffic Engineering**

Code number / CREDIT : TS 211272 / 2 credits

Short description : This course studies among others:

Traffic management and engineering at intersections and road segments (unsignalized intersections, signalized intersections, interchanges and nodes), Performance analysis of unsignalized intersections, Performance analysis of signalized intersections, Study of traffic accidents, Analysis of factors causing traffic accidents, Preventive measures against traffic accidents, Pedestrian and roadside facilities, Level of service of sidewalks (Pedestrian Lane Level of Service), zebra crossing , Pedestrian bridges, Parking and its aspects, Parking management.

Bibliography:

1. Directorate General of Highways, "1997 Indonesian Road Capacity Manual", First Edition, Department of Public Works, Jakarta, 1997.
2. Department of Transportation, "Road Traffic and Transportation Law No. 14 of 1992", Jakarta, 1992.
3. Alamsyah, Alik Ansyori, "Traffic Engineering", Revised Edition, UMM Press, Malang, 2008.
4. Mannering, Fred L., Kilareski, Walter P., and Washburn, Scott S., "Principles of Highway Engineering and Traffic Analysis", Third Edition, John Wiley & Sons Inc, Minnesota, 2005.
5. Munawar, Ahmad, "Urban Traffic Management", 2nd Printing, Beta Offset Publisher, Yogyakarta, 2006.
6. Pignataro, Louis J., "Traffic Engineering - Theory and Practice", First Edition, Prentice Hall Inc, New Jersey, 1973.
7. Putranto, Leksmono S., "Traffic Engineering", 2nd Edition, PT. Index, Jakarta, 2013
8. Roess, Roger P., "Traffic Engineering", Third Edition, Pearson Education Inc, New Jersey, 2004.

Prerequisite : Traffic Engineering

Course Title : **Mass Transportation and Facilities**

Code number / credits : TS 211273 / 2 CREDITS

Short description : This course studies among others: Public transportation system, Characteristics of public transportation, Types of public transportation modes, Land use in public transportation planning, Determination of public transportation routes and networks, Patterns of public transportation networks, Public transportation networks in urban systems and transportation levels, Elements and analysis of public transportation networks, Specifications and classification of public transportation networks, Planning of public transportation facilities based on supply and demand analysis, Management of public transportation facilities and facilities.

Bibliography:

1. Adisasmita, Sakti Adji, "Transportation Networks - Theory and Analysis", First Edition, Graha Ilmu Publisher, Yogyakarta, 2011
2. Meyer, Michael D., and Miller, Eric J., "Urban Transportation Planning - A Decision Oriented Approach", Second Edition, Mc Graw Hill Publisher, New York, 2001.
3. Khisty, Jotin C., and Lall, B. Kent, "Transportation Engineering - An Introduction", Third Edition, Prentice Hall Inc, New Jersey, 2002.
4. Miro, Fidel, "Urban Transportation System", First Edition, Tarsito Publisher, Bandung, 1997.
5. Vuchic, Vulkan R., "Public Transportation", First Edition, Prentice Hall Inc, New York, 1981.

Prerequisites : Transportation Engineering and Modeling,
Transportation Infrastructure

Course Title : **Airport System**

Code number / credits : TS 211274 / 2 CREDITS

Short description : This course studies among others: The main components of the airside facilities at the airport, The main components of the landside facilities at the airport, The relationship between the main components of the airside and landside facilities at the airport, The flow of passenger movements on the landside, The flow of passenger movements on the airside, The concept of passenger service system (passenger handling system), Basic queuing theory, Application of queuing theory and performance evaluation to passenger service systems in the landside, Application of queuing theory and performance evaluation to passenger service systems in the airside, Management and operational management of flight traffic at airport facilities.

Bibliography :

1. Airport Design and Engineering Advisory Circular 150/ 5300-13, Federal Aviation Administration Publishers, Washington D.C., 1989.
2. Airport Design and Engineering Advisory Circular 150/ 5320-6d, Federal Aviation Administration Publishers, Washington D.C., 1989.
3. Airport Design and Engineering Advisory Circular 150/ 5320-5b, Federal Aviation Administration Publishers, Washington D.C., 1989.
4. De Neufville, Richard, and Odoni, Amedeo, "Airport Systems, Planning, Design and Management", McGraw Hill, New York, 2003.
5. Horonjeff, Robert and McKelvey, Francis X., Airport Planning and Design - Volume 1, Erlangga Publishers, Jakarta, 1993.
6. Horonjeff, Robert and McKelvey, Francis X., Airport Planning and Design - Volume 2, Erlangga Publishers, Jakarta, 1993.
7. Kazda, Antonin and Caves, Robert E., "Airport Design and Operation", Pergamon Press, New York, 2000.
8. Kakiay, Thomas J., "Basic Queuing Theory for Real Life", Andi Publisher, Yogyakarta, 2004.

Prerequisite: Transportation Infrastructure

Course Title : **Transportation Safety Applications**

Code number/credits : TS 211275 / 2 CREDITS

Short description: This course studies among others: Concept of transportation in all types of transportation modes (land, sea and air transportation), Problems in all types of transportation modes (land, sea and air transportation), Aspects of transportation safety in all types of transportation modes (land, sea and air transportation), Elements and users of land transportation, Elements and users of sea transportation, Elements and users of air transportation, Techniques for collecting and analyzing transportation accident data, Analysis of accident causes and identification of vulnerabilities, Use of statistical methods for accident analysis, Prevention and mitigation of transportation accidents, Monitoring and evaluation of transportation safety implementation.

Bibliography :

1. Banks, James H., "Introduction to Transportation Engineering", Second Edition, McGraw Hill Inc, New York, 2002.
2. Khisty, Jotin C., and Lall, B. Kent, "Transportation Engineering - An Introduction", Third Edition, Prentice Hall Inc, New Jersey, 2002.
3. Roess, Roger P., "Traffic Engineering", Third Edition, Pearson Education Inc, New Jersey, 2004.

Prerequisites: Transportation Engineering and Modeling, Transportation Infrastructure

Course Title : **Rail-based Transportation Network**

Code number / CREDIT : TS 211276 / 2 credits

Short description: This course studies among others:

Public transportation system, Characteristics of public transportation, Rail-based transportation facilities, Rail road planning based on the type of transportation facilities, Rail road characteristics, rail road components, rail road structure, rail road geometric design, rail road drainage planning, Rail road security and regulation, Rail road-based transportation system planning based on supply and demand analysis, Rail road-based transportation network patterns within cities and between cities, Management of rail-based transportation facilities.

Bibliography:

1. Adisasmita, Sakti Adji, "Transportation Networks - Theory and Analysis", First Edition, Graha Ilmu Publisher, Yogyakarta, 2011
2. Alamsyah, Alik Ansyori, "Railroad Engineering", First Edition, Bayumedia Publishing, Malang, 2003.
3. Meyer, Michael D., and Miller, Eric J., "Urban Transportation Planning- A Decision Oriented Approach", Second Edition, Mc Graw Hill Publisher, New York, 2001.
4. Miro, Fidel, "Urban Transportation System", First Edition, Tarsito Publisher, Bandung, 1997.
5. Tri Utomo, Suryo Hapsoro, "Rail Roads", Revised Edition, Beta Offset, Yogyakarta, 2002.

Prerequisite: Transportation Engineering and Modeling, Transportation Infrastructure

Course Title : **Remote Sensing**

Code Number / CREDIT : TS 211277 / 2 credits

Short Description : This course provides basic remote sensing knowledge, electromagnetic wave theory, light scattering, types of space satellites, types of satellite images, understanding resolution, temporal analysis, characteristics of satellite images, wave theory, light theory, relationship with absorption of objects on earth, how to read satellite images, the basics of color analysis in satellite images, surveys via the internet, introduction to Google Earth.

Bibliography:

1. Sutanto, Remote Sensing, Second Printing 1997, Gajah Mada Publisher University Press
2. Sri Hartati Sunarmo, Remote Sensing, and Introduction to Geographic Information Systems for the Field of Earth Sciences, Publisher ITB Bandung
3. Eddy Prahasta, Map Info Programming Application, Informatics Publisher

Prerequisite: -

Course Title : **Geographic Information System**

Code Number / CREDIT : TS 211278 / 2 credits

Short description: This course provides basic knowledge of spatial data-based information systems, introduction to basic maps or RBI, as well as world maps in general, types of coordinates that apply in Indonesia, how to calculate Geographic coordinates to UTM and radial conversion, introduction to spatial information systems, vector data and raster data, georeferencing processes, map digitization processes, introduction to projection systems, making legends on maps,

introduction to software for reading maps, MapWindows, Quantum GIS, Diva GIS and Arc Views.

Bibliography :

1. Eddy Prahasta, Geographic Information Systems Basic Concepts, Informatics Publisher
2. Sutanto, Remote Sensing, Second Printing 1997, Publisher Gajah Mada University Press
3. Sri Hartati Sunarmo, Remote Sensing, and Introduction to Geographic Information Systems for the Field of Earth Sciences, Publisher ITB Bandung
4. Eddy Prahasta, Map Info Programming Application, Informatics Publisher
Prerequisite : Land Measuring & Mapping Science

Course Title : **Photogrammetry and Image Processing**

Code Number / CREDIT : TS 211279 / 2 credits

Short description : This course provides basic knowledge of photogrammetry and satellite image processing, this course provides material on the basics of global mapping, aerial photographs and their properties, recognizing the concept of mosaic photos, panoramic photos, the concept of grayscale, calculating coordinates on earth, the concept of GPS on aerial photographs, basic GPS recognition on android 4 or mobile phones with 4G features, image processing and recognizing types of image processing software and experiments in image processing laboratories with open source software or freeware.

Bibliography:

1. Paul R. Wolf, Elements of Photogrammetry, Gajah Mada University Publisher Press
2. Aniasi Murni Arymurthy, Introduction to Image Processing, Alex Media Komputindo Publisher
3. Sri Hartati Sunarmo, Remote Sensing, and Introduction to Systematic Information for Geographic of the Field of Earth Sciences, Publisher ITB Bandung.

Course Title : **Cartography**

Code Number / CREDIT : TS 211280 / 2 credits

Short Description: This course provides basic knowledge of MAP in general, provides material on the history of map making from the Babylonian era to the modern era, reading analog maps with digital maps, types of maps and their characteristics, scales on maps, calculating map scales, types of paper/paper sizes, recognize map legends and their creation, contour concepts on maps, fonts on maps, map layout, digital map resolution, analog to digital map recording in JPG and BMP or TIFF formats, small and large scale map printing process in A0 or B0 sizes.

Bibliography:

1. Hadwi Soendjoyo, Akhmad Riqqi, ITB Publisher
2. Denis Wood. 1993, The Power Of Map
3. Sri Hartati Sunarmo, Remote Sensing, and Introduction to Geographic Information Systems for the Field of Earth Sciences, Publisher ITB Bandung.

Prerequisite: -

Course Title : **Engineering Geology**
Code Number / Credits : TS 211281 / 2 CREDITS
Short Description : Introduction ; Basic concepts and Endogenic processes ; Rocks ; Exogenic processes ; Soil formation ; Geological and geotechnical investigations ; Field lectures.

Bibliography:

1. Billing MP, "Structural Geology", 1980.
2. Hamblin and Howard, "Earth Dynamics System", 1978.
3. John Pits, HS, "A Manual of Geology for Civil Engineering", 1984.
4. Todd D.K., "Ground Water Hydrology", 1980. Prerequisite : -

Course Title : **Soil Improvement Technology**

Code Number / CREDIT : TS 211282 / 2 credits

Short Description: Students are able to calculate the height of the embankment used as preloading, determine the strength of the micropile in receiving horizontal forces, determine the number of micropiles that must be installed, recognize geosynthetic materials and their use in the field of Civil Engineering, calculate the need for geotextile to increase the bearing capacity of soft soil, calculate vertical drain planning, calculate phased embankment planning and its correlation with the bearing capacity of the subgrade, analyze the properties of peat soils and methods of dealing with peat soils, be able to analyze the swelling-shrinkage mechanism and methods of dealing with Swelling soils for buildings and roads, analyze mechanical and chemical stabilization for handling swelling soils, monitor matters related to reclamation stages, analyze the properties of collapsible soils and methods of dealing with collapsible soil design soil reinforcement on slopes and retaining walls with soil reinforcement system (Vertical Wall)

Bibliography :

1. Mochtar B. Indrasurya, Soil Improvement Technology and Alternative Planning
2. On Problematic Soils. ITS, Surabaya, 2000
Mitchell K. James, Fundamentals Of Soil Behavior, University of California, Berkeley, 1976

Prerequisite : Foundation Engineering II

Course Title : **Advanced Foundation Engineering**

Code Number / CREDIT : TS 211284 / 2 credits

Short Description: This course will explain the introduction to foundation requirements, functions and uses, deep foundations, chicken claw foundations, spider nest foundations, mat foundations, caisson foundations and retaining wall machine foundations.

Bibliography:

1. Bowles J.E., "Foundation Analysis and Design", 1982.
2. Braja M. Das (translated by Noor Endah and Indrasurya B. Mochtar), "Soil Mechanics, Principles of Geotechnical Engineering, volumes 1 and 2".
3. Costet J and Sanglerat G., "Cours Pratique de Mecanique des Sols, Tome 1 and", 1981.
4. Herman Wahyudi, "Deep Foundation Support Capacity (diktat)", 1999.
5. Herman Wahyudi, "Shallow Foundation Support (diktat)", 1999

Prerequisites : Foundation Engineering II

XI. MECHANICAL ENGINEERING STUDY PROGRAM

This book was prepared with the intention of providing an explanation of the various academic activities that must be followed by students of the Mechanical Engineering Study Program, Faculty of Engineering, UPN "Veteran" East Java. It is hoped that with this guidebook, students will better understand the academic activities of the Mechanical Engineering Study Program or Study Program as an option.

In this book, you can find the history and development of UPN "Veteran" East Java and the Mechanical Engineering study program, educational objectives, curriculum, course syllabus, laboratory facilities, lecturers and education staff, educational implementation regulations, about student life and other information. In addition, this guidebook also contains guidelines for writing thesis and practical work reports. By knowing this from the start, it is hoped that students can pursue their studies more smoothly.

Finally, we would like to thank the members of the team that compiled this guidebook for all their efforts from the preparation of the manuscript to its publication.

XI.1. VISION, MISSION, AND OBJECTIVES OF MECHANICAL ENGINEERING STUDY PROGRAM

Vision

The Mechanical Engineering Study Program is under the Faculty of Engineering. Therefore, the vision formulated is not far from the vision of the Faculty of Engineering and the UPN "Veteran" of East Java, namely "Becoming a Mechanical Engineering Study Program with State Defense Character with an International Reputation in Science and Technology that Supports Industry and as a Reference Study Program based on Biomedical Technology".

Mission

In an effort to realize this vision, the Engineering Study Program The machine has a mission:

1. Organizing and developing education with state defense character to produce graduates who are able to apply expertise by utilizing science and technology in the field of Mechanical Engineering and fostering innovation to support the industrialization process, Biomedical technology, and are ready to face the challenges of the industrial revolution 4.0 era.
2. Improving the culture of research in the development of science and technology in Mechanical Engineering that is useful for the welfare of society.
3. Organizing research-based community service and local wisdom in the field of Mechanical Engineering.
4. Improve study program management and integrated infrastructure management, in order to establish cooperation with the community, institutions, and government and private agencies.

Objectives

Based on the description of the Vision and Mission, the Mechanical Engineering Study Program of Universitas Pembangunan Nasional "Veteran" East Java has the following objectives.

1. Producing mechanical engineering graduates as human resources who are devoted to God Almighty.
2. Producing high quality mechanical engineering graduates in developing independent attitudes and professional skills in the field of mechanical engineering so that they are able to adapt to the development of science and technology.
3. Able to apply the basic concepts of science and technology in designing, analyzing, and solving complex engineering problems in the fields of materials, manufacturing, energy conversion, and biomedicine both independently and in teams.
4. Producing Mechanical Engineering graduates who are able to compete nationally and internationally with the following qualifications.
 - a. Mastering knowledge and skills in the basic science of mechanical engineering in accordance with technological developments, especially in the field of Biomedical Engineering expertise.
 - b. Able to communicate, have a leadership spirit, apply science, knowledge and technological skills in industry and the environment and be able to work independently or in groups.
 - c. Characterized by national defense.

XI.2. CURRICULUM OF MECHANICAL ENGINEERING STUDY PROGRAM

Based on the competency criteria decided by the Mechanical Engineering Study Program UPN "Veteran" East Java, and referring to the National Higher Education Standards No.3 of 2020, KKNI, BKS- TM, and IABEE, the 2020 curriculum of the Mechanical Engineering Study Program UPN "Veteran" East Java is arranged as follows.

SEMESTER I

No.	Code	Course Name	Credit			Laboratory
			T	P	Total	
1		Religious Education	2	0	2	
2	UV141107	Pancasila Education	2	0	2	
3	UV141111	Engineering English	3	0	3	
4	TM201108	Calculus I	3	0	3	
5	TM201104	Physics I	3	0	3	
6	TM201101	Chemistry	2	0	2	
7	TM201102	Engineering Drawing	1	1	2	Drawing Studio
8	TM201103	Engineering Materials I	2	0	2	
9	TM201105	HSE (Health, Safety, and Environmental Protection)	2	0	2	
10	TM201106	Life Sciences	2	0	2	
Total credits 1st semester					23	

SEMESTER 2

No.	Code	Course Name	Credit			Laboratory
			T	P	Total	
1	UV141108	Civic Education	2	0	2	
2	UV141109	Bahasa Indonesia	2	0	2	
3	TM201109	Calculus II	3	0	3	
4	TM201127	Machine Drawing	1	1	2	Drawing Studio
5	TM201107	Physics II	3	1	4	Physics
6	TM201114	Structure Statics	3	0	3	
7	TM201116	Kinematics	2	0	2	
8	TM201113	Engineering Materials II	0	2	2	Material
9	TM201112	Statistics & Probability	2	0	2	
Total credits Semester 2					22	

SEMESTER 3

No.	Code	Course Name	Credit			Laboratory
			T	P	Total	
1	TM201110	Math I	4	0	4	
2	TM201117	Dynamics	2	0	2	
3	TM201115	Strength Mechanics of Materials	3	0	3	
4	TM201119	Thermodynamics I	2	1	3	Energy Conversion
5	TM201121	Fluid Mechanics I	1	1	2	Energy Conversion
6	TM201123	Heat Transfer and Mass I	1	1	2	Energy Conversion
7	TM201139	CAD/CAM	0	2	2	Computer
8	UV141110	State Defense	2	1	3	
Total credits 3rd semester					21	

SEMESTER 4

No.	Code	Course Name	Credit			Laboratory
			T	P	Total	
1	TM201111	Math II	4	0	4	
2	TM201120	Thermodynamics II	2	1	3	Energy Conversion
3	TM201122	Fluid Mechanics II	2	1	3	Energy Conversion
4	TM201124	Heat Transfer and Mass II	1	1	2	Energy Conversion
5	TM201128	Manufacturing Process I	0	3	3	Manufacturing
6	TM201130	Machine Elements I	3	0	3	
7	TM201125	Industrial Metrology	2	0	2	
Total credits 4th semester					20	

SEMESTER 5

No.	Code	Course Name	Credit			Laboratory
			T	P	Total	

1	TM201129	Manufacturing Process II	0	3	3	Manufacturing
2	TM201132	Energy Conversion Machine I	1	1	2	Energy Conversion
3	TM201134	Control System	2	0	2	
4	TM201141	Scientific Writing	2	0	2	
5	TM201118	Mechanical Vibration	1	1	2	FDM
6	TM201145	Computer Programming	0	2	2	Computer
7	TM201138	Finite Element Method	2	0	2	
8	TM201142	Professional Ethics	2	0	2	
9	TM201131	Machine Elements II	3	0	3	
Total credits 5th semester					20	

SEMESTER 6

No.	Code	Course Name	Credit			Laboratory
			T	P	Total	
1	TM201133	Energy Conversion Machines II	2	1	3	Energy Conversion
2	TM201126	Electrical Power Engineering	1	1	2	FDM
3	TM201136	Machine Design Engineering	0	4	4	
4	UV141115	Community service	0	2	2	
5	TM201146	Research Methodology	2	0	2	
6	TM201140	Basic Machine Phenomena	0	2	2	
7	TM201135	Mechatronics	3	0	3	
8	UV141114	Entrepreneurship	2	0	2	
Total credits 6th semester					20	

SEMESTER 7

No.	Code	Course Name	Credit			Laboratory
			T	P	Total	
1	TM2012XX	Elective Courses Concentration I	2	0	2	
2	TM201144	Fieldwork Practices	0	2	2	
3	TM2012XX	Elective Courses Concentration II	2	0	2	
4	TM2012XX	General Elective Courses	2	0	2	
5	TM201143	Proposal Seminar	0	2	2	
Total credits 7th semester					10	

SEMESTER 8

No.	Code	Course Name	Credit			Laboratory
			T	P	Total	
1	TM201137	Thesis & Paper	0	5	5	
2	TM2012XX	Elective Courses Concentration III	2	0	2	
3	TM2012XX	Elective Courses Concentration IV	2	0	2	
Total credits 8th semester					9	

Description: T = theory / face-to-face in class

P = laboratory/studio/field practicum

GENERAL AND CONCENTRATION ELECTIVE COURSES

MATERIALS ENGINEERING CONCENTRATION		
Code	Subject name	Credit
TM201201	Mechanical Metallurgy	2
TM201202	Crystallography	2
TM201203	Nanomaterials	2
TM201204	Composites	2
TM201205	Mineral technology	2
TM201206	Ceramic technology	2
TM201207	Corrosion and its control	2
TM201208	Polymers	2
TM201209	Alloy Metals	2
TM201210	Powder material	2

MANUFACTURING ENGINEERING CONCENTRATION		
Code	Subject name	Credit
TM201211	Product Design	2
TM201212	Manufacturing Optimization	2
TM201213	Welding Technology & Metallurgy	2
TM201214	Robotics and Automation	2
TM201215	Reliability and Maintenance	2
TM201216	Nanomanufacturing	2
TM201217	Appropriate Technology	2
TM201218	Machine Vibration	2
TM201219	CNC	2

BIOMEDICAL ENGINEERING CONCENTRATION		
Code	Subject name	Credit
TM201220	Biomaterials	2
TM201221	Body biomechanics and ergonomics	2
TM201222	Biosensors	2
TM201223	Biomechatronics	2
TM201224	Tribology	2
TM201225	Biomedical imaging	2

CONCENTRATION OF ENERGY CONVERSION		
Code	Subject name	Credit
TM201226	Alternative and renewable energy	2
TM201227	Energy Conversion and Storage Nanotechnology	2
TM201228	Computational Fluid Dynamics	2
TM201229	Gas Turbines and Propulsion Systems	2

TM201230	Cooling and Heating Machines	2
TM201231	Water Turbine	2
TM201232	Steam Turbine	2
TM201233	Solar Technology	2
TM201234	<i>Fuel Cell</i>	2
TM201235	Steam Boiler	2
TM201236	Energy and Environment	2
TM201237	Electric Vehicle System	2

GENERAL ELECTIVE COURSES		
Code	Subject name	Credit
TM201238	Aircraft Lift	2
TM201239	Cutting-edge Vehicle Technology	2
TM201240	Hydraulic and Pneumatic Power Systems	2
TM201241	Piping Engineering	2
TM201242	Robotics	2
TM201243	Reverse Engineering	2
TM201244	Industrial Management	2
TM201245	Production Optimization; Layout Planning Factory, Production Auxiliary Tooling	2
TM201246	Coating Technology	2
TM201247	Micro machining process	2
TM201248	Jet and Rocket Propulsion	2
TM201249	Aerodynamics Engineering	2
TM201250	Aeronautical Engineering	2
TM201251	Aircraft Control and Stability System	2
TM201252	Independent Study Course	2

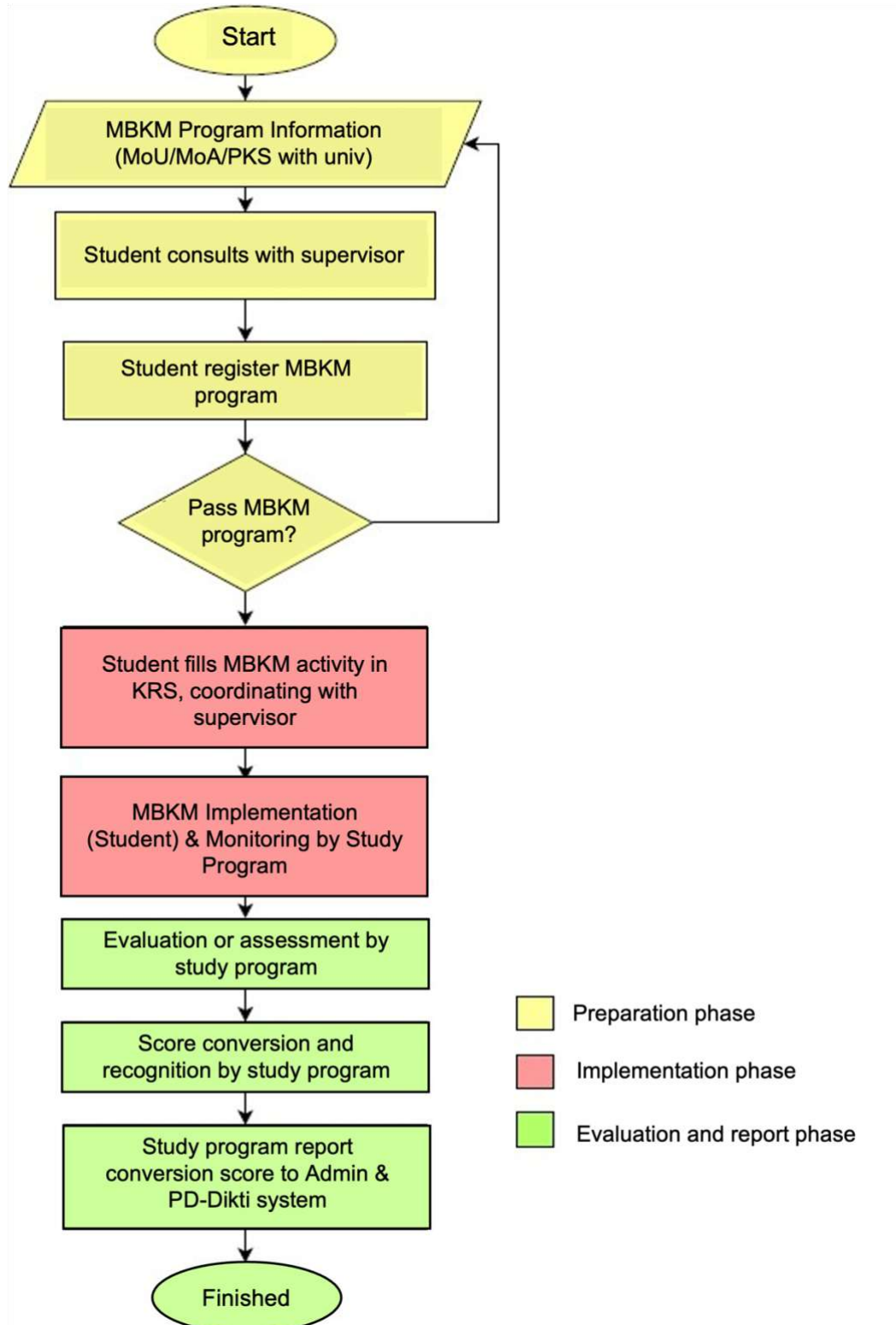
MBKM Based Curriculum

a. MBKM Implementation Process

The learning process and the concept of MBKM are implemented in order to realize an autonomous and flexible learning process in higher education to fulfill the right to study for a maximum of 3 (three) semesters outside the study program, namely studying outside the study program at UPN "Veteran" East Java and/or studying outside the study program at UPN "Veteran" East Java. Based on this, the implementation guide for MBKM at UPN "Veteran" East Java, has a scope:

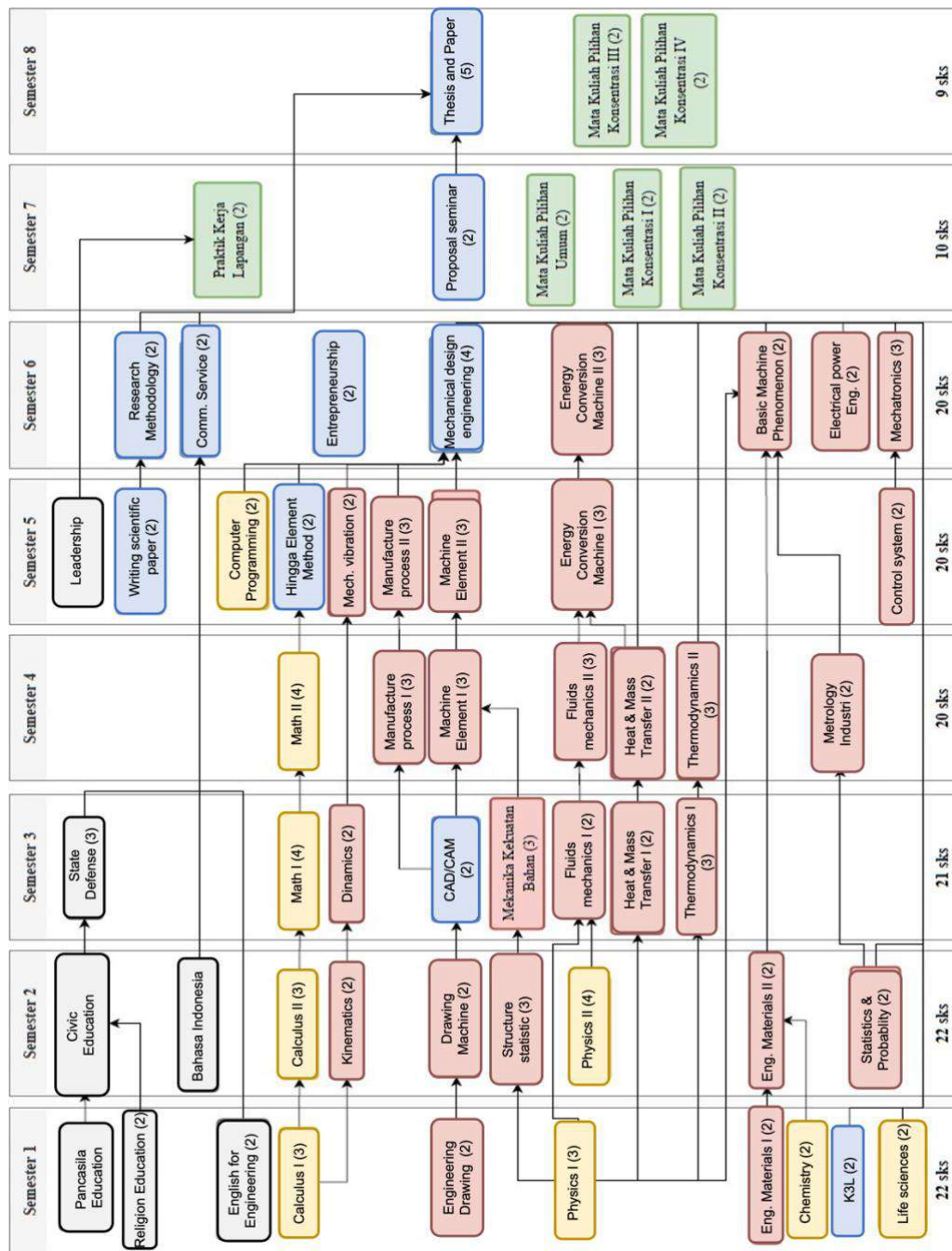
- 1) Learning implementation design model MBKM
- 2) Learning in the form of student exchange, namely: lecture program between study programs at UPN "Veteran" East Java, within the same program outside UPN "Veteran" East Java, between programs outside UPN "Veteran" East Java
- 3) Learning in the form of internship programs, teaching in schools/campuses, research, humanitarian projects, entrepreneurship, independent projects, thematic community services.

- 4) The stages of implementing MBKM Learning, which include: preparation, implementation, monitoring and evaluation.



Flowchart of the implementation of MBKM activities in Mechanical Engineering Study Program

b. MBKM-based Curriculum Roadmap for Mechanical Engineering Study Program



Description:

	MKDU, University Requirements
	Required Courses taken in the program
	Courses can be taken in the study program / outside the study program / outside the university (Regular / MBKM)
	Regular activities in the MBKM study program (Independent Projects, Research Studies)

	<ul style="list-style-type: none"> - Regular street vendors / MBKM-based street vendors - Courses can be taken in the study program / outside the study program & / university or can be converted through MBKM-based PKL activities.
--	---

XI.3. Final Project Writing Guide

In this section of the writing guide, the general format of the writing guide for practical work and final assignments that apply in the Mechanical Engineering Study Program of UPN "Veteran" East Java is attached.

3.1 General Format for Writing Scientific Reports

3.1.1 *The Beginning*

3.1.1.1 Title Page

3.1.1.2 Foreword

The Foreword or Preface contains a brief description of the purpose of the Scientific Report and explanations that can guide readers who will read the Final Project report and thanks. In the preface there are no scientific matters.

3.1.1.3 Table of Contents

The table of contents is intended to provide a comprehensive overview of the contents of the Scientific Report and as a guide for readers who want to immediately see a chapter or subchapter. The table of contents lists the order of titles, chapters, subchapter titles, subchapter titles accompanied by their page numbers.

3.1.1.4 List of Images

The list of images contains the sequence of images along with the title of each image and its page number. If the number of images in the Scientific Report is not too many, then there is no need to make a LIST OF IMAGES.

3.1.1.5 Table List

If there are many tables (lists) in the Scientific Report, it is necessary to have a TABLE OF TABLES that contains a sequence of table titles (lists) along with their page numbers. However, if there are only a few tables (lists), this list does not need to be made.

3.1.1.6 List of Attachments

The list of attachments is used when the Scientific Report has many attachments, so it is necessary to prepare a LIST OF APPENDICES which contains the order of the title of the attachment along with the page number. However, if there are only a few attachments, this list does not need to be made.

3.1.1.7 List of Notations and Abbreviations

We are a large-scale manufacturer specializing in producing various mining machines including different types of sand and gravel equipment, milling equipment, mineral processing equipment and building materials equipment.

3.1.1.8 Digest and Abstract

The digest is written in Indonesian while the abstract is written in English. The digest and abstract are brief, but complete descriptions of the brief background and objectives of the research, methods, as well as research results and conclusions. In general, the digest and abstract consist of three paragraphs and are no more than one page long, with single-spaced typing.

3.1.2 *Main Section*

The main part of the scientific report contains: introduction, literature review, research methods, results and discussion, and conclusion.

3.1.2.1 Introduction

The introductory chapter contains: background, problem formulation, assumptions and limitations of research or design problems, objectives, and benefits of research or design.

a. Background

This section contains: a discussion of the things that form the background of the need for research or design to be carried out in the Scientific Report. This section serves to show that the activities carried out in the Scientific Report (both research and design) are really needed from a scientific or practical perspective.

b. Problem Formulation

This section is a summary or conclusion of the Background of the Problem section. Usually written in one paragraph that has been clearly state the research problem or opportunity to be resolved in the research.

c. Assumptions and Problem Limitations

Contains an explanation of the assumptions taken in carrying out research/design, and contains the boundaries of the problems taken to further focus the research / design activities.

d. Research / Design Objectives

The research objectives specify the objectives to be achieved through the research/design activities in the Scientific Report. This section will later be answered by the conclusion of the Scientific Report.

e. Benefits of Research/Design

This section contains the benefits that can be achieved from the research / design activities in the Scientific Report, including benefits from the scientific or practical side.

3.1.2.2 Literature Review

The literature review contains systematic and thematic descriptions of the results of research conducted by previous researchers and those related to the research being conducted. The purpose of making a literature review is to map research that has been carried out in related fields and to find out the existence of research gaps and positioning of the research to be carried out. The facts stated as far as possible are taken from the original source. All sources used must be mentioned by stating the author's last name and year of publication, as listed in the bibliography.

3.1.2.3 Theoretical Foundation

The theoretical foundation is prepared as a foundation and guidance for solving research/design problems. The theoretical foundation can take the form of qualitative descriptions, mathematical models, or equations that are directly related to the research topic.

3.1.2.4 Research/Design Method

The research / design method explains in detail the stages and methods of research / design which include materials, tools, methods / research methods, the level of accuracy of tools / methods, and difficulties and ways to solve them.

- a. Research/design materials or materials must be specified as fully as possible. The origin, preparation method, physical properties, and chemical composition of the materials used are mentioned. If the experiment was conducted with human subjects, it is necessary to describe the respondents, sampling method, sample size, and design of experiment. This needs to be stated so that other researchers who want to re-test the research do not get the wrong step.
- b. The tools used to carry out the research are clearly described and if possible accompanied by pictures.
- c. The research path is in the form of a flow chart and a complete and detailed description of the steps that have been taken in the implementation of the research, including the method of data collection and its type. Difficulties that arose during the research and how to solve them need to be shown, so that researchers who will be engaged in similar research fields can avoid unpleasant things.

3.1.2.5 Results and Discussion

This chapter contains the results of the research and analysis of the discussion which is integrated and not broken down into separate subchapters.

- a. The results of the research/design should be presented in the form of lists (tables), graphs, photos/images, or other forms, and placed as close as possible to the discussion, so that the reader can more easily follow the description. In the first paragraph of this subchapter, it should be stated that the results of the research can be found in the lists and figures whose numbers are mentioned.
- b. Discussion, contains further review, synthesis, analysis, critical evaluation, and comparison of the results obtained, in the form of theoretical explanations, either qualitatively, quantitatively, or statistically. Except that, the results of research/design should also be compared with the results of previous similar research/design.

3.1.2.6 Cover

This section contains conclusions on the results of the research/design that has been carried out and suggestions for improvement or development of the research/design that has been carried out. Conclusions and suggestions must be stated separately.

- a. The conclusion is a brief and precise statement that is elaborated from the research results and discussion to answer the research objectives.
- b. Suggestions are made based on the author's experience and judgment, addressed to researchers in similar fields, who want to continue, or develop the research that has been completed. Suggestions are not mandatory.

3.1.3 Final Section

The final part of a scientific report consists of a bibliography and appendices.

- a. Bibliography
The bibliography lists all the references in the scientific report. Libraries that are not directly referenced do not need to be included in the bibliography.
- a. Attachment
Appendices are used to place data or other information that serves as a complement to the description that has been presented in the main part of the scientific report. All appendices must be mentioned first in the main part of the report.

3.1.4 Writing Procedure

Writing procedures include materials and size, typing, numbering, lists and figures, and name writing.

3.1.4.1 Material and Size

Materials and sizes include manuscript, cover, cover color, writing on the cover, and size.

- 1. Manuscript
Manuscripts are made on 70-gram HVS A4 paper, not back-to-back.
- 2. Cover
The cover is made of Buffalo paper or similar and is reinforced with cardboard and covered with plastic. The writing printed on the cover is the same as that on the title page, in black ink.
- 3. Cover Color
The cover color of the Final Project / Thesis book is adjusted to the color of the faculty, for the Faculty of Engineering using dark blue. As for the Practical Work Report book, it uses a light blue color.

3.1.4.2 Typing

In typing, the following are presented: typeface, numbers and units, line spacing, margins, filling space, new paragraphs, beginning of sentences, headings and subheadings, detailing downwards, and symmetry.

- 1. *Typeface*
 - a. The manuscript should be typed in Times New Roman 12-point font, and the same font should be used throughout.
 - b. Italics are used for specific purposes such as to write foreign terms (which are difficult to translate).
Example:
Generally, the *rudder* is mounted on the tail of an airplane.
 - c. Symbols, Greek letters, or signs that can be typed must be written with Symbol.
 - d. Chapter titles are written in 12-point font size, bold, and CAPITAL LETTERS.
 - e. Sub-chapter headings are written in 12-point font size, bold, and capitalized in the first letter.
 - f. Sub-chapter headings: 12 points, regular, capitalization in the first word.
 - g. Chapter contents are written left-right aligned (justify)
- 2. *Numbers and units*

- a. Numbers are typed with numbers, except at the beginning of a sentence, for example, 10 g of material. At the beginning of a sentence write: Ten grams of ingredients.
- b. Decimal numbers are marked with a comma instead of a period, for example, the weight of an egg is 50.5g.
- c. Unit expressed with abbreviation official without dot behind, e.g. m, g, kg, cal.

3. *Line spacing*

The distance between 2 lines is made 1.5 spaces, except for the digest made 1 space, direct quotations, list titles (tables) and figures that are more than 1 line, and bibliography, which are typed with a distance of 1 space down.

4. *Edge boundary*

The typing boundaries, in terms of the edges of the paper, are set as follows:

- a. Top edge : 4 cm
- b. Bottom edge : 3 cm
- c. Left edge : 4 cm
- d. Right edge : 3 cm

5. *New paragraph*

A new paragraph begins at the 6th typing from the left margin.

6. *Sentence starters*

Numbers, symbols or chemical formulas that begin a sentence should be spelled out, for example: Ten mice.

7. *Headings, subheadings, subheadings, etc.*

- a. The title should be written in all capital letters and arranged symmetrically, 4 cm from the top edge without ending with a period.
- b. Subtitles are written symmetrically in the middle, all words begin with capital letters, except for conjunctions and prepositions, without ending with a period. The first sentence after the sub-title begins with a new paragraph.
- c. Subtitles are typed starting from the left margin but only the first letter is capitalized, without ending with a period. The first sentence after a subheading begins a new paragraph.
- d. Subheadings start from the 6th typing followed by a period and are underlined. The first sentence that follows is typed all the way back on one line of the subordinate subheading. Except for this, subordinate subtitles can also be written directly as sentences, but those that function as subtitles are placed at the front.

3.1.4.3 *Numbering*

This section is divided into page numbering, tables (lists), figures, and equations.

1. *Page*

- a. The beginning of the report, from the title page to the digest, is numbered with small Roman numerals.

- b. The main and final sections, from the introduction (Chapter I) to the last page, use Arabic numerals as page numbers.
 - c. Page numbers are placed at the top right, unless there is a title or chapter at the top of the page. For such pages, the number is written at the bottom right.
 - d. Page numbers are typed at a distance of 3 cm from the right edge and cm from the top or bottom edge.
2. *Table (list)*
Tables (lists) are numbered sequentially with Arabic numerals and placed above the corresponding table in a centered position. Tables are introduced first before they appear.
3. *Image*
Images are numbered with Arabic numerals and placed below the image in a centered position. Images are introduced first before being displayed.
4. *Equation*
The sequence numbers of equations in the form of mathematical formulas, chemical reactions, etc. are written with Arabic numerals in brackets and placed near the right margin stating the chapter number where the formula is located and the sequence number of the formula in that chapter. Equations are introduced first before they appear. (For example:

.....in Equation (2.5))
Example: $\text{CaSO}_4 + \text{K}_2\text{C}_3\text{CaCO}_3 + \text{K}_2\text{SO}_4$ (2.5)

3.1.4.4 Tables (lists and figures)

1. *Table (list)*
- a. The table (list) number followed by the title is placed symmetrically above the table (list), without ending with a period
 - b. Tables (lists) should not be broken up unless they are so long that they cannot be typed on one page. On the continuation page of the table (list), include the table (list) number, title, and the word continuation written between two brackets.
 - c. The columns are named and kept fairly well separated from each other.
 - d. If the table (list) is wider than the width of the paper, so it must be made to extend the paper, then the top of the table should be placed on the left side of the paper.
 - e. Tables (lists) are typed symmetrically.
 - f. Tables (lists) that are more than 2 pages or that need to be folded are placed in the appendix.
2. *Image*
- a. Charts, graphs, maps and photographs are all called pictures (not differentiated)
 - b. The figure number followed by its title is placed symmetrically below the figure without ending with a period.
 - c. Image captions are written in the empty places in the image and not on other pages.
 - d. When the picture is drawn across the height of the paper, the top of the picture should be placed on the left side of the paper.

- e. Image proportions (width and height) are sought to be reasonable (not too thin or too fat)
- f. The position of the image is arranged so that it is symmetrical.

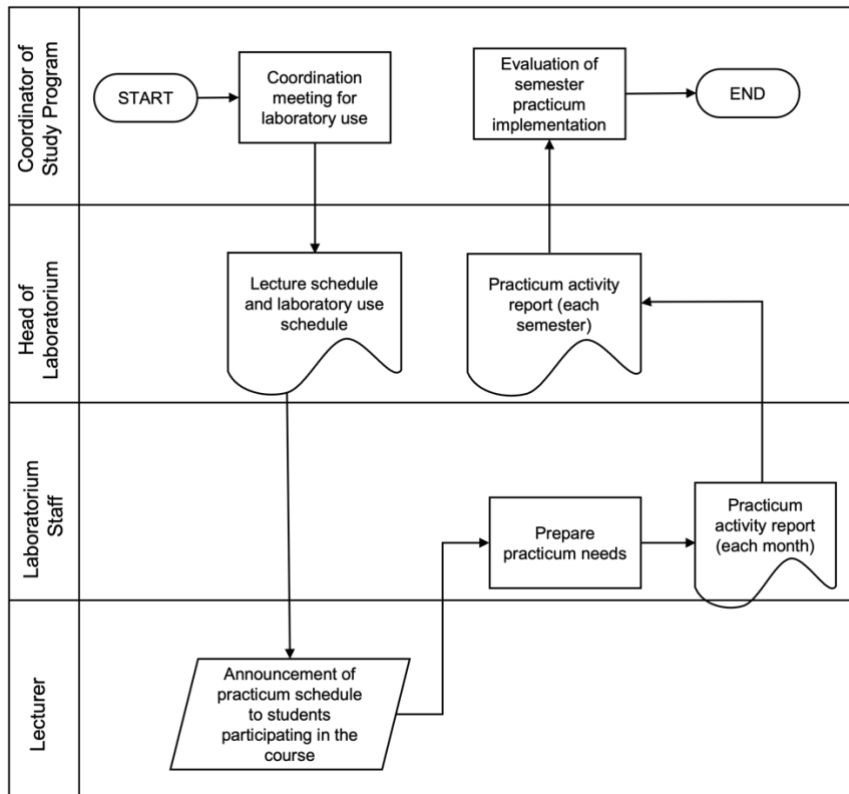
3. *Language*

1. Language used

The language used is standard Indonesian (there is a subject and predicate, and is complemented by an object or description). Spelling is in accordance with Ejaan Yang Disempurnakan (EYD).

APPENDIX

FLOW OF PRACTICUM IMPLEMENTATION



XII. ENVIRONMENTAL SCIENCE MASTER STUDY PROGRAM

XII. 1. INTRODUCTION

1. GENERAL

The Master of Environmental Science Program of UPN "Veteran" East Java was established in 2017 as outlined in the Study Program Decree No. 281/M/KPT/I/2017 dated May 29, 2017 concerning Permission to Open an Environmental Science Study Program for the Master Program at the UPN "Veteran" East Java.

The facilities owned by the Postgraduate Program as a whole include:

1. Comfortable Lecture Hall
2. Computer Laboratory
3. IT Facilities
4. WIFI area
5. Language Laboratory and Library
6. Lecturers who have the title of Professor or Professor, all lecturers have doctoral degrees, there are practitioners who all have doctoral degrees.

2. AIMS AND OBJECTIVES

This guidebook is made based on laws and regulations in the field of education. This book can be used as a reference or guide for every structural official, lecturer and student related to the environment of the Environmental Science Study Program, Masters Program at the UPN "Veteran" East Java.

3. FUNDAMENTALS

The fundamentals for the preparation of this guidebook is based on:

- a) Permenristekdikti No. 44/2015 on National Higher Education Standards
- b) U{NVJT Strategic Plan 2015/2019
- c) Permenristekdikti No.50/2018 amending Permenristekdikti No.44 on National Higher Education Standards
- d) Minister of Finance Decree No.804/KMK.05/2018 on the Determination of UPN "VETERAN" EAST JAVA as a government agency that implements the Public Service Agency (BLU) pla
- e) Skep Rector No Kep/153/UN.63/2019, about Quality Assurance System Policy`
- f) Rector's Decree No. Kep/104/UN.63/2019, concerning UPN "VETERAN" EAST JAVA Academic Policy
- g) UPN "VETERAN" EAST JAVA Rector Regulation No. 184 of 2019 concerning Academic Degrees for UPN "VETERAN" EAST JAVA Graduates

4. DEFINITION

This guidebook will discuss several things, which involve several definitions, among others:

1. Master of Environmental Science Program is an undergraduate study program at Universitas Pembangunan Nasional "Veteran" East Java.

2. The Study Program is an academic implementation unit that carries out academic education
3. Curriculum is a set of plans and arrangements regarding the guidelines for learning activities for each semester, along with course prerequisites.
4. The academic community consists of Lecturers, Education Personnel and students in the Higher Education environment.
5. Students are learners who are legally registered and are following the learning process at the Higher Education level.
6. Lecturers are professional educators who have certified competence as professional educators. Lecturers can also be recruited from professionals who have experience working in a field and have mastered it well.
7. Credit units (credits) are student learning loads and learning loads in the semester credit system.

5. SCOPE AND SEQUENCE

This guidebook will be in the following order:

- A. INTRODUCTION
- B. VISION, MISSION AND OBJECTIVES OF THE MASTER OF ENVIRONMENTAL SCIENCE STUDY PROGRAM
- C. POSITION, DUTIES, FUNCTIONS AND ORGANIZATIONAL STRUCTURE
- D. NEW STUDENTS
- E. ORGANIZATION OF EDUCATION
- F. CLOSING

XII.2. VISION, MISSION AND OBJECTIVES OF THE MASTER OF ENVIRONMENTAL SCIENCE STUDY PROGRAM, FACULTY OF ENGINEERING

1. Vision

The vision of the Master of Environmental Science Study Program is "Becoming a Master of Environmental Science Study Program". Environmental Science that is superior, professional, committed to environmental management and environmental management policies for the welfare of the nation with the character of State Defense".

The establishment of vision, mission, goals and strategies at the University, Faculty and Study Program levels is based on a unified perspective, namely how to create students who are professional, able to compete in the market, have high integrity and have the character of State Defense.

2. Mission

The mission carried out by the Master of Environmental Science Study Program is as follows:

1. Organizing professional academic education programs in the field of environmental management and environmental policy with the character of State Defense;

2. Updating knowledge and skills to be able to collect, disseminate, interpret and apply science and technology for the development of national insight and reliable State Defense;
3. Realizing quality and competitive human resources, facilities and infrastructure, and institutions;
4. Realizing a strong research innovation system to improve competitiveness in the global era.

3. Objectives

The objectives of the Master of Environmental Science Program are:

1. The realization of graduates who have the main competencies of environmental expertise who are able to control the use of natural resources wisely and with interdisciplinary insight.
2. The realization of graduates who have supporting competencies to manage a State Defense-based environment.
3. The realization of graduates who have other competencies who master the science to support the management of natural resources and the environment.

XII. 3. POSITION, DUTIES, FUNCTIONS AND ORGANIZATIONAL STRUCTURE OF THE POSTGRADUATE PROGRAM

1. Position

The Master of Environmental Science Study Program at the UPN "Veteran" East Java is positioned as an academic implementing element that manages the implementation of the Master program.

2. Duties of the Master of Environmental Science Study Program

The Postgraduate Master of Environmental Science Program of UPN "Veteran" East Java has the main task of organizing education and teaching, research and community service in accordance with the vision and mission of the Master of Environmental Science Study Program.

3. Functions of the Master of Environmental Science Study Program

- a. Planning, compiling and formulating policies and planning for the Master of Environmental Science Study Program.
- b. Carrying out education and teaching in the field of science organized by the Master of Environmental Science Study Program.
- c. Carrying out research and scientific development based on research focus of all Master of Environmental Science Lecturers
- d. Carrying out Community Service
- e. Carry out guidance to Student Affairs and staff
- f. Maintain relationships with the neighborhood
- g. Carry out cooperation with other parties, both universities and other non-educational institutions
- h. Carry out administrative and library service activities
- i. Carry out an evaluation of the quality assurance of the Study Program

- j. Prepare a report on the organization of activities to be submitted to the University.

4. Duties of the Master of Environmental Science Study Program

The duties of the Master of Environmental Science Program

1. Formulate, plan and implement academic activities, including public lectures and seminars.
2. Periodically together with lecturers, students and stakeholders compile and revise the curriculum to suit the demands of the field.
3. Documenting every activity both teaching and education, research and community service
4. Evaluate and conduct studies on the workload of Progd Lecturers and formulate with the team to add new lecturers.
5. Providing evaluation and consideration in determining material on new student admission procedures
6. Together with the Faculty Leader, assess and make decisions on cases of an academic nature.
7. Carry out other tasks in the field of the tridarma of higher education

5. Organization

The organization and management of the Master of Environmental Science Study Program at the UPN "Veteran" East Java:

Dean	: Dr. Dra. Jariyah, MP
Vice Dean I	: Euis Nurul Hidayah, ST, MT, PhD.
Vice Dean II	: Ir. Kindriari Nurma Wahyusi, MT ..,
Vice Dean III	: Dr.Ir. Minto Waluyo, MM Study
Study Program Coordinator	: Dr. Farida Pulansari ST.MT.,IPM

XII. NEW STUDENTS

1. New Student Admission Policy

Rules for admission and selection of new student candidates for the Master of Environmental Science Program, Faculty of Engineering, UPN"Veteran" East Java based on the Master Program (S2) admission selection through the Independent pathway. The following is the student admission policy. As for some regulations or laws regarding new student admissions are:

- a. 1945 Constitution of the Republic of Indonesia Article 31
- b. Law no.20/2003 on the National Education System Article 24 paragraph 4
- c. Indonesian Law no 12/2012, on Higher Education
- d. Government Regulation No.4/2014, on the Implementation of Higher Education and Management of Universities
- e. Presidential Regulation No.122/2014, on the Establishment of UPN "Veteran" East Java
- f. Regulation of the Minister of Research, Technology and Higher Education no.02/2015 on Admission of New Undergraduate Students at State Universities
- g. Regulation of the Minister of Research, Technology and Higher Education no.45/2015, concerning Amendments to the Regulation of the Minister of

Research, Technology and Higher Education no.45/2015.02/2015 on Admission of New Undergraduate Students at State Universities

- h. Regulation of the Rector of UPN "Veteran" East Java no.183/2019, concerning Selection and Admission of New Undergraduate Students in the Environment of UPN "Veteran" East Java

2. New Student Admission Criteria

Some of the requirements or criteria for New Students applied to the UPN "Veteran" East Java Master of Environmental Science Study Program are as follows:

- a. Must have an S-1 diploma from a study program that has been accredited by BAN-PT, or equivalent to the S-1 stratum
- b. Have a TOEFL or English Proficiency Test certificate ≥ 450
Prospective new students must reside in the Surabaya area for at least 2 semesters to attend lectures on the UPN "Veteran" East Java campus.
- a) Have a GPA ≥ 2.75
- b) Prospective new students who come from non-linear study programs are required to take matriculation with courses namely:
 - Environmental Impact Analysis
 - Waste Water Management Technology
 - Exhaust Gas Pollution Control Technology
 - Seminar and Journal Publication
- c. The new student recruitment or admission system is;
 - There is only one new student admission per year
 - New students are accepted through several tests, namely: Written Test and Interview Test
 - Enrollment is done in every year

3. New Student Admission Procedure

The following is the procedure for admitting new students to the UPN "Veteran" East Java Master of Environmental Science Study Program:

- a) Prospective students must purchase and fill out the registration form that has been provided
- b) The above form is accompanied by several documents, among others:
Photocopy of diplomas and legalized transcripts of grades 1 sheet
each Photo pass with red background 4x6 size as many as 2 sheets
Proof of payment
- c) Taking the Written Test
- d) Taking the Interview Test
- e) Meeting of the New Student selection team for the UPN "Veteran" East Java Master of Environmental Science Study Program, if passed then;
- f) Following matriculation
- g) Her New Student registration

4. New Student Admission Instrument

The New Student Admission instrument is:

- a. TOEFL score or English proficiency

- b. Passed the selection of supporting documents, status at the time of graduating S-1 (diploma and transcript-university status at the time the student graduated S-1)
- c. Passed Written Test
- d. Passed Interview Test

5. Decision Making System

After prospective new students take the written test, and interview, an assessment will be made of the results of the two tests. Previously, administrative tests had been carried out first, whether prospective students had met the minimum requirements. The next step is that Coordinator of study program will form a selection team consisting of several Lecturers of the Master of Environmental Science Study Program to review the documents and the results of the two tests above.

The decision whether or not to accept a prospective student is based on several considerations, among others:

- a. Administrative requirements and basic documents
- b. TOEFL score or English proficiency
- c. Written Test and Interview Test Scores

The results of the acceptance will be issued and authorized by the Faculty Leader, which is attached to the minutes containing the scores of each prospective student.

XII.5. EDUCATION IMPLEMENTATION OF ENVIRONMENTAL SCIENCE MASTER PROGRAM

1. Education System

The system used in the teaching and learning process of the Postgraduate Program of the UPN "Veteran" East Java uses the Semester Credit System.

2. Definition of Semester Credit System

- a. **Semester Credit System** is a system of organizing education by using semester credit units (credits) to express student study loads, lecturer workloads, learning experiences and program implementation loads.
- b. **Regular Semester** is a unit of time for academic activities consisting of 16 (sixteen) weeks of lectures or other scheduled activities effectively including 2 (two) weeks of assessment activities, along with their accompanying activities.
- c. **Semester credit units (credits)** are a measure of learning activity time charged to students per week per semester in the learning process through various forms of learning models or the amount of recognition of the success of student efforts in following curricular activities in a study program.

3. Provisions on Semester Credit

For lectures, the value of 1 (one) credit is determined based on the activity load for 1 (one) semester which includes a total of 3 (three) kinds of activities per week as follows:

- A. **For students**, the weight of 1 (one) credit in the form of lectures, receptions and tutorials, includes:
 - a. Learning activities with face-to-face 50 (fifty) minutes per week per semester;
 - b. Learning activities with structured assignments 60 (sixty) minutes per week per semester; and
 - c. Independent learning activities 60 (sixty) minutes per week per semester.
- B. **For lecturers**
 - a. 50 (fifty) minutes of face-to-face events with students on a scheduled basis.
 - b. 60 (sixty) minutes of structured academic activity planning and evaluation events.
 - c. 60 (sixty) minutes of course material development.

4. Student Study Load

The study load of the Master of Environmental Science Program is between 36-50 credits with a minimum study period of 4 semesters or 2 years, and a maximum of 8 semesters.

5. Organization of Lectures

a. Course Schedule

1. The lecture schedule will be carried out in accordance with the academic calendar of Universitas Pembangunan Nasional "Veteran" East Java.
2. Lecture activities will be divided into 2 semesters, namely Odd Semester and Even Semester.
3. The number of lectures in 1 semester is 16x meetings, which are divided into 14x face-to-face meetings and 2x meetings for the Midterm and Final Semester Exams.

b. Attendance and Lecture Rules

Student

- a. Every active student must attend lectures at least 75% of the total face-to-face meetings.
- b. Every time you attend a lecture, students are required to take attendance by signing the lecture attendance list.
- c. Working on structured assignments given by the course lecturer.

Lecturer

- a. Must provide lectures in accordance with the schedule that has been made and at least 90% of the total face-to-face meeting.
- b. If the lecturer is unable to attend, the lecturer concerned must replace the lecture on another day according to the agreement between the lecturer and the students.
- c. At the beginning of the lecture, lecturers are required to submit the Lecture Contract, lesson plans and RPS to students.
- d. Fill out the minutes of giving lectures and fill in notes if there are special events during lectures.

c. Lecture Code of Conduct

- a) Both Students or Lecturers must come at least 10 minutes before the lecture starts
- b) Dress neatly and cleanly and wear shoes and no t-shirts. c).Not bringing food into the lecture room
- c) Communication devices must be turned off or on silent mode during lectures.
- d) Students are prohibited from smoking or drinking alcohol during lectures or in the campus area.
- e) Students are required to attend lectures until completion.

d. Course selection

- a) In each semester, each student will take compulsory courses and take specialization courses according to the student's wishes.
- b) After that, it was consulted with the Academic Supervisor and done by on-line to SIAMIK <http://www.siamik.upnjatim.ac.id>.

1. Matriculation

Is an additional learning activity to equalize the knowledge of students in order to follow the education program to be followed.

The matriculation courses at the Master of Environmental Science are:

- Environmental Impact Analysis
- Social Dynamics and Local Wisdom
- Waste Water Management Technology
- Seminar and Journal Publication

2. Study Time Limit

- a. The length of study in the Master of Environmental Science Study Program at the UPN "Veteran" East Java is 4 semesters.
- b. In Semester 1, 2 and 3 students will still take several courses, especially in Semester 3 students have started writing a Thesis.
- c. If the student has not completed 4 semesters, then an additional 4 semesters are given so that the total semester is 8 semesters.

Academic Leave and Reactivation

A. Academic Leave

Academic leave is a period of not participating in academic activities for at least one semester. Academic leave is granted to students if they have attended at least 2 (two) semesters since they were first registered as a student. During the course of study, a student can only be given a maximum of 2 (two) academic leaves, either consecutively or non-consecutively. The semester period during academic leave is not counted as an active semester, so that the study period and evaluation of dropping out of study are adjusted to the semester period when academic leave is given.

Students who have taken academic leave for 2 (two) semesters may not leave academic activities again during the remaining study time. Application for student academic leave is submitted to the head of the study program / program before the implementation of administrative registration.

B. Academic Leave Procedure

- Students fill out the Academic Leave form
- Students submit to the Study Program Coordinator and provide reasons for leave.
- Furthermore, the Dean's approval is required for the Leave of Absence form
- The leave form that has been signed by the Student, Coordinator of study program and Dean will be forwarded to Warek 1 for approval.
- The deadline for submitting a leave application is the first week of the beginning of the lecture.

C. Implementation of Academic Leave

- Students on leave are required to register every semester
- Leave of absence is only given a maximum of 2x while a student

D. Studying/Active Again

- Students submit a written request to the Rector cq Warek 1 by attaching a leave approval letter
- The university will give approval to reactivate the student concerned.
- Students perform registration and obligations
- If a student who has expired his/her leave period, if he/she does not re-register, the student is declared to have resigned.
- Students who are declared inactive, and if they want to be active again, the requirements that must be met are:
 1. Students must submit an application letter to the Rector
 2. If the request is approved by the Rector, the period of inactivity will be counted in the study period limit.
 3. Students are obliged to pay administrative fees and tuition fees during student inactivity along with penalties

Rules of Procedure for Proposal Seminar, Result Seminar and Comprehensive Examination

- a) Students who are going to the seminar must be present 15 minutes before the Proposal Seminar, Results Seminar and Comprehensive Examination begin, and have prepared presentation equipment.
- b) The Proposal Seminar, Results Seminar and Comprehensive Examination are led by a Moderator who has been assigned by the Study Program Coordinator beforehand.
- c) Presentations are carried out for a maximum of 10-15 minutes for each student, and 10 minutes for questions and answers by the examining lecturer.
- d) Improvements to the writing of the Proposal Seminar, Results Seminar and Comprehensive Examination follow the applicable format and pay attention to the suggestions for improvement from the Examiners based on the results of the Proposal Seminar, Result Seminar and Comprehensive Examination
- e) Students who are going to the seminar **MUST** dress politely and neatly according to the applicable regulations in the UPN "Veteran" East Java environment.
- f) Students as participants of the Proposal Seminar, Results Seminar and Comprehensive Examination are expected to be actively involved in the question and answer session in order to get an overview of the Proposal

Seminar, Results Seminar and Comprehensive Examination, so that it is hoped that awareness will be formed to build a good scientific culture.

- g) Matters that have not been regulated will be completed later, and any errors will be corrected accordingly.

A. Thesis

a. Thesis Requirement

1. Students have completed and passed all semester courses I, II and III
2. GPA \geq 2.75
3. Enrolled in the semester in question
4. Have TOEFL English \geq 450

b. Thesis Writing

1. In accordance with the guidelines for writing a thesis for the Master of Environmental Science Study Program of UPN "Veteran" East Java.
2. The weight of the thesis is 6 credits and is supervised by 2 supervisors.
3. Every thesis written by students must be accounted for in a trial.
4. Mentoring
 - 1) The supervisor is determined by the Coordinator of study program which is adjusted to the expertise of the Lecturer to be appointed.
 - 2) The mentoring process is carried out by the appointed lecturer with the student.
 - 3) 3. Guidance schedule according to the agreement between the Supervising Lecturer and
 - 4) the student
 - 5) Each lecturer can only guide a maximum of only 5 students by considering the workload.

B. Judiciary

Judicium is an academic process that involves the application of grades and student graduation from the entire academic process. Judicium also means the announcement of grades to students as the final assessment process of all courses taken by students and the determination of grades in academic transcripts, as well as deciding whether or not students pass their studies for a certain period of time, which is determined by authorized officials resulting from the decision of the judicium meeting. The judicium meeting is organized by the Faculty Senate or Postgraduate Program. The Judicium decision is stated by a decision of the Dean or Director of the Postgraduate Program.

1. Degrees, Transcripts, Diplomas and Graduations

a. Degree

Graduates of the Master of Environmental Science program are entitled to receive a diploma and **M.Ling.** degree, based on UPN "VETERAN" EAST JAVA Rector Regulation no.184 of 2019 concerning Academic Degrees for UPN "Veteran" East Java Graduates.

b. Transcript

Transcript containing all courses taken at the Master's level, complete with grades and grade point average.

- c. Diplomas
Students who have completed the course are entitled to a diploma as proof of graduation.
- d. Graduation
Graduation is held in January and July of each year.

ENVIRONMENTAL SCIENCE S2 SYLLABUS

MATRICULATION

No.	Subject	Credit
1	Seminar and Journal Publication	3 credits
2	Environmental Impact Analysis	3 credits
3	Waste Water Management Technology	3 credits
4	Social Dynamics and Local Wisdom	3 credits

SEMESTER 1

No.	Subject	Credit	Prerequisites
1	Basic Principles of Science Nature (required)	3	-
2	Basic Principles of Environmental Science (required)	3	-
3	Basic Natural Resources Management and Environment (required)	3	-
4	Professional managerial State Defense (Mandatory)	3	-
5	Land Resource Management (interest A)	3	-
6	Policy & Institutional Analysis Environment (interest A)	3	-
7	Environmental Aesthetics (interest A)	3	-
8	Environmental Economics (interest A)	3	-
9	Quality and Pollution Management Environment (interest B)	3	-
10	Climate Change and Global Warming (interest B)	3	-

SEMESTER 2

No.	Subject	Credit	Prerequisites
1	Basic Geographic Information Systems and Environment (REQUIRED)	3	-
2	Environmental Statistical Analysis (required)	3	-
3	Environmental Law and Policy Analysis Public (interest a)	3	-
4	Social Dynamics and Local Wisdom	3	-
5	Environment and Resource Management Nature (interest A)	3	-
6	Gas pollution control technology discard (interest B)	3	-
7	Solid Waste Management Technology and B3 (interest B)	3	-
8	Water pollution control technology Waste (interest B)	3	-

9	Environmental Biotechnology (interest B)	3	-
---	--	---	---

SEMESTER 3

No.	Subject	Credit	Prerequisites
1	Environmental Impact Analysis (required)	3	-
2	Research Methodology and Writing Techniques Thesis (required)	3	-
3	Environmental Management & Audit System (interest A)	3	-
4	Quantitative Methods for Environmental Policy Analysis (interest A)	3	-
5	Decision Making Theory (interest A)	3	-
6	Drinking Water Management Technology (interest B)	3	-
7	Advanced Phytotechnology (interest B)	3	-
8	Environmental Toxicology and Abnormality (interest B)	3	-

SEMESTER 4

No.	Subject	Credit	Prerequisites
1	Proposal Seminar and Journal Publication (required)	3	Methodology Research
2	Thesis (required)	3	-

SUMMARY OF REQUIRED COURSES

Study Material	No.	Subject	Credit
Required Courses	1	Basic Principles of Natural Science	3
	2	Basic Principles of Environmental Science	3
	3	Basics of Natural Resources and Environmental Management	3
	4	Environmental Impact Analysis	3
	5	Basic Geographic and Environmental Information Systems	3
	6	Environmental Statistical Analysis	3
	7	Professional managerial State Defense	3
	8	Research Methodology	3
	9	Proposal Seminar and Publication	3
	10	Thesis	6
		Total (A)	33 credits

SUMMARY OF ELECTIVE/INTEREST COURSES A

Study Material	No.	Subject	Credit
Course Interests:			

Environmental Policy and Science (Maximum take 15 credits)	1	Land Resource Management	3
	2	Environmental Policy & Institutional Analysis	3
	3	Environmental Management & Audit System	3
	4	Environmental Law and Public Policy Analysis	3
	5	Quantitative Methods for Environmental Policy Analysis	3
Study Material	No.	Course Content	Credit
	6	Social Dynamics and Local Wisdom in Environmental and Natural Resource Management	3
	7	Environmental Aesthetics	3
	8	Environmental Economics	3
	9	Decision Making Theory	3
	Total (B)		27 credits

ELECTIVE/INTEREST B COURSE SUMMARY

Study Material	No.	Course Content	Credit
Course Interests: Environmental Pollution Management (maximum 15 credits)	1	Environmental Quality and Pollution Management	3
	2	Environmental Biotechnology	3
	3	Advanced Phytotechnology	3
	4	Exhaust gas pollution control technology	3
	5	Solid and Hazardous Waste Management Technology	3
	6	Wastewater pollution control technology	3
	7	Drinking Water Management Technology	3
	8	Environmental Toxicology and Abnormality	3
	9	Climate Change and Global Warming	3
		Total (C)	

Course Name : **Environmental Aesthetics**
Semester : 1
Number of credits : 3
Learning Methods : Material presentation, collaborative learning, case problem based learning.
Prerequisite Course : -

Description:

This course discusses environmental issues from an aesthetic point of view, starting from the definition of aesthetics, environment, and environmental aesthetics, to the concept of sustainable environmental aesthetics. It discusses various topics such as: environmental psychology, aesthetic principles, visual and spatial structure of the landscape, environmental aesthetic paradigms, aesthetic analysts (visual and non-visual) and legal aspects of aesthetics in spatial planning. Aesthetic analysis includes Visual Resource System (VRM), Visual Impact Assessment (VIA), Scenic Beauty Estimation (SBE), Semantic Differential (SD), Noise Analysis, and other analyses related to human senses

Course Name : **Environmental Economics**
Semester : 1
Number of credits : 3
Learning Methods : Material presentation, collaborative learning, case problem-based learning.
Prerequisite Course : -

Description:

This course discusses starting from the interaction between economics and the environment (from the point of view of classical - neo classical - and ecological economics); market failure and the environment; definition and understanding of pollution control seen from: efficiency, various instruments used to measure pollution control and pollution control policies with imperfect information, supply-demand (MAC and MD) and equimarginal principle; to learning about some international environmental issues.

Course Name : **Basic Natural Resources and Environmental Management**
Semester : 1
Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments
Prerequisite Course : -

Description:

Discusses environmental issues in the world, population, food, housing, industry, energy, displacement; environmental problems in Indonesia; plans to overcome problems environment;

The basics of natural resource and environmental management according to ecological principles and the ecosystem approach. Also discussed are methodologies in resource inventory and planning. The course content outline is introductory (limitations, scope), ecosystem approach, integrated survey, system analysis, application examples and overview.

Course Name : **Land Resource Management Management**
Semester : 1
Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments
Prerequisite Course : -

Description:

Discusses various aspects of land resources and their constituent components. Discuss the concept of sustainable development and its relation to the development of land resources, geometry in the use of land resources, various main soil types, their properties, potential and problems. Discuss various aspects of problem soils. Discuss the position, function and role of land resources in environmental management. Soil damage including damage to physical, chemical and biological properties. Soil erosion and its impact on the environment. Degraded land and critical land. The impact of development on land resources and various efforts to minimize its negative impact. Land resource management with an environmental perspective.
environment.

Course Name : **Basic Principles of Natural Science**
Semester : 1
Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments
Prerequisite Course : -

Description:

Natural resource management is an effort to plan, implement, monitor, and evaluate the implementation of conservation of natural resources and the environment, utilization of natural resources and the environment, and control of their destructive power. Various efforts to manage natural resources and the environment will be studied in this course with focuses on the ability of students to solve natural resources and environmental problems based on ecological development principles.

Course Name : **Basic Principles of Environmental Science**
Semester : 1
Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments
Prerequisite Course : -

Description:

The basic principles of environmental science are related to living organisms, populations, communities, ecosystems and energy. Energy is needed by organisms to fulfill their caloric needs. There are several basic principles in environmental science. Starting from principles that explain energy sources in the environment that affect living things to principles that contain the degree of regularity patterns as well as biodiversity and resources.

Course Name : **State Defense managerial professionals**
Semester : 1
Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments

Prerequisite Course : -

Description:

In this course, students are able to carry out state defense in accordance with the field of environmental science, namely by maintaining the natural conditions of an environmental condition so as to produce the stability of a healthy social life.

Course Name : **Environmental Policy and Institutional Analysis**

Semester : 1

Number of credits : 3

Learning Methods : Material exposure, collaborative learning, case studies, independent assignments

Prerequisite Course : -

Description:

Studies on aspects of development policy and environmental institutions built by the Government have been associated with the effectiveness and efficiency of the development process. Various positive and negative impacts of development physical, biological, socioeconomic cultural and national morality and alternative solutions.

Course Name : **Environmental Quality and Pollution Management**

Semester : 1

Number of credits : 3

Learning Methods : Material exposure, collaborative learning, case studies, independent assignments

Prerequisite Course : -

Description:

Quality factors for environmental protection. Human needs for water, soil and air resources, waste management of solids, liquids and gases recycling. Factor control, food protection, etc. Basic principles of environmental pollution (air, water and soil), and the effects of pollution on the environment

Course Name : **Basic Geographic and Environmental Information Systems**

Semester : 2

Number of credits : 3

Learning Methods : Material exposure, collaborative learning, case studies, independent assignments

Prerequisite Course : -

Description:

Introduction and understanding of basic concepts and how to apply GIS (Geographic Information System) tools, how to present and analyze social data, how to build a data base system on various environmental components, both physical, chemical, biological and socio-economic culture so that they can be recorded and recorded properly and can be utilized for the process of policy making and taking.

Course Name : **Environmental Statistical Analysis Systems**

Semester : 2

Number of credits : 3

Learning Methods : Material exposure, collaborative learning, case studies, independent assignments

Prerequisite Course :-

Description:

Able to describe types of data, sources of data, sampling and estimation, able to distinguish methods of statistical analysis, able to hypothesize a problem, make predictions from research data to test hypotheses by analyzing existing data.

Course Name : **Climate Change and Global Warming**

Semester : 2

Number of credits : 3

Learning Methods : Material exposure, collaborative learning, case studies, independent assignments

Prerequisite Course :-

Description:

In this course students will learn: The definition of climate change adaptation and mitigation, the objectives of climate change adaptation and mitigation, legislation related to adaptation and mitigation, potential disasters due to climate change; regional vulnerability to climate change and its disasters; mitigation and adaptation planning; adaptation actors, climate change adaptation in coastal areas, water resources, agriculture, human health and infrastructure; mitigation actors, climate change mitigation programs (emission reduction and carbon sequestration); steps to reduce emissions and carbon sequestration. mitigation.

Course Name : **Exhaust Gas Pollution Control Technology**

Semester : 2

Number of credits : 3

Learning Methods : Material exposure, collaborative learning, case studies, independent assignments

Prerequisite Course :-

Description:

In this course, students will study: air pollution control programs from mobile and stationary sources, emission reduction from mobile sources, and emission reduction from stationary sources. It is expected that after studying this course students will be able to solve air pollution problems through control programs at the source. Assignment that complement this course are: Planning of air pollution control programs from mobile and or stationary sources.

Course Name : **Wastewater Pollution Control Technology**

Semester : 2

Number of credits : 3

Learning Methods : Material exposure, collaborative learning, case studies, independent assignments

Prerequisite Course :-

Description:

Students will study various industrial waste treatment processes (liquid and solid) in a physical- chemical and biological manner with an emphasis on mastering advanced theories, as a continuation of the basic theory at the undergraduate level. The assignments that must be made by students are: Planning industrial effluent treatment process, evaluation of industrial effluent treatment process.

Course Name : **Biotechnology**
Semester : 2
Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments
Prerequisite Course : -

Description:

Students are able to synthesize biotechnology with the methods used in biotechnology, from this course students get biotechnology application material in various fields along with examples of biotechnology products that have been produced, as well as bioremediation and bioethics in biotechnology with logical thinking and the ability to convey good, structured opinions, and uphold good manners. Students can evaluate fundamental issues about biotechnology, namely: development of biotechnology, potential benefits, and potential public concern for biotechnology processes and products, Can evaluate and synthesize the basic principles of recombinant DNA technology (TDR), able to simulate (with pictures) about recombinant DNA construction Can explain the objectives, methods, and benefits of molecular analysis techniques: Polymerase Chain Reaction (PCR) and Hybridization (Southern, Northern, and Western) Can synthesize biotechnology applications in food and antibiotic production Can synthesize biotechnology applications in enzyme production, Can analyze bioengineering principles, Can synthesize biotechnology applications in waste management Can synthesize plant biotechnology: biotechnology applications in the environmental field Can analyze environmental biotechnology: biotechnology applications in the environmental, agricultural, marine, and medical fields Can explain the application of biotechnology in waste management.

Course Name : **Drinking Water Management Technology**
Semester : 3
Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments
Prerequisite Course : -

Description:

In this course, students will study water treatment operations and processes, covering drinking water and wastewater, including advanced water treatment operations and processes. By studying this course, students will gain in-depth knowledge of environmental engineering operations and processes that have been studied in undergraduate programs, which are generally conventional operations and processes. To obtain in-depth material, students are required to study teaching materials independently from various learning sources, such as library materials and the internet. In addition to self-study, students must be able to work together in teams that are realized in group assignments. The results of self-study and group assignments. The group will be evaluated through presentation and discussion.

Course Name : **Environmental Management and Audit**
Semester : 3
Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments
Prerequisite Course : -

Description:

Discusses the development, role and function of various voluntary Environmental Management System (EMS) tools, understanding of procedures and their application as well as a critical review in terms of theory and scientific arguments and international trade politics. Case studies are emphasized on understanding environmental audit practices, ecolabeling and ISO 14000 certification.

Course Name : **Quantitative Methods for Environmental Policy Analysis**

Semester : 3

Number of credits : 3

Learning Methods : Material exposure, collaborative learning, case studies, independent assignments

Prerequisite Course : -

Description:

Concepts of environmental policy analysis, sustainable development paradigm, public policy theory, quantitative methods, policy analysis and formulation, participatory research concepts and applications, stakeholder analysis, input-output (I-O) and environmental I-O analysis, analytical hierarchy process (AHP) and SWOT, trade-off analysis (TOA), multidimensional scaling (MDS), dynamic systems, application of quantitative methods in policy research. environment.

Course Name : Environmental Toxicology and Abnormality

Semester : 3

Number of credits : 3

Learning Methods : Material exposure, collaborative learning, case studies, independent assignments

Prerequisite Course : -

Description:

Understanding of the concept of environmental toxicology, its impact on human life and other living things, studying developmental and congenital abnormalities birth, both functional and morphological abnormalities caused by environmental factors such as toxic compounds, drugs, diseases, nutrition and other environmental conditions.

Course Name : **Environmental Impact Analysis**

Semester : 3

Number of credits : 3

Learning Methods : Material exposure, collaborative learning, case studies, independent assignments

Prerequisite Course : -

Description:

The function and use of EIA, procedures and implementation of EIA, scoping, methods of identification and prediction and evaluation of impacts, physical chemical, biological and socio-economic and cultural impacts, regulations and quality standards applicable in Indonesia. The EIA process is provided in practicum through discussion and simulation of document preparation. EIA based on actual case examples

Course Name : **Research Methods and Thesis Writing Techniques**

Semester : 3

Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments
Prerequisite Course :-

Description:

Discusses the concept and application of the philosophy of science in natural resources and environmental research activities in order to find solutions to solving development and environmental problems and seeking scientific truth. The formulation of problems and hypotheses, the use of logic and intuition in analyzing problems, data collection methods, how to present data, how to interpret and thesis writing techniques and scientific publications are discussed intensively through lectures and discussions in practicum. The output of this course is the preparation of a draft research proposal and recommendations for the composition of the Supervisory Commission Team for the thesis.

Course Name : **Advanced Phytotechnology**
Semester : 3
Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments
Prerequisite Course :-

Description:

In this course, students will learn Students are able to synthesize phytotechnology in environmental improvement. This course will discuss the transformation of asynchronous water flow into synchronous need for reservoirs, setting limits on the concentration of substances in the environment that do not have a negative effect on living things in a sustainable manner, the ability of plants to respond to environmental dynamics that underlie the application of phytotechnology in various environmental problems, calculating the need for green open space, determining the distribution of space.

Green open space based on natural treatment, determination of the area and distribution of green open space in coastal areas, integrated drainage system between drainage channels and phytodrainage. spatial planning of water bodies and riparian areas; the potential of phytotechnology in drinking water treatment and wastewater treatment processes, phytotechnology of leachate treatment and stable and mature compost, air quality preservation of landfills using green belts and remediation methods (specifically phytoremediation) of polluted environments, feasibility of phytotechnology and planning for further stages of study to produce planning criteria, planning of plant maintenance measures and prediction of potential post-environmental treatment plant handling technology and evaluating the functions, systems and methods of monitoring monitoring in accordance with the needs of environmental quality management.

Course Name : **Proposal Seminar**
Semester : 4
Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments
Prerequisite Course : Research Methodology

Description:

Compile and present thesis research. Students are also equipped to create a scientific article to be submitted to indexed scientific journals or seminars organized at the national, regional and international levels.

Course Name : **Thesis**
Semester : 4
Number of credits : 3
Learning Methods : Material exposure, collaborative learning, case studies, independent assignments
Prerequisite Course : Research Methodology

Description:

Discusses environmental problems in the world, population, food, housing, industry, energy, displacement; environmental problems in Indonesia; plans to overcome environmental problems; the basics of managing natural resources and the environment (life) according to ecological principles and the ecosystem approach. Also discussed are methodologies in resource inventory and planning. The content outlines of the course are introduction (limitation, scope), ecosystem approach, integrated survey, analysis of natural resource inventory and planning systems, implementation examples and overview

-Graduation Degree

Students who have completed their studies in their entirety will be awarded a degree.

MAGISTER OF ENVIRONMENT (M.Ling)