UNIVERSITAS ISLAM INDONESIA

#Future Process Engineer

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Academic Guide Book

2023/2024

Department of Chemical Engineering
Faculty of Industrial Technology
Islamic University of Indonesia
Yogyakarta - INDONESIA

Che.uii.ac.id

Academic Guidebook International Program 2023/2024

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Department of Chemical Engineering
Faculty of Industrial Technology
Universitas Islam Indonesia
Yogyakarta – Indonesia

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Compiled by : Department of Chemical Engineering, UII

FOREWORD

Assalamu'alaikum warahmatullahi wabarakatuh
May the Peace, Mercy, and Blessings of Allah be upon you.

Alhamdu lillahi rabbil 'alamin, we compiled this Academic Guide, thanks to His divine help and guidance. On behalf of the entire academic community of the Department of Chemical Engineering, Faculty of Industrial Technology, Universitas Islam Indonesia (UII), we proudly welcome new students of the International Program, Department of Chemical Engineering, for the academic year 2023/2024. This book contains the curriculum used by the Department of Chemical Engineering, including the rules and procedures for the learning process that must be obeyed by the entire academic community of the Department of Chemical Engineering UII.

Since the academic year 2020/2021, the Department of Chemical Engineering UII has implemented an Outcome-Based Education (OBE) curriculum combined with the concept of "*Merdeka Belajar-Kampus Merdeka*," a learning system designed to fulfill the needs and challenges of the future. In the 4th Industrial Revolution era (Industry 4.0), we will invite students to study in the scope of a classroom or laboratory and invite them to study outside the campus. The students have opportunities to conduct *internships* in the industrial sector, exchange with universities abroad, take a double degree program with other educational institutions, and undergo training to build a *startup business*.

With this format, we hope that, after completing the study, the graduates can participate in various sectors of life and make the best contribution to the progress of themselves, religion, nation, and the universe.

Finally, it is to Allah that we pray and surrender. May Allah always guide and bless us, amen.

Wassalamu'alaikum warahmatullahi wabarakatuh

Sholeh Ma'mun, S.T., M.T., Ph.D.
Head of Undergraduate Program

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CHAPTER 1
INTRODUCTION

A. Brief History of The Department of Chemical Engineering

The Department of Chemical Engineering (DChE) is one of the pioneers of the Faculty of Industrial Technology (FIT), Universitas Islam Indonesia (UII). The history started with the Department of Textile Technology opening in 1975 as one of the departments at the Faculty of Engineering. After experiencing a change from being a department to being the FIT in 1982, it was changed back to become Textile Department in 1993 with the Decree of the Minister of Education and Culture of the Republic of Indonesia No. 257/DIKTI/Kep/1993. Finally, in 1995, it became the Department of Chemical Engineering with the Minister of Education and Culture Decree No. 433/DIKTI/Kep/1995, with two concentrations, namely Chemical Engineering and Textile Engineering. The grouping of the two concentrations is carried out in the 3rd semester until graduation. In 2020, the Textile Engineering concentration was established as a new department, namely Textile Engineering. The DChE UII has been accredited "A" by the National Accreditation Board of Higher Education (BAN-PT) with SK No. 1796/SK/BAN-PT/Akred/S/VII/2018, which shows a recognition of the education quality in the Department. In April 2023, The DChe UII is accredited "Unggul" By Indonesian Accreditation Agency for Higher Education in Engineering (LAM Teknik) with SK No. 0082/SK/LAM/ Teknik/AS/IV/2023.

B. Vision, Mission, And Objective

Vision

The vision of DChE UII is to become a chemical engineering department committed to Islamic values and professionalism, and global competitiveness in the fields of Education, Research, Community Service, and Islamic Da'wah by 2038.

Mission

1. Carrying out international standard education in the field of chemical engineering.
2. Carrying out international quality research with an environmental perspective in the field of chemical engineering, which is beneficial for the development of science and society.
3. Carrying out community service that provides sustainable benefits.
4. Carrying out Islamic Da'wah based on the Koran and the guidance of the Prophet Muhammad.

Objective

1. Forming graduates of the DChE UII who are Islamic, competent, and able to apply their knowledge in society.
2. Providing the best service and fulfilling the satisfaction of all stakeholders.
3. Producing research outputs with an international reputation to face global competition in the era of the Industrial Revolution 4.0.
4. Producing research-based community service programs that are beneficial to the community.
5. The realization of the Department as Rahmatan lil 'Alamin through Da'wah Islamiyah activities.

Program Educational Objective

The Program Educational Objective (PEO) of DChE UII and their descriptions, as formulated in the Curriculum 2020:

1. **Islamic personality** – Showing devotion to God Almighty, behaving honestly, being disciplined, responsible, work smart, independent, and having an entrepreneurial spirit
2. **Process engineer** – Understanding chemical engineering and supporting sciences for engineering processes, processing systems, and equipment in the chemical industries.
3. Process manager – Ability to work in teams, having a leadership attitude, being creative & innovative, thinking critically, and communicating effectively.

Student Outcomes

Student outcomes (SO) describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program (ABET, 2021). The SO of the DChE UII are designed based on the Indonesian National Qualifications Framework (KKNI), National Higher Education Standards (SNPT), the SO of the Indonesian Chemical Engineering Higher Education Association (APTEKIM), and the SO of the Indonesian Accreditation Board for Engineering Education (IABEE). The SO also contain the capabilities needed in Industry 4.0 regarding data literacy, technological literacy, and human literacy.

1. SO for the attitude of the DChE graduates:
   1) Be faithful to God Almighty and behave in Islam (honest, discipline, responsibility, and intelligent work) in every role, both in the chemical industry and the public (SO-1)
   2) An ability to internalize the spirit of independence and entrepreneurship (SO-2)
   3) An ability to be responsible to the community and adhere to professional ethics in solving chemical engineering problems (SO-3)

2. SO for general skills of the DChE graduates:
   1) An ability to communicate effectively both verbally and in writing (SO-4)
   2) An ability to plan, complete, and evaluate tasks within existing boundaries (SO-5)
   3) An ability to work in multidisciplinary and multicultural teams (SO-6)

3. SO for special skills of the DChE graduates:
   1) An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering (SO-7)
   2) An ability to identify, formulate, analyze, and solve the chemical engineering complex problems (SO-8)
   3) An ability to design chemical processes, process systems, and industrial equipment to meet the expected needs within realistic constraints, such as legal, economic, environmental, social, political, health and safety, sustainability, and to recognize and/or utilize the potential of local and national resources with global insight (SO-9)
   4) An ability to apply methods, skills, and modern technical tools needed to chemical engineering practices (SO-10)

5) An ability to design and conduct laboratory and/or field experiments and analyze and interpret data to strengthen technical judgment (SO-11)

4. SO for knowledge of the DChE graduates:
   1) An ability to understand the need for lifelong learning, including access to knowledge related to relevant contemporary issues (SO-12)

C. Management

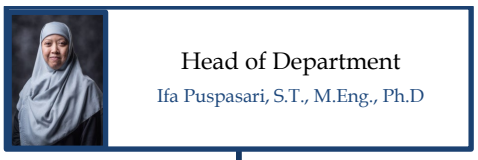
Faculty of Industrial Technology

Dean of Faculty of Industrial Technology
Prof. Dr. Ir. Hari Purnomo, M.T., IPU, ASEAN.Eng

Vice Dean for Resources
Dr. Agus Mansur, S.T., M.Eng.Sc.

Vice Dean for Students, Religion, and Alumni
Dr. Arif Hidayat, S.T, M.T.

Department of Chemical Engineering



Head of Department
Ifa Puspasari, S.T., M.Eng., Ph.D

Secretay of Department
Dyah Retno Sawitri, S.T., M.Eng., Dr.

Head of Undergraduate Program
Sholeh Ma'mun, S.T., M.T., Ph.D.

Head of Master Program
Diana, S.T., M.Sc., Dr.

Secretary of Regular Program
Venitalitya Alethea Sari Augustia, S.T., M.Eng.

Secretary of International Program
Khamdan Cahyari, S.T., M.Sc., Dr.

Department Quality Assurance Officer
: Umi Rofiqah, S.T., M.T.

Heads of Laboratory

Chem. Eng. Fundamental 1 Lab.	: Umi Rofiqah, S.T., M.T.
Chem. Eng. Fundamental 2 Lab.	: Umi Rofiqah, S.T., M.T.
Unit Operations Laboratory	: Lilis Kistriyani, S.T., M.T.
Computation and Simulation Lab.	: Sholeh Ma'mun, S.T., M.Eng. Ph.D.
Research Laboratory	: Ariany Zulkania, S.T., M.Eng., Dr.

Heads of Division

Academic Administration	: Edi Haryono
General and Domestic Adm.	: Ervin Yulianita I., S.T., M.T.,
Financial Administration	: Masirah, A.Md.
Information Technology	: Rahmat Miftahul Habib, S.Kom.

Laboratory Technicians

Chem. Eng. Fundamental 1 Lab.	: Retno Trihastutiningsih, S.T.
Chem. Eng. Fundamental 2 Lab.	: Nur Laksono, S.Si.

Unit Operations Laboratory : Bagus Handoko, S.Pd.
Computation and Simulation Lab.: Haryadi, S.Pd.Si.
Research Laboratory : Afif Dwijayanto, S.Si.

Department Administration Staffs

: Gadis Prihatin Wahyu Sejati, S.Si. & Hadi Liswanto

D. Supporting Facilities

Information Technology Services

As UII students, students will get various Information Technology (IT) service facilities. These services are provided to support academic activities.

Username / Email : student_number@students.uii.ac.id
Example: 21521XXX@students.uii.ac.id
Default password : Student number + date of birth
Birthdate format: DDMMYYYY
Example: 2152100105082002

UII Gateway

- UII provides services that make it easier for students to get various academic information through the UII Gateway. Visit gateway.uii.ac.id to see all student academic facilities, starting from key-in courses, viewing class schedules, final grades, student status, library services, tuition fees, and any other information.
- One UII Gateway account can be used to access all IT services for UII students.
- UII Gateway accounts are personal and confidential.

Payment UII

- To see the amount of tuition bill and the Catur Dharma fee ahead of the payment schedule, see tagihan.uii.ac.id.
- Login to this service, use the Student Identity Number (NIM) as username and the UII Gateway password.

Online Class

- Online class with Google Classroom. Visit classroom.google.com.
- Students can attend online lectures, take course materials, submit coursework, and discuss with lecturers and students of the class.

Email

- Student email services without quota restrictions that are connected to Google Edu (Google Drive, Google Classroom, Google Cloud Print, etc.) can be accessed through the address gmail.uii.ac.id.
- Use your UII account to log in.

UIIConnect

UII provides high-speed wireless internet access services of up to 200 Mbps per user throughout the UII campus.

Eduroam

Free WiFi global mobility support using UII accounts in more than 12,000 educational institutions spread across 89 countries.

UII Print

- Self-service for print, scan, and photocopy spread across the faculties.
- Get UIIPrint vouchers at all Bank Mandiri counters within the UII campus.
- Find detailed installation and usage information at bsi.uii.ac.id.

SIM PUS & Academic Journal Online Access

- Before students come to the Library Building, students can first search for books they want to read or borrow to check whether they are available. Book searches can be done through SIMPUS (Library Information System): simpus.uii.ac.id.
- Students can also read digital content online and download various scientific journal publications for free when connected to UIIConnect or UII's Virtual Private Network (VPN).

Virtual Private Network (VPN)

- A VPN is a network built to connect remote users to an internal (private) network owned by an organization.
- The connection on the device will be known as an internal UII connection, so the connection is safer and smoother.

Pay Tuition Fees via ATM

Students do not need to queue at the bank counter just to pay tuition fees. UII is currently working with Bank Mandiri, Bank Syariah Indonesia, and Bank BPD DIY Syariah to make it easier to pay tuition fees via Internet Banking and ATMs.

Pay Tuition Fees via Bank Counter

- Students can also pay tuition fees through the offices of Bank Mandiri, Bank Bukopin, Bank Syariah Indonesia, Bank Muamalat, and Bank BPD DIY Syariah throughout Indonesia.
- Visit the Information System Agency, bsi.uii.ac.id, or come directly to the Prabuningrat Building, UII Rectorate Office, 4th floor, to get detailed information about using the services above. If one has trouble, please send a message to itsupport@uii.ac.id.

Library

Libraries support, facilitate, and enhance the teaching and learning process's academic quality by providing information services and various collections. Libraries also aim to form reading habits, independent and sustainable reading skills, open and develop intellectual insights and provide information for research, science, and technology.

The library collection provides various books, magazines, journals, theses, research reports, on-the-job-training reports, and conference proceedings. The library also provides interactive CD programs that can be borrowed and used to benefit teaching

and learning. To support the learning and research process in all UII environments, the Library Directorate subscribes to several international databases.

Teknoin Journal

Teknoin, with ISSN 0583-8697, is a journal that studies issues related to Industrial Technology. The research report can be in the form of scientific development or applied science. The journal is published twice a year, in March and September.

Quality System Assurance

Quality System Assurance is an independent body that extends UII's Quality Control Agency (BPM). This agency aims to support and oversee the faculty managers in implementing ISO 900 1: 2008 to continuously improve the service quality to the consumers. The Faculty of Industrial Technology has a quality plan, which is the quality element that must be achieved to elaborate UII's vision and mission.

Laboratories

The DChE UII has five laboratories to conduct both laboratory work and research activities. The laboratories in the DChE UII are as follows:

1. Chemical Engineering Fundamental 1 Laboratory
   This laboratory serves the students to study the principles of qualitative and quantitative analysis of certain chemicals, such as making standard solutions, quantitative analysis of Pb and Cu mixtures, boiling point enhancement, chemical hardness analysis, and concentration determination by conductometry.
2. Chemical Engineering Fundamental 2 Laboratory
   This laboratory aims to introduce various chemical analyses in the industry, such as the identification of dyes by chromatographic methods, spectrophotometry, oil analysis of industrial materials, analysis of protein content in industrial materials, determination of density and viscosity, surface tension, starch hydrolysis reactions, enzymatic reaction kinetics, distribution of the intermediate of two pure solvents, the solubility of solids in liquid as a function of temperature, esterification reaction, and adsorption equilibrium of liquid solids.
3. Unit Operations Laboratory
   This laboratory serves the students to understand the operating principles of chemical engineering such as sedimentation, liquid-liquid extraction, solid drying, phase equilibrium & HETP, filtering, heat exchange, and process control.
4. Computation and Simulation Laboratory
   This laboratory serves the students to recognize and understand the principles of problem-solving in chemical engineering or engineering drawings with the help of some software such as AUTOCAD, ASPEN, and MATLAB.
5. Research Laboratory
   The Research Laboratory serves the students and lecturers to conduct various research activities.

Health Services

Health facilities are provided in the form of a polyclinic for the entire UII academic community. The polyclinic located to the east of the Ulil Albab Mosque serves all UII lecturers, students, and employees during working hours.

Building

The teaching and learning process of the FIT UII occupies Unit III and Unit XII buildings consisting of 30 lecture rooms, two Audio Visual rooms, 33 laboratories, libraries, offices, courtrooms, auditoriums, and lecturer rooms.

Sports Facilities

The FIT UII has facilities for several sports, such as futsal, basketball, volleyball, and table tennis. The futsal court and basket court are located next to the FIT building, which can also be used as a volleyball court. A table tennis court is in the basement room of the east wing of the FIT UII building.

Parking

The parking lot facility has a capacity of approximately 800 motorbikes and 150 cars to accommodate the vehicles of FIT lecturers, employees, and students. The motorcycle parking lot is located east of the FIT building, while the car park is located north of the FIT building.

Internet connection

The FIT UII has wireless (WiFi) facilities. With WiFi access, students can quickly get an internet connection. Several points at the FIT buildings are ready to serve students with information technology services. The FIT UII wants to create a *Smart Campus*.

Student Affairs

The FIT UII has several student organizations that are engaged in curricular and extra-curricular fields. These student organizations serve as a means for students to develop their interests and talents and training for organizational, managerial, and community life.

The student organizations in the FIT UII are as follows:

- **Student Representative Council (DPM),** an institution that functions as a student legislative body. It is also the highest institution that holds student sovereignty in the "*Student Government*" at the faculty level.
- **Student Executive Institute (LEM),** an institution that has the function to coordinate student activity units within the FIT environment.
- **Department Student Association (HMJ),** a student family organization at the department level. This association aims to coordinate student activities held by students according to their majors. The position is equal to the departments in LEM FTI UII.
- **Student Press Institute (LPM),** an institution in charge of publishing printed communication media in magazines for faculty students. The magazine published by this institution is titled "Profesi."
- **Paguyuban Rukun Rencang,** a student activity unit that aims to foster and develop Islamic art and Islamic Da'wah.
- **Djemuran Theatre,** a student activity unit engaged in the performing arts and theatre.
- **Takmir Masjid Bahrul Ullum,** a student activity unit of FTI UII that strives to build Islamic Da'wah and relationship between people, taking a basis at the Bahrul Ullum Mosque.

Student organizations, study clubs, and activity units synergistically create and organize student activities at the faculty. These activities can be in scientific activities that aim to improve students' insight and reasoning power, such as seminars, panel discussions, training on science and technology, religion, politics, culture, and entertainment activities, such as sports and arts.

E. Scholarships and Collaborations

Scholarship

UII also provides scholarships for students, which can be accessed on the Directorate of Student Development Universitas Islam Indonesia (DPK UII, kemahasiswaan.uii.ac.id). The scholarships available are:

- Internal Scholarships: Tuition Fee Assistance Scholarships (B3P), Academic Achievement Improvement (PPA), Abdul Kahar Muzakkir and Sardjito Scholarships (AKMS), Lazis UII, Outstanding Students of UII Islamic Boarding School, Hafidz Al-Qur'an 20 Juz, and Hafidz Al-Qur'an 30 Juz
- External Scholarships: Dikpora Scholarships, Bidik Misi, Supersemar, DIY Regional Government, National Zakat Agency (BAZNAS), Toyota-Astra, Bank Bukopin, Bank Syariah Mandiri (BSM), Bank Mandiri, Bank BPD DIY, Bank CIMB Niaga, Tokopedia, BFI Finance, the Van Deventer-Maas Foundation, Alumni of the DChE UII, and the ASEAN Scholarship

Collaborations

UII also collaborates with various parties, including:

- International Cooperation: Chulalongkorn University, The Halal Science Center Chulalongkorn University, Kansai University, Kumamoto University, Hokkaido University, Saxion University of Applied Sciences, Universiti Sains Malaysia, Universiti Sains Islam Malaysia, Universiti Putra Malaysia, Universiti Teknologi MARA, Universiti Teknologi PETRONAS, International Islamic University Malaysia, University of South Asia, University of Western Australia, and others.
- Domestic Cooperation: LIPI Chemical Research Center, National Nuclear Energy Agency (BATAN), LIPI Physics Research Center, LIPI Natural Material Technology Research Institute, PT. Wijaya Karya (PERSERO) Tbk., PT. Asia Pacific Fibers, Center for Handicrafts and Batik, Directorate General of Intellectual Property of the Ministry of Law and Human Rights, National Standardization Body (BSN), Bantul Regency Government, PT. Primissima, Bank BNI Syariah, Gadjah Mada University, Bogor Agricultural Institute, Telkom University, College of Nuclear Technology of the National Nuclear Energy Agency (STTN BATAN)

Information about the MoU held by UII with various domestic and foreign agencies can be seen at uii.ac.id/kemitraan/.

CHAPTER 2
ACADEMIC SYSTEM

A. Definition of Credit Systems

Universitas Islam Indonesia applies a course credit system (SKS). The application of this system helps students to finish their studies faster than the packaged system. In addition, it provides flexibility for students to take majors that meet their interests, talents, and capabilities and take different combinations of compulsory and elective courses in one semester.

The advantages of the course credit system are as follows:

a. Students have the flexibility and opportunity to finish their studies faster than other undergraduate programs.
b. Students are free to choose a major based on their interests.
c. The educational curriculum is adjustable to knowledge and technological developments, and hence a 'link and match educational system' is made possible. There is no such thing as a class promotion. Programs of semester credits, course composition, and study completion are individually designed.
d. Credits measure the academic load of each course. The credits for each academic activity vary depending on how many hours it takes per week.
    - A two-credit subject must be formally administered once a week in 100 minutes for a meeting in the classroom.
    - A three-credit subject must be provided once a week for 150 minutes for a meeting in the classroom.
    - A four-credit subject should be given twice a week in 100 minutes for each session.
e. Academic activities consist of compulsory and optional activities. The compulsory activities must be attended by all students at a certain level, whereas optional activities are provided to accommodate students' different interests, talents, and skills.

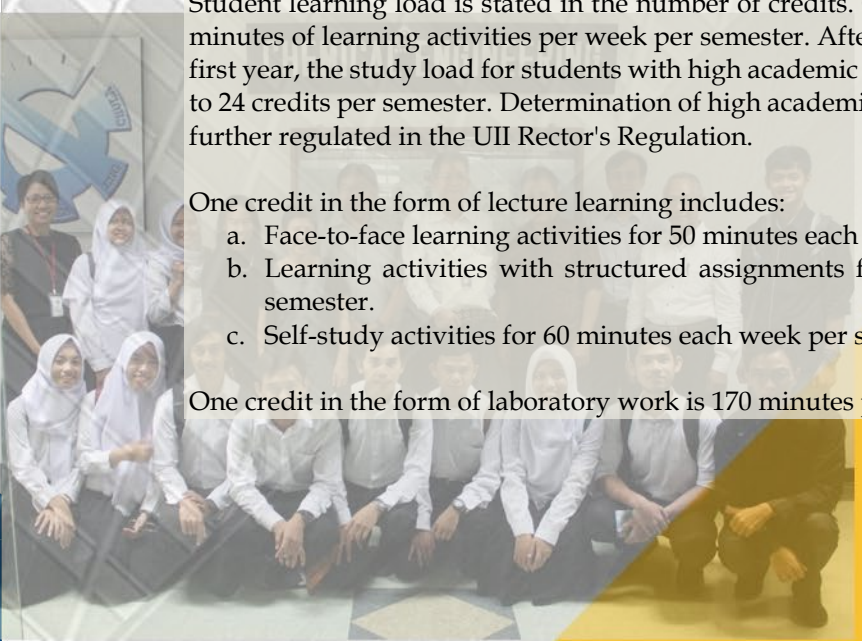
B. Student Study Load

Student learning load is stated in the number of credits. One credit is equivalent to 170 minutes of learning activities per week per semester. After the first two semesters of the first year, the study load for students with high academic achievements can be added up to 24 credits per semester. Determination of high academic achievement qualifications is further regulated in the UII Rector's Regulation.

One credit in the form of lecture learning includes:

a. Face-to-face learning activities for 50 minutes each week per semester.
b. Learning activities with structured assignments for 60 minutes each week per semester.
c. Self-study activities for 60 minutes each week per semester.

One credit in the form of laboratory work is 170 minutes per week per semester.



C. Student Study Period

The student study period consists of:

a. On-time study period, a period of study with a duration following the duration designed in the department curriculum.
b. Standardized study period, a study period with the most prolonged duration of study time plus three months.
c. The maximum study period, the time duration allowed to complete the entire learning process of the undergraduate program, which is a maximum of seven years.

D. Course and Exam

Courses are held based on a specific schedule. Students might select courses independently during the course registration period ("key-in" period) generally carried out in the early semester.

Every student must participate in at least 75% of the total meetings of each subject. Later, evaluation is performed three times for each semester, as follows:

a. Mid Exam,
b. Final Exam, and
c. Remedial Exam

Important Notes:
Each type of exam for a subject is only conducted once as stated in the official schedule released by Faculty; NO make-up exam is allowed in any. The condition for participating Final Exam is the minimum 75% attendance of total sessions; it also applies for the remedial exam.

In implementing the learning process, students are required to obey the lecture rules. Students are required to follow the entire learning process in the courses they are taking. Students must attend lectures for at least 75% of the number of meetings held by lecturers who teach courses. Students who do not meet the attendance requirements are not eligible to take the Final Semester Examination and Remedial Examination in these courses and receive an F grade. Students are required to take lab work 100% of the activities carried out.

E. Course Assessment

The course assessment is conducted through the final & midterm exams, quizzes, and assignments. The final grade (G_f) with a total of 100 is calculated based on the proportion of those four elements as follows:

$$G_f = \sum_{1}^{n} w_i G_i$$

where w_i refers the weight factor ($0 \leq w \leq 1$) of the course assessment of component i (i.e., the final & midterm exams, quizzes, and assignments) and G_i refers to the grade of the course assessment of component i. The grade proportion for each element (the weight factor) is informed by the lecturers to the students in the first meeting of the class. For example, a lecturer may take a final grade with a proportion of 35% for the final exam, 35% for the midterm exam, 10% for the quizzes, and 20% for the assignments.

The results of the learning assessment ($0 \leq G_f \leq 100$) are then converted into letters that have the designation, dignity, and meaning of qualification achievement as follows:

a. The grades A and A- are called "Very Good," meaning that students show the fulfillment of superior and innovative learning achievements and excellent involvement and participation in learning.
b. The scores of A/B, B+, B, and B- are called "Good," meaning that students show good achievement of learning achievement and involvement in suitable learning activities.
c. The scores of B/C, C+, C, and C- are called "Enough," meaning that students show adequate learning achievement and involvement in pretty good learning activities.
d. The scores of C/D, D+, and D are called "Less," meaning that students show low fulfillment of learning achievement and show low learning activities.
e. The E value is called "Very Less," meaning that students cannot show the fulfillment of learning achievement and/or do not show sufficient learning activities to be assessed.
f. The F-value is called "Not Eligible to be Graded," meaning that students do not show adequate learning activities.

Based on the Rector of Universitas Islam Indonesia No. 2 of 2017, the value of D can be passed in a limited number as stipulated in the department curriculum and does not exceed 10% of the total notable credits for the students enrolled in 2019, 2020, and later. Besides, grades E and F refer not to pass.

The range between the results of the assessment is regulated by the Rector's Regulation. The weight of each value is as follows:

A	= 4.00	B-	= 2.75	C/D	= 1.50
A-	= 3.75	B/C	= 2.5	D+	= 1.25
A/B	= 3.50	C+	= 2.25	D	= 1
B +	= 3.25	C	= 2.00	E	= 0
B	= 3.00	C-	= 1.75	F	= 0

The criteria and benchmarks for assessing student learning outcomes using the Principal Reference Assessment (PAP) are stated in the following letters:

a. **A** if the student's average score reaches 80.00 to 100
b. **A-** if the student's average score reaches 77.50 to 79.99
c. **A/B** if the student's average score reaches 75.00 to 77.49
d. **B+** if the student's average score reaches 72.50 to 74.99
e. **B** if the student's average score reaches 70.00 to 72.49
f. **B-** if the student's average score reaches 67.50 to 69.99
g. **B/C** if the student's average score reaches 65.00 to 67.49
h. **C+** if the student's average score reaches 62.50 to 64.99
i. **C** if the student's average score reaches 60.00 to 62.49
j. **C-** if the student's average score reaches 55.00 to 59.99
k. **C/D** if the student's average score reaches 50.00 to 54.99
l. **D+** if the student's average score reaches 45.00 to 49.99
m. **D** if the student's average score reaches 40.00 to 44.99
n. **E** if the student's average score is less than 40
o. **F** if the student does not meet the requirements to be assessed

Students are entitled to improve their grades by repeating courses and/or going through remediation exams. The final score of learning outcomes for each subject and/or lab work is the best value of all the scores obtained in that course.

The assessment results are announced to students after the learning phase is completed according to the learning plan. The accumulated results of student assessments in each semester are stated by the Semester Grade Point Average (Semester GPA). The accumulation of graduate assessment results at the end of the study period is stated by the Grade Point Average (GPA).

The Semester GPA is calculated by:

a. add up the multiplication between the letter grades of each course taken; and
b. credits of the relevant subject are divided by the number of credits of courses taken in one semester.

The GPA is calculated by:

a. add up the multiplication between the letter grades of each course taken; and
b. credits of the relevant subject are divided by the number of credits of courses that have been taken.

Semester GPA and GPA determine the maximum number of credits of courses a student can take in the following semester. The maximum number of credits is regulated by a Rector Regulation as follows:

Table 2.1 The maximum number of credits based on the Semester GPA

No	Semester GPA	Max credits that can be taken
1.	≤1.49	14
2.	1.50 - 1.99	17
3.	2.00 - 2.49	20
4.	2.50 - 2.99	22
5.	≥3.00	24

F. Learning Evaluation

Evaluation of learning outcomes includes:

a. Course evaluation
   Course evaluation is manifested in learning reflection sheets prepared by lecturers to evaluate the fulfillment of student and course outcomes (SO's and CO's) in each course.
b. Final semester study evaluation
   The Department carries out the final semester study evaluation to determine the development of student academic achievement and the fulfillment of student outcomes in each semester.
c. Mid-study evaluation
   Mid-term evaluation for undergraduate programs is carried out by evaluating academic achievement during the first four semesters as a basis for determining student eligibility to continue studies.
d. Final evaluation of study

The final evaluation of the study is carried out to determine the fulfillment of all graduate learning outcomes and/or fulfillment of graduation requirements set by the University and the Department to determine student graduation.

e. Evaluation of the study period deadline
   The study period deadline is evaluated by evaluating the study period and students' academic achievement at the limit of the maximum study period.

Based on the University regulations No. 2 of 2017, students who cannot complete their studies are grouped into the following statuses:

a. Resign.
b. Drop out.

The students are declared to have resigned if they:

a. resign in writing,
b. declare moving in writing,
c. passed away,
d. not active in the second semester of the first year for new students,
e. not active without written permission from the Rector for two consecutive semesters, or
f. not active for more than four semesters with written permission from the Rector or without the Rector's permission.

As referred to in letters E and F, inactive students are not registered in a particular semester without the Rector's permission. The Rector can give students with such cases a resignation certificate.

Students are declared to be expelled (drop out) if they do not pass the mid-course evaluation or the evaluation of the study period deadline. Students are declared expelled because they do not pass the mid-study evaluation if:

a. Do not meet the minimum number of credits from the best score with a minimum GPA. The minimum number of credits and minimum GPA for undergraduate programs is at least 40 credits with a minimum GPA of 2.00.
b. Cannot meet the passing criteria within the maximum study period limit of 14 semesters.

Students who cannot pass the evaluation of the study period deadline can be given a warning period as inactive students for one semester before the study period ends. Students who are given the warning period can reactivate themselves with the Rector's permission. If the student does not carry out the reactivation process, it can be declared that the Rector will issue him/her.

G. Graduation Standards

Students can be declared to graduate from the Department if they have:

a. Completed minimum credits, fulfill the participation credits, and other provisions stipulated in the department curriculum.
b. Met a minimum GPA of 2.25.
c. Passed university courses with a minimum grade of C.

d. Passed English proficiency test with a minimum CEPT score of 422 or equivalent to a minimum TOEFL ITP score of 500 or a minimum TOEFL iBT score of 38 or a minimum IELTS score of 4.

The graduation predicate is determined as follows:

a. GPA 2.76 - 3.00 = Graduated with a "Satisfactory" predicate.
b. GPA 3.01 - 3.50 = Graduated with a "Very Satisfactory" predicate.
c. GPA 3.51 - 4.00 = Graduated with a "Cum laude" predicate.

The predicate of graduation with honors (Cum laude) only applies to students with a maximum study period of five years for a bachelor's degree and four years for an associate degree and does not apply to transferred students.

H. Student Status and Academic Leave

Student status consists of:

a. Active students
   Active Students are registered in a particular semester so that they are entitled to complete the study plan and participate in academic activities and receive administrative and academic services.
b. Inactive students
   Inactive students are students who are not registered in a particular semester without the Rector's permission. Non-active students are subject to paying a fixed tuition fee during the idle period, which must be paid when they will be active again and can only take a maximum of 12 credits.

Student status, as mentioned above, has consequences for:

a. Study period calculation.
b. Evaluation of the study period.
c. Tuition fees.

Students on academic leave are those who are not registered in a particular semester with the permission of the Rector with the following conditions:

a. Students who take academic leave are exempt from tuition fees, and if the students are active again, they are required to pay administrative fees and can take credits according to the final semester GPA.
b. Academic leave students are not entitled to participate in academic activities.
c. Students who take academic leave are only allowed for students who have actively taken two semesters in the first year.
d. The academic leave period is not counted as a student's study period.
e. The academic leave is given per semester, and the maximum duration is four semesters, either successively or non-consecutively.
f. Applications for academic leave are submitted according to the schedule in the academic calendar. They are made by filling out a form available at the faculty, which is signed by the Dean, enclosing:
   1) Copy of Student Identity Card.
   2) Library Free Certificate.
   3) Semester GPA report signed by the academic supervisor and the Head of the Department.

4) Copy of proof of payment of the last tuition fee.
5) Proof of payment for academic leave administration.

Extension of academic leave:
The extension of academic leave is carried out by applying for an extension of academic leave through the Academic Directorate by including the original Academic Leave Permit signed by the Deputy Rector for Academic Development and Research.

Permission to be active again:
Students who will be active again after academic leave must submit a letter of application for reactivity according to the schedule listed in the academic calendar through the Academic Directorate by filling out a form and attaching the original Academic Leave Permit signed by the Deputy Rector for Academic Development and Research.

I. Dropout

A student is considered a dropout (DO), if:

a. No credit is accomplished during the first two semesters. Hence, it is concluded that the student has no intention to study at the International Program, DChE UII.
b. In the first four semesters, the accumulative credits accomplished < 30 credits with GPA < 2.25, therefore, the student is concluded to be suspended (withdrawn) from the program.
c. Performs the unregistered academic leave for four semesters consecutively (automatic DO and the action is considered as self-resignation).

J. Teaching and Learning Process Regulations

Regulations for Students (Offline meeting)

Students' regulation for offline classes:

a. A student should dress adequately. T-shirts, sandals, and earrings for a male are not permitted. The dress code requirements are as follows:
   - MALE students: neat trousers (torn or ripped trousers are unacceptable), a neat shirt or polo shirt (t-shirts or ripped shirts are unacceptable), shoes.
   - FEMALE students: hijab (Moslem/Shar'i outfit), shoes.
b. It is highly expected for students to be on time for class. If a student comes more than 15 minutes late, he/she is considered absent from the class, even though he/she may join the lecture.
c. Use online gateway attendance information systems to record student attendances (gateway.uii.ac.id).
d. Students should pay special attention to the importance of a face-to-face meeting so that they can reach 75% of class attendance. Failure to fulfill the obligation leads them not to be permitted to join the examination.
e. An academic sanction will be given to those who violate academic regulations.
f. Students should not leave the class for unreasonable causes. Leaving the class will be considered an absence for the whole meeting.
g. Students and a lecturer have a structured meeting in 50 minutes.
h. Students are required to carry out a structured assignment for 60 minutes.
i. Students should arrange regular independent activities in 60 minutes.

Regulations of Lecturing Program

In running offline classes, lecturers:

a. Must attend 100% of scheduled classes.
b. Must arrive and dismiss the class on time as scheduled.
c. Must dress properly. The dress code requirements are as follows:
   - Male: formal attire – long trousers, shirt, and tie (optional)
   - Female: shar'i outfit
d. Use online gateway attendance information systems to record student attendances (gateway.uii.ac.id).
e. Must not tolerate students who are more than 15 minutes late.
f. Must not tolerate students who do not wear the required dress.
g. May dismiss the class if no student comes within 15 minutes and vice versa.
h. Are considered teaching one meeting if the dismissal is caused by the students' absence and do not need to hold an extra meeting to substitute it.
i. Are required to hold an extra meeting to substitute the dismissal if caused by the lecturer's absence.
j. Are required to have a face-to-face meeting with students at least 75% of the required total meetings based on the subject's credit points.
k. Must hold the class with the time allocation based on the subject's credit point. Per credit, the point is equivalent to 50 minutes of the meeting.
l. Should apply a "student-centered" (active learning) method when teaching and are recommended to use case studies as a part of independent assignments.
m. Determine the assessment components and the percentage of each component (if the students achieve their minimum 75% attendance). For students who cannot achieve their 75% attendance, the lecturers can give them the maximum grade of C.
n. Should at least use PowerPoint presentation when teaching. Computers and a smartboard are provided. Please, contact IP management for any troubles caused by this equipment.
o. Are strongly required to hold a substitution class. Please, set the timetable with the students and let the IP management know of scheduled arrangements to ensure there is no scheduling conflict.
p. Should apply the examination form (for Chemical Engineering lecturers): oral and written. It is also kindly suggested to combine the classical method and case study presentation when holding the mid and final examination. Classical method examinations will be held as scheduled for courses that cannot apply the case study presentation.

CHAPTER 3
CURRICULUM

A. Introduction

Curriculum development is part of the continuous improvement process in the DChE UII. The curriculum implemented by the Department is the one developed in 2020, which is based on the vision, mission, and goals set by the Department. Various reference sources have been used in developing this curriculum, including inputs from industrial practitioners, alumni, academic staff, students, and the results of benchmarking studies from various chemical engineering departments at leading universities domestically and abroad. In addition, this curriculum developed was following the regulations of the Indonesian National Qualifications Framework (KKNI), the Indonesian Accreditation Board for Engineering Education (IABEE), the chemical engineering core curriculum of the Chemical Engineering Higher Education Association (APTEKIM), and the curriculum Ulil Albab of the Universitas Islam Indonesia. The Curriculum 2020 is an Outcome-based Education (OBE) curriculum with 12 Student Outcomes (SOs). With the 12 SOs, it is hoped that the DChE UII will be able to make a real contribution to the Indonesian nation through chemical engineering graduates who are competent in their fields.

B. Program Educational Objective

A Program Educational Objective (PEO) is a role that graduates can play in a particular field of expertise or work after completing their studies. The PEO is used to develop SOs. The PEO of DChE UII and the descriptions are presented in Table 3.1.

Table 3.1 The Program Educational Objective of DChE UII

PEO	Description
Islamic personality	Showing devotion to God Almighty, behaving honestly, being disciplined, responsible, work intelligently, being independent, and having an entrepreneurial spirit.
Process engineer	Understanding chemical engineering and supporting sciences for engineering processes, processing systems, and equipment in the chemical industries.
Process manager	Ability to work in teams, have a leadership attitude, be creative & innovative, think critically, and communicate effectively.

C. Student Outcomes

The student outcomes, according to the Accreditation Board for Engineering and Technology (ABET), describe what students are expected to know and be able to do by the time of graduation relating to the knowledge, skills, and behaviors that students acquire as they progress through the department. The SO of DChE UII are shown in Table 3.2.

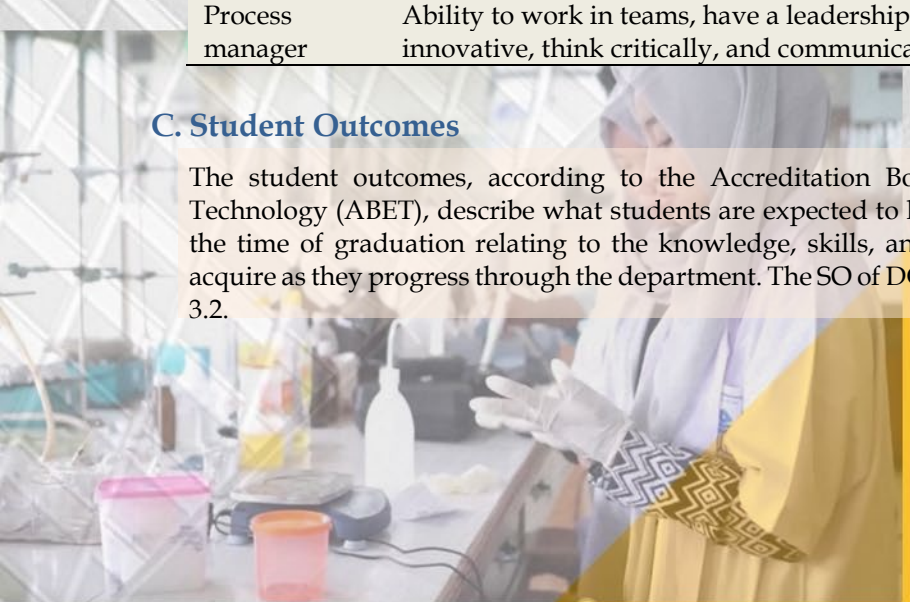


Table 3.2 Student Outcomes of DChE UII

Short Description	SO Code	Student Outcomes
ATTITUDE		
Islamic personality	SO 1	Be faithful to God Almighty and behave in Islam (honest, disciplined, responsible, and intelligent) in every role, both in the chemical industry and the public.
Having a spirit of independence and entrepreneurship	SO 2	An ability to internalize the spirit of independence and entrepreneurship
Responsibility to society and adhering to professional ethics	SO 3	An ability to be responsible to the community and adhere to professional ethics in solving chemical engineering problems
GENERAL SKILLS		
Ability to communicate effectively	SO 4	An ability to communicate effectively both verbally and in writing
Ability to solve problems in general	SO 5	An ability to plan, complete, and evaluate tasks within existing boundaries.
Ability to work in teams	SO 6	An ability to work in multidisciplinary and multicultural teams
SPECIAL SKILLS		
Ability to use mathematics, natural sciences, information technology, and engineering principles	SO 7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering
Ability to solve complex chemical engineering problems	SO 8	An ability to identify, formulate, analyze and solve the chemical engineering complex problems
Ability to design chemical processes, processing systems, and industrial equipment	SO 9	An ability to design chemical processes, process systems, and industrial equipment to meet the expected needs within realistic constraints, such as legal, economic, environmental, social, political, health and safety, sustainability, and to recognize and/or utilize the potential of local and national resources with global insight
Ability to use modern engineering tools	SO 10	An ability to apply methods, skills, and modern technical tools needed to chemical engineering practices
Ability to design and carry out experiments and data analysis	SO 11	An ability to design and conduct laboratory and/or field experiments and analyze and interpret data to strengthen technical judgment
KNOWLEDGE		
Lifelong learning and understanding contemporary issues	SO 12	An ability to understand the need for lifelong learning, including access to knowledge related to relevant contemporary issues

The formulation of each SO is then broken down into Performance Indicators to facilitate measurement of SO achievement. Table 3.3 shows the breakdown of each SO into Performance Indicators. Furthermore, the SO mapping of the DChE with the PEO with SO is shown in Table 3.4.

Table 3.3 Student Outcomes performance criteria

SO 1 Be faithful to God Almighty and behave in Islam (honest, discipline, responsibility, and intelligent work) in every role, both in the chemical industry and the public
1.1 Understanding Islam and Muslim thought and civilization 1.2 Showing Islamic behavior in every role
SO 2 An ability to internalize the spirit of independence and entrepreneurship
2.1 Understanding entrepreneurship as a means to develop self-potential and improve quality of life 2.2 Showing an independent and entrepreneurial attitude in life 2.3 Creating a business plan
SO 3 An ability to be responsible to the community and there to professional ethics in solving chemical engineering problems
3.1 Understanding the impact of chemical engineering technology on community welfare, environmental safety, and sustainable development 3.2 Understanding and complying with professional code of ethics and regulations
SO 4 An ability to communicate effectively both verbally and in writing
4.1 Ability to make effective presentations both in Indonesian and English 4.2 Ability to write ideas/reports according to scientific principles both in Indonesian and English
SO 5 An ability to plan, complete, and evaluate tasks within existing boundaries
5.1 Ability to plan and complete curricular tasks (research, internship, and plant design) 5.2 Ability to evaluate the process and results of curricular tasks
SO 6 An ability to work in multidisciplinary and multicultural teams
6.1 Ability to work in a team with different disciplines, fields, and cultural backgrounds
SO 7 An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering
7.1 Understanding knowledge of mathematics, natural sciences, and information technology 7.2 Ability to implement mathematics, natural sciences, and information technology to understand chemical engineering principles
SO 8 An ability to identify, formulate, analyze, and solve the chemical engineering complex problems
8.1 Ability to identify and formulate chemical engineering problems 8.2 Ability to analyze and solve chemical engineering problems
SO 9 An ability to design chemical processes, process systems, and industrial equipment to meet the expected needs within realistic constraints, such as legal, economic, environmental, social, political, health and safety, sustainability, and to recognize and/or utilize the potential of local and national resources with global insight
9.1 Ability to design chemical processes, processing systems, and industrial equipment 9.2 Ability to identify and utilize potential resources for designing chemical processes, processing systems, and industrial equipment

Table 3.3 (Cont'd)

SO 10 An ability to apply methods, skills, and modern technical tools needed for chemical engineering practices
10.1 Ability to select appropriate methods & tools, along with their strengths and weaknesses by the problems
10.2 Ability to use and adjust methods & tools by the problems
SO 11 An ability to design and conduct laboratory and/or field experiments and analyze and interpret data to strengthen technical judgment
11.1 Ability to design and carry out laboratory & field experiments and computer simulations
11.2 Ability to analyze and interpret experimental data
SO 12 An ability to understand the need for lifelong learning, including access to knowledge related to relevant contemporary issues
12.1 Ability to understand the need for continuous professional development
12.2 Ability to obtain the recent information and knowledge

Table 3.4 Mapping of Program Educational Objective with Student Outcomes

PEO	SO 1	SO 2	SO 3	SO 4	SO 5	SO 6	SO 7	SO 8	SO 9	SO 10	SO 11	SO 12
1. Islamic personality	√	√	√									√
2. Process engineer					√		√	√	√	√	√	√
3. Process manager				√	√	√		√	√			√

D. Body of Knowledge

The Body of Knowledge (BOK) of the DChE UII is based on three pillars, namely the unit operations, the unit process, and the equipment design. The three pillars are supported by basic skills consisting of mass and energy balance, thermodynamics, materials science, utilities, economics & management, statistics, and based on general basic knowledge consisting of the basic science of engineering (mathematics, chemistry, and physics), morals, ethics, and humanities. Elective courses can represent student expertise, which comprehensively leads to the chemical plant design project. The three pillars of the BOK are as follows:

1) The Unit Operation pillar produces value-added products with processes that do not involve chemical reactions such as distillation, absorption, and extraction. Each process influences factors, characteristics, and indicators in this pillar to produce high economic value products with low-cost processes.
2) The Unit Process pillar produces value-added products through chemical processes such as esterification, hydrolysis, fermentation, and thermo-nuclear reactions. In this pillar, various influencing factors, characteristics, and indicators of each reaction are studied to produce the optimum product.
3) The Equipment Design pillar designs the equipment needed by the Unit Operation pillar and the Process Unit pillar based on the optimum cost.

In general, the BOK of the DChE UII is visualized in Figure 3.1, while the capstone design is presented in Figure 3.2.

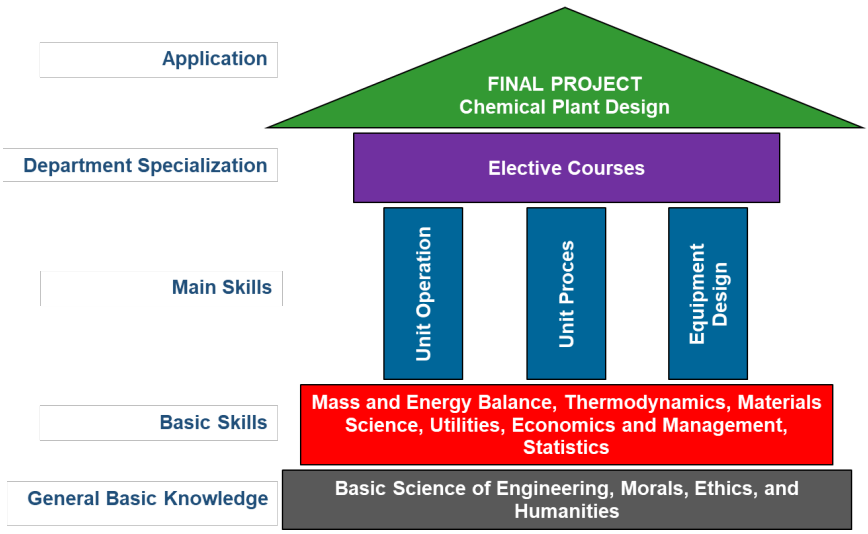


Figure 3.1 The body of knowledge of the DChE UII

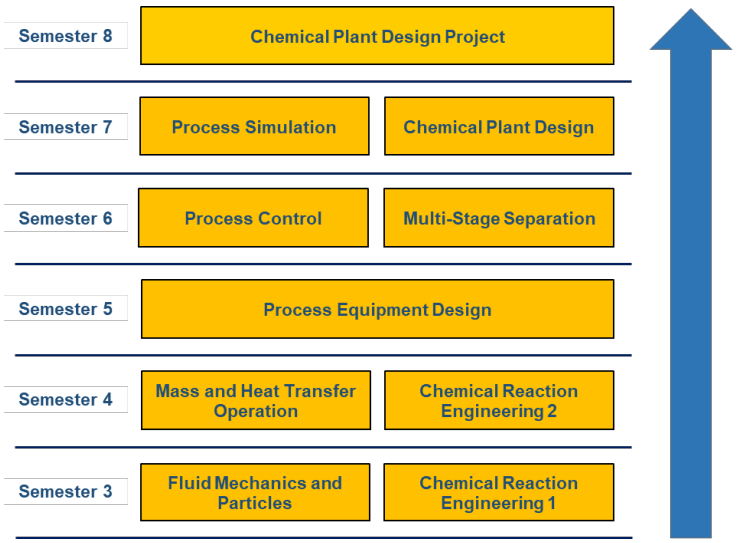


Figure 3.2 Flowchart of Capstone Design courses

E. Course Distribution

The Curriculum 2020 structure of DChE UII, learning methods, and prerequisite courses are shown in Table 3.5. Furthermore, a list of elective courses representing student's specialization can be seen in Table 3.6. In the Curriculum 2020, there are 26 elective courses which are divided into 4 clusters: (1) Food and Drug Technology Cluster, (2) Energy and Environmental Cluster, (3) Material Technology Cluster, and (4) Simulation Cluster and Others. In this case, students must take four elective courses with 12 credits in the same or different clusters according to their interests. Tables 3.7 and 3.8 show the

mandatory student activities and the recapitulation of courses and student activities. The course structure is shown in Figure 3.3, while the mapping of courses with SO is shown in Tables 3.10 and 3.11.

Table 3.5 Course distribution per semester

Code	Course	Learning method	Credit	Prerequisite course
Semester 1				
UNI600	Islamic Religion	Class	2	-
UNI603	State Philosophy	Class	2	-
UNI606	English	Class, Practice	2	-
STK111	Fundamentals of Chemistry	Class	3	-
STK112	Organic Chemistry	Class	3	-
STK113	Calculus	Class	3	-
STK114	Fundamental of Physics	Class	4	-
Semester 2				
UNI601	Islam for Scholar	Class	3	-
STK215	Analytical Chemistry	Class	3	-
STK216	Physical Chemistry	Class	3	-
STK217	Linear Algebra	Class	3	-
STK231	Introduction to Chemical Engineering	Class	2	-
STK232	Mass and Energy Balances	Class	4	Calculus, Fundamental of Chemistry
STK281	Fundamental of Chemistry and Organic Chemistry Lab Work	Laboratory work	1	-
Semester 3				
UNI602	Islam Rahmatan Lil Alamin	Class	3	-
UNI604	Citizenship Education	Class	2	-
STK333	Chemical Engineering Thermodynamics	Class	4	Mass and Energy Balances
STK334	Chemical Engineering Mathematics	Class	3	Calculus, Linear Algebra
STK335	Fluid Mechanics and Particles	Class	4	-
STK341	Chemical Reaction Engineering 1	Class	3	Fundamental of Chemistry
STK282	Analytical Chemistry and Physical Chemistry Lab Work	Laboratory work	1	-
Semester 4				
UNI605	Sharia Entrepreneurship	Class	2	-
STK436	Chemical Industrial Processes	Class	3	-
STK437	Materials and Corrosion	Class	2	-
STK442	Chemical Reaction Engineering 2	Class	3	Chemical Reaction Engineering 1
STK443	Mass and Heat Transfer Operation	Class	4	Mass and Energy Balances
STK444	Mathematical Modeling and Numerical Computation	Class	4	Mass and Energy Balances, Chemical Engineering Mathematics
STK483	Unit Operation Lab Work 1	Laboratory work	1	Fluid Mechanics and Particles

Table 3.5 (Cont'd)

Code	Course	Learning method	Credit	Prerequisite courses
Semester 5				
UNI607	Scientific Communication Skill	Class, Practice	2	-
STK521	Engineering Economics	Class	2	-
STK522	Statistics for Engineering	Class, Cases	2	
STK538	Utilities	Class	3	-
STK539	Process Engineering Drawing	Class, Practice	2	-
STK545	Transport Phenomena	Class	3	Chemical Engineering Mathematics
STK546	Process Equipment Design	Class	3	Mass and Heat Transfer Operation, Materials and Corrosion
STK584	Unit Operation Lab Work 2	Laboratory work	1	Unit Operation Lab Work 1, Mass and Heat Transfer Operation
STK585	Research Methodology	Class	2	Unit Operation Lab Work 1
Semester 6				
UNI608	Community Services	Practice in society	2	Min. 100 credits with a GPA ≥ 2.25 and passed the S3D Program
STK623	Industrial Project Management	Class	2	-
STK647	Multi-Stage Separation	Class	4	Mass and Heat Transfer Operation
STK648	Process Control	Class	3	Mathematical Modeling and Numerical Computation
STK649	Bioprocess Technology	Class	3	-
STK686	Research	Practice in the laboratory	3	Research Methodology
STK991	Elective Course 1	Class	3	80 credits
Semester 7				
STK724	Waste Management and Industrial Safety	Class	4	-
STK750	Process Simulation	Class, Practice	3	Multi-Stage Operation, Chemical Reaction Engineering 2
STK751	Chemical Plant Design	Class	4	Process Control, Multi-Stage Operation, Process Equipment Design, Utilities
STK752	Internship	On Job Training	2	Min. 100 credits with a GPA ≥ 2.25 and passed the S3D program
STK992	Elective Course 2	Class	3	-
STK993	Elective Course 3	Class	3	-
Semester 8				
STK853	Chemical Plant Design Project	Independent project	4	120 credits with a GPA ≥ 2.25 and can be taken simultaneously with the Chemical Plant Design course (STK751)
STK854	Comprehensive Exam	Exam	1	120 credits
STK994	Elective Course 4	Class	3	-

Table 3.6 List of elective courses

No	Course code	Course	Credit
		Cluster 1: Food and Drug Technology	
1.	STK911	Food Technology	3
2.	STK912	Functional Food Technology	3
3.	STK913	Food Nanotechnology	3
4.	STK914	Drying Technology	3
5.	STK915	Active and Smart Packaging	3
6.	STK916	Microbiology	3
7.	STK917	Controlled Drug Release System	3
		Cluster 2: Energy and Environment	
1.	STK921	Biomass Energy Technology	3
2.	STK922	Fuel Cell Technology	3
3.	STK923	Energy Storage Technology and Management	3
4.	STK924	Petroleum Technology	3
5.	STK925	Energy from Waste	3
6.	STK926	Clean and Renewable Energy	3
7.	STK927	Green Chemistry for Sustainable Development	3
		Cluster 3: Material Technology	
1.	STK931	Biomaterials Technology	3
2.	STK932	Smart Material Technology	3
3.	STK933	Nanomaterials Technology	3
4.	STK934	Polymer Technology	3
5.	STK935	Ceramic Technology	3
		Cluster 4: Simulation and Others	
1.	STK941	Advanced Modeling and Simulation	3
2.	STK942	Petroleum Processing Technology Simulation	3
3.	STK943	Gas Purification Technology and Simulation	3
4.	STK944	System Optimization	3
5.	STK945	Advanced Adsorption	3
6.	STK946	Industrial Internet of Things	3
7.	STK947	Startup Business	3

In addition to the compulsory courses of 144 credits, there are also non-curricular student activities measured in Participation Credit Units (SKP) and must be taken by students during the study. Based on UII Rector's Regulation No. 7/2018, every undergraduate student must complete taking 60 Participation Credit Units consisting of 50 mandatory credits and ten elective credits during the study. The ten credits can be obtained from several student activities as follows:

a. Student Institutional Leadership Practical Activities, max. five credits.
b. Foreign Language Activities for Global Communication, max. ten credits.
c. Arabic Training Activities, max. ten credits.
d. Community Service Activities, max. ten credits.

Table 3.7 List of mandatory student activities

Code	Learning Activity Name	Learning activities	Credit
STK-10A	Intensive course on Islamic Basic Values	Islamic Short Boarding School and Islamic Mentoring	20
STK-10B	Self-development based on Koran	Islamic Short Boarding School and Islamic Mentoring	20
STK-10C	Self-development Training	Islamic Short Boarding School	5
STK-10D	Leadership and Da'wah Training	Islamic Short Boarding School	5
Number of mandatory Participation Credit Units			**50**

Table 3.8 Recapitulation of courses and student activities

Courses and Activities	Credit	Total of Credit
Compulsory courses	132	**144**
Elective courses	12	
Mandatory student activities	50	**60**
Elective student activities	10	

F. "Merdeka Belajar – Kampus Merdeka"

"Merdeka Belajar – Kampus Merdeka" (MBKM) Policy launched by the Minister of Education and Culture is a framework to prepare students to become strong scholars relevant to the times' needs and ready to become leaders with a high national spirit. For this reason, students currently studying in universities must be prepared to become natural learners who are skilled, flexible, and resilient (agile learners).

The Policy on MBKM is stated in the Regulation of the Minister of Education and Culture No. 3/2020 concerning National Standards for Higher Education (SNPT) Article 18 paragraph 1, which states that the fulfillment of the period and study load for students of undergraduate or applied undergraduate programs can be conducted: a) participating in the entire learning process in the Department at universities according to the period and study load, and b) participating in the learning process in the Department to fulfill part of the study period and study load and the rest participating in the learning process outside the Department. Meanwhile, regarding the Regulation of the Minister of Education and Culture No. 3/2020 concerning National Standards for Higher Education (SNPT) Article 18 paragraph 3 that through the MBKM program, students have the opportunity for one semester or equivalent with 20 credits to study outside the Department at the same university; and a maximum of two semesters or equivalent with 40 credits of studying in the same Department at different universities, studying at different departments at different universities; and/or studying outside educational institutions.

1. **General Requirements and Implementation**
   As stated in the MBKM Guidebook that the general requirements that must be met by students and universities in the "Three-semester Merdeka Belajar" program include:
   a) Students from accredited departments.
   b) Active students who are registered in the Higher Education Database (PDDikti).

The implementation of the MBKM program will involve several parties, including:

a. University

1) Regulation of the Minister of Education and Culture (Permendikbud) No 3/2020 about the National Standards for Higher Education: University is **obliged to facilitate** students (students may or may not take the "Merdeka Belajar" Program) to study outside the university for a maximum of **two semesters or equivalent to 40 credits**. The students can study in different departments at the same university for **one semester or equivalent to 20 credits**.
2) Developing academic policies/guidelines to facilitate learning activities outside the Department.
3) Creating MoU with partners.

b. Faculty

1) Preparing the list of courses at the faculty level that students across departments can take.
2) Preparing MoU with relevant partners.

c. Department

1) Preparing or adapting the curriculum to the independent campus implementation model.
2) Facilitating students who will study outside the Department in the same university.
3) Offering courses that students can take outside the Department and the university along with its requirements.
4) Equating courses with learning activities outside both the Department and university.
5) If there are unfulfilled courses/credits from learning activities outside the Department and university, the Department should provide online courses.

d. Student

1) Planning with the Academic Advisors about courses/programs to be taken outside the Department.
2) Enrolling in the program.
3) Completing the requirements for the program, including the selection process, if any.
4) Participating in the program under the academic guidelines.

e. Partner

1) Preparing MoU with universities/faculties/departments.
2) Conducting the MBKM program according to the MoU.

The "Merdeka Belajar" Program, according to Permendikbud No. 3/2020 Article 15 paragraph 1, that can be conducted within the Department and outside the Department includes student exchange, internship, teaching, research, social project, entrepreneurial activities, independent study/project, and community service.

2. Learning outside DChE UII

DChE UII provides facilities for students who want to take the "Merdeka Belajar" Program by following the learning process for a maximum of 3 (three) semesters outside the Department which consists of one semester (20 credits) in the university and two semesters (40 credits) outside the university with the following conditions:

a) The "Merdeka Belajar" Program is started in Semester 3.
b) The "Merdeka Belajar" Program outside the Department in UII is conducted during the first four semesters.
c) The "Merdeka Belajar" Program outside UII is conducted in semesters 6 and 7.

3. Learning outside DChE within UII

DChE UII provides facilities for students to take 20 credits outside the Department within UII, in which 12 out of 20 credits are included in the curriculum (University Courses) consisting of five courses held by UII. The remaining eight credits can be taken in other departments within UII.

Table 3.9 List of university courses

No.	Code	Course	Credit
1.	UNI600	Islamic Religion	2
2.	UNI601	Islam for Scholar	3
3.	UNI602	Islam Rahmatan Lil Alamin	3
4.	UNI603	State Philosophy	2
5.	UNI604	Citizenship Education	2
		Total	**12**

4. Learning Outside DChE and UII

a. Student Exchange

DChE UII facilitates students to undertake the Student Exchange Program for one semester. This program aims to build student attitudes such as respecting the diversity in culture, ideology, religion & beliefs, respecting others, working in a team, and having social & environmental awareness. The objectives of student exchange are:

1) Studying across universities, living with a host family, building students' insight of Bhinneka Tunggal Ika (Unity in Diversity), strengthening the cross-cultural relationship.
2) Building student friendships among different regions, ethnicities, cultures, and religions, thereby enhancing the spirit of national unity and integrity.
3) Transferring knowledge to reduce educational disparities among universities in Indonesia and foreign universities.

The student exchange program is conducted between chemical engineering (or related disciplines) departments outside UII. For this purpose, DChE UII will offer the following courses:

1) Chemical Engineering Students:

a) Process Simulation (3 credits)
b) Advanced Modeling and Simulation (3 credits)
c) Petroleum Processing Technology Simulation (3 credits)
d) Gas Purification Technology and Simulation (3 credits)

2) **Chemical/Non-Chemical Engineering Students:**
   a) Waste Management and Industrial Safety (4 credits)
   b) Bioprocess Technology (3 credits)
   c) Functional Food Technology (3 credits)
   d) Food Nanotechnology (3 credits)
   e) Active and Smart Packaging (3 credits)
   f) Controlled Drug Release System (3 credits)
   g) Energy Storage Technology and Management (3 credits)
   h) Energy from Waste (3 credits)
   i) Green Chemistry for Sustainable Development (3 credits)
   j) Smart Material Technology (3 credits)
   k) Nanomaterials Technology (3 credits)
   l) Industrial Internet of Things (3 credits)
   m) Startup Business (3 credits)

The requirements for external students who will undertake the student exchange program at DChE UII are:

1) Students must show the approval letter from the home university.
2) Students are from the Department of chemical engineering (or related disciplines).
3) Students must undertake at least four semesters at the home university.

Meanwhile, for students of DChE UII who will undertake a student exchange program in the Department of chemical engineering of other universities, transfer credits can be done among courses with similar material contents. If the credits taken from other universities are less than that of DChE UII, the students must take additional courses, for instance, elective courses.

b. Internship

DChE UII provides students facilities to participate in an Internship Program in chemical industries for one semester, equivalent to a maximum of 20 credits. This program aims to provide students to learn from experience in the workplace to improve hard skills (complex problem solving and analytical skills) and soft skills (professional/work ethics, communication, and cooperation). Furthermore, this program is expected to bring industrial problems to universities; thereby, the learning materials and research topics could be updated.

The requirements for implementing this program refer to the MBKM Guidebook published by the Directorate General of Higher Education of the Ministry of Education and Culture in 2020. They will be made in more detail in the Academic Guidebook for DChE UII 2023/2024.

c. Research

DChE UII facilitates students passionate about being researchers to conduct research activities at research institutes/study centers for one semester, equivalent to a maximum of 20 credits. Through research, students can build critical thinking to explore, understand, and do research methods better.

The objectives of the research program include:

1) Improving the quality of student research and strengthening student experience in a large research project.
2) Enhancing students' research competence through direct mentoring by researchers at research institutes/study centers.
3) Improving the ecosystem and research quality in DChE UII by providing research resources and preparing researchers early.

The requirements for implementing this program refer to the MBKM Guidebook published by the Directorate General of Higher Education of the Ministry of Education and Culture in 2020. They will be made in more detail in the Academic Guidebook for DChE UII 2023/2024.

d. Humanitarian Project

DChE UII facilitates students to be directly involved in natural disaster mitigations through humanitarian programs for one semester or the equivalent of a maximum of 20 credits.

Humanitarian project program objectives include:

1) Preparing students who respect humanity in performing their duties based on religion, morals, and ethics.
2) Training students to have social sensitivity to explore existing problems and contribute solutions according to their interests and expertise.

The requirements for implementing this program refer to the MBKM Guidebook published by the Directorate General of Higher Education of the Ministry of Education and Culture in 2020. They will be made in more detail in the Academic Guidebook for DChE UII 2023/2024.

e. Entrepreneurial Program

Based on the IDN Research Institute research results in 2019, 69.1% of millennials in Indonesia are interested in entrepreneurship. However, the entrepreneurial potential of the millennial generation has not been appropriately managed. For this reason, DChE UII supports students having entrepreneurial interests with appropriate learning activity programs.

DChE UII facilitates students interested in entrepreneurial activity with one semester or the equivalent of a maximum of 20 credits. The objectives of this program include:

1) Providing students who have an entrepreneurial interest to develop their startup business.
2) Addressing the unemployment problem in society, including among scholars.

The requirements for implementing this program refer to the MBKM Guidebook published by the Directorate General of Higher Education of the Ministry of Education and Culture in 2020. They will be made in more detail in the Academic Guidebook for DChE UII 2023/2024.

f. Independent Project

The objectives of the independent project include:

1) Implementing students' ideas in developing innovative products.
2) Organizing research and development-based education.
3) Improving student achievement in national and international events.

DChE UII facilitates students interested in this project with one semester or the equivalent of a maximum of 20 credits.

The requirements for implementing this program refer to the MBKM Guidebook published by the Directorate General of Higher Education of the Ministry of Education and Culture in 2020. They will be made in more detail in the Academic Guidebook for DChE UII 2023/2024.

g. Community Service Program

The Community Service Program (KKN) is a form of education that provides learning experiences for students to live in a community outside the campus. Besides, students learn to directly identify and develop village potentials and contribute solutions to the community's problems. This program is expected to enhance partnerships, cross-disciplinary teamwork, and student leadership in managing development programs in rural areas.

The objectives of the program include:

1) Providing opportunities for students to implement their knowledge, technology, and skills to the community in collaboration with many stakeholders in the field.
2) Accelerating rural areas' development with the Ministry of Village, Development of Disadvantaged Regions and Transmigration of Indonesia.

DChE UII facilitates students interested in the program with one semester or the equivalent of a maximum of 20 credits.

The requirements for implementing this program refer to the MBKM Guidebook published by the Directorate General of Higher Education in the Ministry of Education and Culture in 2020. They will be made in more detail in the Academic Guidebook for DChE UII 2023/2024.

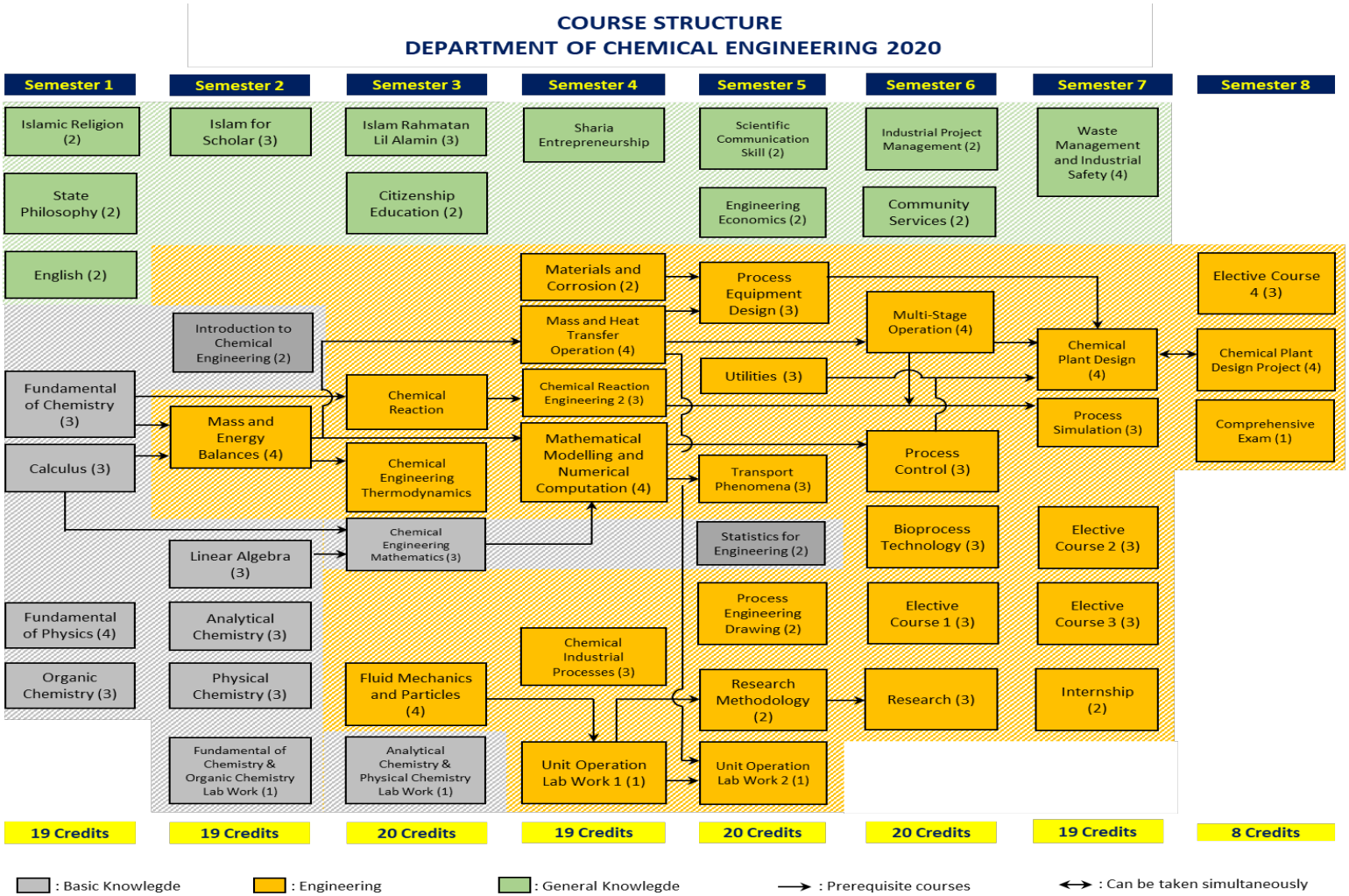


Figure 3.3 Course structure of DChE UII

Table 3.10 Course mapping on the Student Outcome of the DChE UII

Courses	SO 1	SO 2	SO 3	SO 4	SO 5	SO 6	SO 7	SO 8	SO 9	SO 10	SO 11	SO 12
Islamic Religion	√		√									
State Philosophy	√		√									
English				√								
Fundamental of Chemistry							√					
Organic Chemistry							√					
Calculus							√					
Fundamental of Physics							√					
Fundamental of Chemistry and Organic Chemistry Lab Work				√		√					√	
Islam for Scholar	√		√									
Citizenship Education	√											
Kimia Analiitk							√					
Analytical Chemistry							√					
Physical Chemistry							√					
Linear Algebra							√					
Introduction to Chemical Engineering							√					
Analytical Chemistry and Physical Chemistry Lab Work				√		√					√	
Islam Rahmatan Lil Alamin	√		√									
Sharia Entrepreneurship		√										
Chemical Engineering Thermodynamics							√					
Chemical Engineering Mathematics							√					
Chemical Industrial Processes							√					√
Fluid Mechanics and Particles									√			
Chemical Reaction Engineering 1							√		√			
Engineering Economics		√										
Materials and Corrosion							√					
Utilities							√					
Chemical Reaction Engineering 2							√		√			
Mass and Heat Transfer Operation									√			
Mass and Heat Transfer Operation							√	√				

Table 3.10 (Cont'd)

Courses	SO 1	SO 2	SO 3	SO 4	SO 5	SO 6	SO 7	SO 8	SO 9	SO 10	SO 11	SO 12
Transport Phenomena							√					
Unit Operation Lab Work 1				√		√					√	
Scientific Communication Skill				√								
Statistics for Engineering											√	
Process Engineering Drawing										√		
Process Equipment Design									√			
Multi-Stage Separation									√			
Unit Operation Lab Work 2				√		√					√	
Research Methodology				√							√	
Community Services	√		√			√		√				
Waste Management and Industrial Safety			√					√				
Industrial Project Management								√				
Process Control							√		√			
Bioprocess Technology							√		√			
Research				√	√						√	
Process Simulation										√		
Chemical Plant Design								√	√			
Internship				√	√							
Chemical Plant Design Project				√	√			√	√			
Comprehensive Exam							√					

Table 3.11 Elective course mapping on the Student Outcome of the DChE UII

Courses	SO 1	SO 2	SO 3	SO 4	SO 5	SO 6	SO 7	SO 8	SO 9	SO 10	SO 11	SO 12
Cluster 1: Food and Drug Technology												
Food Technology							√		√			
Functional Food Technology							√					
Food Nanotechnology							√					
Drying Technology							√		√			
Active and Smart Packaging							√					
Microbiology							√		√			
Controlled Drug Release System							√			√		
Cluster 2: Energy and Environment												
Biomass Energy Technology							√					
Fuel Cell Technology							√					
Energy Storage Technology and Management							√					
Petroleum Technology							√					
Energy from Waste							√					
Clean and Renewable Energy							√					
Green Chemistry for Sustainable Development							√					
Cluster 3: Material Technology												
Biomaterials Technology							√					
Smart Material Technology							√					
Nanomaterials Technology							√					
Polymer Technology							√					
Ceramic Technology							√					
Cluster 4: Simulation and Others												
Advanced Modeling and Simulation										√		
Petroleum Processing Technology Simulation										√		
Gas Purification Technology and Simulation							√			√		
System Optimization							√					
Advanced Adsorption							√					
Industrial Internet of Things												√
Startup Business		√										

CHAPTER 4
SPECIAL PROVISIONS

A. Academic Counseling

Academic counseling is a counseling process dedicated to students about academic and non-academic problems in the form of scheduled and incidental consultations according to the student's needs to ensure the student's success in their studies. During the academic counseling process, each student is guided by an Academic Advisor appointed by the Rector based on the recommendation from the Head of the Department. Students are required to consult with the Academic Advisor, at the following time:

a. Before key-in to discuss the study plans for the next 1 semester.
b. At the end of the mid-term exam to evaluate the teaching and learning process for half a semester.
c. Before the final exam to discuss exam preparation.
d. Before On-Job Training, Research, and Final Project.
e. At other times deemed necessary for counseling.

The Academic Advisor has the responsibilities to:

a. Provide time to meet the students for consultation.
b. Provide regular counseling to students, at least 3 times per semester.
c. Giving guidance for students to take courses at the beginning of the semester.
d. Monitor the achievements of the students.
e. Provide suggestions so that students can finish their studies on time and obtain a maximum grade.
f. Provide a letter of recommendation for students who will apply for scholarships or continue their studies or for certain purposes.
g. Helping students overcome problems faced during the learning process.
h. Report the results of counseling to the head of the Department.

B. Community Service

Community Service is a learning model by students in groups and interdisciplinary fields of study to do a transfer of technology and community service while living in a target community group that has been determined by the Directorate of Research and Community Service (DPPM) UII within a certain period. The Community Service activity is conducted within 32 consecutive days. This activity cannot be accelerated even though students could do so.

Academic requirements:

a. Students can take the regular Community Service if they have been allowed academically by their department through the academic status at UNISYS consisting of:
    1) Have completed a minimum of 100 credits with a minimum GPA of 2.25.
    2) Have passed the S3D (Student Soft Skill Development) Program.
    3) Must attend UII Islamic Boarding School before conducting the Community Service.
b. When taking the regular Community Service, students are not allowed to take remediation/short semester.

Administrative requirements:

a. Students pay the cost of taking Community Service at the designated bank at a predetermined time.
b. Students make initial online registration at www.dppm.uii.ac.id at the specified time.
c. Students take the Community Service or leave 2 credits in the following semester while at the same time choosing the regular Community Service through filling in the study plan (RAS) in UNISYS.
d. Students are required to follow every stage of the Community Service activities; the schedule applies strictly (the Community Service schedule is listed on the academic calendar).

C. On-Job Training

On-Job Training (OJT) is an activity whereby students conducted observations on the facts that occur in the chemical industry. The purpose of OJT is to provide opportunities for students to see and observe directly in the chemical industry to apply their knowledge obtained in university.

As an assignment for the OJT, students are expected to be able to describe the phenomena they observed during the OJT and be able to propose solutions to solving simple problems, as well as be able to synthesize between observed facts, basic laws, theories, techniques, and equipment used.

To train student's ability to solve problems that occur in the industry (*problem-solving*), they will be given a special assignment during the OJT. A special assignment can be given by the supervisor from the DChE UII or by the supervisor from the industry.

a. On-Job Training Terms

Several provisions that must be considered in conducting On-Job Training:

1) OJT is conducted individually or in a group of two students.
2) OJT is conducted within a minimum of one month.
3) OJT can be carried out in institutions that usually employ chemical engineering graduates where students could gain experience in designing and operating chemical and physical processes. The industry may include chemical companies, materials companies, food companies, and research agencies. The case study undertaken may include process analysis, waste treatment, utilities, and quality control.
4) Students are required to complete the report which contains a general report (student observations regarding processes, management, industry operations) and special assignment given by supervisor from the DChE UII and/or supervisor from the industry.
5) Students are required to submit the report that has been approved by the supervisors to the library no later than six months from the date of the Department decree letter.
6) If the submission of the report exceeds two months from the deadline, the maximum grade to be obtained is B and if it is more than six months, then the maximum grade is C. The students are required to repeat the OJT if they cannot complete the report more than one year from the date of the decree letter.

7) The grading for OJT is given by the supervisor from the industry and the supervisor from the DChE UII by considering the attitudes and performance of students during OJT and the OJT reports.

b. On-Job Training Requirements

Students who are entitled to do OJT must meet the following requirements:

1) Active students of the DChE UII (not currently on study leave).
2) Have completed a minimum of 100 credits with a minimum GPA of 2.25.
3) Have done the key-in for the Internship (STK752) on the study plan.
4) Have completed administrative and financial procedures of OJT.
5) Have passed the S3D (Student Soft Skill Development) Program.

c. On-Job Training Submission Procedure

1) Students do the key-in process for the OJT.
2) Students submit a request to the DChE UII to make a cover letter for the company by attaching a transcript of five semesters.
3) Make an OJT plan according to the company.
4) After receiving a reply from the company, students fill in the OJT form provided in the DChE UII by attaching:
    a) Copy of student card,
    b) Receipt of payment for OJT consultation fee, and
    c) Reply letter from the Company.
5) Submit the completed OJT form completely to the DChE UII.
6) Two weeks before the OJT, students obtain several documents from the DChE UII such as:
    a) A decree letter of the OJT supervisor,
    b) Student consultation sheets with supervisor,
    c) An OJT assessment sheet,
    d) An OJT acceptance letter (for attachment to obtain campus permits),
    e) An OJT assignment letter to the company,
    f) An OJT plan to the company, and
    g) An assessment sheet for the supervisor from the company.
7) An application letter for applying OJT may be requested from the Department in the fifth semester, however, the OJT is conducted in the sixth semester after the key-in or after receiving the letter of acceptance from the company. It is not allowed to apply for OJT of more than one company at the same time.
8) A new OJT application letter can only be made if:
    a) There was a refusal from the company proved by an official rejection letter.
    b) Did not receive a response from the company until the deadline has passed, i.e., at least three months since the letter was sent to the company.
    c) If there is no rejection letter from the company, submission of a second letter must be done with the approval of the Head of Department.
9) Students are required to consult with their OJT supervisor at least once before conducting OJT to receive a short briefing and special assignment, if not doing so, then the OJT could be canceled.

d. On-Job Training Guidance

1) On-Job Training is carried out with the guidance of two supervisors, namely a field supervisor from the company and a supervisor from the DChE UII.
2) The supervisor from the Department must at least hold a Master's degree.
3) A decree letter for OJT Supervisor is issued by the Department after the student is accepted by the company. This decree must be given to the supervisor before the student starts the OJT at the company.
4) Any problems related to the preparation, implementation, report writing, and special assignment of the OJT must be consulted with the supervisor as evidenced by the OJT Consultation Card form. (Please contact the Administration Staff of the Department).
5) In carrying out OJT, students must always consult with their supervisor at least five times face to face.
6) The OJT score must be submitted to the academic staff of the Department by the OJT supervisor.

e. Agenda of Activities

Students who conduct OJT are required to make an agenda for OJT activities. The agenda for this activity contains the task of observing or processing data that are carried out every working day. The activity agenda includes the date and description of the activities that have been carried out sequentially as well as obtaining approval from the field supervisor or authorized officially from the company. Consultation with the supervisor from the DChE UII is carried out before and after students conducting the OJT proved by the OJT consultation card.

f. Finishing On-Job Training

After completing the OJT, the student brings the OJT report to the OJT supervisor for approval on the validation page. The assessment sheet from the supervisor in the company is also submitted to the supervisor for the OJT final grade process. The OJT report that has been approved by the supervisors and the head of the Department is submitted to the faculty library. Proof of submission from the library is then submitted to the Department to issue the OJT grade.

The procedure of OJT can be seen in Figure 4.1.

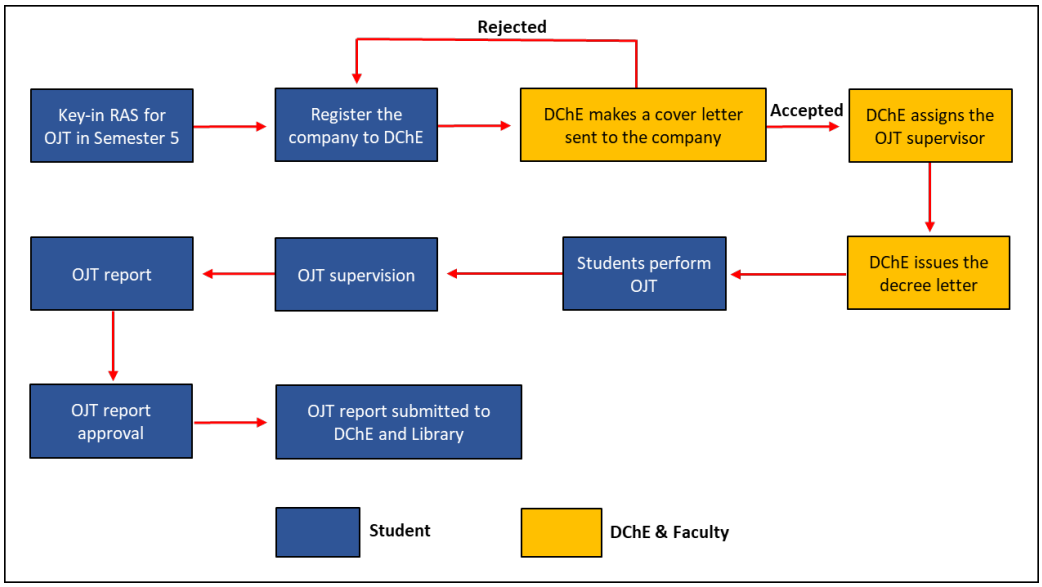


Figure 4.1 On-Job Training Procedure

D. Research

Research assignments in the Department of Chemical Engineering UII are intended to train students in applying the theories and knowledge that have been acquired. Students are expected to show skills in doing analysis, synthesis, analogy, generalization, developing hypotheses, developing concepts, conducting experiments, and making decisions.

In general, the purpose of research is to test the students' ability to implement the knowledge that has been acquired.

a. Research Terms

1) Research can be carried out in the laboratory of the DChE UII or the Faculty, certain institutions such as the chemical industry, petrochemical, oil & gas processing, or other institutions that provide research facilities in the chemical engineering field.
2) The implementation is carried out by a maximum of two students.

b. Research Requirements

1) Active students of the DChE UII (not currently on study leave).
2) Have taken the Research Methodology (STK585) course.
3) Have taken all laboratory works with a minimum grade of C.
4) Have done the key-in for the Research (STK686) on the study plan.
5) Have completed administrative and financial procedures.
6) Submit a research proposal.
7) Have an HSE (Health, Safety, and Environment) workshop certificate.

c. Research Procedures

1) Students are allowed to start writing research proposals when taking the Research Methodology course (one semester before taking the Research).
2) Students are allowed to choose a research supervisor, but the final decision is determined by the Department.
3) Related to point b, if the prospective supervisor agrees to guide the students, the lecturer can provide a letter of recommendation to the Department.
4) Research must be carried out with the approval of the head of the laboratory, attached with a letter of application signed by the supervisor.
5) Experiments in the laboratory must show a laboratory entry permission accompanied by proof of the key-in, the supervisor's decree letter, and proof of the payment.
6) For experiments conducting outside the laboratory of the DChE UII, students must apply to the head of the Department attached with a list of equipment to be used, with the approval from the supervisor.
7) After completing the research, students must submit a laboratory equipment-free letter to the Department. A laboratory equipment free form can be seen in Appendix C.
8) The research is declared to be completed after students submit the research report and conduct the research seminar.
9) The research decree letter does not need to be extended when the research report has been approved by the supervisor.
10) The research report must have a maximum similarity of 30%.
11) Students who have disseminated research results (journals, proceedings, and seminars, both national and international) can be excluded from presenting in the seminar conducted by the Department.
12) Students can disseminate their research results at the seminars or exhibitions held by the DChE UII.

The procedure of the research can be seen in Figure 4.2.

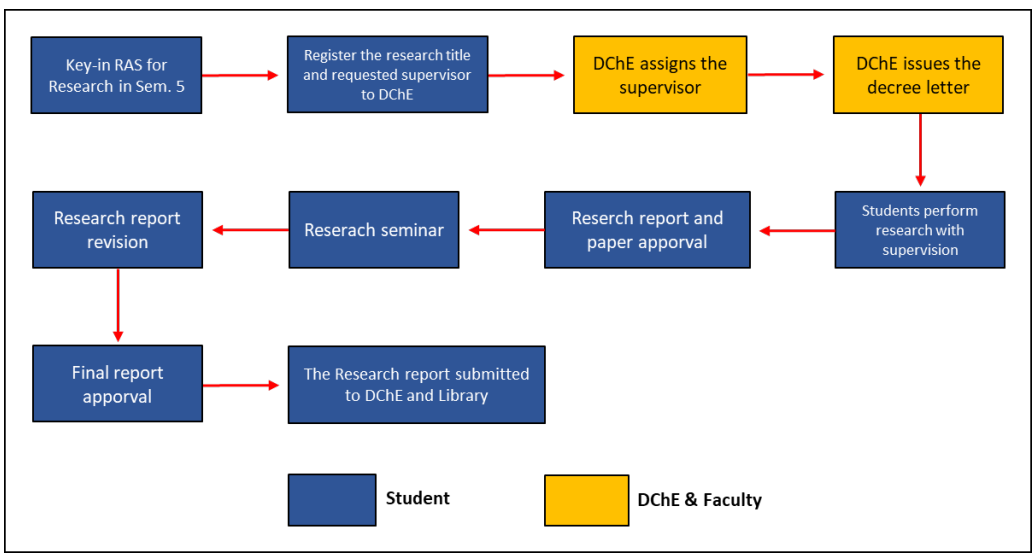


Figure 4.2 Research Procedure

E. Coursework Completion

Students who have been declared as Coursework Completion are only allowed to take Community Service, On-Job Training, Research, Comprehensive Exam, and Final Project and must be listed in the study plan. Students are declared Coursework Completion if they have taken a minimum number of credits other than Community Service, On-Job Training, Research, Comprehensive Exam, and Final Project, with a certain minimum cumulative GPA, a certain maximum number of credits with certain D grades, and certain courses that must get a minimum grade of C, according to the curriculum of the Department.

a. Requirements for Coursework Completion

1) Grade Requirements
   The courses required to have a minimum grade of C are:
   - University courses
   - Laboratory works
2) The minimum number of credits is 135 credits

b. Coursework Completion Procedures

1) Students who want to achieve the Coursework Completion status must apply for the Coursework Completion (*The application form can be taken at the Academic Administration Division*).
2) Students who have excess credits because they take more than two elective courses can apply to the Head of the Department that the excess credits from the Coursework Completion requirement are not considered in determining the cumulative GPA.
3) DChE UII issues a certificate of Coursework Completion.

The students who pass the Coursework Completion are those who meet the following requirements:

a. Administrative Requirements:
   1) Registered as an active student of the DChE UII in the semester of the "Judicium" by attaching a copy of the receipt for the tuition fee payment in the semester of the Coursework Completion.
   2) Have paid the Catur Dharma Fund.

b. Academic Requirements
   1) Have taken all courses.
   2) The grades of university courses and all laboratory works must be at least C.
   3) There is no E grade.
   4) The minimum GPA of 2.25.

Attention:

- *Students who are declared Coursework Completion are not allowed to take courses in the Regular Semester.*
- *Students who have been declared Coursework Completion are not allowed to return to the non-Coursework Completion status.*

F. Final Project: Chemical Plant Design Project

The Final Project, Chemical Plant Design Project, is used to assess the level of students' understanding and applying the knowledge in chemical engineering. With high reasoning and improvisation, the students could comprehensively apply all the theory and skills of chemical engineering into a *preliminary chemical plant design*. The design process is the basis for building a complete plant and the responsibility of chemical engineering graduates before it is developed into plant design, which involves other disciplines.

a. The Final Project Terms

1) The Final Project, the Chemical Plant Design Project, is compulsory as one of the requirements for obtaining a bachelor's degree.
2) The Final Project is a student's independent task that comprehensively applies all the theory and skills of chemical engineering into a plant design.
3) The Final Project is carried out by a maximum of two students with one title.

b. Criteria for The Final Project

1) The process technology used in the Final Project is taken from papers and handbooks that are 20 years old at the most. There is no time limit for references in the form of patents.
2) The title of the Final Project must contain the product, raw materials, process technology, and capacity. All components of the title should not be repeated for at least the last two years.
3) The supervisor is obliged to check the similarity of the Final Project manuscript.

c. The Final Project Requirements

The students who are taking the Final Project must meet the following requirements:

1) Registered as an active student of the DChE UII.
2) Have taken 120 credits, with a minimum GPA of 2.25.
3) Have done the key-in for the Chemical Plant Design Project (STK853).
4) Have completed the administrative procedures for the Final Project.

d. Procedure for the Final Project Submission

The procedures for submitting the Final Project are as follows:

1) The students have done the key-in for the Chemical Plant Design Project (STK853).
2) The students have paid the Final Project fee.
3) The students register at https://simtekim-uii.id/

e. Guidance of the Final Project

1) The Final Project's supervisor may consist of a single supervisor or two supervisors (consisting of the main supervisor and an accompanying supervisor).
2) The number of students per supervisor is reasonably allocated by the Department.

3) The supervisor decree letter must be given to the supervisor before the student starts carrying out the Final Project.
4) The students are deserved to consult with the supervisors at least eight times in which each consultation must be reported in a Consultation Card form (Appendix D).
5) The maximum consultation period is six months starting from the date of the decree letter. If more than six months, the students must apply for an extension of the Final Project starting from the beginning. The maximum extension is once. If the students have not finished after one extension, the students are required to change the supervisor and change the title.
6) The fee for renewing the decree letter is double the normal one.
7) The appointed supervisor cannot be replaced, except:
   - The supervisor is not willing to supervise, or
   - The supervisor is permanently unable to attend.
8) If there is a group change in the middle of the final project, the title of the previous final project is then canceled, each student is therefore required to use a new title with the approval of the previous supervisor.

A more concise flow of the Final Project can be seen in Figure 4.3.

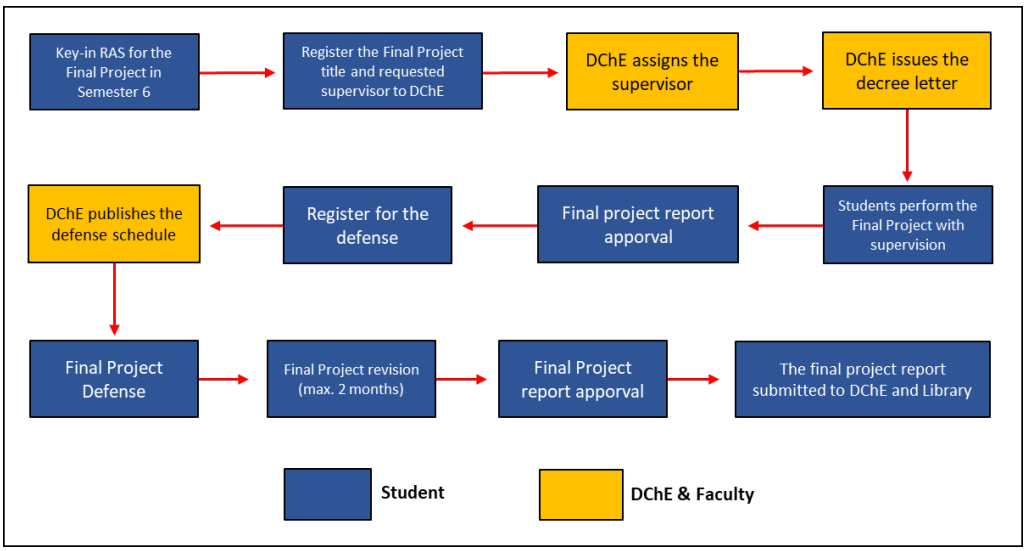


Figure 4.3 Final Project Procedure

G. Comprehensive Exam

The requirements for taking the comprehensive exam:

a. Students have done the key-in for the Comprehensive Exam (STK854).
b. Students have taken a minimum of 120 credits.
c. Students pass the exam if they get a minimum value of C.
d. Students who have received a B grade are not allowed to repeat the comprehensive exam.
e. An IDR 50,000.00 charge is applied for students who want to repeat the exam.

H. Defense

After completing the Final Project, the student must conduct a defense with the following requirements:

a. Have been stated Course Completion.
b. Have taken the Community Service with a minimum value of C.
c. Submit the proof that the Final Project has been completed.
d. Submit the CEPT certificate with a minimum score of 422 or a TOEFL PBT score of min. 425, or a TOEFL @ iBT score of min. 38 or an IELTS score of min. 4.
e. Submit 3 copies of the thesis that have been signed by the supervisor.
f. Have passed BTAQ, ONDI, and LKID.
g. Two copies of the legalized high school diploma.
h. One copy of legalized Birth Certificate.
i. Copy of information on completion of research (if any).
j. Copy of the final project consultation form.
k. Receipt of defense payment from the Bank.
l. Receipt of tuition fee payment.
m. Five 4 x 6 sized photographs with UII blue background (male with ties and female wearing veil).
n. Copy of academic transcripts.
o. Copy of OJT grade.
p. Copy of the research seminar grade.
q. Have passed the comprehensive examination.

I. Judicium

Before graduation, students must pass the Judicium with the following requirements:

a. Students have completed the Final Project report and have submitted the report to the Library and the Department.
b. Students submit all documents to the Academic Administration Division consisting of two 3x4 sized photos, four 4x6 sized photos, a copy of high school diplomas, a copy of birth certificates, and the final project grade.
c. Students fill in the personal data verification form, check the correctness of the data in the system, and preview the transcript of the study.

J. Graduation

The following documents must be submitted during registration:

a. Graduate Registration form which has been affixed with two 4×6 sized and three 2×3 sized photos.
b. Toga Lending form (to be filled even though you don't borrow it.

All documents below need to be attached:

a. Payment proof of Graduation fee from the Bank (2 copies).
b. Copy of CEPT certificate from CILACS UII.
c. Library free certificate from the Directorate of Library UII.
d. Copy of the Final Project approval sheet signed by the Dean/Head of Department.
e. All documents are submitted to the Academic Directorate of UII.

K. Warning Concerning Academic Misconduct

The International Program expects all students and staff to act with honesty and integrity in all matters. That means being truthful and recognizing the intellectual ownership of

other people's words, ideas, research findings, and information is a must. Failure to do so is academically dishonest and may incur a range of penalties. Academic misconduct includes the following:

- Plagiarism,
- Collusion or collaboration,
- Cheating, and/or
- Forging a signature of authorization or falsifying information on an official academic document.

PLAGIARISM

Plagiarism is the use of another person's ideas or expressions without appropriate acknowledgment and presenting these ideas or forms of expression as your own. It includes not only written works such as books or journals, but also data or images that may be presented in tables, diagrams, designs, plans, photographs, film, music, formulae, websites, and computer programs. Plagiarism includes the use of the work of lecturers or other students' work as your own without acknowledgment. Self-plagiarism is the reuse of your work without indicating that you have reused it.

COLLUSION AND COLLABORATION

Collusion involves working with others to deceive examiners about who completed the work. For example, if a student employs someone else to do their work for them, that would constitute collusion. Or if one student willingly allows another student to copy their work for an individual assessment task, that would constitute collusion. In that case, both students may have committed an academic offense. Collusion is not the same as collaboration. Collaboration is working together on a task; collusion is doing so in an unauthorized manner. What is authorized varies from task to task. For example, collaboration is allowed or expected on many assignments, such as group work, but for other tasks, such as exams and some in-class or online tests, no collaboration is allowed. If you have any doubt about what constitutes authorized and unauthorized collaboration on a particular task, you should consult IP management.

CHEATING

Cheating is defined as fraud, deceit, or dishonesty in an academic exam, or using or attempting to use materials, or assisting others in using materials that are prohibited or inappropriate in the context of the examination. Here are some examples of cheating:

- Communicating answers with another person during an exam.
- Preprogramming a calculator, smartphone, Ipad, Tab, or similar device to contain answers or using other unauthorized information for exams.
- Using unauthorized materials, prepared answers, written notes, or concealed information during an exam.
- Taking an exam for another person or having someone take an exam for you.

FORGING A SIGNATURE OF AUTHORIZATION OR FALSIFYING INFORMATION ON AN OFFICIAL ACADEMIC DOCUMENT

Forging a signature of authorization is an act of faking someone else's signature without permission or making a false document without authorization and using it for completing certain academic requirements, for example, forging a TOEFL certificate and using it as if it was authentic and official to fulfill the requirements for a comprehensive or thesis exam registration.

ASSIGNMENT ATTACHMENT SHEET (PLAGIARISM/COLLUSION DECLARATION)

For each assignment submitted, IP students must attach an official assignment attachment sheet which includes the

PENALTIES FOR ACADEMIC MISCONDUCT

You must exercise considerable care in your writing to ensure that you do not use another person's ideas or words in a way that would suggest that they are your own. Whether unintentional or deliberate, any form of academic misconduct is unacceptable and can lead to the following consequences:

- First warning: A firm warning and cautioning of the student allowing a resubmission of an assessment task
- Second warning: Allocated a zero mark for the assessment task
- Third warning: A zero mark for the subject, or
- Suspension from any academic activity for at least one semester

Important Notes:

All academic misconduct cases will be assessed by the IP Academic Honorary Board, consisting of members from IP management and academic teaching staff.

With the issuance of the International Program Academic Guidebook 2023/2024, all provisions and regulations listed in the previous Academic Guidebook are declared invalid if they do not conflict with the provisions and regulations of the Universitas Islam Indonesia.

APPENDICES

Appendix A. List of DChE UII Lecturers


Achmad Chafidz Mas Sahid, S.T., M.Sc.


Ajeng Yulianti Dwi Lestari, S.T., M.T.


Ariany Zulkania, S.T., M.Eng.


Dr. Arif Hidayat, S.T., M.T.


Aris Sugiharto, S.Teks. M.M.


Cholila Tamzysi, S.T., M.Eng.


Dr. Diana, ST., M.Sc.


Dr. Dyah Retno Sawitri, S.T, M.Eng.


Fadilla Noor Rahma, S.T., M.Sc.


Dr. Farham HM Saleh, Ir., MSIE.


Ifa Puspasari, S.T., M.Eng., Ph.D.


Dr. Khamdan Cahyari, ST., M.Sc.


Lilis Kistriyani, S.T., M.Eng.


Lucky Wahyu Nuzulia, S.T., M.Eng.


Muflih Arisa Adnan, S.T., M.Sc.


Nur Indah Fajar Mukti, S.T., M.Eng.


Sholeh Ma'mun, S.T., M.T., Ph.D.


Dr. Suharno Rusdi


Tintin Mutiara, S.T., M.Eng.


Umi Rofiqah, S.T., M.T.


Venitalitya Alethea Sari Augustia, S.T., M.T.


Alinda Fitrotun Nisya, S.T., M.Eng.

Appendix B. Course Syllabi

MAIN COURSES

SEMESTER 1

UNIVERSITAS ISLAM INDONESIA	DEPARTMENT OF CHEMICAL ENGINEERING	Syllabus			
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1. Course Identity			
Course Name / Block	Islamic Religion		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	UNI600	Credits	2
Group	University	Mandatory/Optional	Mandatory
Semester	1	Availability	Open inside university
Method	Class	Media	Blended
Classes / Block	General Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator			

2. Course / Block Descriptions
The Islamic Religion course is scheduled to be taken by students in the first semester with 2 credits and is a compulsory subject with no prerequisites. This course aims to develop and develop an attitude of piety to God Almighty by carrying out His Shari'a in daily life and upholding Islamic morals and universal ethics. This course is recommended to use reflective learning and contextual learning methods. Reflective learning is a learning process through reflection, where students reflect on what they have learned with experiences or situations that have been / are being experienced by each student. Contextual learning is a learning process through contextualizing what is learned with real problems that exist in the community both locally, nationally, and internationally.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-1	Be faithful to God Almighty and behave in Islam (honest, disciplined, responsible, and intelligent) in every role, both in the chemical industry and the public	CO-1	Explain the concept of human nature and guidance according to the Qur'an and Hadith
		CO-2	Demonstrate an attitude of piety by carrying out His Shari'a in daily life
		CO-3	Reflecting personal awareness as a Mukmin, Muslim, and Muhsin
SO-3	An ability to be responsible to the community and adhere to professional ethics in solving chemical engineering problems	CO-4	Identify the universal values of goodness and ethics contained in Islamic teachings and critically examine their implementation in the lives of Muslims
		CO-5	Reflecting the suitability of daily personal behavior with Islamic values

4. Course Materials and Main References	
Course Materials	1. Human nature: why do humans have gods? 2. Tawhid 3. Pillars of Faith 4. Pillars of Islam 5. Integration of faith, Islam, and Ikhsan in forming human beings 6. Islamic universal virtues and ethics
References	[1] Tim Penyusun (2016), Pendidikan Agama Islam untuk Perguruan Tinggi, Dirjen Pembelajaran dan Kemahasiswaan Kemenristekdikti RI, https://belmawa.ristekdikti.go.id/2016/12/09/surat-edaran-bahan-ajar-mata-kuliah-wajib-umum/ [2] Ahmad Azhar Basyir,1990 Pendidikan Agama Islam I (Aqidah), Perpustakaan FH UII. [3] Shalih Bin Fauzan bin Abdullah Al- Fauzan, 1999., Kitab Tauhid 1,2 dan 3 , Yogyakarta, Fakultas Ilmu Agama Islam Universitas Islam Indonesia, Pusat Dakwah dan pelayanan Masyarakat [3] Ahmad Azhar Basyir, Manusia dalam Islam [4] DPPAI UII, Aqidah Islam

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1. Course Identity			
Course Name / Block	State Philosophy		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	UNI603	Credits	2
Group	University	Mandatory/Optional	Mandatory
Semester	1	Availability	Open in college
Method	Class	Media	Blended
Classes / Block	General Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator			

2. Course / Block Descriptions
The State Philosophy course is scheduled to be taken by students in the first semester with a weight of 2 credits. This course is a compulsory subject with no prerequisites. This course aims to develop an understanding, appreciation, and application of Pancasila values in various aspects of life for students as prospective Islamic scholars. This course is recommended to use reflective learning and contextual learning methods. Reflective learning is a learning process through reflection, where students reflect on what they have learned with experiences or situations that have been / are being experienced by each student. Contextual learning is a learning process through contextualizing what is learned with real problems that exist in the community both locally, nationally, and internationally.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-1	Be faithful to God Almighty and behave in Islam (honest, disciplined, responsible, and intelligent) in every role, both in the chemical industry and the public.	CO-1	Expressing an understanding attitude towards the ideology of Pancasila and the concept of Indonesian nationality in the life of society, nation and state
		CO-2	Identify and analyze the relationship between the ideology and perspective of Pancasila with the Islamic perspective
		CO-3	Analyzing the comparison between Pancasila ideology and other ideologies
SO-3	An ability to be responsible to the community and adhere to professional ethics in solving chemical engineering problems	CO-4	Reflecting Pancasila as personal values and norms in the context of social, national and state life
		CO-5	Reflecting Pancasila as an ethical system in the context of the development and application of science and technology in the field of study being studied

4. Course Materials and Main References	
Course Materials	1. Pancasila as the ideology and basis of the state 2. Pancasila as an ethical system 3. The relationship between Pancasila and Islamic values 4. Pancasila as a personal view of life
References	[1] Tim Penyusun (2016), Pendidikan Pancasila untuk Perguruan Tinggi, Dirjen Pembelajaran dan Kemahasiswaan Kemenristekdikti RI [2] Dahlan Thaib

UNIVERSITAS ISLAM INDONESIA	DEPARTMENT OF CHEMICAL ENGINEERING	Syllabus			
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1. Course Identity			
Course Name / Block	English		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	UNI606	Credits	2
Group	University	Mandatory/Optional	Mandatory
Semester	1	Availability	Open in college
Method	Class, Practice	Media	Blended
Classes / Block	General Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator			

2. Course / Block Descriptions

The English course in the field of science is scheduled to be taken by students in the first semester with a weight of 2 credits. This course is a compulsory subject with no prerequisites.

This course aims to develop students' basic skills in communicating in English in their respective fields of knowledge, namely explaining the contents of textbooks in English, paragraphs in English about topics in the field of science they are engaged in, as well as speaking actively describing their own profiles in English. effective and impressive with English.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-4	An ability to communicate effectively both verbally and in writing	CO-1	Explain the contents of the textbook in English according to the field of science that is occupied
		CO-2	Write a paragraph in English about a topic in the field of science that is occupied
		CO-3	Active speaking describes the profile of oneself and a topic in the field of science effectively and impressively in English

4. Course Materials and Main References

Course Materials	1. Reading techniques (skimming and scanning) 2. Dictionary usage 3. Text Understanding 4. Text summary 5. Sentence arrangement 6. Paragraph preparation
References	[1] Anker, S., 2010. Real Writing with Reading: Paragraph and Essays for College, Work, and Everyday Life. Boston: Bedford/St. Martin's . [2] Ackert, Patricia. (2004). Reading & Vocabulary Development 3: Cause & Effect. 4th ed. Boston: Thomson Heinle. [3] Brandon, Lee & Brandon, Kelly. (2005). Paragraphs and Essays : with integrated readings (11th edition). USA : Wadsworth

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1. Course Identity

Course Name / Block	Fundamentals of Chemistry		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK111	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	1	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	Basic Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator	Tintin Mutiara, S.T., M.Eng		

2. Course / Block Descriptions

The Fundamentals of Chemistry courses in the Curriculum 2020 are given to first semester students with a weight of 3 credits. This course is a compulsory subject which is a group of basic science courses.

The main objective of this course is to increase students' understanding of the basic concepts of atoms, the Periodic System of Elements, Chemical Bonds and Molecular Structures, Stoichiometry, Solution Concepts, Acid-Base Concepts, and Chemical Equilibrium.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to explain Atomic and Molecular Theory, Periodic System of Elements, Chemical Bonds and Molecular Structure
		CO-2	Students are able to explain the concept of Stoichiometry and Chemical Equilibrium
		CO-3	Students are able to explain the concept of Solutions and Acid-Base

4. Course Materials and Main References

Course Materials	1. Atomic basic concept 2. Periodic System of Elements 3. Chemical Bonds and Molecular Structure 4. Stoichiometry 5. Solution Concept 6. Acid-Base Concept 7. Chemical equilibrium
References	[1] Brady, J.E. General Chemistry : Principle and Structures. 5th edition. New York : John Wiley and Sons. 1990 [2] Brown, LeMay, and Bursten, Chemistry. The Central Science. 7th. Prentice-Hall International. 1994]. [3] Ralph H. Petrucci, General Chemistry: Principle and Modern Application. 10th. Pearson Prentice Hall. 2010

UNIVERSITAS ISLAM INDONESIA	DEPARTMENT OF CHEMICAL ENGINEERING	Syllabus			
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1. Course Identity			
Course Name / Block	Organic Chemistry		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK112	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	1	Availability	Limited in department
Method	Class	Media	Blended
Classes / Block	Basic Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator	Tintin Mutiara, S.T., M.Eng		

2. Course / Block Descriptions

Organic Chemistry Lectures in the 2020 Curriculum are given to first semester students with a weight of 3 credits. This course is a compulsory subject which is a group of basic science courses.

The main objective of this course is to increase students' understanding of the Basic Principles of Organic Reaction Mechanisms, Hydrocarbons (Alkanes, Alkenes, Alkynes, Aromatics), Alcohols and Ethers, Aldehydes and Ketones, Carboxylic Acids and Their Derivatives, Amines, Amino Acids, Carbohydrates, Lipids and Related Natural Products.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to explain the Basic Principles of Organic Reaction Mechanisms
		CO-2	Students are able to explain various groups of organic chemical compounds

4. Course Materials and Main References

Course Materials	1. Basic Principles of Organic Reaction Mechanisms, Hydrocarbons (Alkanes, Alkenes, Alkynes, Aromatics), Alcohols and Ethers, Aldehydes and Ketones, Carboxylic Acids and Their Derivatives, Amines, Amino Acids, Carbohydrates, Lipids and related Natural Products
References	[1] David R. Klein, 2011, Organic Chemistry, Wiley [2] Morrison, R.T. dan R.N. Boyd, 2002, Organic Chemistry, Edisi 6, Prentice Hall [3] Jonathan Clayden, Nick Greeves, Stuart Warren, Peter Wothers, 2000, Organic Chemistry, Oxford University Press, USA [4] Fessenden, Ralp J. dan Fessenden, Joan S., 1997, Kimia Organik 2, Diindonesiakan oleh Aloysius Hadyana Pudjaamaka

UNIVERSITAS ISLAM INDONESIA	DEPARTMENT OF CHEMICAL ENGINEERING	Syllabus			
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1. Course Identity

Course Name / Block	Calculus		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK113	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	1	Availability	Limited in department
Method	Class	Media	Blended
Classes / Block	Basic Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator	Achmad Chafidz Mas Sahid, S.T., M.Sc.		

2. Course / Block Descriptions

Calculus courses in the 2020 curriculum are given to first semester students with a weight of 3 credits. This course is a compulsory subject that is taken without prerequisites.

The main objective of this course is that students are able to identify, formulate, and solve chemical engineering problems using mathematical methods. The concept of knowledge provided related to the topic of Number systems includes concepts and operations of real and complex numbers, Limit functions, Derivatives of various functions and their applications, Calculate integrals, Error functions, Gamma and Beta.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to use real and complex numbers in arithmetic operations
		CO-2	Students are able to solve the problem of limit functions and derivatives
		CO-3	Students are able to solve mathematical problems using the integral method, error function, gamma and beta

4. Course Materials and Main References

Course Materials	1. The number system includes the understanding of real and complex numbers, the basic principles of arithmetic operations on real and complex numbers, inequalities, inequalities and absolute values. 2. Limits of ordinary functions and limits of indefinite functions 3. Derivatives cover the basic principles of constructing derivatives, calculating derivatives for implicit and explicit functions, extreme values of functions and applying derivatives. 4. Integral includes ordinary and certain integrals (the principle of using integrals in determining arc length, plane area and content of rotating objects). 5. Gamma and Beta Functions
References	[1] Ayres, F. (1996) Calculus [Schaum's Outline series], 2nd Edition, Erlangga, Jakarta [2] Stroud, K. A. (2002) Matematika untuk Teknik (diterjemahkan oleh E. Sucipto), Edisi Keempat, Erlangga, Jakarta. [3] Varberg,D, Purcell, E.J., and Rigdon, S.E., 2007, Calculus 9th ed. Prentice Hall Inc.,(alih bahasa: I Nyoman Susila, dkk., 2010, Kalkullus Jilid I , Edisi kesembilan. Erlangga Jakarta)

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1. Course Identity			
Course Name / Block	Fundamentals of Physic		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK114	Credits	4
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	1	Availability	Limited in department
Method	Class	Media	Blended
Classes / Block	Basic Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator	Achmad Chafidz Mas Sahid, S.T., M.Sc.		

2. Course / Block Descriptions

Fundamentals of Physics courses in the Chemical Engineering Curriculum 2020 are given to semester 1 students with a weight of 4 semester credit units (credits). This course is a compulsory subject that is taken without any prerequisite courses.

The Fundamentals of Physics course aims to provide basic knowledge about the concepts of physics, scalar and vector quantities, kinematics, dynamics, momentum, elasticity, fluids, temperature and expansion, heat, electrostatics, electric quantities, electromotive force, magnetism, alternating current. reverse, as well as optics and photometry. With this knowledge, students are expected to have the ability to analyze processes in the world of Chemical Engineering based on a review of the applicable physical laws.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to solve kinematics, dynamics, momentum, elasticity, and fluid problems
		CO-2	Students are able to solve heat energy problems
		CO-3	Students are able to solve problems of electrostatics, electricity and magnetism
		CO-4	Students are able to solve wave and optical problems

4. Course Materials and Main References

Course Materials	1. Physics Concepts; Scalar and Vector Quantities; Kinematics; Dynamics; Momentum; Elasticity; Fluid 2. Temperature and Expansion; Heat 3. Electrostatics; Electric and Magnet 4. Waves and Optics
Main References	[1] Giancoli, D.C., 2013, Physics: Principles with Applications, 7th ed, Pearson, Washington DC [2] Walker, J. S., 2016, Physics, 5th ed, Pearson, Washington DC

SEMESTER 2

UNIVERSITAS ISLAM INDONESIA	DEPARTMENT OF CHEMICAL ENGINEERING	Syllabus			
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1. Course Identity			
Course Name / Block	Islam for Scholar		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	UNI601	Credits	3
Group	University	Mandatory/Optional	Mandatory
Semester	2	Availability	Open in college
Method	Class	Media	Blended
Classes / Block	General Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator			

2. Course / Block Descriptions
The Ulil Albab Islamic (Islam for Shcolar) course is scheduled to be taken by students at the beginning or middle of the learning period with a weight of 3 credits and is a compulsory subject with no prerequisites. This course aims to develop students' abilities to be able to understand and reflect on the concept of insan ulil albab, as well as take lessons from the thoughts of Muslim scholars, the example of the founding leaders of UII, and from the development of Islamic civilization. This course is recommended to use reflective learning and contextual learning methods. Reflective learning is a learning process through reflection, where students reflect on what they have learned with experiences or situations that have been / are being experienced by each student. Contextual learning is a learning process through contextualizing what is learned with real problems that exist in the community both locally, nationally, and internationally.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-1	Be faithful to God Almighty and behave in Islam (honest, disciplined, responsible, and intelligent) in every role, both in the chemical industry and the public	CO-1	Explaining the concept of insan ulil albab based on the Koran and hadith and reflecting on it as an individual in everyday life
		CO-2	Comparing various thoughts in Islam
		CO-3	Identify the factors that support the triumph, collapse, and revival of Islamic civilization peradaban
SO-3	An ability to be responsible to the community and adhere to professional ethics in solving chemical engineering problems	CO-4	Reflecting on the role and example of the founders and leaders of UII, especially leadership and work ethics in order to develop individuals who are knowledgeable and charitable.

4. Course Materials and Main References	
Course Materials	1. Ulil Albab concept 2. Islamic Thought 3. Islamic Civilization 4. The leadership and example of the founders and figures of UII tokoh
References	[1] Tim Penyusun (2016), Pendidikan Agama Islam untuk Perguruan Tinggi, Dirjen Pembelajaran dan Kemahasiswaan Kemenristekdikti RI, https://belmawa.ristekdikti.go.id/2016/12/09/surat-edaran-bahan-ajar-mata-kuliah-wajib-umum/ [2] Antonio, Syafii Muhammad.(2007). Muhammad SAW: The Super Leader Super Manager. Jakarta: ProLM Centre & Tazkia Multimedia. [3] Karim, M. Abdul. (2012). Sejarah Pemikiran Peradaban Islam. Bagaskara: Yogyakarta. [4] Prof. Faisal Ismail, Islam, Doktrin, dan Ilmu Kontemporer Universitas Islam Indonesia. (2015). 9 Windu Universitas Islam Indonesia. Yogyakarta. [5] DPPAI UII, Pemikiran dan Peradaban Islam [6] DPPAI UII, Kepemimpinan dalam Islam

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1. Course Identity			
Course Name / Block	Analytical Chemistry		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK115	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	2	Availability	Limited in department
Method	Class	Media	Blended
Classes / Block	Basic Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator	Lucky Wahyu Nuzulia S, S.T., M.Eng.		

2. Course / Block Descriptions

The Analytical Chemistry course in the Chemical Engineering Curriculum 2020 is given to 2nd semester students with a weight of 3 credits. This course is a compulsory subject that is taken without prerequisites.

The Analytical Chemistry course aims to develop students' ability to identify elements and compounds qualitatively and quantitatively using appropriate analytical methods and instruments.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to perform volumetric and gravimetric analysis and calculations
		CO-2	Students are able to perform conductometric and potentiometric analysis and calculations
		CO-3	Students are able to perform analysis and calculation of electrodeposition and electrochemistry
		CO-4	Students are able to perform thermogravimetric, chromatographic, and spectrophotometric analysis and calculations

4. Course Materials and Main References

Course Materials	1. Introduction to Analytical Chemistry: Principles of Quantitative and Qualitative Analysis, The Role of Chemical Analysis in Industry and Research. 2. Volumetric Analysis: Determination of Indicators, Acidi-Alkalimetry, Oxidimetry, Iodo-Iodimetry, Permanganometri, Argentometry and Complexometry. 3. Gravimetric Analysis 4. Conductometric Analysis 5. Potentiometric Analysis 6. Electrodeposition Analysis 7. Electrochemical Analysis 8. Thermal-Thermogravimetric Analysis 9. Chromatographic Analysis: General Chromatography, Partition Chromatography, Adsorption Chromatography 10. Spectrophotometric Analysis: FTIR and UV-Vis
References	[1] Christian, G.D., 1986, "Analitical Chemistry", 4 ed., John Wiley and Sons, New York. [2] Vogel, A.I., 1953, "Macro and Semimicro Qualitative Inorganic Analysis", 4 ed., Longmans, Green and Co., London. [3] Treadwell, F.P. and Hall, W.T., 1956, "Analytical Chemistry", Volume I, Qualitative Analysis, 5 ed., John Wiley and Sons, Inc., London. [4] Ewing, 1985, "Instrumental Methods of Chemical Analysis", 5 ed., McGraw Hill Book Co., New York.

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1. Course Identity			
Course Name / Block	Physical Chemistry		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK116	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	2	Availability	Limited in department
Method	Class	Media	Blended
Classes / Block	Basic Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator	Lucky Wahyu Nuzulia S, S.T., M.Eng.		

2. Course / Block Descriptions

Physical Chemistry courses in the Chemical Engineering Curriculum 2020 are given to 2nd semester students with a weight of 3 credits. This course is a compulsory subject that is taken without prerequisites.

The Physical Chemistry course aims to develop students' abilities to be able to analyze phenomena in chemical processes by applying the basic principles of the concept of gas and liquid properties, phase equilibrium, surface phenomena, colligative solutions, colloids, and thermochemistry.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to solve ideal gas and real gas problems
		CO-2	Students are able to apply thermochemical concepts in determining the nature of chemical reactions
		CO-3	Students are able to explain the concept of phase equilibrium
		CO-4	Students are able to explain the colligative properties of solutions and the properties of colloids
		CO-5	Students are able to explain surface phenomena that occur in chemical processes

4. Course Materials and Main References

Course Materials

1. Ideal Gases: Phase Properties of Substances, Equations of State, Boyle's Law, Charles' Law, Gay Lussac's Law, Avogadro's Law, Dalton's Law.
2. Real Gases: Molecular Interactions, Compression Factors, Virial Coefficients, Condensation, Critical Constants, Van Der Waals Equations.
3. Phase Equilibrium: Physical Equilibrium, Phase Rules, Fundamental Laws of Phase Equilibrium, Phase Equilibrium of Ideal and Non-ideal Systems, Coefficient of Fugasity and Activity.
4. Thermochemistry: Standard Enthalpy of Formation, Reaction Enthalpy, enthalpy of physical and chemical change, standard molar enthalpy, enthalpy of reaction at a certain temperature and Hess's Law.
5. Colligative Solutions: Boiling Point Increase, Freezing Point Decrease, Vapor Pressure Decrease, Osmotic Pressure and Raoult's Law.
6. Colloids: Colloidal Properties, Emulsion Theory, Dialysis, Osmotic Pressure, Coagulation and Granulation, Colloid Manufacturing Process.
7. Surface Phenomena: Surface Chemistry Theory, Interface Concepts, Surface Tension, Physical Adsorption, Chemical Adsorption and Isothermal Adsorption.

References

[1] Alberty, R.A., dan Silbey, R. J., 1992, *Physical Chemistry*, New York, John Wiley & Sons.
[2] Atkins, P. W., 1990, *Physical Chemistry*, Oxford University Press.
[3] Moore, W.J., 1955, *Physical Chemistry*, 2 ed., Prentice Hall, Inc., New York.
[4] Blasstow, S., and Lewis, D., 1960, *Element of Physical Chemistry*, 2 ed., Van Nostrand comp., Inc., New York.

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1. Course Identity

Course Name / Block	Linear Algebra		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK117	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	2	Availability	Limited in department
Method	Class	Media	Blended
Classes / Block	Basic Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator	Achmad Chafidz Mas Sahid, S.T., M.Sc.		

2. Course / Block Descriptions

Linear Algebra courses in the 2020 Chemical Engineering Study Program Curriculum are given to 2nd semester students with a weight of 3 credits. This course is a compulsory subject that is taken without course prerequisites.

Linear algebra course aims to provide basic knowledge about Operations with vectors, matrices, determinants, and solving linear equations. With this course, students are expected to have basic knowledge to identify, formulate, and solve problems in chemical engineering.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to solve a system of linear equations (SPL) using the Gauss/Gauss Jordan elimination method and the matrix and determinant method
		CO-2	Students are able to explain the concept of vectors and their operations
		CO-3	Students are able to determine eigenvalue and eigenvector

4. Course Materials and Main References

Course Materials	1. System of linear equations 2. Gauss/Jordan . elimination 3. Matrix and Determinants 4. Vector 5. Eigenvalue and eigenvector
References	[1] Stephen Boyd, Lieven Vandenberghe, 2016, Introduction to Applied Linear Algebra – Vectors, Matrices, and Least Square, Cambridge University Press [2] David C. Lay, Steven R. Laym Judi J. McDonald, 2016, Linear Algebra and Its Applications 5th, Pearson

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1. Course Identity			
Course Name / Block	Introduction to Chemical Engineering		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK231	Credits	2
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	2	Availability	Limited in department
Method	Class	Media	Blended
Classes / Block	Basic Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator	Umi Rofiqah, S.T., M.T.		

2. Course / Block Descriptions

The Introduction to Chemical Engineering course in the 2020 Chemical Engineering Curriculum is given to 2nd semester students with a weight of 2 credits. This course is a compulsory subject that is taken without course prerequisites.

The Introduction to Chemical Engineering course aims to support providing knowledge about 1) understanding and history of chemical engineering, 2) profile, employment and contributions of chemical engineering, 3) professional code of ethics for chemical engineering, 4) basic calculus in chemical engineering, 5) chemical engineering processes. chemical engineering processes and process variables, 6) introduction of process flow diagrams (Input-Output, BFD, introduction of PFD) and operating modes, 7) chemical engineering equipment. With this knowledge, students are expected to have the ability to recognize and understand the scope of chemical engineering, types of chemical engineering equipment, processes in chemical engineering and process flow in the chemical industry.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to explain the profile, contribution and code of ethics of the chemical engineering profession
		CO-2	Students are able to perform basic chemical engineering calculations: dimensions, units and conversions
		CO-3	Students are able to apply knowledge of chemical industry processes and equipment to create process flow diagrams

4. Course Materials and Main References

Course Materials	1. Definition and history of chemical engineering 2. Profile, employment and contribution of chemical engineering 3. Chemical engineering professional code of ethics 4. Basic calculus in chemical engineering 5. Chemical engineering processes and process variables 6. Introduction to process flow diagrams (Input-Output, BFD, PFD recognition) and operating modes 7. Chemical engineering equipment
References	[1] Himmelblau D.M., Basic Principles and Calculations in Chemical Engineering, Prentice-Hall, Englewood Cliff, New Jersey, 1989. 6th ed [2] Hougen, D. A., K. M. Watson, dan R. A. Ragatz. Material and Energy Balance. Bagian 1 dari Chemical Process Principles. Edisi 2. New York: John Wiley & Sons, 1973. [3] Shreve, R. N. Chemical Process Industries. Edisi 5. Tokyo: McGraw-Hill Book Kogakusha Ltd., 1937.

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1. Course Identity

Course Name / Block	Mass and Energy Balances		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK232	Credits	4
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	2	Availability	Limited in department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Calculus, Fundamental of Chemistry
Lecturer / Supervisory Coordinator	Ifa Puspasari, S.T., M.Eng., Ph.D		

2. Course / Block Descriptions

Mass and Energy Balance Lectures in the 2020 Curriculum are given to 2nd semester students with a weight of 4 credits. This course is a compulsory subject that is taken with the prerequisites having completed the Basic Calculus and Chemistry courses.

The Mass and Energy Balance course introduces basic concepts and methods for subsequent courses in the chemical engineering curriculum. This course focuses on two main principles: 1) conservation of mass, and 2) conservation of energy. The application of these two principles is very important in the design and analysis of chemical engineering systems. This course applies mass conservation to chemical systems in the form of a mass balance. The study of mass balances includes systems in which chemical reactions occur as well as systems consisting of several phases (gases, liquids) at thermodynamic equilibrium. At the end of this course, you will study energy conservation in the form of an energy balance to analyze chemical systems undergoing heating and/or phase changes as well as solving simultaneous mass balance and energy balance problems.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to solve mass balance problems for single units and processing circuits without and with chemical reactions
		CO-2	Students are able to solve energy balance problems for systems without and with chemical reactions
		CO-3	Students are able to solve simultaneous mass balance and energy balance problems

4. Course Materials and Main References

Course Materials	1. Mass balance concept 2. Mass balance for a single unit without a chemical reaction 3. Mass balance for a single unit with chemical and stoichiometric reactions 4. Mass balance for a system consisting of many units 5. Recycle, by pass, purge 6. Terminology related to energy, types of energy, and energy balance concepts 7. Enthalpy change 8. Energy balance for a system without chemical reactions reaksi 9. Energy balance for a system with a chemical reaction 10. Simultaneous mass balance and energy balance
References	[1] Himmelblau, D. M. & Riggs, J. B. (2004). Basic principles and calculations in chemical engineering (7th ed). USA: Bernard Goodwin. [2] Felder, R. M., Rousseau, R. W., & Bullard, L. G. (2015). Elementary principles of chemical processes (4th ed). New York: John Wiley & Sons. [3] Ghasem, N. & Henda, R. (2015). Principles of chemical engineering processes: Material and energy balances (2nd ed). Florida: CRC Press.

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1. Course Identity

Course Name / Block	Fundamentals of Chemistry and Organic Chemistry Lab Work		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK281	Credits	1
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	2	Availability	Limited in department
Method	Laboratory work	Media	Blended
Classes / Block	Basic knowledge	Prerequisite	-
Lecturer / Supervisory Coordinator	Tintin Mutiara, S.T., M.Eng		

2. Course / Block Descriptions

Fundamentals of Chemistry and Organic Chemistry Lab Work in the 2020 Curriculum is given to semester 1 students with a weight of 1 credit.

The main objective of this practicum is to develop students' abilities in applying the theory they have learned in basic chemistry and organic chemistry courses to measure pH, determine physical properties of liquids, determine equilibrium constants, identify functional groups of organic compounds, synthesis and purification of organic compounds, synthesis of compounds. Industrial Organics, Develop tools, perform separation and determine the composition of the mixture, Determination of Reaction Order & Reaction Rate Constants, Isolating natural components.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-11	An ability to design and conduct laboratory and/or field experiments and analyze and interpret data to strengthen technical judgment	CO-1	Students are able to measure the pH of the solution
		CO-2	Students are able to determine the physical properties of liquids and solutions
		CO-3	Students are able to determine the physical quantity of gas
		CO-4	Students are able to determine the thermodynamic equilibrium constant
		CO-5	Students are able to synthesize organic compounds
		CO-6	Students are able to synthesize industrial organic compounds
		CO-7	Students are able to isolate components of natural materials bahan
SO-4	An ability to communicate effectively both verbally and in writing	CO-8	Students are able to compile group practicum reports
SO-6	An ability to work in multidisciplinary and multicultural teams		

4. Course Materials and Main References

Course Materials	1. Measurement of solution pH 2. Partial molal volume 3. Molecular weight of gas 4. Weak acid equilibrium constant 5. Esterification, Nitration, Reduction, Hydrolysis, Substitution 6. Soap making, polymer making, methylsalicylate manufacture 7. Insulation of natural components
References	[1] Tim Penyusun (2020). Praktikum Kimia Dasar dan Organik. Laboratorium Kimia Dasar Prodi Teknik Kimia Universitas Islam Indonesia. Tidak diterbitkan.

SEMESTER 3

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1. Course Identity			
Course Name / Block	Islam Rahmatan Lil Alamin		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	UNI602	Credits	3
Group	University	Mandatory/Optional	Mandatory
Semester	3	Availability	Open in college
Method	Class	Media	Blended
Classes / Block	General Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator			

2. Course / Block Descriptions
The Islamic Rahmatan lil Alamin course is scheduled to be taken by students in the middle or end of the learning period with a weight of 3 credits and is a compulsory subject with no prerequisites. This course aims to develop students' abilities to be able to integrate Islamic values into the science they are engaged in and to formulate personal contributions in the field of science they are engaged in for the advancement of Islamic civilization in the present and in the future. This course is recommended to use reflective learning and contextual learning methods. Reflective learning is a learning process through reflection, where students reflect on what they have learned with experiences or situations that have been/is being experienced by each student. Contextual learning is a learning process through contextualizing what is learned with real problems that exist in society both nationally, nationally and internationally.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-1	Be faithful to God Almighty and behave in Islam (honest, disciplined, responsible, and intelligent) in every role, both in the chemical industry and the public	CO-1	Students are able to explain the concept of Islam Rahmatan Lil Alamin based on the Al-Quran and Hadith
		CO-2	Students are able to explain the interaction of Islamic values with the field of science they are engaged in
		CO-3	Students are able to show thoughts, products and/or performance which are the embodiment of the results of the integration of Islamic values in the field of science they are engaged in.
SO-3	An ability to be responsible to the community and adhere to professional ethics in solving chemical engineering problems	CO-4	Students are able to grow a proactive attitude and pride as a Muslim / Muslimah
		CO-5	Students are able to formulate personal contributions in the field of science that they are engaged in within the scope of the surrounding environment for the advancement of Islamic civilization

4. Course Materials and Main References	
Course Materials	1. Konsep rahmatan lil alamin 2. Islam Tematik : Islam dalam disiplin ilmu 3. Problematika umat kontemporer
References	[1] Tim Penyusun (2016), Pendidikan Agama Islam untuk Perguruan Tinggi, Dirjen Pembelajaran dan Kemahasiswaan Kemenristekdikti RI, https://belmawa.ristekdikti.go.id/2016/12/09/surat-edaran-bahan-ajar-mata-kuliah-wajib-umum/ [2] Fazlur Rahman, (1985). Islam dan Modernitas, Tentang Tranformasi Intelektual. [3] Fazlur Rahman, Islam, terj. Ahsin Muhammad. Pustaka Bandung. [4] Nurcholish Madjid, Islam Doktrin dan Peradaban [5] Quraish Shihab, Membumikan Al-Quran [6] Hamim Ilyas, Fikih Akbar : Prinsip-prinsip Teologis Islam Rahmatan lil 'Alamin Kuntowijaya, Islam sebagai Ilmu

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1. Course Identity			
Course Name / Block	Citizenship Education		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	UNI604	Credits	2
Group	University	Mandatory/Optional	Mandatory
Semester	3	Availability	Open in college
Method	Class	Media	Blended
Classes / Block	General Knowledges	Prerequisite	-
Lecturer / Supervisory Coordinator			

2. Course / Block Descriptions

The Citizenship Education course is scheduled to be taken by students in the middle of the learning period or the final semester with a weight of 2 credits and is a compulsory subject with no prerequisites. This course aims to develop students' abilities as citizens in terms of civic knowledge, civic skills, and civic dispositions. . Civic knowledge is related to the content or what citizens should know. Civic skills are what skills citizens should have which include intellectual skills and participation skills, while civic dispositions are related to the private and public characters of citizens that need to be maintained and improved.

This course is recommended to use reflective learning and contextual learning methods. Reflective learning is a learning process through reflection, where students reflect on what they have learned with experiences or situations that have been/is being experienced by each student. Contextual learning is a learning process through contextualizing what is learned with real problems that exist in the community both locally, nationally, and internationally.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-1	Be faithful to God Almighty and behave in Islam (honest, disciplined, responsible, and intelligent) in every role, both in the chemical industry and the public	CO-1	Able to demonstrate an attitude as an intelligent and responsible citizen based on Islamic and Indonesian values
		CO-2	Have a moderate view (ummatan wasathan) as a citizen in implementing national insight
		CO-3	Able to identify and reflect on personal roles, as well as develop alternative solutions to contemporary national problems

4. Course Materials and Main References

Course Materials	1. Civic knowledge: knowledge of citizens 2. Civic skills: intellectual skills and participation of citizens 3. Civic disposition: private and public character of citizens
References	[1] Tim Penyusun (2016), Pendidikan Kewarganegaraan untuk Perguruan Tinggi, Dirjen Pembelajaran dan Kemahasiswaan Kemenristekdikti RI [2] Sabirin Mailan dan Suparman Marzuki (2003), Pendidikan kewarganegaraan dan hak asasi manusia, UII Press

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1. Course Identity			
Course Name / Block	Chemical Engineering Thermodynamics		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK333	Credits	4
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	3	Availability	Limited inside department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Mass and Energy Balances
Lecturer / Supervisory Coordinator	Dr. Khamdan Cahyari, ST, M.Sc.		

2. Course / Block Descriptions

The Chemical Engineering Thermodynamics course in the Chemical Engineering Curriculum 2020 is given to 3rd semester students with a weight of 4 semester credit units (credits). This course is a compulsory subject that is taken without any prerequisite courses.

The Chemical Engineering Thermodynamics course aims to provide basic knowledge about the principle of conservation of energy, the laws of thermodynamics, thermodynamics of flow processes, thermodynamic properties of fluids, heat effects, energy generation from heat, refrigeration, phase balance and chemistry. With this knowledge, students are expected to have the ability to analyze processes in the world of Chemical Engineering based on Thermodynamics.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to explain and implement the laws and properties of thermodynamics
		CO-2	Students are able to explain and implement the concept of cycle thermodynamics
		CO-3	Students are able to explain and implement phase equilibrium and chemical equilibrium

4. Course Materials and Main References

Course Materials	1. Review of Primary and Secondary Quantities 2. I and II Laws of Thermodynamics 3. Volumetric Properties of Pure Fluids 4. Heat Effects 5. Thermodynamic Properties of Fluids 6. Applications of Thermodynamics in Process Flow 7. Energy Production from Heat (Heat Engine) 8. Refrigeration and Liquefaction 9. Phase Equilibrium 10. Chemical equilibrium
References	[1] Smith, J.M., Van Ness, H.C., Abbott, M.M., Swihart, M.T., 2018, Introduction to Chemical Engineering Thermodynamics, 8th ed., Mc-Graw Hill Education, New York.

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1. Course Identity			
Course Name / Block	Chemical Engineering Mathematics		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK334	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	3	Availability	Limited inside department
Method	Class	Media	Blended
Classes / Block	Basic Knowledge	Prerequisite	Calculus, Linear Algebra
Lecturer / Supervisory Coordinator	Sholeh Ma'mun, S.T., M.T., Ph.D.		

2. Course / Block Descriptions
The Chemical Engineering Mathematics course in the 2020 Chemical Engineering Study Program Curriculum is given to 3rd semester students with a weight of 3 credits. This course is a compulsory subject that is taken with prerequisite courses in Calculus and Linear Algebra. The Chemical Engineering Mathematics course aims to provide knowledge about the mechanism of solving ordinary and partial differential equations with certain methods.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to compose and solve mathematical equations for simple physical events
		CO-2	Students are able to compile and solve Ordinary Differential Equations (GDP) with the appropriate method
		CO-3	Students are able to compose and solve Partial Differential Equations (PDP) with the appropriate method

4. Course Materials and Main References	
Course Materials	1. Formulation and solving of mathematical equations for simple physical events 2. Ordinary Differential Equation (GDP) Basic concepts of GDP, linearity, IVP and variable separation pemisahan Exact GDP, integral factor, homogeneous and non-homogeneous Series method Bessel and Legendre functions Laplace Transform 3. Partial Differential Equation (PDP) Basic concepts and preparation of PDP with variable changes and implicit functions Solution with variable combination Solution with variable separation Solving with Laplace Transform
References	[1] Kreyszig, E.; Kreyszig, H., and Norminton, E.J. 2011. Advanced Engineering Mathematics 10th ed., John Wiley & Son, Inc., NJ, USA [2] Zill, D.G. 2013. A First Course in Differential Equations with Modeling Applications 10th Ed., Boston, USA.

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1. Course Identity			
Course Name / Block	Fluid Mechanics and Particles		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK335	Credits	4
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	3	Availability	Limited inside department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	-
Lecturer / Supervisory Coordinator	Lilis Kistriyani, S.T., M.Eng.		

2. Course / Block Descriptions

The Fluid Mechanics and Particles Lecture in the 2020 Curriculum is given to 3rd semester students with a weight of 4 credits. This course is a compulsory subject that is taken without any previous prerequisites.

The main objective of this course is to develop students' abilities in designing fluid transportation equipment, designing solid transportation equipment, completing performance calculations of solid-liquid separation equipment and solid-material handling equipment.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-9	An ability to design chemical processes, process systems, and industrial equipment to meet the expected needs within realistic constraints, such as legal, economic, environmental, social, political, health and safety, sustainability, and to recognize and/or utilize the potential of local and national resources with global insight	CO-1	Students are able to explain the concept of fluid flow and apply it to design fluid transportation equipment
		CO-2	Students are able to explain operations and design mixing and mixing equipment
		CO-3	Students are able to explain operations and design solid-liquid separation devices
		CO-4	Students are able to explain the basic concepts of handling solid materials and designing solid transportation equipment

4. Course Materials and Main References

Course Materials	1. Fluid properties 2. Fluid flow through pipes (Pipes, connections, and valves), 3. Fluid flow meter 4. Fluid transportation equipment (pumps, compressors) 5. Stirring and mixing, 6. filtration, 7. sedimentation, 8. Crystallization 9. Size reduction 10. Screening 11. Solid material transportation equipment (Conveyor, Bucket elevator)
References	[1] Brown, G.G., 1959,"Unit Operation.", edisi ke 4 , John Wiley & Sons, New York [2] McCabe, W.L., Smith, J.L., Harriot, P., 2004, "Unit Operation of Chemical Engineering, 7th ed, Mc GrawHill Book, NewYork [3] Foust, A.S., 1980, "Principle of Unit Operation", 2nd ed, John Wiley & Sons, New York [4] Perry, R.H. and Green, D.W., 2018, "Perry's Chemical Engineer's Handbook", 9th ed, McGraw Hill.

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1. Course Identity			
Course Name / Block	Chemical Reaction Engineering 1		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK341	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	3	Availability	Limited inside department
Method	Class	Media	Fundamentals of Chemistry
Classes / Block	Engineering	Prerequisite	-
Lecturer / Supervisory Coordinator	Dyah Retno Sawitri, S.T., M.Eng.		

2. Course / Block Descriptions

The Chemical Reaction Engineering 1 course in the 2020 Chemical Engineering Curriculum is given to 3rd semester students with a weight of 3 credits. This course is a compulsory subject that is taken with the prerequisites for the Basic Chemistry course.

Chemical Reaction Engineering Course 1 aims to develop students' abilities in analyzing homogeneous reaction kinetics and applying them in reactor design. Knowledge of kinetics and homogeneous reactor design is expected to provide basic skills in chemical plant design.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to explain the concept of chemical stoichiometry and classify the types of chemical reactions and types of reactors
		CO-2	Students are able to explain reaction mechanisms and interpret reaction kinetics data for homogeneous systems
SO-9	An ability to design chemical processes, process systems, and industrial equipment to meet the expected needs within realistic constraints, such as legal, economic, environmental, social, political, health and safety, sustainability, and to recognize and/or utilize the potential of local and national resources with global insight	CO-3	Students are able to design homogeneous reactor

4. Course Materials and Main References

Course Materials	1. Classification of chemical reactions based on the phase involved, reversibility, heat effect, and reaction system 2. Chemical reactor classification 3. Stoichiometry, conversion, selectivity and yield Konsep concepts 4. Mechanism and rate of reaction 5. Homogeneous reaction kinetics data interpretation 6. Design of isothermal and non-isothermal homogeneous reactors (batch, CSTR, PFR) 7. Reactor selection based on performance, operating conditions and configuration
References	[1] Fogler, H.S., 2006, *Element of Chemical Reaction Engineering*, 4th edition, Prentice Hall PTR, New Jersey. [2] Levenspiel, O., 1999, *Chemical Reaction Engineering*, 3rd edition, John Wiley and Sons Inc., New York. [3] Smith, R., 2005, *Chemical Process Design and Integration*, John Wiley and Sons Ltd, West Sussex.

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1. Course Identity			
Course Name / Block	Analytical Chemistry and Organic Chemistry Lab Work		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK382	Credits	1
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	3	Availability	Limited in department
Method	Laboratory work	Media	Blended
Classes / Block	Basic knowledge	Prerequisite	-
Lecturer / Supervisory Coordinator	Lucky Wahyu Nuzulia S, S.T., M.Eng.		

2. Course / Block Descriptions

Analytical Chemistry and Organic Chemistry Lab Work in the Chemical Engineering Curriculum 2020 are given to 2nd semester students with a weight of 1 credit. This course is a mandatory course that is taken at least in conjunction with Analytical Chemistry, Physical Chemistry and Basic Physics.

Practical courses in Analytical Chemistry and Physical Chemistry aim to develop students' abilities to be able to choose appropriate analytical instruments and methods, perform calibrations and measurements with accuracy and precision on a material. Furthermore, this ability will be used to analyze the data obtained based on the relevant theory.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-11	An ability to design and conduct laboratory and/or field experiments and analyze and interpret data to strengthen technical judgment	CO-1	Students are able to perform quantitative analysis and perform calculations to determine the levels of a substance
		CO-2	Students are able to separate and identify substances in a mixture
		CO-3	Students are able to determine the physical properties of liquids and solutions
		CO-4	Students are able to arrange equipment and determine the physical quantity of gas
		CO-5	Students are able to measure electrochemical quantities
SO-4	An ability to communicate effectively both verbally and in writing	CO-6	Students are able to compile group practicum reports
SO-6	An ability to work in multidisciplinary and multicultural teams		

4. Course Materials and Main References

Course Materials	1. Gravimetric, Volumetric, Spectrophotometric Analysis Visible light: FTIR & UV-Vis 2. Chromatography: Paper Chromatography and Gas Chromatography 3. Determination of Refractive Index, Colligative Properties of Solutions (Decreased Freezing Point and Elevation of Boiling Point of Solution), Determination of Viscosity, Determination of Surface Tension 4. Gas Density Determination 5. Measurement of Electrochemical Quantities: Galvanic Cells and Electrolytic Cells
References	[1] Alberty, R.A., dan Silbey, R. J., 1992, *Physical Chemistry*, New York, John Wiley & Sons. [2] Atkins, P. W., 1990, *Physical Chemistry*, Oxford University Press. [3] Christian, G.D., 1986, "Analitical Chemistry", 4 ed., John Wiley and Sons, New York. [4] Vogel, A.I., 1953, "Macro and Semimicro Qualitative Inorganic Analysis", 4 ed., Longmans, Green and Co., London. [5] Ewing, 1985, "Instrumental Methods of Chemical Analysis", 5 ed., McGraw Hill Book Co., New York. [6] Halliday, H., Resnick, R., and Walker, J., 1997, "Fundamentals of Physics. Extended", 5 ed., John Wiley & Sons, Inc., New York. [7] Alonso, M., and Finn, E.J, 1992, "Dasar-Dasar Fisika Universitas", Jilid I dan II, 2 ed. (terj. Prasetyo, L dan Hadi, K), Erlangga, Jakarta. [8] Sears and Zemansky, 1993, "Fisika untuk Universitas", Jakarta.

SEMESTER 4

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1. Course Identity			
Course Name / Block	Sharia Entrepreneurship		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	UNI605	Credits	2
Group	University	Mandatory/Optional	Mandatory
Semester	3	Availability	Open inside university
Method	Class	Media	Blended
Classes / Block	General Knowledge	Prerequisite	-
Lecturer / Supervisory Coordinator			

2. Course / Block Descriptions
The Sharia Entrepreneurship course is scheduled to be taken by students in the third semester with 2 credits. This course is a mandatory subject with no prerequisites. This course aims to develop the spirit of independence, persistence, and entrepreneurship for students. These are necessary for building entrepreneurial characters, such as creativity, innovation, independence, persistence, ability to catch opportunities, and integrity. These qualities are needed for students who want to pursue career as an entrepreneur, as well as the other professions.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-2	An ability to internalize the spirit of independence and entrepreneurship	CO-1	Identify, formulate, and reflect on the character of the Prophet and his companions as muslim entrepreneurs
		CO-2	Identify, formulate, analyze, and develop entrepreneurship opportunities according to Islamic law in the field of interest
		CO-3	Develop business plan concept in accordance with Islamic law in the field of interests

4. Course Materials and Main References	
Course Materials	Development of entrepreneurial interest Entrepreneurship in Islamic perspective Sharia business ethics and law Business feasibility analysis Business model canvas
References	Moh. Mufid (2015), Kaidah Fiqh Ekonomi Syariah : Teori dan Aplikasi Praktis Mustafa Kamal Rokan (2013), Bisnis ala Nabi : Teladan Rasulullah SAW dalam Berbisnis, Penerbit Bunyan Abdullah, Ma'ruf (2012). Wirausaha Berbasis Syari'ah, Cetakan I, Yogyakarta: Aswaja Pressindo Abdurrahman, N.H. (2013). Manajemen Bisnis Syari'ah dan Kewirausahaan. Edisi Pertama. Bandung: CV. Pustaka Setia Ducker, P. (2006). Innovation and Entrepreneurship: Practice and principles, New York: Harper and Row. Johnson. D.K. (2013) The Entrepreneur Mind: 100 Essential Beliefs, Characteristics, and Habits of Elite Entrepreneurs, New York, Johnson Media.Inc

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1. Course Identity

Course Name / Block	Chemical Industrial Processes		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK436	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	4	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	-
Lecturer / Supervisory Coordinator	Umi Rofiqah, S.T., M.T.		

2. Course / Block Descriptions

The Chemical Industrial Processes course is given to the third semester students with 3 credits. This course is a compulsory subject with no course prerequisites.

The Chemical Industrial Processes course aims to provide knowledge about 1) the history, development, characteristics, and types of the chemical industries, 2) the source of raw materials for chemical industries (organic and inorganic compounds), chemical products, and industrial trees. With this knowledge, students are expected to have the ability to explain organic and inorganic products and their production processes.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students have the ability to explain the history, characteristics, and types of the chemical industries
		CO-2	Students have the ability to explain chemical products and industrial trees
SO-12	An ability to understand the need for lifelong learning, including access to knowledge related to relevant contemporary issues	CO-3	Students have the ability to explore the development of the production processes of organic and inorganic compounds in the chemical industry

4. Course Materials and Main References

Course Materials	History and development of chemical industry Characteristics and types of chemical industry Sources of raw materials (organic and inorganic compound) in chemical industry Chemical products and industrial trees Examples of organic chemical industrial processes Examples of inorganic chemical industrial processes
Main References	[1] Hidayat, A., 2004, "Diktat Proses Industri Kimia", Jurusan Teknik Kimia, Fakultas Teknologi Industri Kimia, Universitas Islam Indonesia. [2] Groggins, P.H., 1958, "Unit Process in Organic Synthetic", 5th ed., McGraw-Hill Book Company, New York. [3] Austin, G. T., 1996, "Industri Proses Kimia", alih bahasa. Jasfji, Erlangga. [4] Fathoni, A.Z., 2000, Diktat Proses Pengolahan Gas dan Petrokimia, Jurusan Teknik Kimia, Fakultas Teknologi Industri, Universitas Islam Indonesia, Yogyakarta. [5] Hardjono, A., 2002, Teknologi Minyak Bumi, Gadjah Mada University Press, Yogyakarta. [6] Grant, E.L. Principles of Engieering Economy. New York : John Wiley ad Sons. 1976. [7] Thuesen, H.B. et.all. Engieering Economy. New Delhi : PrenticeHall. 1975.

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1. Course Identity			
Course Name / Block	Materials and Corrosion		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK 437	Credits	2
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	4	Availability	Limited to the department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	-
Lecturer / Supervisory Coordinator	Venitalitya Alethea Sari Augustia, S.T., M.Eng.		

2. Course / Block Descriptions

The Materials and Corrosion course is given to the fourth semester students with 2 credits. This course is a compulsory subject with no prerequisite.

Materials and Corrosion course aims to provide knowledge about the physical and chemical properties of materials, interpretation of phase diagrams and their relationship to metal characteristics, oxidation and corrosion theory, and selection of construction materials. With this knowledge, students are expected to be able to apply the material properties for designing construction materials in the chemical engineering industry.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students have the ability to explain the classification, properties, and phases of engineering materials
		CO-2	Students have the ability to explain about corrosion and degradation that occurs in engineering materials
		CO-3	Students have the ability to choose the appropriate engineering materials in chemical plant design

4. Course Materials and Main References

Course Materials	Introduction to materials science and corrosion Classification of engineering materials Properties of engineering materials (mechanical, thermal, chemical, and physical) Phase diagrams and their relationship to engineering material characteristics Corrosion and degradation of engineering materials Corrosion testing and corrosion resistance Selection of engineering materials
Main References	[1] Callister Jr., W. D., Materials Science and Engineering: An Introduction, 8th ed, John Wiley & Sons, Inc., 2010. [2] R.K. Sinnott. Chemical Engineering An Introduction to Chemical Engineering Design. Pergamon (1983). [3] Brownell L.E. and Young E. H. Process Equipment Design. John Willey & Sons, Inc. 1959.

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1. Course Identity

Course Name / Block	Chemical Reaction Engineering 2		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK442	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	4	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Chemical Reaction Engineering 1
Lecturer / Supervisory Coordinator	Dyah Retno Sawitri, S.T., M.Eng.		

2. Course / Block Descriptions

The Chemical Reaction Engineering 2 course is given to third semester students with 3 credits. This course is a compulsory subject which has the prerequisite of Chemical Reaction Engineering 1 course.

Chemical Reaction Engineering Course 2 aims to develop students' abilities in analyzing heterogeneous reaction kinetics and applying them in reactor design. Knowledge of the kinetics and design of heterogeneous reactors is expected to provide basic skills in chemical plant design.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students have the ability to explain the types of catalysts, stages of catalytic heterogeneous reactions, and catalyst deactivation
		CO-2	Students have the ability to analyze the kinetics of catalytic and non-catalytic heterogeneous reactions
		CO-4	Students have the ability to explain the basic concepts and working principles of membrane reactors and reactive distillation systems
SO-9	An ability to design chemical processes, process systems, and industrial equipment to meet the expected needs within realistic constraints, such as legal, economic, environmental, social, political, health and safety, sustainability, and to recognize and/or utilize the potential of local and national resources with global insight	CO-3	Students have the ability to design catalytic and non-catalytic heterogeneous reactors

4. Course Materials and Main References

Course Materials	Catalytic and non-catalytic heterogeneous reactions Interpretation of heterogeneous reaction kinetics data Catalyst deactivation Catalytic heterogeneous reactor design Non-catalytic heterogeneous reactor design Special topics: membrane reactors and reactive distillation
Main References	[1] Fogler, H.S., 2006, Element of Chemical Reaction Engineering, 4th edition, Prentice Hall PTR, New Jersev. [2] Levenspiel, O., 1999, Chemical Reaction Engineering, 3rd edition, John Wiley and Sons Inc., New York. [3] Harriot, P., 2003, Chemical Reactor Design, Marcel Dekker, Inc., New York.

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1. Course Identity			
Course Name / Block	Mass and Heat Transfer Operation		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK443	Credits	4
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	4	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Mass and Energy Balance
Lecturer / Supervisory Coordinator	Nur Indah Fajar Mukti, S.T., M.Eng.		

2. Course / Block Descriptions
The Mass and Heat Transfer Operation course is given to the fourth semester students with 4 credits. This course is mandatory with the prerequisite of Mass and Energy balance course. The Mass and Heat Transfer Operations course aims to provide students with the ability to analyze cases involving simultaneous heat transfer, mass transfer, and mass and heat transfer, design heat exchangers, mass transfer devices and simultaneous mass and heat transfer devices.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-9	An ability to design chemical processes, process systems, and industrial equipment to meet the expected needs within realistic constraints, such as legal, economic, environmental, social, political, health and safety, sustainability, and to recognize and/or utilize the potential of local and national resources with global insight	CO-1	Students have the ability to explain the concepts and mechanisms of heat transfer and to design heat exchangers.
		CO-2	Students have the ability to explain the concepts and mechanisms of mass transfer and design mass transfer devices (adsorption, absorber, stripper).
		CO-3	Students have the ability to design simultaneous mass and heat transfer devices (humidifier, cooling tower, and dryer).

4. Course Materials and Main References	
Course Materials	Review of heat transfer mechanisms concept: conduction, convection, and radiation. Heat transfer in systems with more than one mechanism: latent heat and sensible heat, LMTD, temperature correction FT, and rule of thumb FT, Overall heat transfer coefficient Heat exchanger design: basic design equations, heat exchanger design algorithm, fouling factor, codes and standards, specific equipment (heater, cooler, condenser, vaporizer, condenser-subcooler, desuperheater-condenser) Review of the mass transfer concept (molecular diffusion, bulk diffusion, mass transfer with one and two layers of film) Mass transfer in isothermal continuous contact system: adsorption, absorber, stripper Simultaneous mass and heat transfer: humidifier, cooling tower, and dryer calculation.
Main References	[1] McCabe, W.L., Smith, J.L., Harriot, P., 2004, "Unit Operation of Chemical Engineering, 7 ed., Mc GrawHill Book, NewYork [2] Treybal, R. E., 1981, "Mass Transfer Operations", 3 ed., McGraw Hill- Book Company, New York. [3] Welty, J.R., Wicks, C.E., and Wilson, R.E., 1990, "Fundamental of Momentum, Heat and Mass Transfer", 3 ed., John Wiley and Sons Inc., New York. [4] Kern, D. Q., 1950, Process Heat Transfer, McGraw-Hill Book Company, New York.

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1. Course Identity			
Course Name / Block	Mathematical Modelling and Numerical Computation		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK444	Credits	4
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	4	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Mass and Energy Balance, Chemical Engineering Mathematics
Lecturer / Supervisory Coordinator	Sholeh Ma'mun, S.T., M.T., Ph.D.		

2. Course / Block Descriptions
The Mathematical Modelling and Numerical Computation course is given to fourth semester students with 4 credits. This course is compulsory with the prerequisites of Mass and Energy Balance and Chemical Engineering Mathematics courses. Mathematical Modeling and Numerical Computing course aims to provide knowledge about the formulation and solution of mathematical models and numerical methods.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students have the ability to formulate and solve mathematical models for process models with algebraic and differential equations systems
		CO-2	Students have the ability to formulate and solve high order polynomial equations, simultaneous linear and non-linear equations with numerical methods
		CO-3	Students have the ability to formulate empirical equations and evaluate parameter values based on available data
		CO-4	Students have the ability to formulate and solve differential equations and numerical integration
SO-8	An ability to identify, formulate, analyze and solve the chemical engineering complex problems	CO-5	Students have the ability to formulate and solve mathematical modeling applications in chemical engineering

4. Course Materials and Main References	
Course Materials	- Formulation of mathematical models in chemical engineering processes: Step-by-step mathematical approach, modeling strategy, and modeling logic Process model with algebraic equations system Process models with systems of differential equations - Formulation and solution of high order polynomial equations: Tabulation Method Bisection method False Regulation Method Function Iteration Method Newton-Raphson method Factorization Method - Formulation and solution of simultaneous linear and non-linear equations: Inverse method and matrix determinant LU. decomposition method Jakobi and Gauss Siedel Iteration Methods Newton Raphson method Multivariable iteration method - Formulation of empirical equations and evaluation of parameter values based on available data - Formulation and solution of ordinary differential equations Euler's Method Runge-Kutta method - Formulation and solution of differentials and numerical integrations: Trapezoid Method Simpson's Method - Chemical Engineering Tools - Introduction to MATLAB - Formulation and solution of mathematical modeling applications in chemical engineering
Main References	[1] Chapra, S.C. and Canale, R.P. 2015. Numerical Methods 7th Ed., Mc Graw-Hill Education, New York, USA [2] Rice, R.G. and Do, D.D. 2012. Applied Mathematics and Modeling for Chemical Engineers 2nd Ed., John Wiley & Sons, Inc., Hoboken, NJ, USA [3] Sediawan, W.B dan Prasetya, A, Pemodelan Matematis dan Penyelesaian Numeris Dalam Teknik Kimia, 1997, Penerbit Andi, Yogyakarta [4] MathWorks, 2013, Introduction to MATLAB

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1. Course Identity			
Course Name / Block	Unit Operation Lab Work 1		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK483	Credits	1
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	4	Availability	Limited to department
Method	Laboratory Experiment	Media	Blended
Classes / Block	Engineering	Prerequisite	Fluid Mechanics and Particles
Lecturer / Supervisory Coordinator	Ifa Puspasari, S.T., M.Eng., PhD.		

2. Course / Block Descriptions

The Unit Operation Lab Work 1 course is given to the fourth semester students with 1 credit. This course is mandatory with the prerequisite of Fluid Mechanics and Particles course.

This course aims to enable students to carry out experiments that produce fundamental information and apply theory to analyze phenomena in chemical engineering physical processes.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-11	An ability to design and conduct laboratory and/or field experiments and analyze and interpret data to strengthen technical judgment	CO-1	Students have the ability to operate fluid flow equipment and perform measurements of variables to determine performance parameters
		CO-2	Students have the ability to operate sieving equipment and measure variables to determine performance parameters
		CO-3	Students have the ability to operate fluid mixing equipment and measure variables to determine performance parameters
		CO-4	Students have the ability to operate filtration equipment and perform measurements of variables to determine performance parameters
		CO-5	Students have the ability to operate sedimentation equipment and measure variables to determine performance parameters
		CO-6	Students have the ability to operate fluidization equipment and measure variables to determine performance parameters
SO-4	An ability to communicate effectively both verbally and in writing	CO-7	Students have the ability to compile laboratory work reports in groups
SO-6	An ability to work in multidisciplinary and multicultural teams		

4. Course Materials and Main References

Course Materials	a. Fluid Flow b. Sieving c. Fluid mixing d. Filtration e. Sedimentation f. Fluidization
Main References	[1] Brown, G.G., 1959, "Unit Operations", 4th ed., John Wiley and Sons, New York. [2] Mc Cabe, W.L., Smith, J. C., and Harriot, P., 2004, "Unit Operations of Chemical Engineering", 7th ed., Mc Graw-Hill Book Co., New York. [3] Treybal, R. E., 1981, "Mass Transfer Operation", 3rd ed., McGraw-Hill Book Co., New York [4] Foust, A.S., 1980, "Principles of Unit Operations", 2nd ed., John Wiley & Sons, New York

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1. Course Identity			
Course Name / Block	Scientific Communication Skill		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	UNI607	Credits	2
Group	University	Mandatory/Optional	Mandatory
Semester	5	Availability	Open inside university
Method	Class, Practice	Media	Blended
Classes / Block	General Knowledge	Prerequisite	-
Lecturer / Supervisory Coordinator			

2. Course / Block Descriptions
The Scientific Communication Skill course is scheduled for fifth semester students with 2 credits. This course is a compulsory subject with no prerequisite. This course aims to develop students' ability to compose writings and make presentations in a coherent and structured academic context and to comply with the General Guidelines for Indonesian spelling, scientific writing, and anti-plagiarism.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-4	An ability to communicate effectively both verbally and in writing	CO-1	Reflecting the use of Indonesian language as Indonesian identity in daily oral and written communication
		CO-2	Compose writings and presentations in a coherent and structured academic context and comply with the General Guidelines for Indonesian Spelling, scientific writing, and anti-plagiarism.
		CO-3	Utilizing technology to support the preparation of academic writings, such as word processing software and citation management software

4. Course Materials and Main References	
Course Materials	Formulation of sentences and paragraphs Academic and non-academic texts General Guidelines for Indonesian Spelling Anti-Plagiarism Preparation of presentation materials
Main References	Direktorat Jendral Pembelajaran dan Kemahasiswaan. (2016). Buku Ajar Mata Kuliah Wajib Umum Bahasa Indonesia : Ekspresi Diri dan Akademik. Direktorat Jendral Pembelajaran dan Kemahasiswaan Kementerian Riset, Teknologi dan Pendidikan Tinggi. Mohammad Noer. (2012). Presentasi Memukau : Bagaimana Menciptakan Presentasi Luar Biasa. www.presentasi.net. Diambil dari http://kilat.presentasi.net/presentasi-memukau.pdf

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1. Course Identity			
Course Name / Block	Engineering Economics		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK521	Credits	2
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	5	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	General Knowledge	Prerequisite	-
Lecturer / Supervisory Coordinator	Ir. Zainus Salimin, M.Si.		

2. Course / Block Descriptions
The Engineering Economics course is given to fifth semester students with 2 credits. This course is a compulsory subject with no prerequisite. The Engineering Economics course aims to provide knowledge about economic analysis for establishing a chemical factory. With this knowledge, students are expected to have the ability to conduct economic analysis and evaluate the feasibility of a chemical plant.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-2	An ability to internalize the spirit of independence and entrepreneurship	CO-1	Students have the ability to explain the concept of money value against time
		CO-2	Students have the ability to calculate fixed investment capital and manufacturing costs as well as to evaluate profits
		CO-3	Students have the ability to carry out feasibility analysis of a chemical plant

4. Course Materials and Main References	
Course Materials	The concept of money value against time Fixed investment capital Manufacturing cost Profit generating ability Profit evaluation Feasibility analysis
Main References	[1] De Garmo. Ekonomi Teknik. Jakarta : Prehallindo. 1999. [2] Grant, E.L. Principles of Engieering Economy. New York : John Wiley ad Sons. 1976. [3] Thuesen, H.B. et.all. Engieering Economy. New Delhi : Prentice-Hall. 1975.

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1. Course Identity			
Course Name / Block	Statistics for Engineering		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK522	Credits	2
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	5	Availability	Limited to department
Method	Class, Case Study	Media	Blended
Classes / Block	Fundamental Knowledge	Prerequisite	-
Lecturer / Supervisory Coordinator	Farham HM. Saleh, Dr. Ir. MSIE		

2. Course / Block Descriptions
The Statistics for Engineering course is given to fifth semester students with 2 credits. This course is a compulsory subject with no prerequisite. The Statistics for Engineering course aims to make students understand statistical terms, process data into information, causality relationship, and analysis of variance.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-11	An ability to design and conduct laboratory and/or field experiments and analyze and interpret data to strengthen technical judgment	CO-1	Students have the ability to explain central tendencies and present data
		CO-2	Students have the ability to perform Regression and Correlation Analysis
		CO-3	Students have the ability to perform Analysis of Variance and Hypothesis Testing

4. Course Materials and Main References	
Course Materials	a. Central Tendency b. Frequency Distribution and Data Presentation c. Regression and Correlation d. Analysis of Variance e. Hypothesis and Hypothesis Test
Main References	[1] Abdul hakim, 2010., Statistika Deskriptif., Penerbit Ekonesia, FE UII Yogyakarta [2] Partino dan Idrus, 2010, Statistik Inferensial, Penerbit Safiria Insania Press, Yogyakarta

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1. Course Identity			
Course Name / Block	Utilities		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK538	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	5	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	-
Lecturer / Supervisory Coordinator	Fadilla Noor Rahma, S.T., M.Sc.		

2. Course / Block Descriptions
The Utility course is given to fifth semester students with 3 credits. This course is a mandatory subject with no prerequisite. The Utilities course aims to provide knowledge about the supply of various utilities in the chemical industry. With this knowledge, students are expected to have the ability to identify utility requirements and design utility supply tools.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students have the ability to identify and calculate utility supply requirements (water, steam, electricity, compressed air, inert gas, cooling and heating fluids)
		CO-2	Students have the ability to explain water treatment systems
		CO-3	Students have the ability to explain the mechanism of steam generation and perform boiler calculation

4. Course Materials and Main References	
Course Materials	Water supply Production of saturated steam and superheated steam Electricity supply Compressed air supply Preparation of inert gas Non-aqueous cooling fluid Non-steam heating fluid
Main References	[1] Colbourne Jeni, Basic Water Treatment, The Royal Society of Chemistry, 2009 [2] Flick Ernest W., Water treatment chemicals, Crest Publising House, 2005 [3] Kitto J. B., Steam: Its Generation and Use, Babcok & Wilcox, 1992

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1. Course Identity			
Course Name / Block	Process Engineering Drawing		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK539	Credits	2
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	5	Availability	Limited to department
Method	Class, Practice	Media	Blended
Classes / Block	Engineering	Prerequisite	-
Lecturer / Supervisory Coordinator	Cholila Tamzysi, S.T., M.Eng. Muflih Arisa Adnan, S.T., M.Sc		

2. Course / Block Descriptions

The Process Engineering Drawing course is given to fifth semester students with 2 credits. This course is a compulsory subject with no prerequisite. The Process Engineering Drawing course aims to provide knowledge about the basics of engineering drawing, Block Flow Diagrams (BFD), Process Flow Diagrams (PFD), Process and Instrumentation Diagrams (P&ID), as well as technical drawings of major equipment in the chemical industry using software for drawing, namely Autocad or Microsoft Visio.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-10	An ability to apply methods, skills, and modern technical tools needed for chemical engineering practices	CO-1	Students are able to explain and utilize the standard rules of process engineering drawings
		CO-2	Students are able to draw Block Flow Diagrams (BFD), Process Flow Diagrams (PFD), and Process and Instrumentation Diagrams (P&ID) systems using appropriate software
		CO-3	Students are able to draw chemical industrial equipment using appropriate software

4. Course Materials and Main References

Course Materials	1. Introduction to process engineering drawing 2. Standard rules of 2D drawing (line, scale, and geometric position) 3. Principles of constructing process diagrams based on operating conditions 4. Introduction of process diagram symbols 5. Introduction to software 6. Design of Block Flow Diagrams (BFD) with software 7. Process Flow Diagram (PFD) design with software 8. Process and Instrumentation Diagram (P&ID) design with software 9. Design of engineering drawings for chemical industry tools with software
Main References	[1] Bernd S. P., Alf Y. (2017). Introduction to AutoCAD 2017 2D and 3D. Newyork: Taylor & Francis [2] R. K. Sinnott. (2013). Coulson and Richardson Chemical Engineering – Volume 6, Chemical Engineering Design (3rd edition). UK: Oxford [3] Austin, D.G. (1979). Chemical Engineering Drawing Symbol. Newyork: John Wiley & Sons

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1. Course Identity			
Course Name / Block	Transport Phenomena		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK545	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	5	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Chemical Engineering Mathematics
Lecturer / Supervisory Coordinator	Nur Indah Fajar Mukti, S.T., M.Eng.		

2. Course / Block Descriptions
The Transport Phenomena course is given to fifth semester students with 3 credits. This course is a compulsory subject with a prerequisite of Chemical Engineering Mathematics course. The Transport Phenomena course aims to provide knowledge about the mechanisms of heat transfer (conduction, convection, and radiation), mass transfer (diffusion, convective mass transfer, etc.) and momentum transfer. With this knowledge, students are expected to have the ability to analyze cases involving heat, mass, and momentum transfer.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to explain basic concepts, as well as compose and complete momentum transfer models
		CO-2	Students are able to explain basic concepts, as well as compose and complete heat transfer models
		CO-3	Students are able to explain basic concepts, as well as compose and complete mass transfer models in steady and unsteady states

4. Course Materials and Main References	
Course Materials	a. Fundamental laws of momentum, heat, and mass transfer b. The basic concepts of heat transfer mechanisms: conduction, convection, and radiation c. The basic concepts of mass transfer mechanisms: diffusion, mass transfer between phases d. Formulation of mass, heat, and momentum transfer equations based on the volume element concept e. Evaluation of physical properties (viscosity, thermal conductivity, diffusivity) based on experimental data
Main References	[1] Cengel, Y. A., 2015, Heat and Mass Transfer: Fundamental and Practical Approach, 5 ed., McGraw Hill Publisher. [2] Bird, R.B., Stewart, W.E., Lightfoot, E.N., 2002, Transport Phenomena, 2 ed., John Wiley & Sons, Inc. [3] Welty, J.R., Wicks, C.E., and Wilson, R.E., 1990, "Fundamental of Momentum, Heat and Mass Transfer", 3 ed., John Wiley and Sons Inc., New York.

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1. Course Identity			
Course Name / Block	Process Equipment Design		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK546	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	5	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Mass and Heat Transfer Operation, Materials and Corrosion
Lecturer / Supervisory Coordinator	Achmad Chafidz Mas Sahid, S.T., M.Sc.		

2. Course / Block Descriptions

The Process Equipment Design course is given to fifth semester students with 3 credits. This course is a compulsory subject with the prerequisites of Mass & Heat Transfer Operation and Materials & Corrosion courses. The Process Equipment Design course aims to provide knowledge about the basic calculations and design of various process equipment in the chemical industry. With this knowledge, students are expected to have the ability to design various chemical industrial process equipment.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-9	An ability to design chemical processes, process systems, and industrial equipment to meet the expected needs within realistic constraints, such as legal, economic, environmental, social, political, health and safety, sustainability, and to recognize and/or utilize the potential of local and national resources with global insight	CO-1	Students are able to design storage tanks and silos or hoppers
		CO-2	Students are able to design decanters, flash drums, and separators
		CO-3	Students are able to perform the mechanical design of distillation tower
		CO-4	Students are able to perform the mechanical design of evaporator

4. Course Materials and Main References

Course Materials	Fundamentals of design and types of process equipment Low and high pressure storage tank design Silo and hopper design Distillation tower design Design of heat exchanger with phase change Design of decanters, flash drums, and separators
Main References	[1] Brownell, L.E., Young, E.H., 1959, Process Equipment Design, John Wiley and Sons Inc., New York. [2] Coulson, J.M., and Richardson, J.F., 2005, Chemical Engineering Design, volume VI, 4th ed., Wheaton and Co. Ltd. [3] Branan, C, 2002, rule of thumb for Chemical Engineers, 3rd ed., Elsevier Exclusive, New York.

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1. Course Identity			
Course Name / Block	Unit Operation Lab Work 2		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK584	Credits	1
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	5	Availability	Limited to department
Method	Laboratory Experiment	Media	Blended
Classes / Block	Engineering	Prerequisite	Unit Operation Lab Work 1, Mass and Heat Transfer Operation
Lecturer / Supervisory Coordinator	Ifa Puspasari, S.T., M.Eng., Ph.D.		

2. Course / Block Descriptions

The Unit Operation Lab Work 2 course is given to fifth semester students with 1 credit. This course is a mandatory subject with the prerequisites of Unit Operation Lab Work 1 and Mass and Heat Transfer Operation courses. This course aims to enable students to carry out experiments that produce fundamental information, apply theory to analyze phenomena in chemical engineering physical processes.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-11	An ability to design and conduct laboratory and/or field experiments and analyze and interpret data to strengthen technical judgment	CO-1	Students are able to operate absorption equipment and measure variables to determine performance parameters
		CO-2	Students are able to operate extraction equipment and perform measurements of variables to determine performance parameters
		CO-3	Students are able to operate distillation equipment and perform measurements of variables to determine performance parameters
		CO-4	Students are able to operate evaporation equipment and perform measurement of variables to determine performance parameters
		CO-5	Students are able to operate drying equipment and perform measurement of variables to determine performance parameters
		CO-6	Students are able to operate heat exchanger equipment and perform measurement of variables to determine performance parameters
		CO-7	Students are able to operate process control equipment and perform measurement of variables to determine performance parameters
SO-4	An ability to communicate effectively both verbally and in writing	CO-8	Students are able to compile laboratory work reports in group
SO-6	An ability to work in multidisciplinary and multicultural teams		

4. Course Materials and Main References

Course Materials	a. Absorption b. Extraction c. Distillation d. Evaporation e. Drying f. Heat exchanger (HE) g. Process control
Main References	[1] Brown, G.G., 1953, "Unit Operations", 4th ed., John Wiley and Sons, New York. [2] Mc Cabe, W.L., Smith, J. C., and Harriot, P., 2001, "Unit Operations of Chemical Engineering", 6th ed., Mc Graw-Hill Book Co., New York. [3] Treybal, R. E., 1981, "Mass Transfer Operation", 3rd ed., McGraw-Hill Book Co., New York [4] Foust, A.S., 1979, "Principles of Unit Operations", 2nd ed., John Wiley & Sons, New York [5] Cengel, Y. dan Ghajar, A., 2015, "Heat and Mass Transfer: Fundamentals and Applications", 5th ed., Mc Graw Hill. [6] Flynn, A.M., Akashige, T., Theodore, L., 2019, "Kern's Process Heat Transfer", 2nd ed., John Wiley and Sons.

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1. Course Identity			
Course Name / Block	Research Methodology		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK585	Credits	2
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	5	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Unit Operation Lab Work 1
Lecturer / Supervisory Coordinator	Ifa Puspasari, S.T., M.Eng., Ph.D.		

2. Course / Block Descriptions

The Research Methodology course is given to fifth semester students with 2 credits. This course is a compulsory subject with a prerequisite of Unit Operation Lab Work 1. The Research Methodology course aims to enable students to design and run experiments as well as analyze and interpret data, provide understanding about contemporary issues, awareness of Islamic values (honest, discipline and professional responsibility) and ethics.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-11	An ability to design and conduct laboratory and/or field experiments and analyze and interpret data to strengthen technical judgment	CO-1	Students are able to prepare research proposals
SO-4	An ability to communicate effectively both verbally and in writing		
SO-4	An ability to communicate effectively both verbally and in writing	CO-2	Students are able to present research proposals

4. Course Materials and Main References

Course Materials	- Research basics - Literature review - Research problem formulation - Research variable - Experimental design - Research proposal - Scientific presentation techniques
Main References	[1] Montgomery, D., Design and Analysis of Experiments. John Wiley & Sons, Inc., 2013. [2] Hasan, I., Analisis Data Penelitian dengan Statistik. Bumi Aksara, 2008. [3] Nazir, M., Metode Penelitian. Ghalia Indonesia, 2003. [4] Arikunto, S., Prosedur Penelitian: Suatu Pendekatan Praktek. Rineka Cipta, 2002. [5] Kumar, R., Research Methodology: A Step-by-step Guide for Beginners. Sage Publication, 1999.

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1. Course Identity			
Course Name / Block	Community Services		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	UNI608	Credits	2
Group	University	Mandatory/Optional	Mandatory
Semester	6	Availability	Open in university
Method	Practice in Community	Media	Blended
Classes / Block	Curricular Task	Prerequisite	Credit points>100, GPA>2.25
Lecturer / Supervisory Coordinator			

2. Course / Block Descriptions
The Community Services course is given for sixth semester students with 2 credits. This course is a mandatory subject with the prerequisites of having completed a minimum of 100 credit points and obtained a minimum GPA of 2.25. This course integrates the learning process through community service activities. Through this course, students learn, perform da'wah, and work in community service and empowerment activities. The implementation of KKN includes all components of Catur Dharma UII (education and learning, research, community service, and Islamic da'wah) which are carried out in interdisciplinary groups.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-1	Be faithful to God Almighty and behave in Islam (honest, discipline, responsibility, and intelligent work) in every role, both in the chemical industry and the public	CO-1	Students are able to do Islamic da'wah bil hal or bil khitabah or bil kitabah
SO-6	An ability to work in multidisciplinary and multicultural teams	CO-2	Students are able to collaborate with other disciplines to plan and implement programs to solve real community problems
SO-3	An ability to be responsible to the community and there to professional ethics in solving chemical engineering problems	CO-3	Students are able to analyze the real potential and problems faced by the community
SO-8	An ability to identify, formulate, analyze and solve the chemical engineering complex problems	CO-4	Students are able to plan, coordinate, implement, and evaluate programs according to the field of science that directly involve the community

4. Course Materials and Main References	
Course Materials	Community service Community empowerment
Main References	Tim Penyusun, 2019, Pedoman Penyelenggaraan Kuliah Kerja Nyata, Pusat KKN Direktorat Penelitian dan Pengabdian Masyarakat Universitas Islam Indonesia.

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1. Course Identity			
Course Name / Block	Industrial Project Management		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK623	Credits	2
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	6	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	General Knowledge	Prerequisite	-
Lecturer / Supervisory Coordinator	Farham HM. Saleh, Dr. Ir. MSIE		

2. Course / Block Descriptions
The Industrial Project Management course is given to sixth semester students with 2 credits. This course is a mandatory subject with no prerequisite. The Industrial Project Management course aims to make students understand how to manage a project, especially in a chemical industry.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-8	An ability to identify, formulate, analyze and solve the chemical engineering complex problems	CO-1	Students are able to explain the Scope of Project Management and Project Planning
		CO-2	Students are able to arrange Project Scheduling and Project Control

4. Course Materials and Main References	
Course Materials	a. Project Management Scope b. Project Planning c. Project Scheduling d. Project Control e. Risk control
Main References	[1] Hegney, j; 2012; Fundamentals of Project Management., Fourth Edition, AMACOM, New York, USA [2] Abrar Husen, 2011., Manajemen Proyek, Edisi Revisi, Penerbit Andi, Yogyakarta

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1. Course Identity			
Course Name / Block	Multi-Stage Operation		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK647	Credits	4
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	6	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Mass and Heat Transfer Operations
Lecturer / Supervisory Coordinator	Lilis Kistriyani, S.T., M.Eng.		

2. Course / Block Descriptions
The Multi-Stage Operation course is given to sixth semester students with 4 credits. This course is a mandatory subject with the prerequisite of Mass and Heat Transfer Operations course. The main objective of this course is to develop students' ability to understand the concept of phase equilibrium, complete performance calculations and select separation process equipment, as well as identify operating modifications and economic considerations of the separation process.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-9	An ability to design chemical processes, process systems, and industrial equipment to meet the expected needs within realistic constraints, such as legal, economic, environmental, social, political, health and safety, sustainability, and to recognize and/or utilize the potential of local and national resources with global insight	CO-1	Students are able to explain the concept of vapor-liquid phase equilibrium and design a distillation tower for binary and multi-component systems
		CO-2	Students are able to explain the concept of vapor-liquid phase equilibrium and design extractors

4. Course Materials and Main References	
Course Materials	1. Principles of separation processes and equipment (distillation, extraction, leaching, etc.) 2. Vapor-liquid phase equilibrium 3. Process calculation for a stage-wise contact distillation tower based on mass balance and phase balance (MccabeThiele method, stage-to-stage calculation) 4. Multicomponent distillation using shortcut method and stage-to-stage calculations. 5. Modification of distillation operation 6. Liquid-liquid phase equilibrium 7. Process calculations for multi-stage extractors assuming phase equilibrium 8. Modification of extraction operation 9. Economic considerations of separation processes
Main References	[1] Purwono, S. Dkk, 2005, "Pengantar Operasi Stage Seimbang", Gadjah Mada University Press, Yogyakarta. [2] Mc Cabe, W.L., Smith, J. C., and Harriot, P., 2004, "Unit Operations of Chemical Engineering", 7th ed., Mc GrawHill Book Co., New York. [3] Sinnott, R.K, 2005, "Coulson and Richardson's Chemical Engineering Series : Chemical Engineering Design", Vol.6, 4th ed, Elsevier [4] Budiman, Arif, 2016, "Distilasi : Teori dan Pengendalian Operasi", Gadjah Mada University Press, Yogyakarta.

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1. Course Identity			
Course Name / Block	Process Control		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK648	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	6	Availability	Limited to department
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Mathematical Modelling and Numerical Computation
Lecturer / Supervisory Coordinator	Ariany Zulkania, S.T., M.Eng.		

2. Course / Block Descriptions

The Process Control course is given to sixth semester students with 3 credits. This course is a mandatory subject with the prerequisite of Mathematical Modelling and Numerical Computation course. The Process Control course aims to provide students with the ability to design chemical process control equipment configurations, develop dynamic models of chemical processes in order to design process control and design feedback control systems.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to develop models and analyze the dynamic behavior of chemical processes
SO-9	An ability to design chemical processes, process systems, and industrial equipment to meet the expected needs within realistic constraints, such as legal, economic, environmental, social, political, health and safety, sustainability, and to recognize and/or utilize the potential of local and national resources with global insight	CO-2	Students are able to design a Feedback Control System

4. Course Materials and Main References

Course Materials	1. Introduction to Process Control in Chemical Engineering. 2. Introduction to dynamic models: Formulation and development of mathematical models, input-output models, degrees of freedom and process control 3. Linearization and Laplace transform: linearization, Laplace transform of some basic functions, derivatives, integrals, inversions 4. Transfer function and Input-output model: SISO and MIMO transfer function, qualitative analysis of response. 5. Dynamic Behavior of First Order System: Transient Response, process model as first order system 6. Dynamic Behavior of Second-Order System: dynamic response, multicapacity process, inherent second-order process, second-order system due to control. 7. Feedback controller: introduction to block diagrams, positive-negative feedback, servo-regulator problems. feedback control concept. development of block diagrams. 8. PUB design: outline design problem, simple performance criteria, "Time-integral" Performance criteria, selection of controller type
Main References	[1] Coughanowr, D.R., 1991, Process System Analysis and Control, New York. [2] Luyben, W.L., 1999. Process Modelling, Simulation, and Control for Chemical Engineers, 2nd Ed., Mc-Graw Hill Publishing Co. [3] Marlin, T.E., 2015. Process Control: Designing Process and Control Systems for Dynamic Performance, 2nd Ed. (http://pc-textbook.mcmaster.ca/) [4] Manurung, R., 2004, Diktat: Pengendalian Proses, ITB, Bandung [5] Stephanopoulos, G., 1984, Chemical Process Control: An Introduction to Theory and Practice, New York.

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1. Course Identity			
Course Name / Block	Bioprocess Technology		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK649	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	6	Availability	Open to other universities
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	-
Lecturer / Supervisory Coordinator	Ajeng Yulianti Dwi Lestari, S.T., M.T.		

2. Course / Block Descriptions
The Bioprocess Technology course is given to sixth semester students with 3 credits. This course is a mandatory subject with no prerequisite. The Bioprocess Technology course aims to provide students with an understanding of cell metabolism, cell cultivation, fermentation technology processes, enzyme and microorganism kinetics, batch bioreactor operation design, bioreactor flow design, and bioprocess safety.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students are able to explain fermentation technology and its supporting units
		CO-2	Students are able to analyze the kinetic data of enzymes and microorganisms
SO-9	An ability to design chemical processes, process systems, and industrial equipment to meet the expected needs within realistic constraints, such as legal, economic, environmental, social, political, health and safety, sustainability, and to recognize and/or utilize the potential of local and national resources with global insight	CO-3	Students are able to design bioreactors

4. Course Materials and Main References	
Course Materials	Cell metabolism Cell Cultivation Fermentation technology process Enzyme and microorganism kinetics Batch bioreactor operation design Flow bioreactor design Bioprocess safety
Main References	1. Pauline M Doran, 2013, Bioprocess Engineering Principles, Elsevier Science Publishing Inc Co. 2. Shijie Liu, 2017, Bioprocess Engineering, Elsevier Science Publishing Inc Co.

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1. Course Identity			
Course Name / Block	Research		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK686	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Mandatory
Semester	6	Availability	Limited to department
Method	Laboratory Practice	Media	Laboratory
Classes / Block	Curricular Task	Prerequisite	Research Methodology
Lecturer / Supervisory Coordinator	Sholeh Ma'mun, S.T., M.T., Ph.D.		

2. Course / Block Descriptions
The Research course is given to sixth semester students with 3 credits. This course is a mandatory curricular task with a prerequisite of Research Methodology course. The Research course aims to provide the ability to design and carry out laboratory and/or field experiments as well as analyze and interpret data to strengthen technical assessment and the ability to communicate effectively both orally and in writing.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-11	An ability to design and conduct laboratory and/or field experiments and analyze and interpret data to strengthen technical judgment	CO-1	Students are able to carry out research in the field of chemical engineering
SO-5	An ability to plan, complete, and evaluate tasks within existing boundaries		
SO-4	An ability to communicate effectively both verbally and in writing	CO-2	Students are able to compile and present research results in the form of research reports and seminars

4. Course Materials and Main References	
Course Materials	- Research proposal - Experimental design - Research report - Scientific presentation techniques
Main References	

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1. Course Identity

Course Name / Block	Waste Management and Industrial Safety		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK724	Credits	4
Group	Department of Chemical Engineering	Mandatory/Optional	Compulsory
Semester	7	Availability	Open outside university
Method	Classroom	Media	Blended
Classes / Block	General Education	Prerequisite	-
Lecturer / Supervisory Coordinator	Venitalitya Alethea Sari Augustia, S.T., M.Eng.		

2. Course / Block Descriptions

The Waste Management and Industrial Safety course in Chemical Engineering Curriculum 2020 is delivered to students on the 6th semester with 4 credits. This course is compulsory without any prerequisites.

The Waste Management and Industrial Safety course aims to provide knowledge about the principles of industrial waste treatment, rules and basics of occupational health and safety, safety management and risk analysis. With this knowledge, students are expected to have the ability to apply their knowledge in industry.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-3	Ability to be responsible to society and comply with professional ethics in solving chemical engineering problems	CO-1	Students are able to explain the parameters of air, water and soil pollutions
		CO-3	Students are able to explain the basics of occupational health and safety in accordance with applicable laws / regulations
SO-8	Ability to identify, formulate, analyze and solve chemical engineering problems	CO-2	Students are able to explain how to treat waste physically, biologically, and chemically according to quality standards
		CO-4	Students are able to explain the characteristics of B3 chemicals and carry out a risk analysis

4. Course Materials and Main References

Course Materials

1. Introduction to environmental engineering
2. Pollution and Life Cycle Analysis (LCA)
3. Gas dispersion
4. Water pollution parameters
5. Soil pollution
6. Clean production
7. Waste quality standards
8. Physical waste treatment
9. Biological waste treatment
10. Chemical waste treatment
11. Work safety and labor protection
12. Legislation in work safety
13. Work safety and prevention of work accidents
14. Basics of occupational health and safety according to ILO
15. Characteristics of chemicals and B3
16. Process safety management
17. Risk analysis (HAZOP, HAZID)
18. Safety procedure in the laboratory

References

[1] UU RI No. 21 tahun 2003 Tentang Pengesahan *ILO Convention No. 81 Concerning Labour Inspection in Industry and Commerce* (Konversi ILO No. 81 Mengenai Pengawasan Ketenagakerjaan dalam Industri dan Perdagangan).
[2] UU No. 1 Tahun 1970 Tentang Keselamatan Kerja.
[3] Hyatt N., Dyadem P. Guidelines for Process Hazards Analysis (Pha, HAZOP), Hazards Identification, and Risk Analysis (2003).
[4] Center for Chemical Process Safety (CCPS) - Guidelines for Chemical Transportation Safety, Security, and Risk Management-Wiley (2008).
[5] Genserik L.L. Reniers - Multi-Plant Safety and Security Management in the Chemical and Process Industries-Wiley-VCH (2010).
[6] Nilson L., Persson P.O., Ryden L., Darozhka S., Zaliauskiene A. Cleaner Production, Technologies and Tools for Resource Efficient Production. The Baltic University Press, 2007.
[7] Kepmenaker No 1135 Tahun 1987 ttg Bendera K3
[8] UNDANG-UNDANG REPUBLIK INDONESIA NOMOR 13 TAHUN 2003 TENTANG KETENAGAKERJAAN

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1. Course Identity			
Course Name / Block	Process Simulation		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK750	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Compulsory
Semester	7	Availability	Open outside university
Method	Classroom, Practice	Media	Blended
Classes / Block	Engineering	Prerequisite	Multistage Separation Operation, Chemical Reaction Engineering 2
Lecturer / Supervisory Coordinator	Cholila Tamzysi, S.T., M.Eng. Muflih Arisa Adnan, S.T., M.Sc		

2. Course / Block Descriptions
The Process Simulation course in Chemical Engineering Curriculum 2020 is delivered to 7th semester students with 3 credits. This course is compulsory with prerequisites courses including: Multistage Separation Operation and Chemical Reaction Engineering 2. Process Simulation course aims to provide knowledge about the concept and synthesis of process simulations including simulation of chemical industry tools and chemical industry equipment using ASPEN Plus software.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-10	Ability to apply modern engineering methods, skills and tools necessary for chemical engineering practice	CO-1	Students are able to simulate simple process equipment using ASPEN Plus software
		CO-2	Mahasiswa mampu melakukan simulasi unit proses dan unit operasi kimia menggunakan *software* ASPEN Plus Students are able to simulate process units and chemical operation units using ASPEN Plus software

4. Course Materials and Main References	
Course Materials	1. Introduction to process simulation 2. Introduction to component, method assistant, and database 3. Introduction to properties analysis on pure substances, binary and ternary mixtures 4. Simulation of pressure changer, flash separator and heat exchanger 5. Simulation of distillation tower, absorber & stripper 6. Reactor simulation based on equilibrium, conversion, and reaction kinetics 7. Simulation of unit operation and solid transport 8. Introduction to HYSIS software
References	[1] Kamal, I. M. Al-Malah. (2017). *ASPEN Plus Chemical Engineering Application*. New Jersey: John Wiley & Sons [2] R. K. Sinnott. (2013). Coulson and Richardson Chemical Engineering – Volume 6, Chemical Engineering Design (3rd edition). UK: Oxford

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1. Course Identity			
Course Name / Block	Chemical Plant Design		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK751	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Compulsory
Semester	7	Availability	Limited to Department of Chemical Engineering
Method	Classroom	Media	Blended
Classes / Block	Engineering	Prerequisite	Process Control, Multistage Separation Operation, Process Equipment Design, Utilities
Lecturer / Supervisory Coordinator	Dr. Diana, S.T., M.Sc.		

2. Course / Block Descriptions

The Chemical Plant Design course in Chemical Engineering Curriculum 2020 is delivered to 7th semester students with 3 credits. This course is compulsory.

The Chemical Plant Design course aims to provide knowledge about various aspects of the design of a chemical plant. With this knowledge, students are expected to have the ability to design a chemical plant.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-8	Ability to identify, formulate, analyze and solve chemical engineering problems	CO-1	Students are able to identify factors for selecting chemical plants and determine their capacity
		CO-4	Students are able to determine the location and layout of a chemical plant
		CO-5	Students are able to evaluate the feasibility of a chemical plant
SO-9	Ability to design chemical industry processes, processing systems and equipments to meet expected needs within realistic boundaries, for example legal, economic, environmental, social, political, health and safety, sustainability and to recognize and/or exploit potential local and national resources with global insight	CO-2	Students are able to make process selection, equipment selection, and optimization of chemical reactors
		CO-3	Students are able to do flow-sheeting process

4. Course Materials and Main References

Course Materials	1. The determining factors for selection of a chemical plant 2. Determination of chemical plant capacity 3. Selection process based on initial economic evaluation 4. Equipment selection 5. Determination of plant location 6. Plant layout 7. Equipment layout 8. Chemical reactor optimization 9. Flow-sheeting 10. Economic evaluation
References	[1] Douglas, J.M., Conceptual Design of Chemical Processes, McGraw-Hill Book Co, New York, 1988 [2] Peter, M.S., dan Timmerhauss, R.D., Plant Design and Economics for Chemical Engineering, McGraw-Hill Book Co., New York 1994 [3] Smith, R., Chemical Process Design, McGraw-Hill Book Co., New York, 1995

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1. Course Identity			
Course Name / Block	Internship		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK752	Credits	2
Group	Department of Chemical Engineering	Mandatory/Optional	Compulsory
Semester	7	Availability	Limited to Department of Chemical Engineering
Method	Practical work at plant	Media	Field work
Classes / Block	Curricular Assignments	Prerequisite	Minimum of 100 credits with CGPA ≥ 2.25, Have passed S3D Program
Lecturer / Supervisory Coordinator	Dr. Arif Hidayat, S.T., M.T.		

2. Course / Block Descriptions

Internship in the Department of Chemical Engineering UII is an activity where students conducted orientation and observation on facts that occurs in the chemical industry. During the Internship, students are given assignment and expected to be able to describe the phenomena that exist in these process activities and be able to propose solutions to solve simple problems, and be able to synthesize between observed facts, basic laws, theories, techniques and equipment used.

The purpose of Internship is to provide opportunities for students to see and observe directly in the field of chemical industry to apply the knowledge gained in university.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-5	Ability to plan, complete, and evaluate tasks within existing constraints	CO-1	Students are able to apply chemical engineering knowledge in the chemical industry and complete field-specific assignments
SO-4	Ability to communicate effectively both oral and written	CO-2	Students are able to compile and present the final report of Practical Work

4. Course Materials and Main References

Course Materials	
References	

SEMESTER 8

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1. Course Identity			
Course Name / Block	Chemical Plant Design Project		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK853	Credits	4
Group	Department of Chemical Engineering	Mandatory/Optional	Compulsory
Semester	8	Availability	Limired to Department of Chemical Engineering
Method	Independent Practice	Media	
Classes / Block	Curricular Assignments	Prerequisite	Minimum of 120 credits with CGPA ≥ 2.25, can be taken at the same semester with Chemical Engineering Plant Design course (STK751)
Lecturer / Supervisory Coordinator	Dr. Arif Hidayat, S.T., M.T.		

2. Course / Block Descriptions
Chemical Plant Design Project is a tool used to examine the student's level of understanding and applying the knowledge that has been received during the lectures. In their final project, students with high reasoning and improvisation are able to comprehensively apply all the theory and skills of chemical engineering into a simple chemical plant design (preliminary design). The design process is the basis for building a complete plant and it is the responsibility of a chemical engineering bachelor before it is developed into a plant design.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-5	Ability to plan, complete, and evaluate tasks within existing constraints	CO-1	Students are able to apply knowledge of chemical engineering to design chemical plant
SO-8	Ability to identify, formulate, analyze and solve chemical engineering problems		
SO-9	Ability to design chemical industry processes, processing systems and equipments to meet expected needs within realistic constraints, e.g. legal, economic, environmental, social, political, health and safety, sustainability and to recognize and/or exploit local and national resource potentials with global insight		
SO-4	Ability to communicate effectively both oral and written	CO-2	Students are able to write and present the Chemical Plant Design Project Report

4. Course Materials and Main References	
Course Materials	
References	

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1. Course Identity			
Course Name / Block	Comprehensive Exam		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK854	Credits	1
Group	Department of Chemical Engineering	Mandatory/Optional	Compulsory
Semester	8	Availability	Limited to Department of Chemical Engineering
Method	Examination	Media	
Classes / Block	Curricular Assignments	Prerequisite	Have taken at least 120 credits
Lecturer / Supervisory Coordinator	Dr. Arif Hidayat, S.T., M.T.		

2. Course / Block Descriptions
The Comprehensive Exam is an examination that must be taken by students of the Department of Chemical Engineering UII. The Comprehensive Exam includes courses that support professionalism in the chemical engineering field. The exam material includes the main courses of the Department of Chemical Engineering. The Comprehensive Exam aims to measure the student's level of proficiency in the field of chemical engineering. Comprehensive Exam is conducted so that there are scientific standards owned by the students after graduating from the Department of Chemical Engineering UII.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	Ability to apply knowledge of mathematics, natural and/or materials science, information technology, and engineering to gain a thorough understanding of chemical engineering principles	CO-1	Students are able to demonstrate their proficiency of knowledge in the field of chemical engineering comprehensively

4. Course Materials and Main References	
Course Materials	
References	

ELECTIVE COURSES

CLUSTER 1: Food and Drug Technology

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1. Course Identity			
Course Name / Block	Food Technology		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK911	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Elective
Semester	Starting from semester 6	Availability	Limited to Department of Chemical Engineering
Method	Classroom, Practice	Media	Blended
Classes / Block	Engineering	Prerequisite	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Lilis Kistriyani, S.T., M.Eng.		

2. Course / Block Descriptions

Food Technology course in the Curriculum 2020 is given to students starting in semester 6 with 3 credits. This course is an elective course with the prerequisite that a minimum of 80 credits has been taken.

The main objective of this course is to develop students' abilities in determining food preservation methods, determining food processing methods, identifying critical points of halal food, and being able to design food innovation products.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	Ability to apply knowledge of mathematics, natural and/or materials science, information technology, and engineering to gain a thorough understanding of chemical engineering principles	CO-1	Students can determine physical, chemical and biological food preservation methods
		CO-2	Students can determine the suitable food processing method according to the needs
		CO-3	Students can identify critical points of halal food ingredients
SO-9	Ability to design chemical industry processes, processing systems and equipment to meet expected needs within realistic constraints, e.g. legal, economic, environmental, social, political, health and safety, sustainability and to recognize and/or exploit local and national resource potential with global insight	CO-4	Students are able to design food innovation products

4. Course Materials and Main References

Course Materials	1. Physical and chemical properties of food ingredients 2. Physical food preservation methods (thermal and non-thermal) 3. Food packaging and food safety 4. Methods of chemical and biological food preservations 5. Laboratory work on physical, chemical, and biological food preservations 6. The principle of processing raw materials into products. 7. Laboratory work on processing raw materials into products. 8. Techniques for identifying the critical point of a product's halalness 9. Laboratory work on identification of the halalness of a product.
References	[1] Berk, Zeki, 2009, Food Process Engineering and Technology, Elsevier, USA [2] R. H. Schmidt and G. E. Rodrick, 2003, Food Safety Handbook, John Wiley & Sons, Inc., New Jersey. [3] N. D. Dono, -, Halal Class Kajian Halal-Haram Makanan, Minuman, Obat, dan Kosmetika, Universitas Gadjah Mada.

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1. Course Identity			
Course Name / Block	Functional Food Technology		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK912	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Elective
Semester	Starting from Semester 6	Availability	Open outside university
Method	Classroom, Practice	Media	Blended
Classes / Block	Engineering	Prerequisite	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Dr. Diana, S.T., M.Sc.		

2. Course / Block Descriptions

Functional Food Technology course in the Chemical Engineering Curriculum 2020 is given to students with 3 credits. This course is an elective course that is taken with prerequisites of a minimum of 80 credits.

The Functional Food Technology course aims to provide knowledge about food technology with active ingredients that have specific physiological functions for health. With this knowledge, students are expected to have additional insights into functional food technology.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	Ability to apply knowledge of mathematics, natural and/or materials science, information technology, and engineering to gain a thorough understanding of chemical engineering principles	CO-1	Students can explain basic concepts, regulations, and prospects for functional food ingredients
		CO-2	Students can explain about bioactive compounds in functional food
		CO-3	Students can analyze trends in the development of functional food products
		CO-4	Students can explore the potential of Indonesian food as functional food

4. Course Materials and Main References

Course Materials	1. Functional Food, changes in lifestyle and eating habits 2. Functional food regulation and prospects 3. Bioactive compounds in food: supplements, antioxidants, functional carbohydrates, probiotics, prebiotics, omega fatty acids, proteins, and bioactive peptides 4. Development of food products anti-trans fatty acids and cholesterol 5. Trends in the development of functional food products 6. The potential of Indonesian food as functional food
References	[1] Shetty K, G.Paliyath, AL Pometto and RE Levin. 2005. Functional food and biotechnology. CRC Taylor and Francis [2] GR Gibson and CM Williams. 2000. Functional Foods-concepts to product. CRC Press-England

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1. Course Identity

Course Name / Block	Food Nanotechnology		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK9113	**Credits**	3
Group	Department of Chemical Engineering	**Mandatory/Optional**	Elective
Semester	Starting from Semester 6	**Availability**	Open outside university
Method	Classroom	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Venitalitya Alethea Sari Augustia, S.T., M.Eng.		

2. Course / Block Descriptions

The Food Nanotechnology course in the Chemical Engineering Curriculum 2020 is given to students with 3 credits. This course is an elective course that is taken with prerequisites of a minimum of 80 credits.

The Food Nanotechnology course aims to provide knowledge about nanotechnology, especially in the food and bioproduct industries. With this knowledge, students are expected to have additional insights into the latest technology in nanotechnology.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	Ability to apply knowledge of mathematics, natural and/or materials science, information technology, and engineering to gain a thorough understanding of chemical engineering principles	CO-1	Students can explain about material components in nanostructures
		CO-2	Students can explain about nanocomposite
		CO-3	Students can choose the suitable method of synthesizing nanostructures and nanocomposites
		CO-4	Students can explain about the use of nanotechnology in the food industry

4. Course Materials and Main References

Course Materials	1. Introduction to nanotechnology 2. Material components in the nanostructure 3. Nanostructure manufacturing methods 4. Nanocomposites 5. Nanotechnology for the food industry
References	[1] Graciela W. Padua dan Qin Wang. 2012. Nanotechnology Research Methods for Food and Bioproducts. Wiley-Blackwell. [2] Hari Singh Nalwa. 2002. Nanostuctured Materials and Nanotechnology. Academic Press, California.

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1. Course Identity			
Course Name / Block	Drying Technology		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK914	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Elective
Semester	Starting from Semester 6	Availability	Limited to Department of Chemical Engineering
Method	Classroom	Media	Blended
Classes / Block	Engineering	Prerequisite	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Ifa Puspasari, S.T., M.Eng., Ph.D.		

2. Course / Block Descriptions

Drying is one of the most frequently used operations in the food processing industries. Drying is very important to maintain the safety, quality and functionality of food products and ingredients. Drying Technology course aims to provide an understanding of the basics of drying processes and drying technologies commonly used in the food industries.

The Drying Technology course in the Chemical Engineering Curriculum 2020 is given to students with 3 credits. This course is an elective course with prerequisites of having a minimum of 80 credits.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	Ability to apply knowledge of mathematics, natural and/or materials science, information technology, and engineering to gain a thorough understanding of chemical engineering principles	CO-1	Students can explain the types of drying equipment in industry
		CO-2	Students can do calculations in the drying process
SO-9	Ability to design chemical industry processes, processing systems and equipment to meet expected needs within realistic constraints, e.g. legal, economic, environmental, social, political, health and safety, sustainability and to recognize and/or exploit local and national resource potential with global insight	CO-3	Students can apply the drying model in designing various types of dryers

4. Course Materials and Main References

Course Materials	1. Industrial drying equipment and its operating mode (batch and continuous) 2. Psychrometry 3. Water content in solids 4. Drying periods 5. Drying models
References	[1] J.D. Seader & Ernest J. Henley. 2006. Separation Process Principles. Second Edition. John Wiley & Sons. [2] Arun S. Mujumdar. 2014. Handbook of Industrial Drying. Fourth Edition. CRC Press. [3] Evangelos Tsotsas & Arun S. Mujumdar. 2014. Modern Drying Technology. CRC Press. [4] Tadeusz Kudra & A.S. Mujumdar. 2009. Advanced Drying Technologies. Taylor & Francis.

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1. Course Identity			
Course Name / Block	Active and Intelligent Packaging		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK915	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Elective
Semester	Starting from Semester 6	Availability	Open outside university
Method	Classroom	Media	Blended
Classes / Block	Engineering	Prerequisite	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Dr. Diana, S.T., M.Sc.		

2. Course / Block Descriptions

Active and Intelligent Packaging course in the Chemical Engineering Curriculum 2020 is given to students with 3 credits. This course is an elective course that can be taken with the prerequisites of having taken a minimum of 80 credits.

The Active and Intelligent Packaging course aims to provide knowledge about food packaging technology that able to preserve or provide certain required information. With this knowledge, students are expected to have additional insights into food processing by utilizing packaging technology.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	Ability to apply knowledge of mathematics, natural and/or materials science, information technology, and engineering to gain a thorough understanding of chemical engineering principles	CO-1	Students can explain the concept of active and intelligent packaging in food ingredients
		CO-2	Students can explain various kinds of active and intelligent packaging technologies for food ingredients
		CO-3	Students can explain freshness indicators for food packaging
		CO-4	Students can explore the potential for the development of active and intelligent packaging in Indonesia

4. Course Materials and Main References

Course Materials	1. The concept of active and intelligent packaging for foodstuffs 2. Active and intelligent packaging for foodstuffs: non-meat, meat and poultry 3. Active and intelligent packaging for foodstuffs: fish and seafood 4. Active and intelligent packaging for food ingredients: fruit and vegetables 5. Active and intelligent packaging for beverage products 6. Freshness indicator for food packaging 7. The potential, development, and regulation of active intelligent packaging in Indonesia
References	[1] Joseph Kerry dan Paul Butler. 2008. Smart Packaging Technologies for Fast Moving Consumer Goods. John Wiley & Sons, Ltd. West Sussex, England.

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1. Course Identity			
Course Name / Block	Microbiology		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK916	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Elective
Semester	Starting from Semester 6	Availability	Limited to Department of Chemical Engineering
Method	Classroom	Media	Blended
Classes / Block	Engineering	Prerequisite	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Venitalitya Alethea Sari Augustia, S.T., M.Eng.		

2. Course / Block Descriptions

The Microbiology course in the Chemical Engineering Curriculum 2020 is given to students starting from semester 6 with 3 credits. This course is elective with prerequisites of having taken a minimum of 80 credits.

The Microbiology course aims to provide knowledge about microorganisms and their use in the chemical industry. With this knowledge, students are expected to have the ability to design various processes involving microorganisms.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	Ability to apply knowledge of mathematics, natural and/or materials science, information technology, and engineering to gain a thorough understanding of chemical engineering principles	CO-1	Students can explain about the types and characteristics of cells, and growth factors of microorganisms
		CO-2	Students can analyze microorganisms quantitatively
SO-9	Ability to design chemical industry processes, processing systems and equipment to meet expected needs within realistic constraints, e.g. legal, economic, environmental, social, political, health and safety, sustainability and to recognize and/or exploit local and national resource potentials with global insight	CO-3	Students can apply microbiology to design food and non-food products

4. Course Materials and Main References

Course Materials	1. Diversity of microorganisms in the environment 2. Microorganism cell character 3. Methods for recognizing microorganisms 4. Factors affecting the growth of microorganisms 5. Applications of microbiology in industry
References	[1]. Hidayat, N., Masdiana,C.P., dan Suhartini, S., 2006, *Mikrobiologi Industri*, Penerbit ANDI, Yogyakarta. [2]. Shuler, M.K. dan Kargi, F., 1992, Bioprocess Engineering: Basic Concepts, 2nd edition, Prentice Hall International Series. [3]. Ritmann, B.E., dan Mc Carty, P.L., , Environmental Biotechnology: Principles and Applications, McGraw-Hill. [4]. Waites, M.J., Morgan, N.L., Rockey, J.S. and Higton, G., 2009. Industrial microbiology: an introduction. John Wiley & Sons.

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1. Course Identity			
Course Name / Block	Controlled Drug Release System		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK917	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Elective
Semester	Starting from Semester 6	Availability	Open outside university
Method	Classroom	Media	Blended
Classes / Block	Engineering	Prerequisite	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Lilis Kistriyani, S.T., M.Eng.		

2. Course / Block Descriptions

The Controlled Drug Release System course in the 2020 Curriculum is given to students starting from semester 6 with 3 credits. This course is elective with prerequisites of having taken a minimum of 80 credits.

The main objective of this course is to develop students' abilities in determining the characteristics of drug release media, determining drug release kinetics, understanding controlled release dosage technology, and designing controlled drug release systems with software.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	Ability to apply knowledge of mathematics, natural and/or materials science, information technology, and engineering to gain a thorough understanding of chemical engineering principles	CO-1	Students can determine the characteristics of the active ingredients of drug release media
		CO-2	Students can determine the kinetic model of drug release
		CO-3	Students can explain controlled release dosage technology
SO-10	Ability to apply modern methods, skills, and technical tools required for chemical engineering practice	CO-4	Students can design controlled drug release systems with software

4. Course Materials and Main References

Course Materials	1. Biopharmaceutical Classification Scheme 2. Biopharmaceutical aspects of controlled drug formulation 3. Pharmaceutical polymer 4. Drug release kinetics 5. Biodegradable system 6. Solubilization and insolubilization of drugs 7. Controlled release dosage technology 8. Artificial Neural Network for controlled drug release system design
References	[1] Agoes, Goeswin, 2008, Sistem Penghantaran Obat Pelepasan Terkendali, Penerbit ITB, Bandung [2] Puri, Munish; Pathak, Yashwant; Sutariya, Vijay Kumar; Tipparaju, Srinivas; Moreno, Wilfrido; 2016, Artificial Neural Network for Drug Design, Delivery and Disposition, Elsevier, USA. [3] Paolino, Donatella; Fresta, Massimo; Sinha, Piyush; Ferrari, Mauro; 2016; Drug Delivery System, Encyclopedia of Medical Devices and Instrumentation, Second Edition, edited by John G. Webster, John Wiley & Sons, Inc.

CLUSTER 2: Energy and Environment

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1. Course Identity			
Course Name / Block	Biomass Energy Technology		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK921	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Elective
Semester	Starting from Semester 6	Availability	Limited to Department of Chemical Engineering
Method	Classroom	Media	Blended
Classes / Block	Engineering	Prerequisite	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Cholila Tamzysi, S.T., M.Eng. Muflih Arisa Adnan, S.T., M.Sc.		

2. Course / Block Descriptions
The Biomass Energy Technology course in the Chemical Engineering Curriculum 2020 is an elective course with 3 credits taken with prerequisites of having taken a minimum of 80 credits. The Biomass Energy Technology course aims to provide knowledge about the potential of biomass energy, the basics of energy conversion, and the utilization of biomass conversion products.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	Ability to apply knowledge of mathematics, natural and/or materials science, information technology, and engineering to gain a thorough understanding of chemical engineering principles	CO-1	Students can identify the types of energy from biomass
		CO-2	Students can explain the classification of energy conversion technology
		CO-3	Students can explain the potential use of biomass energy and its economic analysis

4. Course Materials and Main References	
Course Materials	1. Definition of biomass energy 2. Constraints and challenges to the development of biomass energy 3. Conversion of biomass energy by chemical, biological, and thermal methods 4. Conversion technology via thermal process (torrefaction, pyrolysis, gasification) 5. Conversion technology via anaerobic fermentation (biogas and biofuel (bioethanol and biodiesel)) 6. Economic analysis of biomass energy conversion
References	[1]. Capareda, S. 2013. Introduction to Biomass Energy Conversion. UK: Taylor & Franciss

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1. Course Identity			
Course Name / Block	Fuel Cell Technology		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK922	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Elective
Semester	Starting from Semester 6	Availability	Limited to Department of Chemical Engineering
Method	Classroom	Media	Blended
Classes / Block	Engineering	Prerequisite	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Cholila Tamzysi, S.T., M.Eng.		

2. Course / Block Descriptions

The Fuel Cell Technology course in the 2020 Chemical Engineering Curriculum is given to 6th semester students with 3 credits. This course is elective with prerequisites of having taken a minimum of 80 credits.

The Fuel Cell Technology course aims to provide knowledge about the basic principles of fuel cell technology, thermodynamic calculations, reaction kinetics, electrocatalysis, mass transfer, evaluation of fuel cell work, and the commercial products.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	Ability to apply knowledge of mathematics, natural and/or materials science, information technology, and engineering to gain a thorough understanding of chemical engineering principles	CO-1	Students can explain basic principles, develop, and solve thermodynamic equations as well as chemical reaction kinetics of fuel cells
		CO-2	Students can explain and perform basic calculations of electrocatalysis, electric charge and mass transfer in fuel cells
		CO-3	Students can explain and calculate the need for hydrogen production and storage
		CO-4	Students can evaluate the performance and commercial scale of fuel cell technology

4. Course Materials and Main References

Course Materials	1. Introduction and overview of fuel cell technology 2. Fuel cell thermodynamics 3. Fuel cell reaction kinetics 4. Electrocatalysis 5. Electric charge and mass transfer in fuel cells 6. Hydrogen production and storage 7. Consideration of safety, economy, and life cycle analysis of fuel cell 8. Commercial products of fuel cell technology
References	[1] O'hayre, R., Cha, S.W., Colella, W. and Prinz, F.B., 2016. Fuel cell fundamentals. John Wiley & Sons.

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1. Course Identity			
Course Name / Block	Energy Storage Technology and Management		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK923	Credits	3
Group	Department of Chemical Engineering	Mandatory/Optional	Elective
Semester	Starting from Semester 6	Availability	Open outside university
Method	Classroom	Media	Blended
Classes / Block	Engineering	Prerequisite	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Dr. Khamdan Cahyari, S.T., M.Sc.		

2. Course / Block Descriptions

Energy Storage Technology and Management course in the 2020 Chemical Engineering Curriculum is given to students starting from semester 6 with 3 credits. This course is elective with prerequisites of having taken a minimum of 80 credits.

The Energy Storage Technology and Management course aims to provide knowledge about the concepts and technologies of various types of energy storage. With this knowledge, students are expected to have the ability to explore, determine, and evaluate environmentally friendly technologies that can be applied in chemical plants in particular, and various sectors of life in general.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	Ability to apply knowledge of mathematics, natural and/or materials science, information technology, and engineering to gain a thorough understanding of chemical engineering principles	CO-1	Students can explain the concept of energy storage
		CO-2	Students can explain the types of energy storage technology
		CO-3	Students can explain medium-large scale energy storage applications

4. Course Materials and Main References

Course Materials	1. Introduction: Storage in the fuel distribution system 2. Thermal Energy Storage 3. Energy Storage in Organic Fuels 4. Mechanical Energy Storage 5. Electromagnetic Energy Storage 6. Hydrogen Storage 7. Introduction to Electrochemical Energy Storage 8. Primary, Non-Rechargeable Batteries 9. Lead-acid Batteries 10. Energy Storage for Propulsion Vehicles (jets) 11. Medium-large scale energy storage applications
References	[1] Huggins, R.A., 2016, Energi Storage: Fundamentals, Materials and Applications, 2nd ed., Springer Intl Publishing, Switzerland [2] Rufer, A., 2018, Energi Storage: System and Components, CRC Press, Taylor & Francis Group, FL, USA

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1. Course Identity

Course Name / Block	Petroleum Technology		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK924	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Ariany Zulkania, S.T., M.Eng.		

2. Course / Block Descriptions

The Petroleum Technology course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

Through this course, students can have an ability to explain the petroleum technology, in which they can understand the process of petroleum formation, determine the composition of petroleum and types of petroleum products, determine the types of testing for petroleum and pseudo-component, and can identify the physical and chemical properties of petroleum. Besides, the students can explain and understand the petroleum refining process.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain the composition and products of petroleum
		CO-2	Students can explain the properties and test of petroleum and its products
		CO-3	Students can explain the petroleum refining processes
		CO-4	Students can explain the product blending and the supporting processes

4. Course Materials and Main References

Course Materials	1. Introduction to the petroleum formation and its refining process 2. Composition of petroleum and its products 3. Testing of petroleum and its products and pseudo-components 4. Properties of petroleum and its products 5. Petroleum refining processes: distillation, catalytic cracking, hydrocracking, hydrotreating, catalytic reforming, etc. 6. Product blending 7. Supporting processes
References	[1] Fahim, M.A., Al-Sahhaf, T.A., Elkilani, A.S., 2010, *Fundamentals of Petroleum Refining*, Elsevier, Oxford UK [2] Gary, J.H., Handwerk, G.E., Kaiser, M.J., 2007, *Petroleum Refining Technology and Economics*, 5th ed., CRC Press – Taylor & Francis's Group, France [3] Hardjono, A., 2001, *Petroleum Technology*, Yogyakarta. [4] Treese, S.A., Pujadó, P.R., Jones, D.S.J., 2015, *Handbook of Petroleum Processing*, 2nd ed., Springer Int'l Publ., Switzerland

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1. Course Identity

Course Name / Block	Energy from Waste		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK925	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Dr. Khamdan Cahyari, S.T., M.Sc.		

2. Course / Block Descriptions

The Energy from Waste course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

This course aims to provide knowledge about energy recovery technology from waste by applying the Waste Management Hierarchy principle to improve energy efficiency. With this knowledge, students are expected to have the ability to explore, determine, and evaluate environmentally friendly technologies that can be applied in chemical plants.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain the hierarchy of waste to energy management
		CO-2	Students can explain waste-to-energy (WtE) technology for various types of waste
		CO-3	Students can explain the concepts of economic feasibility and environmental sustainability of a multi-component bioenergy system on a communal scale

4. Course Materials and Main References

Course Materials	1. Introduction to the Waste Management Hierarchy 2. Waste-to-Energy (WtE) concepts and technology 3. Examples of Waste-to-Energy (WtE) cases 4. Economic feasibility and environmental sustainability of a communal scale multi-component bioenergy system
References	[1] Ghosh, S.K., 2020, *Energy Recovery Processes from Wastes*, Springer Nature Singapore Pte Ltd., Singapore [2] Chang, N.B., Pires, A., 2015, *Sustainable Solid Waste Management: A System Engineering Approach*, John Wiley & Sons, Inc., New Jersey, USA [3] Audibert, F., 2006, *Waste Engine Oils: Rerefining and Energy Recovery*, Elsevier B.V., Oxford, UK

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1. Course Identity			
Course Name / Block	Clean and Renewable Energy		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK926	Credits	3
Group	Dept. of Chemical Engineering	Mandatory/Optional	Elective course
Semester	Starting from semester 6	Availability	Open outside university
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Nur Indah Fajar Mukti, S.T., M.Eng.		

2. Course / Block Descriptions

The Clean and Renewable Energy course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

This course aims to support the knowledge about the various kinds of sources of both clean and renewable energy.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain about the types of clean and renewable energy
		CO-2	Students can explain about the impact of energy sources on the environment
		CO-3	Students can explain energy management and audit

4. Course Materials and Main References

Course Materials	1. Introduction and definition of energy 2. Types of renewable energy 3. Clean energy technology 4. Environmental impact by energy sources 5. Energy management and audit
References	[1] Sutarno, 2013, *Energy Resources*, Graha Ilmu, Yogyakarta [2] Budiman, A., 2018, *Biomass: Untouched Grace and Blessings*, Gadjah Mada University Press, Yogyakarta. [3] Budiman, A., 2018, *Biorefinery*, Gadjah Mada University Press, Yogyakarta. [4] Allen, D.T and Shonnard, D.R., 2002, *Green Engineering: Environmentally Conscious Design of Chemical Processes*, Prentice Hall PTR, Upper Saddle River, NJ. [5] Anastas, P.T. and Warner, J.C., 1998, *Green Chemistry: Theory and Practice*, Oxford University Pers Inc, New York. [6] Curran, M.A., 1996, *Environmental Life-Cycle Assessment*, McGrawHill Book Company, NewYork. [7] Beggs, C., 2002, *Energy: Management, Supply and Conservation*, Elsevier ButterworthHeinemann, Oxford.

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1. Course Identity

Course Name / Block	Green Chemistry for Sustainable Development		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK927	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Dr. Khamdan Cahyari, S.T., M.Sc.		

2. Course / Block Descriptions

The Green Chemistry for Sustainable Development course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

This course aims to provide knowledge about the principles of green chemistry in the design of chemical production processes to implement sustainable development. With this knowledge, students are expected to have the ability to explore, determine, and evaluate environmentally friendly technologies that can be applied in chemical plants.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain the principles of green chemistry
		CO-2	Students can explain examples and applications of green chemistry

4. Course Materials and Main References

Course Materials	1. Introduction to Green Chemistry and the concept of Sustainable Development 2. 12 Principles of Green Chemistry 3. Examples and applications of Green Chemistry for sustainable development
References	[1] Anastas, P.T., Zimmerman, J.B., *Innovation in Green Chemistry and Green Engineering*, Springer, New York, USA [2] Ameta, S.C, Ameta, R., 2013, *Green Chemistry: Fundamentals and Applications*, Apple Academic Press, Toronto, Canada and CRC Taylor & Francis Group, FL, US [3] Li, C.J., 2012, *Handbook of Green Chemistry: Green Processes*, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany [4] Perosa, A., Selva, M., 2012, *Green Processes: Green Nanoscience*, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany

CLUSTER 3: Material Technology

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1. Course Identity			
Course Name / Block	Biomaterials Technology		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK931	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Ajeng Yulianti Dwi Lestari, S.T., M.Eng.		

2. Course / Block Descriptions
The Biomaterial Technology course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken. Biomaterials is one of the scientific clusters of advanced materials whose development is closely related to chemical engineering. The Biomaterial Technology course aims to understand the classification, physical properties, synthesis, and application of biomaterials. With an understanding of various aspects of biomaterial technology, students are expected to be able to keep up with the latest developments in biomaterial technology.

3. Learning Outcomes			
SO Code	**Student Outcomes (SO)**	**CO Code**	**Course Outcomes (CO)**
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain the types of biomaterials
		CO-2	Students can explain the applications of biomaterials and their analysis techniques

4. Course Materials and Main References	
Course Materials	1. Definition and development history of biomaterials 2. Types of biomaterials 3. Biocompatibility 4. Biomaterial applications 5. Biomaterial analysis techniques
References	[1] Migonney, V., 2014, *Biomaterials*, John Wiley and Sons, Inc., New York [2] Tanzi M.C., Fare S., Candiani G., 2019, *Foundations of Biomaterials Engineering*, Academic Press

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1. Course Identity

Course Name / Block	Smart Material Technology		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK932	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Ajeng Yulianti Dwi Lestari, S.T., M.Eng.		

2. Course / Block Descriptions

The Smart Material Technology course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

Smart Materials is one of the clusters of advanced materials whose development is closely related to chemical engineering. The Smart Material Technology course aims to understand the classification, physical properties, synthesis, and application of smart materials. With an understanding of various aspects of smart material technology, students are expected to be able to keep up with the latest developments in smart material technology.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain the types of smart materials
		CO-2	Students can explain the applications of smart materials and their analysis techniques

4. Course Materials and Main References

Course Materials	1. Introduction to smart material technology 2. Types of smart materials 3. Smart material applications
References	[1] Li S., Piletsky S.A., Lieberzeit P.A., Turner A.P.F., 2019, *Smart Polymer Catalysts and Tunable Catalysis*, Elsevier. https://www.sciencedirect.com/book/9780128118405/smart-polymer-catalysts-and-tunable-catalysis [2] Bacani R., Politi M.J., Trindade F., Triboni E.R., 2019, *Nano Design for Smart Gels*, Elsevier. https://www.sciencedirect.com/book/9780128148259/nano-design-for-smart-gels [3] Pal K. and Benerjee I., 2018, *Polymeric Gels*, Woodhead Publishing. https://www.sciencedirect.com/book/9780081021798/polymeric-gels#book-info [4] Li G. and Meng H., 2015, *Recent Advances in Smart Self-healing Polymers and Composites*, Woodhead Publishing. https://www.sciencedirect.com/book/9781782422808/recent-advances-in-smart-self-healing-polymers-and-composites [5] Bhatt P., 2019, *Smart Bioremediation Technologies*, Academic Press. https://www.sciencedirect.com/book/9780128183076/smart-bioremediation-technologies#book-info

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1. Course Identity

Course Name / Block	Nanomaterials Technology		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK933	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Lucky Wahyu Nuzulia S., S.T., M.Eng.		

2. Course / Block Descriptions

The Nanomaterials Technology course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

This course aims to understand nanomaterial concepts, physical properties, characterization, synthesis, and application of nanomaterials. This course is expected to be a theoretical guide in carrying out research related to nanotechnology as well as a driving force so that students can follow the latest developments in nanomaterials.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain the properties and characterization of nanomaterials
		CO-2	Students can explain the synthesis method of nanoparticles
		CO-3	Students can explain the applications of nanomaterials

4. Course Materials and Main References

Course Materials	1. Introduction to nanomaterials 2. Nanomaterial properties 3. Characterization of nanomaterials 4. Synthesis of nanomaterials 5. Applications of nanomaterials
References	[1] Rao, C. N. R., Muller, A., and Cheetham, A. K., 2004, *The Chemistry of Nanomaterials: Synthesis, Properties and Applications*, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim [2] Cao, G., and Wang, Y., 2011, *Nanostructures and Nanomaterials: Synthesis, Properties, and Applications*, 2nd Ed., World Scientific Publishing, Hackensack, New Jersey [3] Ozin, G.A., Arsenault, A.C., and Cademartiri, L., 2009, *Nanochemistry: A Chemical Approach to Nanomaterials*, RSC Publishing, Cambridge.

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1. Course Identity

Course Name / Block	Polymer Technology		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK934	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Tintin Mutiara, S.T., M.Eng.		

2. Course / Block Descriptions

The Polymer Technology course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

Polymers, as a type of material commonly encountered in everyday life, have important aspects that can be analyzed from the point of view of chemical engineering. The Polymer Technology course aims to understand the classification, physical properties, synthesis, and application of polymers. With an understanding of various aspects of polymer technology, students are expected to be able to follow the latest developments in polymer technology.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain nomenclature, classification, chemical structure, physical properties, and methods of determining polymer molecular weight
		CO-2	Students can explain the polymer synthesis
		CO-3	Students can explain the production process and application of polymer products

4. Course Materials and Main References

Course Materials	1. Definition, classification, and nomenclature of polymers 2. Polymer synthesis 3. Determination of polymer molecular weight 4. Chemical structure and properties of polymer 5. Commodity plastics, engineering plastics, elastomers, and fibers 6. Adhesive and coating 7. Special topics (biodegradable polymers) 8. Polymer industry
References	[1] Brydson, J.A., 1999, *Plastics Materials*, 7th ed. Butterworth-Heinemann, Oxford. [2] Steven, M.P., 1998, *Polymer Chemistry: An introduction*, 3rd ed., Oxford University Press, England [3] Kricheldorrf, H.R., Nuyken, O., Swift, G., 2005, *Handbook of Polymer Synthesis*, 2nd ed., Marcel Dekker, New York.

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1. Course Identity

Course Name / Block	Ceramic Technology		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK935	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Tintin Mutiara, S.T., M.Eng.		

2. Course / Block Descriptions

The Ceramic Technology course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

The main objective of this course is to increase students' understanding of ceramic materials, ceramic properties, phase diagrams, manufacturing processes, and ceramic applications.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain the properties, characteristics, and phase diagrams of ceramic materials
		CO-2	Students can explain the ceramic manufacturing process and its applications

4. Course Materials and Main References

Course Materials	1. Characteristics of ceramic materials 2. Properties of ceramics 3. Phase diagram 4. The manufacturing process 5. Ceramic applications
References	[1] Callister W.D.Jr., 2007, *Materials Science and Engineering - An Introduction*, 7ed, John Willey & Sons, Inc., [2] Kingery, W.D., Bowen, H.K., and Uhlmann, D.R., 1976, *Introduction to Ceramics*, Wiley, New York [3] Soehardjo,R., 1986, *Ceramic Technology*, Gadjah Mada University Press, Yogyakarta

CLUSTER 4: Simulation and Others

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1. Course Identity			
Course Name / Block	Advanced Modeling and Simulation		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK941	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Cholila Tamzysi, S.T., M.Eng. Sholeh Ma'mun, S.T., M.T., Ph.D.		

2. Course / Block Descriptions
The Advanced Modeling and Simulation course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken. The Advanced Modeling and Simulation course aims to provide knowledge about the use of the toolbox in MATLAB in solving problems in chemical engineering.

3. Learning Outcomes			
SO Code	**Student Outcomes (SO)**	**CO Code**	**Course Outcomes (CO)**
SO-10	An ability to apply methods, skills, and modern technical tools needed to chemical engineering practices	**CO-1**	Students can use the basics of the mathematical operation toolbox in MATLAB
		CO-2	Students can develop mathematical models and solve them using MATLAB
		CO-3	Students can simulate chemical engineering problems with MATLAB

4. Course Materials and Main References	
Course Materials	1. Introduction to MATLAB 2. Algorithm program and data presentation 3. Vector operation and data storage 4. Integration and differentiation 5. Roots of linear, nonlinear, and minimization equations 6. Simulation of chemical engineering problems
References	[1] Hahn, B. and Valentine, D.T., 2007, *Essential MATLAB for Engineers and Scientists*, Oxford, UK [2] Kurniawan, A. and Aji, A.B., 2012, *Calculations with Computer*, Yogyakarta

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1. Course Identity			
Course Name / Block	Petroleum Processing Technology Simulation		
Faculty	Industrial Technology	Department	Chemical Engineering
Code	STK942	Credits	3
Group	Dept. of Chemical Engineering	Mandatory/Optional	Elective course
Semester	Starting from semester 6	Availability	Open outside university
Method	Class	Media	Blended
Classes / Block	Engineering	Prerequisite	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Cholila Tamzysi, S.T., M.Eng. Fadilla Noor Rahma, S.T., M.Sc.		

2. Course / Block Descriptions
The Petroleum Processing Technology Simulation course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken. The Petroleum Processing Technology Simulation course aims to provide knowledge about the use of HYSIS in simulating chemical engineering tools related to the petroleum processing process.

3. Learning Outcomes			
SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-10	An ability to apply methods, skills, and modern technical tools needed to chemical engineering practices	CO-1	Students can explain the processes and tools used in the petroleum industry
		CO-2	Students can use HYSIS to analyze hydrocarbon mixtures
		CO-3	Students can use HYSIS to simulate petroleum processing tools

4. Course Materials and Main References	
Course Materials	1. Introduction to petroleum technology 2. Introduction to HYSIS 3. Introduction to chemical components, fluid package, and stream analysis 4. Multipath pipeline and segmented pipeline simulation 5. Simulation of a fluid separator and solid separator 6. Simulation of refinery equipment
References	[1] Gary, J.H. et al., 2007, *Petroleum Refining Technology and Economics*, Fifth Edition, Taylor and Francis, USA [2] Haydary, J., 2019, *Chemical Process Design and Simulation, Aspen Plus and Aspen HYSYS Applications*, John Wiley and Sons, USA

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1. Course Identity			
Course Name / Block	Gas Purification Technology and Simulation		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK943	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Sholeh Ma'mun, S.T., M.T., Ph.D. Cholila Tamzysi, S.T., M.Eng.		

2. Course / Block Descriptions

The Gas Purification Technology and Simulation course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

This course aims to provide knowledge about gas processing/purification technology. Besides, a simulation of the gas processing/purification process using HYSIS will also be provided.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain the principles of gas purification and the process of removing acid gases
SO-10	An ability to apply methods, skills, and modern technical tools needed to chemical engineering practices	CO-2	Students can simulate the gas purification process with HYSYS

4. Course Materials and Main References

Course Materials	1. Principles of gas purification processes 2. The process of removing acid gases 3. The process of removing and using ammonia in gas purification 4. Simulation of the process of removing acid gases
References	[1] Kohl, A.L., Nielsen, R.B., 1997, *Gas Purification*, 5th ed., Gulf Publishing Company, Houston, Texas, USA [2] Haydary, J., 2019, *Chemical Process Design and Simulation, Aspen Plus and Aspen HYSYS Applications*, John Wiley and Sons, USA [3] Sinnot, R.K., 2005, *Coulson and Richardson's Chemical Engineering Vol. 6 Chemical Engineering Design*, 4th ed., Elsevier Butterworth Heinemann, Oxford, England

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1. Course Identity

Course Name / Block	System Optimization		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK944	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Dr. Ir. Farham HM. Saleh, MSIE		

2. Course / Block Descriptions

The System Optimization course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

This course aims to make students understand how to determine or produce optimal decisions.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain the concept of optimization and its application
		CO-2	Students can solve optimization problems with Linear Programming
		CO-3	Students can solve product distribution and assignment optimization problems

4. Course Materials and Main References

Course Materials	1. The concept of optimization and its implementation in industry, especially the chemical industry 2. Numerical solution for the one-variable optimization model 3. Linear programing optimization models and solution methods 4. Product distribution and transportation optimization models 5. Assignment optimization models
References	[1] Edgar T.F., Himmelblau, D.M. and Lasdon L.S., 2001, *Optimization of Chemical Processes*, 2nd ed., McGraw-Hill Co., Singapore [2] Tarliah T. and Dimyati A., 1994., *Operation Research: Decision Making Models*, 3rd ed., Sinar Baru Agresindo, Bandung

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1. Course Identity

Course Name / Block	Advanced Adsorption		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK945	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Nur Indah Fajar Mukti, S.T., M.Eng.		

2. Course / Block Descriptions

The Advanced Adsorption course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

This course aims to provide knowledge about adsorption (adsorbent, adsorbate, etc.), the mechanism of the adsorption process, adsorption isotherm equations, adsorption case examples, and applications in the field. With this knowledge, students are expected to have the ability to analyze processes related to adsorption and their application.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-7	An ability to apply mathematical knowledge, natural and/or material sciences, information technology, and engineering to gain a comprehensive understanding of the principles of chemical engineering	CO-1	Students can explain the adsorption process and the characteristics of adsorbent materials
		CO-2	Students can solve adsorption isotherm equations based on available data
		CO-3	Students can explain the applications of adsorption in the chemical industries

4. Course Materials and Main References

Course Materials	1. Introduction to adsorption 2. Types of adsorption processes 3. Types and characteristics of adsorbent materials 4. Solving adsorption isotherm equations based on experimental data 5. Adsorption mechanism and kinetics 6. Adsorption applications in chemical industries
References	[1] Do, D. D., 1998, *Adsorption analysis: Equilibria and Kinetics*, Imperial College, London [2] Foo, K.Y., Hameed, B.H., Insights into the Modelling of Adsorption Isotherm Systems, *Chem. Eng. J.* 2010, *156*, 2-10 [3] Baker, F. S., 1980, *Activated Carbon Adsorption Handbook*, 2nd ed., Ann Arbor Science Pub Inc., Michigan

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1. Course Identity			
Course Name / Block	Industrial Internet of Things (IoT)		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK946	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Dr. Khamdan Cahyari, S.T., M.Sc.		

2. Course / Block Descriptions

The Industrial Internet of Things (IoT) course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

This course aims to provide knowledge about the basic principles of online Information System Management in Industry and their application in Chemical Plants. With this knowledge, students are expected to have the ability to analyze the need for implementing an online management information system in the processes at the chemical plants.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-12	An ability to understand the need for lifelong learning, including access to knowledge related to relevant contemporary issues	CO-1	Students can explain about the industrial internet and its innovators
		CO-2	Students can explain the meaning of Industry 4.0 and the concept of Smart Factories
		CO-3	Students can explain the IoT applications in Industries

4. Course Materials and Main References

Course Materials	1. Introduction to the Industrial Internet 2. Technical Aspects and Business Innovators in Industrial Internet 3. Industry 4.0 and Smart Factories 4. IoT applications in industries
References	[1] Gilchrist, A., 2016, *Industry 4.0: The Industrial Internet of Things*, Apress Media, LL.C, California, USA [2] Thiene, S.V, et al, 2018, *Industry 4.0 and The Chemical Industry*, Deloitte University Press, New York, US [3] Yang, H et al, 2019, The IoT for Smart Manufacturing: A Review, IISE: DOI: 10.1080/24725854.2018.1555383 [4] Maksimović, M., Vujović, V., & Mikličanin, E. O. (2015). Application of internet of things in food packaging and transportation. International Journal of Sustainable Agricultural Management and Informatics, 1(4), 333. doi:10.1504/ijsami.2015.075053

UNIVERSITAS ISLAM INDONESIA	DEPARTMENT OF CHEMICAL ENGINEERING	Syllabus			
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1. Course Identity			
Course Name / Block	Startup Business		
Faculty	Industrial Technology	**Department**	Chemical Engineering
Code	STK947	**Credits**	3
Group	Dept. of Chemical Engineering	**Mandatory/Optional**	Elective course
Semester	Starting from semester 6	**Availability**	Open outside university
Method	Class	**Media**	Blended
Classes / Block	Engineering	**Prerequisite**	Have taken min 80 credits
Lecturer / Supervisory Coordinator	Dr. Ir. Farham HM. Saleh, MSIE		

2. Course / Block Descriptions

The Startup Business course is given starting in semester 6 with a total credit of 3. As an elective course, this course can be taken with the prerequisite that a minimum of 80 credits has been taken.

This course aims to make students have the motivation and ability to start entrepreneurship in the form of a startup business.

3. Learning Outcomes

SO Code	Student Outcomes (SO)	CO Code	Course Outcomes (CO)
SO-2	An ability to internalize the spirit of independence and entrepreneurship	CO-1	Students can show motivation in starting a business
		CO-2	Students can choose promising business fields
		CO-3	Students can create and present a business plan

4. Course Materials and Main References

Course Materials	1. Motivation and intention 2. Choosing a business field and the scope of consideration in choosing a business field 3. Make a business plan 4. Choose the source of investment costs
References	[1] Timmons, J.A and Spinelli, S., 2008, *New Venture Creation Entrepreneurships for the 21st Century*, 6th ed., Andi Yogyakarta [2] Osterwalder A. and Pigneur Y., 2012, *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*, USA [3] Reiss E., 2015, *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*, USA.

Appendix C. Laboratory Equipment-Free Form

UNIVERSITAS ISLAM INDONESIA

FAKULTAS
TEKNOLOGI INDUSTRI

Gedung KH. Abas Mansur
Kampus Terpadu Universitas Islam Indonesia
Jl. Kaliurang km 14,5 Yogyakarta 55584
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LABORATORY EQUIPMENT-FREE FORM
DEPARTMENT OF CHEMICAL ENGINEERING

Assalamu'alaikum warahmatullahi wabarakatuh,

The undersigned below, the Heads of the Laboratory, Department of Chemical Engineering, Faculty of Industrial Technology, Universitas Islam Indonesia explained:

1. Name : .....
   Student ID No. : .....
2. Name : .....
   Student ID No. : .....

That the above-mentioned students do not have loans or dependents on raw materials or laboratory equipment within the Department of Chemical Engineering UII.

This certificate is, therefore, made to be used properly.

Wassalamu'alaikum warahmatullahi wabarakatuh.

Agreed:

No.	Laboratory	Name	Signature	Date
1.	Chem. Eng. Fundamental 1 Laboratory			
2.	Chem. Eng. Fundamental 2 Laboratory			
3.	Unit Operations Laboratory			
4.	Computation and Simulation Laboratory			
5.	Research Laboratory			

Appendix D. Consultation Sheet

CHEMICAL PLANT DESIGN PROJECT
Consultation Sheet

Name of Student 1 : .....
Student ID No. : .....
Name of Student 2 : .....
Student ID No. : .....
Chemical Plant Design Project title :
.....
.....
.....
Supervisor period :
Start date : .....
End date : .....

No.	Date	Topic	Signature

Approved Writing Draft,
Yogyakarta, ...

Supervisor

(.....)

Notes:
- This consultation sheet must be attached to the final project report
- This consultation sheet can be copied