Study Program: Chemical Engineering – *"Where Chemistry Powers the Industries of Tomorrow"*

Description: The Chemical Engineering Study Program is designed to meet the evolving demands of modern industry in the era of Industry 5.0**.** In today's world, industries are not only required to be efficient and productive, but also environmentally conscious, sustainable, and able to integrate advanced technologies with human-centered values. This program aims to produce graduates who are well-versed in the fundamentals of engineering and chemistry while also possessing advanced knowledge in green technology, bioprocessing, biotechnology, as well as the herbal, pharmaceutical, and cosmetic industries.

Students will be equipped to play a key role in driving industrial transformation towards sustainability through the implementation of green technologies, including low-waste processes, renewable energy utilization, and energy-efficient production systems. In line with the global shift toward bio-based industries, the curriculum emphasizes competencies in bioprocess and biotechnology, such as fermentation, enzymatic reactions, and the use of microorganisms for the production of biofuels, biodegradable materials, pharmaceuticals, and nutraceuticals.

Indonesia's rich biodiversity provides an exceptional opportunity for innovation in the herbal and pharmaceutical sectors. Therefore, the program includes in-depth studies on natural compound extraction, purification techniques, and compliance with pharmaceutical production standards, ranging from traditional medicines to modern drug development. In addition, students explore cosmetic science and technology, including product formulation, active ingredient stability, and scientific approaches to innovation in the beauty industry.

In anticipation of the digital transformation of manufacturing, students are also prepared to manage modern industrial operations that integrate digitalization, including the use of Internet of Things (IoT), Artificial Intelligence (AI), big data analytics, and industrial automation. These skills prepare graduates to lead in diverse industrial settings and adapt to rapidly changing technological landscapes.

What sets Chemical Engineering apart from other engineering disciplines is its multidisciplinary nature and broad applicability. The field combines elements of chemical, mechanical, biological, and environmental sciences, providing a comprehensive understanding of both product and process design — from laboratory research to full-scale industrial production. Unlike many other engineering programs, Chemical Engineering focuses not only on product development but also on the transformation processes that convert raw materials into valuable end products through sustainable and innovative methods.

Graduates of this program are highly sought after in a wide range of sectors, including the energy industry (especially renewable energy), oil and gas, food and beverage, pharmaceuticals, cosmetics, biotechnology, and environmental consulting. Additionally, they

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IULI – Eco Campus, The Breeze
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are well-prepared to become entrepreneurs in green technology and bio-based products**,** researchers, or academic professionals.

With a dynamic curriculum, experienced faculty, state-of-the-art laboratories, and strong industry connections, the Chemical Engineering Study Program offers an excellent academic environment for students who aspire to become future engineers capable of designing sustainable processes and contributing to a better world. This is the ideal place to grow, explore, and innovate at the intersection of science, technology, and humanity.

Biotechnology and Bioprocess Engineering

The biotechnology and bioprocess focus equips students with the knowledge and skills to design and optimize biological systems for industrial applications. It integrates microbiology, biochemical engineering, and process technology to enable the production of valuable products such as biofuels, bioplastics, enzymes, and pharmaceuticals. Students gain hands-on experience in fermentation technology, cell culture, and bioreactor design, as well as the downstream processing required for product purification. This specialization prepares graduates to contribute to cutting-edge developments in health, energy, and environmental sustainability.

Green Technology

Green technology in chemical engineering emphasizes the development and application of environmentally sustainable processes and materials. This includes innovations aimed at minimizing waste, reducing carbon emissions, and utilizing renewable energy sources in industrial operations. Students learn to design chemical processes that are energy-efficient, environmentally benign, and aligned with the principles of circular economy and sustainable development. Through this focus, the program prepares future engineers to lead in creating cleaner technologies that support global efforts to combat climate change and promote responsible industrial practices.

Herbal and Pharmaceutical Technology

The herbal and pharmaceutical technology focus addresses the growing global demand for natural and synthetic health-related products. Students explore the extraction, isolation, and formulation of active compounds from medicinal plants, alongside the design and scale-up of pharmaceutical production processes. Emphasis is placed on Good Manufacturing Practices (GMP), product quality assurance, and regulatory compliance. This area bridges traditional knowledge with modern science, enabling students to innovate in the development of herbal medicines, nutraceuticals, and pharmaceutical formulations that are safe, effective, and market-ready.

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IULI 3+1 International Program in Germany

Students at Chemical Engineering Program also have the opportunity to gain experience of studying, doing research, and working in an internship program in Germany in our **3+1 International program.**

In the program, students will study for 3 years in Indonesia at IULI, and will spend the last 1 year in Germany. Our partner, **TU Ilmenau (*Technische Universität Ilmenau*),** offer a unique and challenging experience that will open up the perspectives of our students to start their international career after graduation, or to continue with Masters and Doctorate degrees.

In this program, students will be given the chance to experience classroom study in Germany, while also doing fundamental cutting edge research supervised by experienced research team in our partner university. Finally, the internship program will give students new and exciting experience of working in Germany. This can be working in a company/industry, or in a university research laboratory. The multicultural setting faced by the students will give our graduates confidence to work in international companies.

International Exchange Program and Double Degree (B.Sc.) Program in Germany

During this **3+1 International Program**, our students are given the options to take the status of exchange students, or to take the Double Degree (DD) Program. In the DD program, students are required to take in total of 60 ECTS[1] (European Credit Transfer System) during the 1 year stay, which will allow the student to get a Bachelor Double Degree from the TU Ilmenau. The required ECTS credits are fulfilled by completing courses, research work for thesis, and by the internship program.

Field of Studies: Chemistry • Physical Chemistry • Bioprocess Engineering and Bioreactor Design • Biotechnology • Fermentation Technology • Nanotechnology • Renewable Energy • Mass and Energy balance • Thermodynamics • Pharmaceutical Process Development • GMP Compliance • Drug Delivery System • Fluid and Particle Mechanics • Heat and Mass Transfer • Chemical Reactor Engineering Design • Separation Process • Distillation • Extraction and purification • Membrane Technology • Unit Process Design • Microbiology • Innovations and new Products development • Herbal Medicine, Nutraceuticals and Cosmetics • Engineering Economics • Chemical Engineering Plant Design

[1] 1 SKS (Indonesia) = 1.4 ECTS (European)

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General Information:

Legal Base / Accreditation:	SK DIKTI No. 425/E/O/2014
Duration of Study:	4 years (8 semester)
Academic Year:	2 semesters (even + odd) Even Semester: February - July Odd Semester: August - January
Academic weeks/semester:	16 (14 academics + 2 exams)
SKS[2] per semester:	Max. 24
SKS per study:	144-160
Duration of a lecture:	50 minutes
Number of students per subject:	16-32
Language of Instruction:	English
Academic Degree:	Indonesia: Sarjana Teknik – S.T. (S1) International: Bachelor of Science (B.Sc)
Tuition Fee/semester:	Rp. 29.900.000
Online Application:	https://pmb.iuli.ac.id

[2] SKS: 1 SKS (preparation, lecture, exercises)

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Structure of a study:

1	2	3	4	5	6	7	8
	Semester 1-6: Academic Education (see curriculum), OFSE (Oral Final Study Examination)						
	Semester 7: Research Semester (abroad for Double Degree)						
	Semester 8: Thesis Defense, Graduation						

Score System:

Grade Letter	Grade Wording	IULI	Indonesian Grade	Germany Grade	Grade Descriptions	Student Representation
A	Excellent	86-100	4	1	Outstanding Performance	10%
B	Good	71-85	3.0-3.9	2	Performance is considerably higher than the average requirements	25%
C	Satisfactory	56-70	2.0-2.9	3	Performance meets the average requirements	30%
D	Poor	46-55	1.0-1.9	4	Performance is poor and likely to lead to failure	25%
F	Fail	<45	0	5	Performance does not meet the minimum criteria. Considerable further work is required	10%

Contacts:

Runita Rizkiyanti Putri, S.T., M.Sc.

Head of Chemical Engineering
runita.putri@iuli.ac.id

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Curriculum: in SKS

University Compulsory Subjects			Semester								
			1	2	3	4	5	6	7	8	Total
1	English	ENGL	2	2	2	2	1	1			10
2	Computer Network & IT Security	CNIS	2								2
3	Applied Statistics	MATH		2							2
4	Research Methodology	RESM		2							2
5	Environmental Sciences	ENVI			2						2
6	Civics	CIVI				2					2
7	Ethics and Religious Philosophy	ETRP					2				2
8	Innovation & Product Development	PROD					2				2
9	E-Commerce	ECOM						2			2
10	Indonesian Language & Culture	IDLC						2			2
11	Pancasila	PANC						2			2
12	Oral Final Study Examination (OFSE)	OFSE						0			0
13	Research Semester	RESS							6		6
14	Elective : Internship / Project	INSP								6	6
15	Thesis / Thesis Defence	THES								6	6
	Total		**4**	**6**	**4**	**4**	**5**	**7**	**6**	**12**	**48**

Life Science Faculty Compulsory			Semester								
			1	2	3	4	5	6	7	8	∑
1	Introduction to Engineering	INLS	1								1
2	Physics & Laboratory 1	PHY1	3								3
3	Physics & Laboratory 2	PHY2		3							3
4	Engineering Mathematics 1	MAT1	3								3
5	Engineering Mathematics 2	MAT2		3							3
6	Applied Mathematics	MAT3			3						3
7	Numerical Methods	NUME				2					2
8	Chemistry	CHEM	2								2
9	Chemistry Laboratory	CHEL		1							1
10	Organic Chemistry	ORCH		3							3
11	Organic Chemistry Laboratory	ORCL			1						1
12	Electrical Engineering & Laboratory 1	EEL1	3								3
13	Electrical Engineering & Laboratory 2	EEL2		3							3
14	Material Science	MATS	2								2
15	Biology	BIOL	3								3
16	Biochemistry	BICH			3						3

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17	Algorithm, Programming 1	PRO1	3								3
18	Algorithm, Programming 2	PRO2		3							3
19	Engineering Economy	EECO					2				2
	Total		**20**	**16**	**9**	**2**	**2**	**0**	**0**	**0**	**47**

CHE - Department Compulsory			Semester								
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**∑**
1	Fluid and Particle Mechanics	TFSC			3						3
2	Mass and Energy Balance	MEBA		2							2
3	Microbiology	MIBI			3						3
4	Microbiology Laboratory	MIBL				1					1
5	Physical Chemistry	PHCH			3						3
6	Analytical Chemistry	ANCH			2						2
7	Physical and Analytical Chemistry Laboratory	PACL				1					1
8	Heat & Mass Transfer Operations	HMTO				3					3
9	Chemical Engineering Thermodynamics	CHTH				4					4
10	Transport Phenomena	TRPH						2			2
11	Process Control	PRCO					3				3
12	Chemical Industrial Technology	CHIT				3					3
13	Plant Health and Safety	PLHS						2			2
14	Chemical Engineering Operations Laboratory 1	COL1					1				1
15	Separation Process	SEPR						3			3
16	Chemical Engineering Plant Design	CEPD						4			4
17	Chemical Engineering Operation Laboratory 2	COL2						1			1
18	Chemical Reaction Engineering Design	CHRE					4				4
19	Electives	ELEC				3	6	3			12
	Department		0	2	11	15	14	15	0	0	57
	Faculty		20	16	9	2	2	0	0	0	48
	University		4	6	4	4	5	7	6	9	47
	Total		**24**	**24**	**24**	**21**	**21**	**22**	**6**	**9**	**152**

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	Elective Courses (*)	
	Subjects	SKS
1	Introduction to Biotechnology	3
2	Introduction to Nanotechnology	2
3	Good Manufacturing Process	2
4	Industrial Waste Water Treatment	2
5	Advances in Engineering Research	2
6	Bioreactor Design	2
7	Fermentation Technology	3
8	Pharmaceutical Process Development	2
9	Bioprocess Technology	2
10	Drug Delivery System	2
11	Cellular Biology	2
12	Indonesian Herbal Medicine	2
13	Nutraceuticals and Cosmetics	2

*) Elective Subjects offered may varied each academic year

Other Extracurricular Courses
German Languages (B1/B2 level by semester 6)

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