



**SAMPOERNA**  
**UNIVERSITY**

# **CURRICULUM DOCUMENT**

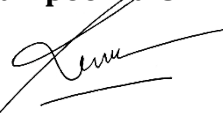
INDUSTRIAL ENGINEERING

**SAMPOERNA UNIVERSITY**  
CURRICULUM TEAM | JAKARTA

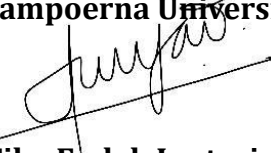
### CURRICULUM DOCUMENT

#### Industrial Engineering Study Program

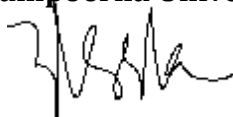
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### FOREWORD

We express our gratitude to God Almighty for His grace that enabled the team responsible for compiling the Industrial Engineering Study Program curriculum at Sampoerna University to complete the task of evaluating the 2022 curriculum and subsequently updating it for 2024.

The evaluation of the 2022 curriculum was conducted by considering several significant references, including the National Curriculum based on the Indonesian National Qualifications Framework (KKNI) Competency Level 6, the 2022 BKS-TI Curriculum, the accreditation criteria of the Indonesian Accreditation Board for Engineering Education (IABEE) for the engineering field, the Independent Learning policy from the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia, the trends of the Fourth Industrial Revolution, and the vision and mission of Sampoerna University. Additionally, surveys were administered via questionnaires and focus group discussions (FGDs) conducted through offline and online platforms (Zoom meetings) with both internal and external stakeholders to gather input that is anticipated to positively impact the development and implementation of the study program in the future.

As a result of this comprehensive evaluation, the 2024 Curriculum for the Industrial Engineering Study Program at Sampoerna University has been formulated. The 2024 curriculum is designed to address the needs and challenges of the digital era, wherein Industrial Engineering graduates are expected to make positive contributions to the industrial sector and society at large.

We, the curriculum team, extend our apologies for any errors or inconsistencies that may remain in the preparation of this 2024 Curriculum document. We welcome constructive criticism and suggestions for future improvements.

Jakarta, 31 July 2024  
Team of Industrial Engineering Study Program

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### IDENTITAS PROGRAM STUDI

|    |                            |                                                                                                                                                                                                                                   |
|----|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Nama Perguruan Tinggi (PT) | Universitas Sampoerna                                                                                                                                                                                                             |
|    |                            | <input type="checkbox"/> PTN <input checked="" type="checkbox"/> PTS                                                                                                                                                              |
| 2  | Fakultas                   | Fakultas Teknik dan Teknologi                                                                                                                                                                                                     |
| 3  | Jurusan/Departemen         | Teknik Industri                                                                                                                                                                                                                   |
| 4  | Program Studi              | Teknik Industri                                                                                                                                                                                                                   |
| 5  | Status Akreditasi          | Baik Sekali No SK LAM Teknik: 0783/SK/LAM Teknik/AS/XII/2024                                                                                                                                                                      |
| 6  | Jumlah Mahasiswa           | 68                                                                                                                                                                                                                                |
| 7  | Jumlah Dosen               | 5                                                                                                                                                                                                                                 |
| 8  | Alamat Prodi               | Jl. Raya Pasar Minggu, Kav 16, Jakarta Selatan                                                                                                                                                                                    |
| 9  | Telpon                     | +62-21-5022-2234, Ext:7727                                                                                                                                                                                                        |
| 10 | Web Prodi/PT               | <a href="https://www.sampoernauniversity.ac.id/academics/faculty-of-engineering-technology/industrial-engineering/">https://www.sampoernauniversity.ac.id/academics/faculty-of-engineering-technology/industrial-engineering/</a> |

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### 1. Curriculum Foundation

The Undergraduate Industrial Engineering Study Program is one of the higher educations in engineering and has an important role in solving complex problems in society. The expertise or competencies that are expected from the graduates are the skills in performing Engineering Design and Analysis, which are needed to solve complex problems. Included also in the competencies of the graduates are the skills to communicate effectively, to collaborate in teamwork, to uphold ethics, norms, standards, and rules in society. Industrial Engineering knowledge is supported with a strong foundation from mathematics and basic sciences such as physics and chemistry. The foundation from mathematics and basic science is needed in performing industrial engineering practice in solving complex problems in society.

The role of Industrial Engineering Graduates in this technological advance era of Industrial Revolution 4.0 becomes increasingly challenged. To improve the Global Competitiveness Index Indonesia (GCI), Indonesian government has announced the 'Roadmap Making Indonesia 4.0', where local industries in automotive, robotics and automation, Internet of Things (IoT), and additive manufacturing are expected to innovate to create superior and efficient products. The graduates of Industrial Engineering are expected to play a key role in realizing these superior and efficient industrial-related products.

In answering the above-mentioned challenges, the Undergraduate Curriculum of Industrial Engineering (IE) Study Program at Sampoerna University (SU) must be evaluated regularly and revised when necessary to ensure the quality of the graduates that can fulfill the demands in the industries and societies. This is the motivation in developing the Curriculum of Undergraduate IE Study Program of SU.

In evaluating and revising the curriculum, below are the rules, laws, and the policy that are used as references:

1. Undang-Undang Republik Indonesia Nomor 14 Tahun 2005 tentang Guru dan Dosen (Lembaran Negara Republik Indonesia Tahun 2005 Nomor 157, Tambahan Lembaran Negara Republik Indonesia Nomor 4586);
2. Undang-Undang Republik Indonesia Nomor 12 Tahun 2012 tentang Pendidikan Tinggi (Lembaran Negara Republik Indonesia Tahun 2012 Nomor 158, Tambahan Lembaran Negara Republik Indonesia Nomor 5336);
3. Peraturan Presiden Republik Indonesia Nomor 8 Tahun 2012, Tentang Kerangka Kualifikasi Nasional Indonesia (KKNI);
4. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 73 Tahun 2013, Tentang Penerapan KKNI Bidang Perguruan Tinggi;
5. Peraturan Menteri Riset, Teknologi, dan Pendidikan Tinggi Republik Indonesia Nomor 62 Tahun 2016 tentang Sistem Penjaminan Mutu Pendidikan Tinggi;
6. Peraturan Menteri Riset, Teknologi, dan Pendidikan Tinggi Nomor 59 tahun 2018, tentang Ijazah, Sertifikat Kompetensi, Sertifikat Profesi, Gelar dan Tata Cara Penulisan Gelar di Perguruan Tinggi;

7. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 3 Tahun 2020, Tentang Standar Nasional Pendidikan Tinggi;
8. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 5 Tahun 2020, Tentang Akreditasi Program Studi dan Perguruan Tinggi;
9. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 7 Tahun 2020, Tentang Pendirian, Perubahan, Pembubaran PTN, dan Pendirian, Perubahan, Pencabutan Izin PTS;
10. Peraturan Menteri Pendidikan dan Kebudayaan No. 22 tahun 2020, tentang Rencana Strategis Kementerian Pendidikan dan Kebudayaan.

To develop the substantial aspect of the curriculum, the following references are used:

1. Core curriculum developed by Badan Kerja Sama Teknik Industri (Kurikulum BKS-TI tahun 2022).
2. General criteria and field of knowledge criteria from Indonesian Accreditation Board for Engineering Education (IABEE).
3. Bloom Taxonomy.
4. Curriculum 2022 of Undergraduate Study Program of Industrial Engineering, Faculty of Engineering Technology (FET), Sampoerna University (SU).
5. Input and suggestions from teaching staff in IE Study Program, FET, SU.
6. Input and suggestions from advisory board: Industrial Advisory Board, academics, students, and alumni.
7. Benchmarking with local and international universities.
8. Panduan Penyusunan Kurikulum Pendidikan Tinggi di era Industri 4.0 untuk mendukung Merdeka Belajar-Kampus Merdeka, Direktorat Jenderal Pendidikan Tinggi Kementerian Pendidikan dan Kebudayaan, 2020.
9. Buku Panduan Merdeka Belajar-Kampus Merdeka 2020, Direktorat Jenderal Pendidikan Tinggi Kementerian Pendidikan dan Kebudayaan, 2020.

Based on the above consideration, the 2024 Curriculum of IE Study Program of SU is designed to create superior graduates that can compete globally. The graduates are emphasized to have superior core industrial engineering skills, moral integrity, ethics, teamwork, and leadership, and the initiative to conduct lifelong learning to continuously innovate and create useful products for society.

## **2. Vision, Mission, Purpose, and Strategy of Study Program**

### **2.1. Vision**

#### **University's Vision**

Sampoerna University aspires to foster future leaders with strong moral character and internationally competitive skills sets, enabling them to actively participate in building a more prosperous, equitable, respected, and globally competitive Indonesia.

#### **Faculty's Vision**

The Faculty of Engineering and Technology at Sampoerna University aspires to become a faculty that is internationally competitive in the field of engineering and technology by 2030 whose graduates are highly sought after by industries, are entrepreneur minded, are socially responsible, and are competent to pursue advanced degrees.

#### **Study Program's Scientific Vision**

To advance knowledge in Industrial and Systems Engineering by integrating Augmented Intelligence into the design and optimization of sustainable production, manufacturing, and logistics systems, creating efficient and adaptive integrated systems for future industries by the year 2030.

### **2.2. Mission**

#### **University's Mission**

Sampoerna University aims to provide students with affordable access to education that meets the highest international standards. Sampoerna University offers a curriculum unique in Indonesia built around an American general education core, successfully preparing students for credential completion at Sampoerna University or for recognized transfer abroad. We also provide a full spectrum of co-curricular and pre-professional opportunities that ensure student success, preparing leaders for a global society.

#### **Faculty's Mission**

The Faculty of Engineering and Technology at Sampoerna University strives

- To provide an education in engineering and technology having international standards, built around an American general education core, that prepares its graduates as highly competent, entrepreneur minded, and socially responsible leaders; and are committed to giving back to Indonesia and society.
- To conduct innovative research in the field of engineering and technology for the benefits of humankind.

#### **Study Program's Mission**

The Industrial Engineering Study Program of the Faculty of Engineering and Technology at Sampoerna University strives

- To provide Industrial Engineering curriculum that meets the needs of industries and contributes to the wellbeing of society and the nation (M1).
- To engage in innovative research in Industrial Engineering (M2).
- To instill leadership and entrepreneurship characteristics in our graduates (M3).
- To impart high ethical standards and social awareness in our graduates (M4).

### 2.3. Purpose

#### University's Purpose

Sampoerna University aims to provide students affordable access to education that meets the highest international standards.

#### Study Program's Purpose

1. To produce high quality industrial engineering graduates which have high competitiveness to become leaders upholding ethics and integrity.
2. To produce industrial engineering graduates who have international insights and are able to communicate and compete internationally.
3. To produce applied research and scientific work which contribute to the development of industrial engineering knowledge, science and technology, business, and academic society nationally, regionally, and internationally.
4. To produce industrial engineering graduates who have responsibility in the development of the national economy to improve life by the program of society service.

### 2.4. Strategy

#### University's Strategy

Sampoerna University employs four pillars:

1. Reimagine and maintain our core curriculum. This is done to identify skills and competencies of graduates and to review and strengthen Sampoerna University's core curriculum.
2. Create an Institution of and for our students. This is done by recruiting and preparing qualified students to enroll and succeed in Sampoerna University, also to engage students in university governance, policy development, and external relations.
3. Build toward the future of Indonesia. This is done to develop students' capacity to contribute to the nation.
4. Provide a model of tomorrow's university today. This is to ensure affordability and access to education that increases in value.

#### Study Program's Strategy

To ensure graduates of IE Study Program upholding Sampoerna University's values (see section 2.5), the graduate profiles of IE Study Program are first derived by considering university's values. These graduate profiles are then derived into PLO

(Program Learning Outcomes), Body of Knowledge, Courses, and Subject Learning Outcome.

In focusing on the American style general education, IE Study Program adopts General Education Sampoerna University Core Curriculum. Meanwhile IE Study Program adopts the guidance from IABEE in developing its curriculum.

In ensuring the achievement of the graduate profiles, IE Study Program measures the learning outcome for each course and develops assessments to measure the achievement of the learning outcomes.

### **2.5. University Value**

Sampoerna University strives to produce graduates with a strong moral character and has sufficient skill sets to contribute to the nation. Sampoerna University values the contribution or giving to the nation as the highest goal in all aspects. Historically, Putera Sampoerna Foundation, which owns Sampoerna University, has had a strong responsibility in contributing to the nation and this is shown greatly in the vision and mission of the university. In supporting this value, IE Study Program strives to equip the graduates with competitive skill sets and strong moral character to be able to contribute to the nation.

In general, following are the values that are instilled to the graduates of Sampoerna University:

1. Integrity → Accountability, intellectual integrity, and respect for human values and social ethics.
2. Growth → Intellectually curious to expand their competencies and courageously take initiative, sharing expertise as responsible leaders in the community.
3. Knowledge → Authoritative and internationally articulate in their field, while continuing to be at the forefront of expanding knowledge, especially in modern science and technology.
4. Inspiration → Able to inspire individuals and communities through effective communication, critical thinking and problem solving.
5. Tenacity → Determined and persistent in achieving goals.
6. Empowerment → Has entrepreneurial spirit and be creative in achieving outcomes.

These values are taught by focusing on an American-style general education which is a distinctive value of academic programs at Sampoerna University. By referring to these values and the distinctive American-style general education, IE Study Program then developed the 2024 Curriculum.

### **3. Curriculum Evaluation & Tracer Study**

#### **3.1. Curriculum Evaluation**

The curriculum was evaluated to include the needs of graduate users such as the industries that have not been covered in the previous curriculum, learning process, research, and the society service at the faculty level. Usually, the change in the curriculum is expected to take place once every five years if there are fundamental changes related to the graduate competencies. However, the curriculum review of IE Study Program is expected to be done once every two years.

The 2024 Curriculum is the result of evaluation to the 2022 Curriculum. The review of the 2024 Curriculum is done because of the requirement to obtain IABEE accreditation that employs outcome-based education (OBE). The followings are the steps in evaluating the curriculum in IE Study Program of Sampoerna University:

1. The Dean of Faculty of Engineering and Technology issues a Dean's decree to form the Curriculum Development team in each study program.
2. The Head of Study Program holds evaluation meetings on the ongoing curriculum with all the teaching staff in the study program.
3. The Head of Study Program forms the schedule and the curriculum development team.
4. The Head of Study Program with the curriculum development team develop the curriculum framework which refers to: (i) discussion meeting with teaching staffs, (ii) recent trends in science, technology, and information, (iii) government's law, (iv) vision and mission of the university, faculty, and study program, (v) graduates' user, (vi) stakeholders' opinion (Academia, Industrial Advisor Board, Students, Alumni), and (vii) benchmarking with related universities.
5. The Head of Study Program holds meetings on the curriculum concepts by inviting all stakeholders, i.e., permanent lecturers, non-permanent lecturers, practitioners, and graduates' users to obtain input.
6. The Head of Study Program improves the curriculum based on input from several stakeholders and prepares the presentation.
7. The curriculum is presented at the faculty and university level to obtain the approval from the Vice Rector of Academic Affairs.
8. The Head of Study Program finalizes the concept of the curriculum to be the document that is ready to be validated.
9. The Dean of FET submitted a letter to the Vice Rector of Academic Affairs to validate the curriculum.
10. The curriculum is then submitted to the University Senate for approval. After approval, the Rector signs the decree acknowledging the new curriculum.
11. Once the curriculum is validated, the curriculum is socialized to all lecturers and students.
12. The new curriculum is implemented.

In evaluating the curriculum of the IE Study Program, the flowchart shown in Figure 1 is used as a reference. In the flowchart, the curriculum development starts from the

definition of the Graduate Profile (GP). The GP is formulated based on the market needs considering the university's vision. In detail, following are the mechanism in evaluating the 2024 Curriculum at the study program:

1. The market needs of industrial engineering graduates are evaluated by getting the inputs from the IAB (Industrial Advisory Board) of the study program. These inputs are then made as a reference to evaluate the GP of the study program. The GP is also evaluated and developed by considering the university's vision. In addition, the inputs from the alumni and the current students are also considered. The meetings with the alumni were performed online. Meanwhile, surveys were carried out to the current students to obtain their inputs on the strengths and weaknesses of the current courses.
2. After the GP is evaluated, the PLOs (Program Learning Outcomes) are evaluated. The PLOs are defined as the outcomes necessary to be achieved so that graduates have the characteristics of the GP. Benchmarking with other universities was also performed to evaluate the PLOs. The PLOs is finalized with a curriculum team meeting with the Head of Study Program.
3. After PLOs' evaluation, mapping of PLOs to the courses are done. This evaluation is done by technical meeting of teaching staff in the study program by considering rules from the university pertaining courses.
4. The next step is to evaluate the SLO (Subject Learning Outcome). This is the outcome setting for each course which must refer to the PLOs related to the course. To bridge the PLO and SLO, we define PI (Performance Indicator) for each PLO which is developed from Bloom's Taxonomy. Basically, PI divides its PLO into several steps of outcome.
5. The SLO is one of the contents in the Syllabus (RPS). The RPS explains about the outcome expected from the course and the learning plan in one semester. The RPS for all courses are then evaluated thoroughly to conform to the newly defined PLOs and SLOs.
6. The last step is to develop the operational guidance for MBKM (Merdeka Belajar Kampus Merdeka).

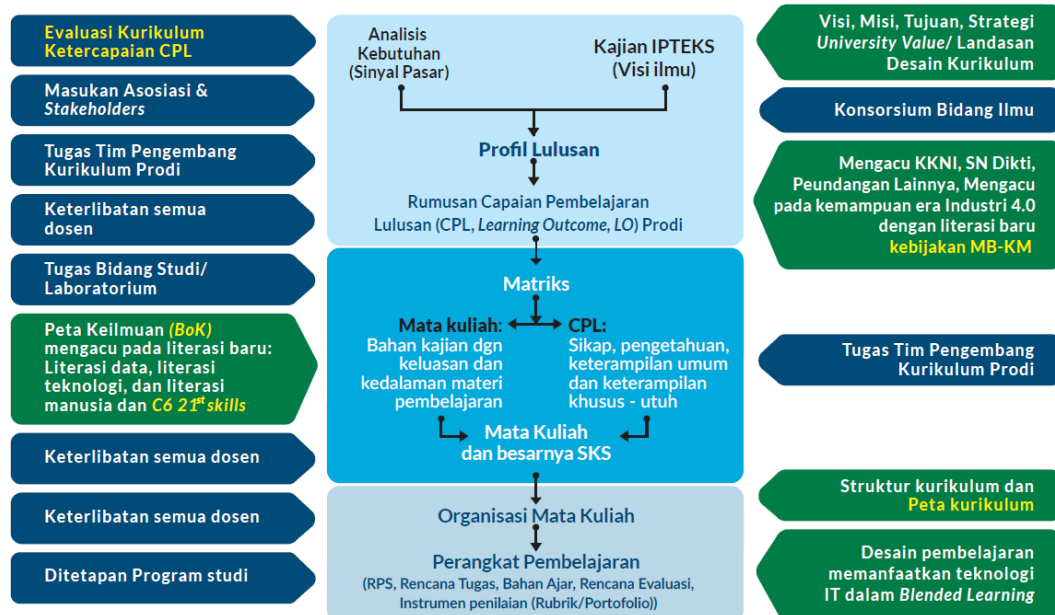


Figure 1. Flowchart of the curriculum development

Following is the summary of changes/evaluations done to the curriculum of IE Study Program of SU:

1. Graduate Profiles in the 2024 Curriculum adopt the concept of career line as the GP, for example engineer, researcher, etc. Based on the input from IAB, this is too restricting and thus needs many GP to be listed. The reason is that the graduates from IE Study Program can contribute in many ways in society, not just as an engineer or research engineer. The 2024 curriculum does not state the career line anymore as the GP, but it states only the characteristics of the graduates. These characteristics include the hard skill (key profile of IE graduates) and soft skill to support the graduates in contributing to the society.
2. The 2024 Curriculum adopts the PLOs recommended by ABET with only 7 PLOs.
3. The mapping from PLOs to the courses are changed drastically. In 2022 Curriculum mapping, the soft skills are mapped only to some core courses in IE. Meanwhile, in 2024 Curriculum mapping, all core IE courses have soft skills in addition to the IE hard skills as the learning outcome. The 2024 Curriculum mapping is more focused than the previous one.
4. The SLOs for each course are defined based on the related PI. These SLOs are more compact and more focused than the SLOs in the previous curriculum. The SLOs are set so that it is measurable.
5. The RPS is reviewed and redeveloped based on the defined SLOs. These change some of the assignments in the course.
6. The implementation of "Freedom of Learning Independent Campus" (Merdeka Belajar Kampus Merdeka - MBKM) is included in the 2024 Curriculum.

### 3.2. Tracer Study

IE Study Program has prepared the necessary instrument for the graduates' tracer study which is integrated with the university. The instrument is a questionnaire

handled by SAA (Student and Alumni Affairs) of Sampoerna University. There are two types of questionnaires. The first type of questionnaire is distributed to the Alumni to obtain feedback for the study program whether the Alumni thinks that they have achieved the Program Learning Outcomes (PLOs). The second type of questionnaire is distributed to the graduates' user (companies where our graduates work), essentially to obtain feedback whether the Alumni have achieved the specified PLOs. The second type of questionnaire is also used to gather information from the graduates' user about the skills needed by the graduates in the working field.

IE Study Program strives to improve the performance and quality of the study program to produce graduates with skills that are needed by the industry and the society and able to compete globally. IE Study Program is also directing the graduates to open their own startup company to open employment opportunities for the society.

The first type of questionnaire is given in **Table 1**. The questionnaire asks the graduates whether they have the listed skill set on the left-most column. The skill set is straightforwardly taken from the Performance Indicator (see chapter 4) which directs to the PLOs. An example is given to make the skill set easy to understand. The second type of questionnaire is shown in Figure 2. This questionnaire is given to the graduates' user (companies where our graduates work); thus, it can validate the opinion from the Alumni, especially those who directly work under the same structure in the company.

**Table 1. Questionnaire to be Distributed to IE Graduates.**

| Skill set                                                                                                                                                                                                                                | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| <b>The ability to <i>explain</i> principles of Mathematics (Calculus &amp; Mathematical Foundation of IE ).</b><br>Example: can you explain how to estimate the maxima and minima of two variable functions under different constraints? |                   |          |         |       |                |
| <b>The ability to <i>explain</i> principles of Science (Physics &amp; Chemistry).</b><br>Example: can you explain the principle of gravity?                                                                                              |                   |          |         |       |                |
| <b>The ability to <i>explain</i> principles of Engineering (taught in IE courses).</b><br>Example: can you explain the concept of continuous improvement?                                                                                |                   |          |         |       |                |
| <b>The ability to <i>solve</i> complex engineering problems by applying principles from Mathematics, Science, and Engineering.</b><br>Example: can you explain the roles of logistic management in a supply chain?                       |                   |          |         |       |                |

| Skill set                                                                                                                                                                                                                                                                                                      | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| <b>The ability to apply engineering design to produce solutions to a problem.</b><br>Example: given a problem of a simply supported beam where the beam supports an object, can you specify the material and the geometry of the beam?                                                                         |                   |          |         |       |                |
| <b>The ability to justify a design based on specified needs and various non-technical aspects.</b><br>Example: pick any available product in the market (let us say a passenger car), can you justify whether that car is a good product (in both technical and economic sense)?                               |                   |          |         |       |                |
| <b>The ability to identify written and oral communication methods.</b><br>Example: can you differentiate how to write or talk to your peer and to your supervisor (lecturer)? Can you differentiate the writing style of laboratory report and email to your peer?                                             |                   |          |         |       |                |
| <b>The ability to express ideas and arguments effectively to a range of audiences.</b><br>Example: during a discussion or when you present your work, do you think others are able to comprehend what you are trying to say?                                                                                   |                   |          |         |       |                |
| <b>The ability to describe ethical and professional responsibility in engineering situations.</b><br>Example: suppose you are working on an engineering project that potentially affects the ecosystem, can you explain your responsibility as an engineer?                                                    |                   |          |         |       |                |
| <b>The ability to assess global, economic, environmental, societal, and cultural context in relation to engineering judgments.</b><br>Example: suppose a new battery factory is opened in DKI Jakarta; whether you agree or not, can you come up with a reason to support your choice (to agree or not agree)? |                   |          |         |       |                |
| <b>The ability to recognize and carry out personal role and responsibility as an equally contributing member of a team.</b><br>Example: clear enough.                                                                                                                                                          |                   |          |         |       |                |
| <b>The ability to collaborate effectively on a team to achieve goals.</b>                                                                                                                                                                                                                                      |                   |          |         |       |                |

| Skill set                                                                                                                                                                                                                                                                                                                         | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| Example: clear enough.                                                                                                                                                                                                                                                                                                            |                   |          |         |       |                |
| <b>The ability to demonstrate initiatives and leadership.</b><br>Example: clear enough.                                                                                                                                                                                                                                           |                   |          |         |       |                |
| <b>The ability to perform experiments to acquire data.</b><br>Example: given an experiment module, can you perform the experiment on your own or with little help from the operator for a dangerous process?                                                                                                                      |                   |          |         |       |                |
| <b>The ability to analyze data based on mathematics, science, and engineering principles.</b><br>Example: given an experiment, can you construct relation between two sets of data, identify and draw control chart? or you can identify and apply queuing model in your daily life.                                              |                   |          |         |       |                |
| <b>The ability to draw conclusions based on evaluation and interpretation of data.</b><br>Example: given an investigation of complex problems: Use research based knowledge and research methods including design of experiments , analysis and interpretation of data and synthesis of the information provide valid conclusion. |                   |          |         |       |                |
| <b>The ability to identify and utilize various available resources and learning strategies to independently acquire new knowledge.</b><br>Example: suppose you are given a task to simulate a physical system in MATLAB, can you list your strategy to learn quickly in two days?                                                 |                   |          |         |       |                |
| <b>The ability to apply new knowledge according to needs.</b><br>Example: there must be at least one experience in IE where you need to learn something new on your own for a project. Did you succeed with that project?                                                                                                         |                   |          |         |       |                |

**Table 2. Questionnaire to be Distributed to Employers in Companies or Institutions.**

| Skill set                                                                                                                                                                                                                                                                                                  | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | Comments |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|----------|
| <b>Do our graduates have the ability to analyze and design industrial systems and solve complex engineering problems?</b><br>Note: If the job scope is not related to Industrial Engineering, please write your comments in the last column. You can also write your related testimony in the last column. |                   |          |         |       |                |          |
| <b>Do our graduates have the moral integrity?</b><br>Note: You can also write your related testimony in the last column.                                                                                                                                                                                   |                   |          |         |       |                |          |
| <b>Do our graduates have high ethical standard?</b><br>Note: You can also write your related testimony in the last column.                                                                                                                                                                                 |                   |          |         |       |                |          |
| <b>Are our graduates able to work in a team?</b><br>Note: You can also write your related testimony in the last column.                                                                                                                                                                                    |                   |          |         |       |                |          |
| <b>Do our graduates exhibit leadership characteristics?</b><br>Note: You can also write your related testimony in the last column.                                                                                                                                                                         |                   |          |         |       |                |          |
| <b>Do our graduates exhibit independence to learn new skills and knowledge?</b><br>Note: You can also write your related testimony in the last column.                                                                                                                                                     |                   |          |         |       |                |          |

#### 4. Graduate Profile (GP) & Program Learning Outcomes (PLOs)

##### 4.1. Graduate Profile

The Graduate Profile (GP) or PEO (Program Educational Objectives) of the IE Study Program is developed based on the inputs from the stakeholders. The GP is aligned with the input from IAB where the GP needed is the one that can cover many prospectuses career lines in the industrial engineering area. This GP, recommended by BKS-TI, is then adopted into GP of IE Study Program with some modification (see Table 3, GP1 & GP2). GP1 & GP2 is the core skills IE graduates, and it must be complemented with the soft skills as the supporting profile. These soft skills are enlisted in Table 3 as GP3 and GP4. With these four GPs, the IE graduates have the superior skills in Industrial Engineering, and they also have soft skills that support them in contributing to the society that always changes. The ability to continuously contribute to the society is also aligned with the inputs from the stakeholders.

The benchmarking between GP of 2024 Curriculum with GPs from other universities are given in Table 3a. It shows the comparison of GPs between IE Study Program of SU, Oregon State University, and Georgia Institute of Technology. We can see that GPs of both Oregon State University, and Georgia Institute of Technology are based on specific career lines and the characteristics of the graduates. We can also see from Table 3a that GPs of SU are more compact and straightforward. As a note, the vision and mission of SU are clearly reflected in the GPs.

**Table 3. Graduate Profiles and Descriptions.**

| No         | Graduate Profile      | Description                                                                                                                                                                                                                                                | Missions Addressed |
|------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| <b>GP1</b> | Professional Engineer | <p>Graduates are equipped to design, analyze, and optimize integrated systems involving people, materials, machines, and information across industrial and service sectors.</p> <p>Common Roles: Process Engineer, Quality Engineer, Systems Engineer.</p> | M1, M4             |
| <b>GP2</b> | Engineering Manager   | <p>Graduates possess leadership skills to oversee and manage projects, operations, and teams, ensuring efficiency, sustainability, and organizational success.</p> <p>Common Roles: Operations Manager, Supply Chain Manager, Project Manager.</p>         | M1, M3             |

| No         | Graduate Profile                | Description                                                                                                                                                                                                                                                      | Missions Addressed |
|------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| <b>GP3</b> | Researcher and Lifelong Learner | <p>Graduates are capable of advancing knowledge through research, innovation, and continuous learning, contributing to academic or industrial advancements.</p> <p>Common Roles: Researcher, Academic, R&amp;D Specialist.</p>                                   | M2, M4             |
| <b>GP4</b> | Entrepreneur.                   | <p>Graduates demonstrate entrepreneurial spirit and innovation, creating ventures or solutions that address industrial challenges with a focus on sustainability and efficiency</p> <p>Common Roles: Business Owner, Industrial Consultant, Startup Founder.</p> | M3, M4             |

**Table 3a. Comparison of GPs with other universities (IE Study Program).**

| No          | Sampoerna University                                                                                                                                                                                         | Oregon State University, United States                                                                                                                                                                       | Georgia Institute of Technology, United States                                   |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <b>GP 1</b> | <p>Professional Engineer</p> <p>Graduates are equipped to design, analyze, and optimize integrated systems involving people, materials, machines, and information across industrial and service sectors.</p> | <p>Graduates are able to create value to organizations through the analysis, evaluation, and improvement of engineered systems and processes using appropriate industrial engineering methods and tools.</p> | <p>Graduates are able to become successful Industrial Engineers.</p>             |
| <b>GP 2</b> | <p>Engineering Manager</p> <p>Graduates possess leadership skills to oversee and manage projects, operations, and teams, ensuring efficiency, sustainability, and organizational success.</p>                | <p>Graduates communicate effectively across disciplines and cultures to manage and/or lead activities in support of organizational goals and objectives.</p>                                                 | <p>Graduates are able to take leadership in their endeavors.</p>                 |
| <b>GP 3</b> | <p>Researcher and Lifelong Learner.</p> <p>Graduates are capable of advancing knowledge through research, innovation, and continuous learning, contributing to academic or industrial advancements.</p>      |                                                                                                                                                                                                              | <p>Graduates are able to succeed in professional and educational advancement</p> |

| No          | Sampoerna University                                                                                                                                                                                     | Oregon State University, United States                                                                                                                                                                                                               | Georgia Institute of Technology, United States                 |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| <b>GP 4</b> | <p>Entrepreneur.</p> <p>Graduates demonstrate entrepreneurial spirit and innovation, creating ventures or solutions that address industrial challenges with a focus on sustainability and efficiency</p> | <p>Graduates are able to innovate systems and processes, in response to organizational challenges, though the application of structured and unstructured industrial engineering methodologies, including engineering design and problem-solving.</p> | <p>Graduates are able to to be self-learners and starters.</p> |

#### 4.2. Formulation of PLOs (Program Learning Outcomes)

PLOs of the Study Program are defined to ensure the graduates have the characteristics mentioned in the GP (see **Table 4**). Specifically, GP1 is supported by six PLOs (PLO1 thru PLO6), GP2 is supported by four PLOs (PLO3, PLO4, PLO6, and PLO7), lastly GP3 is supported by three PLO's (PLO3, PLO4, and PLO5).

The PLOs are defined based on the guidance from IABEE (Indonesian Accreditation Board for Engineering Education) and BKS-TI. In this case, BKS-TI transforms the engineering curriculum guidance from IABEE to industrial engineering curriculum. The PLOs are also defined by considering the outcomes based on KKNI's criteria.

The IE Study Program, like other study programs at Sampoerna University, adopts the General Education Sampoerna University Core (GenEd SU Core) Curriculum for the basic science courses and general courses. These courses are mathematics, physics, chemistry, and general courses such as Bahasa Indonesia, English language courses, Religion, etc. To ensure the achievement of the PLOs of Study Program, a mapping matrix between the PLOs of GenEd SU Core and PLOs of Study Program is needed.

The relation between PLOs of the 2024 Curriculum and PLOs from IABEE, BKS-TI, KKNI, and GenEd SU Core can be seen in **Tables 5 – 8**. We can see that the matrices in **Tables 5** and **6** are similar. This is because PLOs recommended by BKS-TI are based on IABEE's PLOs. We can also see that PLOs of Study Program number 2, 3, 4, 6, and 7 are mapped one to one to the PLOs from IABEE and BKS-TI. Meanwhile, PLO1 of Study Program covers three PLOs from IABEE and BKS-TI, and PLO5 of Study Program covers two PLOs from IABEE and BKS-TI.

**Table 4. PLOs of IE Study Program.**

| No           | Description of Program Learning Outcome (PLO)                                                                                                                                                                                               | GP 1 | GP 2 | GP 3 | GP 4 |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| <b>PLO 1</b> | An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.                                                                                                  | ✓    |      |      |      |
| <b>PLO 2</b> | An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.                   | ✓    | ✓    |      |      |
| <b>PLO 3</b> | An ability to communicate effectively with a range of audiences.                                                                                                                                                                            | ✓    | ✓    | ✓    | ✓    |
| <b>PLO 4</b> | An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. |      | ✓    | ✓    | ✓    |
| <b>PLO 5</b> | An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.                                                 | ✓    | ✓    |      | ✓    |
| <b>PLO 6</b> | An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.                                                                                               | ✓    | ✓    | ✓    |      |
| <b>PLO 7</b> | An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.                                                                                                                                             |      |      | ✓    |      |

**Table 5. Relation between PLOs of Study Program and PLOs recommended by IABEE and BKS-TI Core Curriculum 2**

| No | PLOs from IABEE and BKS-TI Core Curriculum 2                                                                                                                                                                                                                                                                                | PLO of Study Program |   |   |   |   |   |   |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---|---|---|---|---|---|
|    |                                                                                                                                                                                                                                                                                                                             | 1                    | 2 | 3 | 4 | 5 | 6 | 7 |
| 1  | Ability to apply knowledge of mathematics, natural and/or materials sciences, information technology and engineering to acquire comprehensive understanding of engineering principles.                                                                                                                                      | ✓                    |   |   |   |   |   |   |
| 2  | Ability to design components, systems, and/or processes to meet desired needs within realistic constraints in such aspects as law, economic, environment, social, politics, health and safety, sustainability as well as to recognize and/or utilize the potential of local and national resources with global perspective. |                      | ✓ |   |   |   |   |   |
| 3  | Ability to design and conduct laboratory and/or field experiments as well as to analyze and interpret data to strengthen the engineering judgment.                                                                                                                                                                          |                      |   |   |   |   | ✓ |   |
| 4  | Ability to identify, formulate, analyze, and solve complex engineering problems.                                                                                                                                                                                                                                            | ✓                    |   |   |   |   |   |   |
| 5  | Ability to apply methods, skills, and modern engineering tools necessary for engineering practices.                                                                                                                                                                                                                         | ✓                    |   |   |   |   |   |   |
| 6  | Ability to communicate effectively in oral and written manners.                                                                                                                                                                                                                                                             |                      |   | ✓ |   |   |   |   |
| 7  | Ability to plan, accomplish, and evaluate tasks under given constraints.                                                                                                                                                                                                                                                    |                      |   |   |   | ✓ |   |   |
| 8  | Ability to work in multidisciplinary and multicultural teams.                                                                                                                                                                                                                                                               |                      |   |   |   | ✓ |   |   |
| 9  | Ability to be accountable and responsible to the society and adhere to professional ethics in solving engineering problems.                                                                                                                                                                                                 |                      |   |   | ✓ |   |   |   |
| 10 | Ability to understand the need for life-long learning, including access to the relevant knowledge of contemporary issues.                                                                                                                                                                                                   |                      |   |   |   |   |   | ✓ |

Table 6 shows the mapping of IE Study Program PLOs with those of KKNi. This list was taken from the 2022 Curriculum. The result shows all the 7 PLOs matched well.

**Table 6. Relations Between PLOs of Study Program and PLOs based on KKNi.**

| No                                       | PLO based on KKNi                                                                                                                                                                                                                                      | PLO of Study Program |   |   |   |   |   |   |   |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---|---|---|---|---|---|---|
|                                          |                                                                                                                                                                                                                                                        |                      | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| <i>Sikap/ Attitude</i>                   |                                                                                                                                                                                                                                                        |                      |   |   |   |   |   |   |   |
| S-1                                      | Devoted to God Almighty and able to present a religious attitude;                                                                                                                                                                                      |                      |   |   |   | ✓ |   |   |   |
| S-2                                      | Uphold humanistic values in carrying out duties based on religion, morals, and ethics;                                                                                                                                                                 |                      |   |   |   | ✓ |   |   |   |
| S-3                                      | Contribute in improving the quality of the community, citizenship and civilized progress based on the Pancasila;                                                                                                                                       |                      |   | ✓ |   |   |   |   |   |
| S-4                                      | Act as a citizen who is proud and loves his/her homeland, nationalistic and has a sense of responsibility to the state and the nation;                                                                                                                 |                      |   |   |   | ✓ |   |   |   |
| S-5                                      | Appreciate cultural diversity, views, religions, beliefs, and other people's original opinions;                                                                                                                                                        |                      |   |   |   |   | ✓ |   |   |
| S-6                                      | Able to cooperate, have social sensitivity, and care about the community and the environment;                                                                                                                                                          |                      |   |   |   |   | ✓ |   |   |
| S-7                                      | Obey the law and discipline in being part of the community and in exercising citizenship;                                                                                                                                                              |                      |   |   |   | ✓ |   |   |   |
| S-8                                      | Internalize values, norms, and academic ethics.                                                                                                                                                                                                        |                      |   |   |   | ✓ |   |   |   |
| S-9                                      | Demonstrate responsible attitude towards work in the field of expertise independently;                                                                                                                                                                 |                      |   |   |   | ✓ |   |   |   |
| S-10                                     | Internalize the spirit of independence, tenacity, and entrepreneurship;                                                                                                                                                                                |                      |   |   |   |   |   |   | ✓ |
| <i>Penguasaan Pengetahuan/ Knowledge</i> |                                                                                                                                                                                                                                                        |                      |   |   |   |   |   |   |   |
| PP-1                                     | mastering the basic concepts of knowledge about differential-integral calculus, linear algebra, complex variables, physics and chemistry, applications of mathematics and technical analysis as basic material in the field of industrial engineering; |                      | ✓ |   |   |   |   |   |   |
| PP-2                                     | mastering the principles of engineering (engineering fundamentals), engineering science and engineering design required for the analysis and design of industrial systems and the components required;                                                 |                      | ✓ |   |   |   |   |   |   |

| No                                       | PLO based on KKNI                                                                                                                                                                                                                                      | PLO of Study Program |   |   |   |   |   |   |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---|---|---|---|---|---|
|                                          |                                                                                                                                                                                                                                                        | 1                    | 2 | 3 | 4 | 5 | 6 | 7 |
| PP-3                                     | mastering the concepts of manufacturing control systems that support industrial systems;                                                                                                                                                               | ✓                    |   |   |   |   |   |   |
| PP-4                                     | mastering the concept of knowledge in basic science practicums (physics, chemistry), computers, and manufacture;                                                                                                                                       |                      |   |   |   |   | ✓ |   |
| PP-5                                     | mastering the concepts and principles of environmental conservation;                                                                                                                                                                                   |                      |   |   | ✓ |   |   |   |
| PP-6                                     | mastering the concepts and principles of Occupational Safety, Health, and Environment [Keselamatan, Kesehatan Kerja dan Lingkungan (K3L)] in the laboratory and in the field;                                                                          |                      |   |   |   |   | ✓ |   |
| PP-7                                     | mastering the principles and current issues in the economy and socio-culture in general;                                                                                                                                                               |                      |   |   | ✓ |   |   |   |
| PP-8                                     | mastering general concepts, principles, and communication techniques for specific purposes;                                                                                                                                                            |                      |   | ✓ |   |   |   |   |
| PP-9                                     | having insight into the latest and latest technological developments in the field of design, manufacturing processes, as well as the operation and maintenance of industrial systems and components needed;                                            |                      | ✓ |   |   |   |   | ✓ |
| PP-10                                    | mastering factual knowledge, principles, and application methods of national and international codes and standards of maintenance, maintenance, repair, production of machine components and machine design; and                                       |                      | ✓ |   |   |   |   |   |
| PP-11                                    | mastering the concept of academic integrity in general and the concept of plagiarism, in terms of the types of plagiarism, the consequences of violations and efforts to prevent them.                                                                 |                      |   |   | ✓ |   |   |   |
| <b>Keterampilan Umum/ General Skills</b> |                                                                                                                                                                                                                                                        |                      |   |   |   |   |   |   |
| KU-1                                     | Able to implement logical, critical, systematic, and innovative thinking, within the context of development or implementation of science and technology that cares and applies the appropriate humanistic values related to his/her area of expertise; | ✓                    |   |   | ✓ |   |   | ✓ |
| KU-2                                     | Able to demonstrate the ability to work independently, with quality and measurable performance;                                                                                                                                                        | ✓                    | ✓ |   |   | ✓ |   |   |

| No                                         | PLO based on KKNi                                                                                                                                                                                                                                                 | PLO of Study Program |   |   |   |   |   |   |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---|---|---|---|---|---|
|                                            |                                                                                                                                                                                                                                                                   | 1                    | 2 | 3 | 4 | 5 | 6 | 7 |
| KU-3                                       | Able to review developmental areas or science and technology implementations which applies humanistic values in accordance with his/her expertise based on scientific rules, procedures, and ethics to improve solutions, ideas, designs, or artistic criticisms; | ✓                    |   |   | ✓ |   |   |   |
| KU-4                                       | Capable of preparing scientific descriptions of the results produced in a thesis form or final project report, and upload them into the higher education website;                                                                                                 |                      |   | ✓ |   |   |   |   |
| KU-5                                       | Capable of making decisions appropriately to solve problem in his/her area of expertise based on the analysis of information and data;                                                                                                                            | ✓                    |   |   | ✓ |   |   |   |
| KU-6                                       | Able to maintain and develop his/her working network with advisors, colleagues, and peers in both inside and outside his/her institution.                                                                                                                         |                      |   | ✓ |   |   |   |   |
| KU-7                                       | Capable of taking responsibility for the group's work achievement by conducting appropriate supervision and evaluation towards work completion assigned to those who work under his/her responsibility;                                                           |                      |   |   |   | ✓ |   |   |
| KU-8                                       | Able to conduct self-evaluation process related to the work of the group who is under his/her responsibility, and manage independent learning;                                                                                                                    |                      |   |   |   | ✓ |   | ✓ |
| KU-9                                       | Capable of documenting, storing, securing, and rediscovering data to ensure validity and prevent plagiarism;                                                                                                                                                      |                      |   |   | ✓ |   |   |   |
| KU-10                                      | Demonstrate quantitative reasoning and develop graphical facility. Able to apply a deductive and/or inductive approach to inquiry and demonstrate methodical problem-solving skills;                                                                              | ✓                    |   |   |   |   |   |   |
| KU-11                                      | Able to write clearly and coherently; speak and listen interactively; and apply non-verbal communication techniques;                                                                                                                                              |                      |   | ✓ |   |   |   |   |
| KU-12                                      | Able to locate information, read and evaluate with a critical comprehension of information, and able to use it effectively to support an argument or solve a problem.                                                                                             | ✓                    |   |   |   |   |   | ✓ |
| <b>Keterampilan Khusus/Specific Skills</b> |                                                                                                                                                                                                                                                                   |                      |   |   |   |   |   |   |

| No   | PLO based on KKNI                                                                                                                                                                                                                                                           | PLO of Study Program |   |   |   |   |   |   |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---|---|---|---|---|---|
|      |                                                                                                                                                                                                                                                                             | 1                    | 2 | 3 | 4 | 5 | 6 | 7 |
| KK-1 | Able to apply basic concepts of knowledge about differential-integral calculus, linear algebra, complex variables, physics and chemistry, mathematical applications, and technical analysis to create or modify engineering models in the field of industrial systems;      | ✓                    |   |   |   |   |   |   |
| KK-2 | Able to apply the principles of engineering (engineering fundamentals), engineering science and engineering design required for the analysis and design of industrial systems (industrial systems) and the required components;                                             |                      | ✓ |   |   |   |   |   |
| KK-3 | Able to identify, formulate, analyze, and find the source of engineering problems in the field of industrial systems through a process of empirical investigation (experiment), theoretical analysis, data interpretation, and information based on engineering principles; | ✓                    |   |   |   |   | ✓ |   |
| KK-4 | Able to provide the best solutions to solve engineering problems in the field of industrial systems based on engineering principles, considering factors of economic, security, public safety, and environmental sustainability;                                            |                      | ✓ |   |   |   |   |   |
| KK-5 | Able to design an industrial system and the necessary components, such as making engineering designs with an analytical approach and considering technical standards, aspects of performance, reliability, ease of application, and sustainability;                         |                      | ✓ |   |   |   |   | ✓ |
| KK-6 | Able to redesign and optimize processes, processing systems, and components required in engineering design in the field of existing industrial systems;                                                                                                                     |                      | ✓ |   |   |   | ✓ | ✓ |
| KK-7 | Able to select resources and utilize the most suitable, effective, and efficient engineering design and analysis tools in solving engineering problems in the field of industrial systems;                                                                                  |                      | ✓ |   |   |   |   |   |
| KK-8 | Able to criticize the policy of solving industrial engineering problems that have been and/or are being implemented, and are stated in the form of scientific working papers;                                                                                               | ✓                    | ✓ |   |   |   |   |   |

**Table 7. Relation Between PLOs of Study Program and PLOs of Sampoerna University's General Education (Gen-Ed).**

| No | PLOs from GenEd SU Core                   | PLO of Study Program |   |   |   |   |   |   |
|----|-------------------------------------------|----------------------|---|---|---|---|---|---|
|    |                                           | 1                    | 2 | 3 | 4 | 5 | 6 | 7 |
| 1  | Critical Thinking (CT)                    | ✓                    |   |   |   |   |   |   |
| 2  | Effective Communication (EC)              |                      |   | ✓ |   |   |   |   |
| 3  | Ethical Reasoning (ER)                    |                      |   |   | ✓ |   |   |   |
| 4  | Global Self Awareness (GSA)               |                      |   |   |   | ✓ |   |   |
| 5  | Information Literacy (IL)                 |                      |   |   |   |   |   | ✓ |
| 6  | Mathematical & Scientific Reasoning (MSR) | ✓                    |   |   |   |   | ✓ |   |

Table 7 gives the mapping of the new seven PLOs with the PLOs of General Education (Gen-Ed) courses provided in Sampoerna University. We can see that PLO2 from the Study Program is not mapped to the GenEd PLOs and this is as expected since GenEd PLOs are not specific to the skills of the IE Study Program (PLO 2 of Study Program is about skills of developing engineering design).

#### 4.3. Performance Indicator of PLOs

The PLOs of Study Program in Table 4 will be mapped to the courses. Each course has its specific SLOs (Subject Learning Outcomes) or CPMK (Capaian Pembelajaran Mata Kuliah) and PLOs of Study Program are achieved in stages by the entire courses' SLO's offered in the study program. We will see later in Table 10 that most courses cannot cover the entire aspects of the PLOs assigned to it. In other words, we need to split the aspects of the PLOs so that when the aspects of one PLO are too many to be covered by one course, two or more courses can be designed to be mapped to that PLO. Since essentially the offered courses are designed to achieve the SLOs, an index that bridges the PLOs and SLOs is needed. This index is called the Performance Indicator (PI). The PI for each PLO is given in **Table 8**.

The PI is defined based on the Bloom's Taxonomy:

1. **Remember:** recall facts and basic concepts. Selected-related keywords to this taxonomy are choose, define, find, list, recall, and label.
2. **Understand:** explain ideas or concepts. Selected-related keywords to this taxonomy are classify, perform, carry out, describe, generate, compare, explain, illustrate, expand, rephrase, identify, recognize, express.
3. **Apply:** use information in new situations. Selected-related keywords to this taxonomy are implement, apply, solve, plan, and utilize.
4. **Analyze:** draw connections among ideas. Selected-related keywords to this taxonomy are analyze, assume, examine, and question.
5. **Evaluate:** justify a stand or decision. Selected-related keywords to this taxonomy are assess, criticize, decide, evaluate, determine, prove, estimate, and conclude.

6. **Create:** produce new or original work. Selected-related keywords to this taxonomy are combine, compile, assemble, design, develop, modify, and propose.

Following is the description of Bloom's Taxonomy related to the PLOs of Study Program:

- a. PLO1 of the Study Program has the main outcome as the ability of the graduate to solve complex engineering problems. To solve a problem, then one needs to understand the basic concepts and they need the ability to apply those concepts to solve the problem. Thus, PLO1 is related to Bloom's Taxonomy 2 and 3 (Understanding and Apply).
- b. PLO2 of the Study Program has the main outcome as the ability of the graduate to produce solutions that meet certain criteria (engineering design). In producing the said solutions, one needs the ability to apply concepts of engineering design, to evaluate the design parameters, and to create or propose the solutions. Therefore, PLO2 is related to Bloom's Taxonomy 3, 5, and 6 (Apply, Evaluate, and Create).
- c. PLO3 of the Study Program has the main outcome as the ability of the graduate to communicate effectively with a range of audiences. Effective means that the information conveyed must be understood properly by the audience. To achieve this, the graduate must have the ability to identify oral and writing communication methods and they must also have the ability to express their ideas and arguments effectively. Thus, PLO3 is related to Bloom's Taxonomy 2 and 3 (Understand and Apply).
- d. PLO4 of the Study Program has the main outcome as the ability to identify the professional responsibility and the ability to make decisions. In short, PLO4 is related to Bloom's Taxonomy 2 and 5 (Understand and Evaluate).
- e. PLO5 of the Study Program has the main outcome as the teamwork and project management abilities of the graduate. For teamwork, one needs to identify an individual's role in a team and the ability to collaborate. To manage a project, one needs initiative and leadership qualities. PLO5 is related to Bloom's Taxonomy 2 (Understand).
- f. PLO6 of the Study Program has the main outcome as the ability to perform experimentation and to draw conclusions. Thus, one needs the ability to understand the experimentation steps, analyze the data, and to draw the conclusions. PLO6 is related to Bloom's Taxonomy 2, 4, and 5 (Understand, Analyze, and Evaluate).
- g. PLO7 of the Study Program has the main outcome as the ability of the graduate to identify learning methods, acquire new knowledge, and the ability to apply the newly acquired knowledge. PLO7 is related to Bloom's Taxonomy 2 and 3 (Understand and Apply).

The PI's in **Table 8** will be used as the guidance in creating SLOs (Subject Learning Outcomes) and the examinations problem of the related courses.

**Table 8. Performance Indicator and the Related PLOs.**

| No           | PLO of Study Program                                                                                                                                                                                                                                 | Performance Indicator<br>The ability to ...                                                                                                                                                                                                                                                |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PLO 1</b> | An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics                                                                                                            | A1. describe mathematics, science, and engineering principles<br>A2. apply the principles of mathematics, science, and engineering principles to solve complex engineering problems                                                                                                        |
| <b>PLO 2</b> | An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors                             | B1. apply engineering design to produce solutions to a problem<br>B2. generate engineering drawings according to appropriate standards<br>B3. produce components using appropriate tools and techniques<br>B4. Justify a design based on specified needs and various non-technical aspects |
| <b>PLO 3</b> | An ability to communicate effectively with a range of audiences                                                                                                                                                                                      | C1. identify written and oral communication methods<br>C2. express ideas and arguments effectively to a range of audiences                                                                                                                                                                 |
| <b>PLO 4</b> | An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, societal, and cultural contexts | D1. Describe ethical and professional responsibility in engineering situations<br>D2. assess global, economic, environmental, societal, and cultural context in relation to engineering judgments                                                                                          |
| <b>PLO 5</b> | An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives                                                           | E1. recognize and carry out personal role and responsibility as an equally contributing member of a team<br>E2. collaborate effectively on a team to achieve goals<br>E3. demonstrate initiatives and leadership                                                                           |
| <b>PLO 6</b> | An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions                                                                                                         | F1. perform experiments to acquire data<br>F2. analyze data based on mathematics, science, and engineering principles<br>F3. draw conclusions based on evaluation and interpretation of data                                                                                               |

| No               | PLO of Study Program                                                                           | Performance Indicator<br>The ability to ...                                                                                                                       |
|------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PLO<br/>7</b> | An ability to acquire and apply new knowledge as needed, using appropriate learning strategies | G1. identify and utilize various available resources and learning strategies to independently acquire new knowledge<br>G2. apply new knowledge according to needs |

## 5. Formulation of Body of Knowledge (BoK)

### 5.1. Description of BoK

The Body of Knowledge developed in the study program are:

1. **Work Design & Measurement**
2. **Operations Research & Analysis**
3. **Engineering Economic Analysis**
4. **Facilities Engineering & Energy Management**
5. **Quality & Reliability Engineering**
6. **Ergonomics & Human Factors**
7. **Operations Engineering & Management**
8. **Supply Chain Management**
9. **Engineering Management**
10. **Safety**
11. **Information Engineering**
12. **Design & Manufacturing Engineering**
13. **Product Design & Development**
14. **System Design & Engineering**

These BoK categories are defined to develop expertise in the following fields:

1. **Work Design & Measurement:** Focuses on optimizing work processes, methods, and standards to improve productivity and efficiency.
2. **Operations Research & Analysis:** Involves mathematical modeling, optimization, and analytical techniques to aid decision-making and resource allocation.
3. **Engineering Economic Analysis:** Examines the economic viability and cost-effectiveness of engineering projects and investments.
4. **Facilities Engineering & Energy Management:** Covers the planning, design, and maintenance of facilities and the efficient use of energy resources.
5. **Quality & Reliability Engineering:** Ensures the development of processes and products that meet quality standards and achieve long-term reliability.
6. **Ergonomics & Human Factors:** Enhances the design of systems and processes to suit human capabilities and improve safety, comfort, and performance.
7. **Operations Engineering & Management:** Addresses the design and management of production and operational systems.

8. **Supply Chain Management:** Focuses on the planning, execution, and optimization of supply chain activities to enhance value and efficiency.
9. **Engineering Management:** Integrates technical expertise with management practices to lead engineering projects and teams.
10. **Safety:** Aims to mitigate risks and ensure the safety and well-being of personnel and operations.
11. **Information Engineering:** Deals with the development and management of information systems for efficient data handling and decision support.
12. **Design & Manufacturing Engineering:** Involves the creation and production of goods using innovative design and manufacturing techniques.
13. **Product Design & Development:** Focuses on designing new products to meet market needs, from concept to production.
14. **System Design & Engineering:** Encompasses the integration of multiple components into coherent and efficient systems to achieve desired outcomes.

The Body of Knowledge (BoK) incorporated into the 2024 Curriculum can be seen in **Table 9**. This BoK is chosen by considering the curriculum guidance from IABEE and the 2022 BKS-TI Curriculum. Based on criteria from IABEE, the course group mathematics and basic science (BK-1) must be at least 20% of the total credits. Meanwhile, the course group in engineering science and engineering design (BK-2, BK-3, BK-4, and BK-5) must be at least 40% of the total credits. Lastly, the general education courses must be less than 30% of the total credits.

**Table 9. Curriculum Composition**

| No           | Category                                                    | Credit Hours | Percentage (%) |
|--------------|-------------------------------------------------------------|--------------|----------------|
| BK-1         | Mathematics and Basic Sciences                              | 32           | 22.07          |
| BK-2         | Industrial Engineering Sciences                             | 55           | 37.93          |
| BK-3         | Information and Communication Technology                    | 13           | 8.97           |
| BK-4         | Industrial Engineering Design and Problem-based Experiments | 12           | 8.28           |
| BK-5         | Culminative Major Design Experiences                        | 14           | 9.66           |
| BK-6         | General Education and Government obligatory courses         | 19           | 13.10          |
| <b>Total</b> |                                                             | <b>145</b>   | <b>100</b>     |

**Table 10. Mapping of Body of Knowledge (BoK) to IE Courses.**

| BOK                                                           | BOK Code | Course Code | Course Name                                            | Credits |
|---------------------------------------------------------------|----------|-------------|--------------------------------------------------------|---------|
| Mathematics and Basic Science<br>(32 Credit Hours)            | BK-1     | GMAT1313    | Calculus I                                             | 3       |
|                                                               |          | GMAT1314    | Calculus II                                            | 3       |
|                                                               |          | GMAT2415    | Calculus III                                           | 4       |
|                                                               |          | IENG2305    | Mathematical Foundations for IE                        | 3       |
|                                                               |          | IENG3306    | Intro. to Engr. Probability & Statistics               | 3       |
|                                                               |          | GSCI1312    | General Physics with Calculus I                        | 3       |
|                                                               |          | GSCI1112L   | General Physics with Calculus I Lab                    | 1       |
|                                                               |          | GSCI2313    | General Physics with Calculus II                       | 3       |
|                                                               |          | GSCI2113L   | General Physics with Calculus II Lab                   | 1       |
|                                                               |          | GSCI1303    | General Chemistry I                                    | 3       |
|                                                               |          | GSCI1103L   | General Chemistry I Lab                                | 1       |
|                                                               |          | GSCI2304    | General Chemistry II                                   | 3       |
|                                                               |          | GSCI2104L   | General Chemistry II Lab                               | 1       |
| Industrial Engineering Science<br>(55 Credit Hours)           | BK-2     | GENG1301    | Introduction to Engineering                            | 3       |
|                                                               |          | ENGR2302    | Statics                                                | 3       |
|                                                               |          | IENG2301    | Introduction to Systems & Industrial Engr.             | 3       |
|                                                               |          | IENG3307    | Deterministic Operations Research                      | 3       |
|                                                               |          | IENG3311    | Probabilistic Models in Operations Research            | 3       |
|                                                               |          | IENG2304    | Engineering Economy                                    | 3       |
|                                                               |          | IENG4316    | Simulation Modeling & Analysis                         | 3       |
|                                                               |          | IENG4317    | Human Factor & Ergonomic in Design                     | 3       |
|                                                               |          | IENG3309    | Manufacturing Process                                  | 3       |
|                                                               |          | IENG3109L   | Manufacturing Process Lab                              | 1       |
|                                                               |          | IENG3315    | Quality Control and Six Sigma                          | 3       |
|                                                               |          | IENG3313    | Production Systems Analysis                            | 3       |
|                                                               |          | IENG4320    | Supply Chain Management (IE Elective)                  | 3       |
|                                                               |          | IENG3330    | Fundamentals of Data Science for Engr (Data Analytics) | 3       |
|                                                               |          | ENGR3303    | Environmental Ethics                                   | 3       |
|                                                               |          | IENG4319    | Human Side of Organizations                            | 3       |
|                                                               |          | IENG4328    | Cost Estimation                                        | 3       |
|                                                               |          | IENG4318    | Project Management (IE Elective)                       | 3       |
|                                                               |          | IENG4322    | Technical Sales & Marketing (IE Elective)              | 3       |
| Information and Communication Technology<br>(13 Credit Hours) | BK-3     | ENGR1301    | Computer Programming for Engineering Applications      | 3       |
|                                                               |          | IENG3308    | Software for Engineers                                 | 3       |
|                                                               |          | IENG2302    | Object Oriented Modeling & Design                      | 3       |
|                                                               |          | IENG4421    | Embedded Computer Systems                              | 4       |
| Industrial Engineering                                        | BK-4     | GSOC2303    | General Psychology                                     | 3       |
|                                                               |          | IENG3310    | Technical Writing                                      | 3       |

| BOK                                                                   | BOK Code | Course Code | Course Name                                   | Credits |
|-----------------------------------------------------------------------|----------|-------------|-----------------------------------------------|---------|
| Design and Problem-based Experiments (12 Credit Hours)                |          | IENG3312    | Integrated Manufacturing Systems              | 3       |
|                                                                       |          | IENG4334    | Product Design and Development                | 3       |
| Culminative Major Design Experiences (14 Credit Hours)                | BK-5     | IENG4433    | Final Year Project for Industrial Engineering | 4       |
|                                                                       |          | IENG4331    | Integrated System Design (Capstone Design)    | 3       |
|                                                                       |          | IENG3314    | Engineering Experimental Design               | 3       |
|                                                                       |          | IENG2103    | Industrial Engineering Colloquium             | 1       |
|                                                                       |          | IENG4332    | Internship for Industrial Engineering         | 3       |
| General Education and Government Obligatory Courses (19 Credit Hours) | BK-6     | GHUM1303    | World Religions (GE EP-Humanist)              | 3       |
|                                                                       |          | GHUM1207    | Kewarganegaraan                               | 2       |
|                                                                       |          | GHUM1301    | Pancasila (GE EP-Building Connections)        | 3       |
|                                                                       |          | GHUM1208    | Indonesian Language                           | 2       |
|                                                                       |          | GCOM1304    | Composition I (English)                       | 3       |
|                                                                       |          | GCOM1305    | Composition II (English)                      | 3       |
|                                                                       |          | VCDD3345    | Indonesia Art History (GE EP-Artist)          | 3       |

## 6. List of Courses in Study Program

The courses are formed based on the BoK and the PLOs mapped onto the BoK. The entire course must cover all PLOs. The mapping between the BoK and the corresponding courses for each semester are given in **Table 10**. Then, the mapping between each course and the PLOs are given in **Table 11** in which the PLOs column entry is filled with the related KKNi's PLOs and the related PIs (see **Table 8**). The related PI is denoted with italic letters in brackets. The related GenEd PLOs are written next to the course name, in brackets with abbreviation (see **Table 7**).

**Table 11. Mapping of IE Courses to IE PLO's.**

| Course Name                              | Credit<br>s | Semeste<br>r | PLO |   |   |   |   |   |   |
|------------------------------------------|-------------|--------------|-----|---|---|---|---|---|---|
|                                          |             |              | 1   | 2 | 3 | 4 | 5 | 6 | 7 |
| BK-1: Mathematics and Basic Science      |             |              |     |   |   |   |   |   |   |
| Calculus I                               | 3           | 1            | ✓   | ✓ |   |   |   |   |   |
| Calculus II                              | 3           | 2            | ✓   | ✓ |   |   |   |   |   |
| Calculus III                             | 4           | 3            | ✓   | ✓ |   |   |   |   |   |
| Mathematical Foundations for IE          | 3           | 4            | ✓   | ✓ |   |   |   |   |   |
| Intro. to Engr. Probability & Statistics | 3           | 5            | ✓   |   |   |   |   |   |   |
| General Physics with Calculus I          | 3           | 2            | ✓   | ✓ |   |   |   |   |   |

| Course Name                                            | Credits | Semester | PLO |   |   |   |   |   |   |
|--------------------------------------------------------|---------|----------|-----|---|---|---|---|---|---|
|                                                        |         |          | 1   | 2 | 3 | 4 | 5 | 6 | 7 |
| General Physics with Calculus I Lab                    | 1       | 2        |     | ✓ | ✓ |   |   |   |   |
| General Physics with Calculus II                       | 3       | 3        | ✓   | ✓ |   |   |   |   |   |
| General Physics with Calculus II Lab                   | 1       | 3        |     | ✓ | ✓ |   |   |   |   |
| General Chemistry I                                    | 3       | 1        | ✓   | ✓ |   |   |   |   |   |
| General Chemistry I Lab                                | 1       | 1        |     | ✓ | ✓ |   |   |   |   |
| General Chemistry II                                   | 3       | 2        | ✓   | ✓ |   |   |   |   |   |
| General Chemistry II Lab                               | 1       | 2        |     | ✓ | ✓ |   |   |   |   |
| <b>BK-2: Industrial Engineering Science</b>            |         |          |     |   |   |   |   |   |   |
| Introduction to Engineering                            | 3       | 1        | ✓   |   | ✓ |   | ✓ |   |   |
| Statics                                                | 3       | 4        | ✓   | ✓ |   |   | ✓ |   |   |
| Introduction to Systems & Industrial Engr.             | 3       | 3        | ✓   | ✓ | ✓ | ✓ | ✓ |   |   |
| Deterministic Operations Research                      | 3       | 5        | ✓   | ✓ |   |   |   |   |   |
| Probabilistic Models in Operations Research            | 3       | 6        | ✓   | ✓ |   |   |   |   |   |
| Engineering Economy                                    | 3       | 4        | ✓   | ✓ |   | ✓ |   | ✓ |   |
| Simulation Modeling & Analysis                         | 3       | 7        | ✓   | ✓ |   |   |   | ✓ |   |
| Human Factor & Ergonomic in Design                     | 3       | 7        | ✓   | ✓ |   | ✓ |   | ✓ |   |
| Manufacturing Process                                  | 3       | 5        | ✓   | ✓ |   |   | ✓ |   |   |
| Manufacturing Process Lab                              | 1       | 5        |     | ✓ | ✓ |   |   | ✓ |   |
| Quality Control and Six Sigma                          | 3       | 6        | ✓   | ✓ |   | ✓ |   |   |   |
| Production Systems Analysis                            | 3       | 6        | ✓   | ✓ |   |   |   | ✓ |   |
| Supply Chain Management (IE Elective)                  | 3       | 8        | ✓   | ✓ |   |   |   | ✓ |   |
| Fundamentals of Data Science for Engr (Data Analytics) | 3       | 5        | ✓   |   |   |   |   | ✓ |   |
| Environmental Ethics                                   | 3       | 4        | ✓   | ✓ | ✓ |   |   |   |   |
| Human Side of Organizations                            | 3       | 4        |     | ✓ | ✓ |   | ✓ |   |   |
| Cost Estimation                                        | 3       | 7        |     | ✓ |   |   |   |   |   |
| Project Management (IE Elective)                       | 3       | 7        |     | ✓ |   | ✓ |   | ✓ |   |
| Technical Sales & Marketing (IE Elective)              | 3       | 8        |     | ✓ |   |   |   | ✓ |   |
| <b>BK-3: Information and Communication Technology</b>  |         |          |     |   |   |   |   |   |   |
| Computer Programming for Engineering Applications      | 3       | 2        | ✓   | ✓ |   |   |   |   |   |

| Course Name                                                              | Credits | Semester | PLO |   |   |   |   |   |   |
|--------------------------------------------------------------------------|---------|----------|-----|---|---|---|---|---|---|
|                                                                          |         |          | 1   | 2 | 3 | 4 | 5 | 6 | 7 |
| Software for Engineers                                                   | 3       | 5        | ✓   | ✓ |   |   | ✓ |   |   |
| Object Oriented Modeling & Design                                        | 3       | 3        | ✓   |   | ✓ |   |   |   |   |
| Embedded Computer Systems                                                | 4       | 8        |     | ✓ |   |   |   | ✓ |   |
| <b>BK-4: Industrial Engineering Design and Problem-based Experiments</b> |         |          |     |   |   |   |   |   |   |
| General Psychology                                                       | 3       | 3        |     | ✓ | ✓ |   | ✓ |   |   |
| Technical Writing                                                        | 3       | 5        |     |   | ✓ |   | ✓ |   |   |
| Integrated Manufacturing Systems                                         | 3       | 6        | ✓   | ✓ | ✓ | ✓ | ✓ |   | ✓ |
| Product Design and Development                                           | 3       | 6        | ✓   | ✓ |   | ✓ | ✓ |   |   |
| <b>BK-5: Culminative Major Design Experiences</b>                        |         |          |     |   |   |   |   |   |   |
| Final Year Project for Industrial Engineering                            | 3       | 8        | ✓   | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Integrated System Design (Capstone Design)                               | 3       | 7        | ✓   | ✓ |   | ✓ | ✓ | ✓ | ✓ |
| Engineering Experimental Design                                          | 3       | 6        |     | ✓ |   |   |   | ✓ | ✓ |
| Industrial Engineering Colloquium                                        | 1       | 4        |     |   | ✓ | ✓ |   |   |   |
| Internship for Industrial Engineering                                    | 3       | 7        | ✓   | ✓ |   | ✓ |   |   |   |
| <b>BK-6: General Education and Government Obligatory Courses</b>         |         |          |     |   |   |   |   |   |   |
| World Religions (GE EP-Humanist)                                         | 3       | 1        |     |   | ✓ | ✓ | ✓ |   |   |
| Kewarganegaraan                                                          | 2       | 1        |     |   |   | ✓ | ✓ |   |   |
| Pancasila (GE EP-Building Connections)                                   | 3       | 3        |     |   |   | ✓ | ✓ |   |   |
| Indonesian Language                                                      | 2       | 2        |     |   | ✓ |   | ✓ |   |   |
| Composition I (English)                                                  | 3       | 1        |     |   | ✓ |   | ✓ |   |   |
| Composition II (English)                                                 | 3       | 2        |     |   | ✓ |   | ✓ |   |   |
| Indonesian Arts History                                                  | 3       | 4        |     |   | ✓ |   | ✓ |   | ✓ |

**Table 12. Mapping of IE Courses to IE PLO's by Semester**

| Semester 1                  |         |     |   |   |   |   |   |   |
|-----------------------------|---------|-----|---|---|---|---|---|---|
| Course Name                 | Credits | PLO |   |   |   |   |   |   |
|                             |         | 1   | 2 | 3 | 4 | 5 | 6 | 7 |
| Composition I               | 3       |     |   | ✓ |   | ✓ |   |   |
| Introduction to Engineering | 3       | ✓   |   | ✓ |   | ✓ |   |   |
| General Chemistry I         | 3       | ✓   | ✓ |   |   |   |   |   |
| General Chemistry I Lab     | 1       |     | ✓ | ✓ |   |   |   |   |

|                 |   |   |   |   |   |   |  |  |
|-----------------|---|---|---|---|---|---|--|--|
| Calculus I      | 3 | ✓ | ✓ |   |   |   |  |  |
| World Religions | 3 |   |   | ✓ | ✓ | ✓ |  |  |
| Kewarganegaraan | 2 |   |   |   | ✓ | ✓ |  |  |

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| Semester 2                                        |         |     |   |   |   |   |   |   |
|---------------------------------------------------|---------|-----|---|---|---|---|---|---|
| Course Name                                       | Credits | PLO |   |   |   |   |   |   |
|                                                   |         | 1   | 2 | 3 | 4 | 5 | 6 | 7 |
| Composition II                                    | 3       |     |   | ✓ |   | ✓ |   |   |
| General Chemistry II                              | 3       | ✓   | ✓ |   |   |   |   |   |
| General Chemistry II Lab                          | 1       |     | ✓ | ✓ |   |   |   |   |
| General Physics with Calculus I                   | 3       | ✓   | ✓ |   |   |   |   |   |
| General Physics with Calculus I Lab               | 1       |     | ✓ | ✓ |   |   |   |   |
| Calculus II                                       | 3       | ✓   | ✓ |   |   |   |   |   |
| Computer Programming for Engineering Applications | 3       | ✓   | ✓ |   |   |   |   |   |
| Indonesian Language                               | 2       |     |   | ✓ |   | ✓ |   |   |

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| Semester 3                                 |         |     |   |   |   |   |   |   |
|--------------------------------------------|---------|-----|---|---|---|---|---|---|
| Course Name                                | Credits | PLO |   |   |   |   |   |   |
|                                            |         | 1   | 2 | 3 | 4 | 5 | 6 | 7 |
| Introduction to Systems & Industrial Engr. | 3       | ✓   | ✓ | ✓ | ✓ | ✓ |   |   |
| Object Oriented Modeling & Design          | 3       | ✓   |   | ✓ |   |   |   |   |
| General Physics with Calculus II           | 3       | ✓   | ✓ |   |   |   |   |   |
| General Physics with Calculus II Lab       | 1       |     | ✓ | ✓ |   |   |   |   |
| Calculus III                               | 4       | ✓   | ✓ |   |   |   |   |   |
| General Psychology                         | 3       |     | ✓ | ✓ |   | ✓ |   |   |
| Pancasila                                  | 3       |     |   |   | ✓ | ✓ |   |   |

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| Semester 4          |         |     |   |   |   |   |   |   |
|---------------------|---------|-----|---|---|---|---|---|---|
| Course Name         | Credits | PLO |   |   |   |   |   |   |
|                     |         | 1   | 2 | 3 | 4 | 5 | 6 | 7 |
| Engineering Economy | 3       | ✓   | ✓ |   | ✓ |   | ✓ |   |

|                                   |   |   |   |   |   |   |  |   |
|-----------------------------------|---|---|---|---|---|---|--|---|
| Mathematical Foundations for IE   | 3 | ✓ | ✓ |   |   |   |  |   |
| Industrial Engineering Colloquium | 1 |   |   | ✓ | ✓ |   |  |   |
| Statics                           | 3 | ✓ | ✓ |   |   | ✓ |  |   |
| Indonesian Arts History           | 3 |   |   | ✓ |   | ✓ |  | ✓ |
| Environmental Ethics              | 3 | ✓ | ✓ | ✓ |   |   |  |   |
| Human Side of Organizations       | 3 |   | ✓ | ✓ |   | ✓ |  |   |

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| Semester 5                                             |         |     |   |   |   |   |   |   |
|--------------------------------------------------------|---------|-----|---|---|---|---|---|---|
| Course Name                                            | Credits | PLO |   |   |   |   |   |   |
|                                                        |         | 1   | 2 | 3 | 4 | 5 | 6 | 7 |
| Intro. to Engr. Probability & Statistics               | 3       | ✓   |   |   |   |   |   |   |
| Deterministic Operations Research                      | 3       | ✓   | ✓ |   |   |   |   |   |
| Software for Engineers                                 | 3       | ✓   | ✓ |   |   | ✓ |   |   |
| Technical Writing                                      | 3       |     |   | ✓ |   | ✓ |   |   |
| Fundamentals of Data Science for Engr (Data Analytics) | 3       | ✓   |   |   |   |   | ✓ |   |
| Manufacturing Process                                  | 3       | ✓   | ✓ |   |   | ✓ |   |   |
| Manufacturing Process Lab                              | 1       |     | ✓ | ✓ |   |   | ✓ |   |

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| Semester 6                                  |         |     |   |   |   |   |   |   |
|---------------------------------------------|---------|-----|---|---|---|---|---|---|
| Course Name                                 | Credits | PLO |   |   |   |   |   |   |
|                                             |         | 1   | 2 | 3 | 4 | 5 | 6 | 7 |
| Probabilistic Models in Operations Research | 3       | ✓   | ✓ |   |   |   |   |   |
| Integrated Manufacturing Systems            | 3       | ✓   | ✓ | ✓ | ✓ | ✓ |   | ✓ |
| Product Design and Development              | 3       | ✓   | ✓ |   | ✓ | ✓ |   |   |
| Engineering Experimental Design             | 3       |     | ✓ |   |   |   | ✓ | ✓ |
| Quality Control and Six Sigma               | 3       | ✓   | ✓ |   | ✓ |   |   |   |
| Production Systems Analysis                 | 3       | ✓   | ✓ |   |   |   | ✓ |   |

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| Semester 7                                 |         |     |   |   |   |   |   |   |
|--------------------------------------------|---------|-----|---|---|---|---|---|---|
| Course Name                                | Credits | PLO |   |   |   |   |   |   |
|                                            |         | 1   | 2 | 3 | 4 | 5 | 6 | 7 |
| Simulation Modeling & Analysis             | 3       | ✓   | ✓ |   |   |   | ✓ |   |
| Integrated System Design (Capstone Design) | 3       | ✓   | ✓ |   | ✓ | ✓ | ✓ | ✓ |
| Human Factor & Ergonomic in Design         | 3       | ✓   | ✓ |   | ✓ |   | ✓ |   |
| Cost Estimation                            | 3       |     | ✓ |   |   |   |   |   |
| Project Management (IE Elective)           | 3       |     | ✓ |   | ✓ |   | ✓ |   |
| Internship for Industrial Engineering      | 3       | ✓   | ✓ |   | ✓ |   |   |   |

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| Semester 8                                    |         |     |   |   |   |   |   |   |
|-----------------------------------------------|---------|-----|---|---|---|---|---|---|
| Course Name                                   | Credits | PLO |   |   |   |   |   |   |
|                                               |         | 1   | 2 | 3 | 4 | 5 | 6 | 7 |
| Final Year Project for Industrial Engineering | 4       | ✓   | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Supply Chain Management (IE Elective)         | 3       | ✓   | ✓ |   |   |   | ✓ |   |
| Technical Sales & Marketing (IE Elective)     | 3       |     | ✓ |   |   |   | ✓ |   |
| Embedded Computer Systems                     | 4       |     | ✓ |   |   |   | ✓ |   |

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**Table 13. IE Degree Plan.**

### INDUSTRIAL ENGINEERING DEGREE PLAN AY 2024-2025



#### SEMESTER I

| CODES        | COURSE TITLE                                      | CREDITS   |
|--------------|---------------------------------------------------|-----------|
| GCOM1304     | Composition I (English)                           | 3         |
| GENG1301     | Introduction to Engineering                       | 3         |
| GSCI1303     | General Chemistry I (GE EP-Natural Scientist)     | 3         |
| GSCI1103L    | General Chemistry I Lab (GE EP-Natural Scientist) | 1         |
| GMAT1313     | Calculus I                                        | 3         |
| GHUM1303     | World Religions (GE EP-Humanist)                  | 3         |
| GHUM1207     | Kewarganegaraan                                   | 2         |
| <b>Total</b> |                                                   | <b>18</b> |

#### SEMESTER II

| CODES        | COURSE TITLE                               | CREDITS   |
|--------------|--------------------------------------------|-----------|
| GCOM1305     | Composition II (English)                   | 3         |
| GSCI2304     | General Chemistry II                       | 3         |
| GSCI2104L    | General Chemistry II Lab                   | 1         |
| GSCI1312     | General Physics with Calculus I            | 3         |
| GSCI1112L    | General Physics with Calculus I Lab        | 1         |
| GMAT1314     | Calculus II                                | 3         |
| ENGR1301     | Computer Programming for Engr Applications | 3         |
| GHUM1208     | Indonesian Language                        | 2         |
| <b>Total</b> |                                            | <b>19</b> |

#### SEMESTER III

| CODES        | COURSE TITLE                                | CREDITS   |
|--------------|---------------------------------------------|-----------|
| IENG2301     | Introduction to Systems & Industrial Engr   | 3         |
| IENG2302     | Object-Oriented Modeling & Design           | 3         |
| GSCI2313     | General Physics with Calculus II            | 3         |
| GSCI2113L    | General Physics with Calculus II Lab        | 1         |
| GMAT2415     | Calculus III                                | 4         |
| GSOC2303     | General Psychology (GE EP-Social Scientist) | 3         |
| GHUM1301     | Pancasila (GE EP-Building Connections)      | 3         |
| HED 102A     | Succeeding as a Global Wildcat I            | 0         |
| <b>Total</b> |                                             | <b>20</b> |

#### SEMESTER IV

| CODES        | COURSE TITLE                                      | CREDITS   |
|--------------|---------------------------------------------------|-----------|
| IENG2304     | Engineering Economy                               | 3         |
| IENG2305     | Mathematical Foundations of IE                    | 3         |
| IENG2103     | Industrial Engineering Colloquium                 | 1         |
| ENGR2302     | Statics                                           | 3         |
| VCDD3345     | Indonesia Art History (GE EP-Artist)              | 3         |
| ENGR3303     | Environmental Ethics (GE EP-Building Connections) | 3         |
| IENG4319     | Human Side of Org. (GE EP-Building Connections 3) | 3         |
| HED 102B     | Succeeding as a Global Wildcat II                 | 0         |
| <b>Total</b> |                                                   | <b>19</b> |

#### SEMESTER V

| CODES        | COURSE TITLE                                  | CREDITS   |
|--------------|-----------------------------------------------|-----------|
| IENG3306     | Introduction to Engr Probability & Statistics | 3         |
| IENG3307     | Deterministic Operations Research (UA)        | 3         |
| IENG3308     | Software for Engineers (UA)                   | 3         |
| IENG3310     | Technical Writing                             | 3         |
| IENG3330     | Fundamentals of Data Science for Engineering  | 3         |
| IENG3309     | Manufacturing Process for IE                  | 3         |
| IENG3109L    | Manufacturing Process for IE Lab              | 1         |
| <b>Total</b> |                                               | <b>19</b> |

#### SEMESTER VI

| CODES        | COURSE TITLE                                     | CREDITS   |
|--------------|--------------------------------------------------|-----------|
| IENG3311     | Probabilistic Models in Operations Research (UA) | 3         |
| IENG3312     | Integrated Manufacturing Systems                 | 3         |
| IENG4334     | Product Design and Development                   | 3         |
| IENG3314     | Engineering Experimental Design (UA)             | 3         |
| IENG3315     | Quality Control & Six Sigma                      | 3         |
| IENG3313     | Production System Analysis                       | 3         |
| <b>Total</b> |                                                  | <b>18</b> |

#### SEMESTER VII

| CODES        | COURSE TITLE                               | CREDITS   |
|--------------|--------------------------------------------|-----------|
| IENG4316     | Simulation Modeling & Analysis (UA)        | 3         |
| IENG4331     | Integrated System Design (Capstone Design) | 3         |
| IENG4317     | Human Factors & Ergonomics in Design (UA)  | 3         |
| IENG4328     | Cost Estimation                            | 3         |
| IENG4318     | Project Management (UA)                    | 3         |
| IENG4332     | Internship for Industrial Engineering      | 3         |
| <b>Total</b> |                                            | <b>18</b> |

#### SEMESTER VIII

| CODES        | COURSE TITLE                                  | CREDITS   |
|--------------|-----------------------------------------------|-----------|
| IENG4433     | Final Year Project for Industrial Engineering | 4         |
| IENG4320     | Supply Chain Management (UA)                  | 3         |
| IENG4322     | Technical Sales and Marketing (UA)            | 3         |
| IENG4421     | Embedded Computer Systems (UA)                | 4         |
| <b>Total</b> |                                               | <b>14</b> |

**TOTAL CREDIT HOURS FOR DEGREE PROGRAM 145**

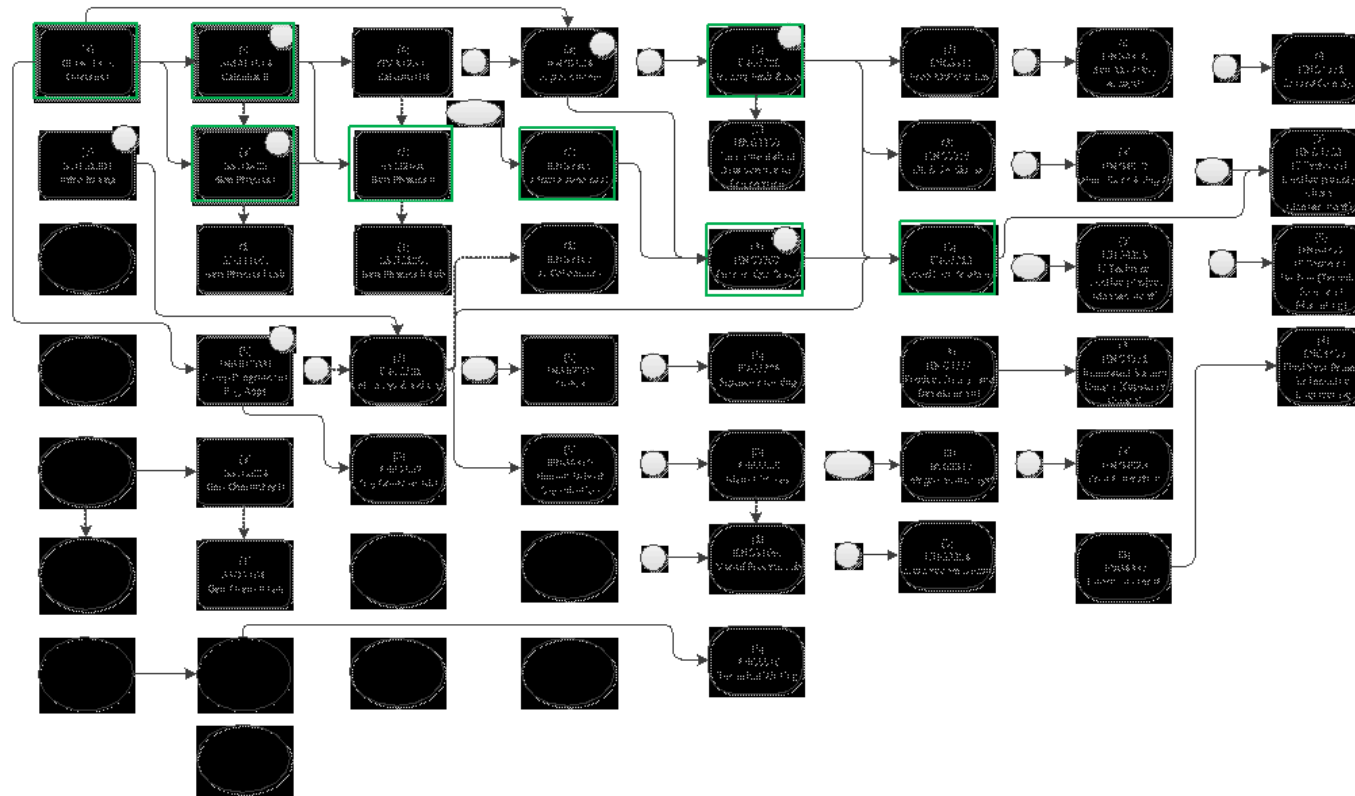


**Figure 2.** IE Flow Chart (AY 2024/2025)

### 7. Course Structure in the Curriculum

Table 14 summarizes the list of courses grouped based on the Compulsory, Elective, and Nationally Compulsory criteria. The course flowchart is shown in Figure 3.

**Table 14. Matrix of the Course Structure in the Curriculum of Study Program**

| Sem. | Credits | # of Courses | Undergraduate Courses (Credit Hours)                                                                                                                                                                                                                  |                  |                                                  |
|------|---------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------------------------------|
|      |         |              | Compulsory Courses                                                                                                                                                                                                                                    | Elective Courses | Nationally Compulsory Courses                    |
| I    | 18      | 7            | 1. Composition I (3)<br>2. Intro. to Engineering (3)<br>3. Gen. Chemistry I (3)<br>4. Gen. Chemistry I Lab (1)<br>5. Calculus I (3)                                                                                                                   |                  | 1. World Religions (3)<br>2. Kewarganegaraan (2) |
| II   | 19      | 8            | 1. Composition II (3)<br>2. Gen. Chemistry II (3)<br>3. Gen. Chemistry II Lab (1)<br>4. Gen. Physics with Calculus I (3)<br>5. Gen. Physics with Calculus I Lab (1)<br>6. Calculus II (3)<br>7. Computer Programming for Engineering Applications (3) |                  | 1. Indonesian Language (2)                       |
| III  | 20      | 7            | 1. Introduction to Systems & Industrial Engr. (3)<br>2. Object Oriented Modeling & Design (3)<br>3. Gen. Physics with Calculus II (3)<br>4. Gen. Physics with Calculus II Lab (1)<br>5. Calculus III (4)<br>6. General Psychology (3)                 |                  | 1. Pancasila (3)                                 |
| IV   | 19      | 7            | 1. Engineering Economy (3)<br>2. Mathematical Foundations for IE (3)<br>3. Industrial Engineering Colloquium (1)<br>4. Statics (3)<br>5. Indonesian Arts History (3)<br>6. Environmental Ethics (3)<br>7. Human Side of Organizations (3)             |                  |                                                  |

| Sem. | Credits | # of Courses | Undergraduate Courses (Credit Hours)                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                               |                               |
|------|---------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|      |         |              | Compulsory Courses                                                                                                                                                                                                                                                                  | Elective Courses                                                                                                                                                                                                                                                                                                                                                                                              | Nationally Compulsory Courses |
| V    | 19      | 7            | 1. Intro. to Engr. Probability & Statistics (3)<br>2. Deterministic Operations Research (3)<br>3. Software for Engineers (3)<br>4. Technical Writing (3)<br>5. Fundamentals of Data Science for Engineering (3)<br>6. Manufacturing Process (3)<br>7. Manufacturing Process Lab (1) |                                                                                                                                                                                                                                                                                                                                                                                                               |                               |
| VI   | 18      | 6            | 1. Probabilistic Models in Operations Research (3)<br>2. Integrated Manufacturing Systems (3)<br>3. Product Design and Development (3)<br>4. Engineering Experimental Design (3)<br>5. Quality Control and Six Sigma (3)<br>6. Production Systems Analysis (3)                      |                                                                                                                                                                                                                                                                                                                                                                                                               |                               |
| VII  | 18      | 6            | 1. Simulation Modeling & Analysis (3)<br>2. Integrated System Design (Capstone Design) (3)<br>3. Human Factor & Ergonomic in Design (3)<br>4. Cost Estimation (3)<br>5. Internship for IE (3)                                                                                       | IE Electives (choose 1):<br>1. Project Management (3)<br>2. Supply Chain Management (3)<br>3. Technical Sales & Marketing (3)<br>4. Engineering Decision Making Under Uncertainty (3)<br>5. Engineering Statistics (3)<br>6. Reliability Engineering (3)<br>7. Survey of Optimization Methods (3)<br>8. The Systems Engineering Process (3)<br>9. Cost Estimation (3)<br>10. Engineering Entrepreneurship (3) |                               |

| Sem.         | Credits | # of Courses | Undergraduate Courses (Credit Hours)                                                     |                                                                                                                                                                                                                                                                                                                                                                                                               |                               |
|--------------|---------|--------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|              |         |              | Compulsory Courses                                                                       | Elective Courses                                                                                                                                                                                                                                                                                                                                                                                              | Nationally Compulsory Courses |
| VIII         | 14      | 4            | 1. Final Year Project for Industrial Engineering (4)<br>2. Embedded Computer Systems (4) | IE Electives (choose 2):<br>1. Project Management (3)<br>2. Supply Chain Management (3)<br>3. Technical Sales & Marketing (3)<br>4. Engineering Decision Making Under Uncertainty (3)<br>5. Engineering Statistics (3)<br>6. Reliability Engineering (3)<br>7. Survey of Optimization Methods (3)<br>8. The Systems Engineering Process (3)<br>9. Cost Estimation (3)<br>10. Engineering Entrepreneurship (3) |                               |
| <b>Total</b> | 145     | 52           | 45                                                                                       | 3                                                                                                                                                                                                                                                                                                                                                                                                             | 4                             |

## 8. Distribution of Courses in Each Semester

**Tables 15-22** tabulates all courses per semester which are categorized as Theory, Practicum, and Practice.

**Table 15. Courses in Semester I**

| SEMESTER I |           |                                                   |              |            |          |       |
|------------|-----------|---------------------------------------------------|--------------|------------|----------|-------|
| No         | Code      | Course                                            | Credit Hours |            |          |       |
|            |           |                                                   | Theory       | Laboratory | Practice | Total |
| 1          | GCOM1304  | Composition I (English)                           | 3            |            |          | 3     |
| 2          | GENG1301  | Introduction to Engineering                       | 3            |            |          | 3     |
| 3          | GSCI1303  | General Chemistry I (GE EP-Natural Scientist)     | 3            |            |          | 3     |
| 4          | GSCI1103L | General Chemistry I Lab (GE EP-Natural Scientist) |              | 1          |          | 1     |
| 5          | GMAT1313  | Calculus I                                        | 3            |            |          | 3     |

|                        |          |                                  |    |   |  |    |
|------------------------|----------|----------------------------------|----|---|--|----|
| 6                      | GHUM1303 | World Religions (GE EP-Humanist) | 3  |   |  | 3  |
| 7                      | GHUM1207 | Kewarganegaraan                  | 2  |   |  | 2  |
| <b>Semester I Load</b> |          |                                  | 17 | 1 |  | 18 |

**Table 16. Courses in Semester II**

| SEMESTER II             |           |                                     |              |            |          |       |
|-------------------------|-----------|-------------------------------------|--------------|------------|----------|-------|
| No                      | Code      | Course                              | Credit Hours |            |          |       |
|                         |           |                                     | Theory       | Laboratory | Practice | Total |
| 1                       | GCOM1305  | Composition II (English)            | 3            |            |          | 3     |
| 2                       | GSCI2304  | General Chemistry II                | 3            |            |          | 3     |
| 3                       | GSCI2104L | General Chemistry II Lab            |              | 1          |          | 1     |
| 4                       | GSCI1312  | General Physics with Calculus I     | 3            |            |          | 3     |
| 5                       | GSCI1112L | General Physics with Calculus I Lab |              | 1          |          | 1     |
| 6                       | GMAT1314  | Calculus II                         | 3            |            |          | 3     |
| 7                       | ENGR1301  | Comp. Programming for Engineers     | 2            |            | 1        | 3     |
| 8                       | GHUM1208  | Indonesian Language                 | 2            |            |          | 2     |
| <b>Semester II Load</b> |           |                                     | 16           | 2          | 1        | 19    |

**Table 17. Courses in Semester III**

| SEMESTER III |           |                                             |              |            |          |       |
|--------------|-----------|---------------------------------------------|--------------|------------|----------|-------|
| No           | Code      | Course                                      | Credit Hours |            |          |       |
|              |           |                                             | Theory       | Laboratory | Practice | Total |
| 1            | IENG2301  | Introduction to Systems & Industrial Engr   | 2            |            | 1        | 3     |
| 2            | IENG2302  | Object Oriented Modeling & Design           | 2            |            | 1        | 3     |
| 3            | GSCI2313  | General Physics with Calculus II            | 3            |            |          | 3     |
| 4            | GSCI2113L | General Physics with Calculus II Lab        |              | 1          |          | 1     |
| 5            | GMAT2415  | Calculus III                                | 4            |            |          | 4     |
| 6            | GSOC2303  | General Psychology (GE EP-Social Scientist) | 3            |            |          | 3     |

|                          |          |                                        |    |   |   |    |
|--------------------------|----------|----------------------------------------|----|---|---|----|
| 7                        | GHUM1301 | Pancasila (GE EP-Building Connections) | 3  |   |   | 3  |
| 8                        | HED 102A | Succeeding as a Global Wildcat I       | 0  |   |   | 0  |
| <b>Semester III Load</b> |          |                                        | 17 | 1 | 2 | 20 |

**Table 18. Courses in Semester IV**

| SEMESTER IV             |          |                                    |              |            |          |       |
|-------------------------|----------|------------------------------------|--------------|------------|----------|-------|
| No                      | Code     | Course                             | Credit Hours |            |          |       |
|                         |          |                                    | Theory       | Laboratory | Practice | Total |
| 1                       | IENG2304 | Engineering Economy                | 3            |            |          | 3     |
| 2                       | IENG2305 | Mathematical Foundations for IE    | 2            |            | 1        | 3     |
| 3                       | IENG2103 | IE Colloquium                      |              |            | 1        | 1     |
| 4                       | ENGR2302 | Statics                            | 2            | 1          |          | 3     |
| 5                       | VCDD3345 | Indonesian Arts Hist. (Arts & Hum) | 3            |            |          | 3     |
| 6                       | ENGR3303 | Environmental Ethics (Indv & Soc)  | 2            |            | 1        | 3     |
| 7                       | IENG4319 | Human Side of Organizations        | 2            |            | 1        | 3     |
| 8                       | HED 102B | Succeeding as a Global Wildcat II  |              |            |          | 0     |
| <b>Semester IV Load</b> |          |                                    | 14           | 1          | 4        | 19    |

**Table 19. Courses in Semester V**

| SEMESTER V |          |                                               |              |            |          |       |
|------------|----------|-----------------------------------------------|--------------|------------|----------|-------|
| No         | Code     | Course                                        | Credit Hours |            |          |       |
|            |          |                                               | Theory       | Laboratory | Practice | Total |
| 1          | IENG3306 | Introduction to Engr Probability & Statistics | 2            |            | 1        | 3     |
| 2          | IENG3307 | Deterministic Operations Research             | 2            |            | 1        | 3     |
| 3          | IENG3308 | Software for Engineers                        | 2            |            | 1        | 3     |
| 4          | IENG3310 | Technical Writing                             | 3            |            |          | 3     |
| 5          | IENG3330 | Fundamentals of Data Science for Engineering  | 3            |            |          | 3     |

|                        |           |                                  |    |   |   |    |
|------------------------|-----------|----------------------------------|----|---|---|----|
| 6                      | IENG3309  | Manufacturing Process for IE     | 3  |   |   | 3  |
| 7                      | IENG3109L | Manufacturing Process for IE Lab |    | 1 |   | 1  |
| <b>Semester V Load</b> |           |                                  | 15 | 1 | 3 | 19 |

**Table 20. Courses in Semester VI**

| SEMESTER VI             |          |                                     |              |            |          |       |
|-------------------------|----------|-------------------------------------|--------------|------------|----------|-------|
| No                      | Course   | Course                              | Credit Hours |            |          |       |
|                         |          |                                     | Theory       | Laboratory | Practice | Total |
| 1                       | IENG3311 | Prob. Models in Operations Research | 2            |            | 1        | 3     |
| 2                       | IENG3312 | Integrated Manufacturing Systems    | 2            |            | 1        | 3     |
| 3                       | IENG4334 | Product Design and Development      | 2            |            | 1        | 3     |
| 4                       | IENG3314 | Engineering Experimental Design     | 2            |            | 1        | 3     |
| 5                       | IENG3315 | Quality Control and Six Sigma       | 2            |            | 1        | 3     |
| 6                       | IENG3313 | Production Systems Analysis         | 2            |            | 1        | 3     |
| <b>Semester VI Load</b> |          |                                     | 12           |            | 6        | 18    |

**Table 21. Courses in Semester VII**

| SEMESTER VII             |          |                                            |              |            |          |       |
|--------------------------|----------|--------------------------------------------|--------------|------------|----------|-------|
| No                       | Code     | Course                                     | Credit Hours |            |          |       |
|                          |          |                                            | Theory       | Laboratory | Practice | Total |
| 1                        | IENG4316 | Simulation Modeling & Analysis             | 2            |            | 1        | 3     |
| 2                        | IENG4331 | Integrated System Design (Capstone Design) | 3            |            |          | 3     |
| 3                        | IENG4317 | Human Factor & Ergonomic in Design         | 2            |            | 1        | 3     |
| 4                        | IENG4328 | Cost Estimation                            | 3            |            |          | 3     |
| 5                        | IENG4318 | Project Management (IE Elective)           | 2            |            | 1        | 3     |
| 6                        | IENG4332 | Internship for Industrial Engineering      |              |            | 3        | 3     |
| <b>Semester VII Load</b> |          |                                            | 12           |            | 6        | 18    |

**Table 22. Courses in Semester VIII.**

| SEMESTER VIII             |          |                                               |              |            |          |       |
|---------------------------|----------|-----------------------------------------------|--------------|------------|----------|-------|
| No                        | Code     | Course                                        | Credit Hours |            |          |       |
|                           |          |                                               | Theory       | Laboratory | Practice | Total |
| 1                         | IENG4433 | Final Year Project for Industrial Engineering | 2            |            | 2        | 4     |
| 2                         | IENG4320 | Supply Chain Management (IE Elective)         | 3            |            |          | 3     |
| 3                         | IENG4322 | Technical Sales & Marketing (IE Elective)     | 2            |            | 1        | 3     |
| 4                         | IENG4321 | Embedded Computer Systems                     | 2            | 1          | 1        | 4     |
| <b>Semester VIII Load</b> |          |                                               | 9            | 1          | 4        | 14    |
| <b>TOTAL</b>              |          |                                               | 112          | 7          | 26       | 145   |

## 9. Implementation Plan of "Freedom of Learning Independent Campus" (Merdeka Belajar Kampus Merdeka - MBKM)

### 9.1. Implementation Model of MBKM

The following MBKM implementation in the Industrial Engineering Study Program is prepared in pursuant to PermenDikBud No. 3 Tahun 2020 (Standar Nasional Pendidikan Tinggi); Pasal 15 dan 18 on MBKM (Merdeka Belajar dan Kampus Merdeka).

The Industrial Engineering Study Program at Sampoerna University has a total of 145 credit hours in its degree plan Figure 3:

### INDUSTRIAL ENGINEERING DEGREE PLAN AY 2024-2025


**SAMPOERNA  
UNIVERSITY**

**KEISER  
UNIVERSITY**

In Collaboration with


**THE UNIVERSITY  
OF ARIZONA**

#### SEMESTER I

| GCOM1304     | Composition I (English)                           | 3         |
|--------------|---------------------------------------------------|-----------|
| GENG1301     | Introduction to Engineering                       | 3         |
| GSCI1303     | General Chemistry I (GE EP-Natural Scientist)     | 3         |
| GSCI1103L    | General Chemistry I Lab (GE EP-Natural Scientist) | 1         |
| GMAT1313     | Calculus I                                        | 3         |
| GHUM1303     | World Religions (GE EP-Humanist)                  | 3         |
| GHUM1207     | Kewarganegaraan                                   | 2         |
| <b>Total</b> |                                                   | <b>18</b> |

#### SEMESTER II

| GCOM1305     | Composition II (English)                   | 3         |
|--------------|--------------------------------------------|-----------|
| GSCI2304     | General Chemistry II                       | 3         |
| GSCI2104L    | General Chemistry II Lab                   | 1         |
| GSCI1312     | General Physics with Calculus I            | 3         |
| GSCI1112L    | General Physics with Calculus I Lab        | 1         |
| GMAT1314     | Calculus II                                | 3         |
| ENGR1301     | Computer Programming for Engr Applications | 3         |
| GHUM1208     | Indonesian Language                        | 2         |
| <b>Total</b> |                                            | <b>19</b> |

#### SEMESTER III

| IBNG2301     | Introduction to Systems & Industrial Engr   | 3         |
|--------------|---------------------------------------------|-----------|
| IBNG2302     | Object-Oriented Modeling & Design           | 3         |
| GSCI2313     | General Physics with Calculus II            | 3         |
| GSCI2113L    | General Physics with Calculus II Lab        | 1         |
| GMAT2415     | Calculus III                                | 4         |
| GSOC2303     | General Psychology (GE EP-Social Scientist) | 3         |
| GHUM1301     | Pancasila (GE EP-Building Connections)      | 3         |
| HED 102A     | Succeeding as a Global Wildcat I            | 0         |
| <b>Total</b> |                                             | <b>20</b> |

#### SEMESTER IV

| IBNG2304     | Engineering Economy                                        | 3         |
|--------------|------------------------------------------------------------|-----------|
| IBNG2305     | Mathematical Foundations of IE                             | 3         |
| IBNG2103     | Industrial Engineering Colloquium                          | 1         |
| ENGR2302     | Statics                                                    | 3         |
| VCDD3345     | Indonesia Art History (GE EP-Artist)                       | 3         |
| ENGR3303     | Environmental Ethics (GE EP-Building Connections)          | 3         |
| IBNG4319     | Human Side of Organizations (GE EP-Building Connections 3) | 3         |
| HED 102B     | Succeeding as a Global Wildcat II                          | 0         |
| <b>Total</b> |                                                            | <b>19</b> |

#### SEMESTER V

| IBNG3306     | Introduction to Engr Probability & Statistics | 3         |
|--------------|-----------------------------------------------|-----------|
| IBNG3307     | Deterministic Operations Research (UA)        | 3         |
| IBNG3308     | Software for Engineers (UA)                   | 3         |
| IBNG3310     | Technical Writing                             | 3         |
| IBNG3330     | Fundamentals of Data Science for Engineering  | 3         |
| IBNG3309     | Manufacturing Process for IE                  | 3         |
| IBNG3109L    | Manufacturing Process for IE Lab              | 1         |
| <b>Total</b> |                                               | <b>19</b> |

#### SEMESTER VI

| IBNG3311     | Probabilistic Models in Operations Research (UA) | 3         |
|--------------|--------------------------------------------------|-----------|
| IBNG3312     | Integrated Manufacturing Systems                 | 3         |
| IBNG4334     | Product Design and Development                   | 3         |
| IBNG3314     | Engineering Experimental Design (UA)             | 3         |
| IBNG3315     | Quality Control & Six Sigma                      | 3         |
| IBNG3313     | Production System Analysis                       | 3         |
| <b>Total</b> |                                                  | <b>18</b> |

#### SEMESTER VII

| IBNG4316     | Simulation Modeling & Analysis (UA)        | 3         |
|--------------|--------------------------------------------|-----------|
| IBNG4331     | Integrated System Design (Capstone Design) | 3         |
| IBNG4317     | Human Factors & Ergonomics in Design (UA)  | 3         |
| IBNG4328     | Cost Estimation                            | 3         |
| IBNG4318     | Project Management (UA)                    | 3         |
| IBNG4332     | Internship for Industrial Engineering      | 3         |
| <b>Total</b> |                                            | <b>18</b> |

#### SEMESTER VIII

| IBNG4433     | Final Year Project for Industrial Engineering | 4         |
|--------------|-----------------------------------------------|-----------|
| IBNG4320     | Supply Chain Management (UA)                  | 3         |
| IBNG4322     | Technical Sales and Marketing (UA)            | 3         |
| IBNG4421     | Embedded Computer Systems (UA)                | 4         |
| <b>Total</b> |                                               | <b>14</b> |

**TOTAL CREDIT HOURS FOR DEGREE PROGRAM 145**

#### Note

Possible MBKM Articulated Courses

Figure 3. IE Degree Plan (MBKM version).

### 9.2. Courses taken at Other Study Programs at Sampoerna University (Maximum 12 Credit Hours)

#### General Education:

| CODES    | COURSE TITLE                  | CREDITS |
|----------|-------------------------------|---------|
| GHUM1306 | Basic Fundamentals of Drawing | 3       |
| VCDD3345 | Indonesia Art History         | 3       |
| GSOC2303 | General Psychology            | 3       |
| GSOC2304 | Social Problems               | 3       |
| ENGR3303 | Environmental Ethics          | 3       |
| GECO2301 | Principles of Macroeconomics  | 3       |
|          | Total                         | 18      |

### 9.3. Courses taken at Other Institutions that can be Articulated as Sampoerna University's Courses (Maximum 40 Credit Hours)

#### General Education:

| CODES    | COURSE TITLE        | CREDITS |
|----------|---------------------|---------|
| GHUM1207 | Kewarganegaraan     | 2       |
| GHUM1208 | Indonesian Language | 2       |
| GHUM1301 | Pancasila           | 3       |
| GHUM1303 | World Religions     | 3       |
|          | Total               | 10      |

#### SU Industrial Engineering:

| CODES    | COURSE TITLE                     | CREDITS |
|----------|----------------------------------|---------|
| IENG3310 | Technical Writing                | 3       |
| IENG3312 | Integrated Manufacturing Systems | 3       |
| IENG3315 | Quality Control & Six Sigma      | 3       |
| IENG4319 | Human Side Organization          | 3       |
|          | Total                            | 21      |

#### University of Arizona:

| CODES    | COURSE TITLE                                | CREDITS |
|----------|---------------------------------------------|---------|
| IENG3307 | Deterministic Operations Research           | 3       |
| IENG3308 | Software for Engineers                      | 3       |
| IENG3311 | Probabilistic Models in Operations Research | 3       |
| IENG3314 | Engineering Experimental Design             | 3       |
| IENG4316 | Simulation Modeling & Analysis              | 3       |
| IENG4317 | Human Factors & Ergonomics in Design        | 3       |
| IENG4318 | Project Management                          | 3       |
| IENG4322 | Technical Sales & Marketing                 | 3       |
| IENG4421 | Embedded Computer Systems                   | 4       |

|          |                         |    |
|----------|-------------------------|----|
| IENG4320 | Supply Chain Management | 3  |
| Total    |                         | 31 |

**9.4. Courses Taken at Industries or Other Institutions that can be Articulated as Sampoerna University's Courses (Maximum 20 Credit Hours)**

SU Industrial Engineering:

| CODES     | COURSE TITLE                                  | CREDITS |
|-----------|-----------------------------------------------|---------|
| IENG3310  | Technical Writing                             | 3       |
| IENG3312  | Integrated Manufacturing Systems              | 3       |
| IENG3315  | Quality Control & Six Sigma                   | 3       |
| IENG4319  | Human Side of Organization                    | 3       |
| IENG 4301 | Internship for Industrial Engineering         | 3       |
| STEM4433  | Final Year Project for Industrial Engineering | 4       |
| IENGXXXX  | Independent Study                             | 1 – 20  |
| Total     |                                               | 20 – 39 |

**9.5. Courses Offered by IE to Other Study Programs at Sampoerna University as MBKM Courses.**

SU Industrial Engineering:

| CODES    | COURSE TITLE                                  | CREDITS |
|----------|-----------------------------------------------|---------|
| IENG2304 | Engineering Economy                           | 3       |
| IENG3306 | Introduction to Engr Probability & Statistics | 3       |
| IENG3310 | Technical Writing                             | 3       |

**9.6. Courses Offered by Sampoerna University to other Institutions as MBKM Courses.**

SU Industrial Engineering (tentative):

| CODES     | COURSE TITLE                              | CREDITS |
|-----------|-------------------------------------------|---------|
| IENG2301  | Introduction to Systems & Industrial Engr | 3       |
| IENG2304  | Engineering Economy                       | 3       |
| IENG2305  | Mathematical Foundations of IE            | 3       |
| IENG3306  | Intro. to Engr. Probability & Statistics  | 3       |
| IENG3309  | Manufacturing Process for IE              | 3       |
| IENG3109L | Manufacturing Process for IE Lab          | 1       |
| IENG3310  | Technical Writing                         | 3       |
| IENG3312  | Integrated Manufacturing Systems          | 3       |
| IENG3315  | Quality Control & Six Sigma               | 3       |
| IENG4319  | Human Side of Organization                | 3       |
| Total     |                                           | 40      |



### 9.7. Stipulations

#### Courses Cannot Be Double Counted:

Courses taken under sections I, II, or III, cannot overlap. In other words, you cannot claim the credit hours of the same course under different sections.

#### Capstone Courses:

Senior Capstones 1 & 2 can be taken entirely at a partner university, or it can be registered at SU while the project itself is done at a partner institution outside SU. When registered at SU but the students do the project at a partner institution, then it is the independent research scheme.

#### Internship (min 160 hours for a 3-hour course):

Internship can be done for a period of three months or six months. The 3-month internship is taken during Summer Semester between the 6<sup>th</sup> and 7<sup>th</sup> Semester. The 6-month internship can be done in two patterns:

- (1) Three months summer semester + three months in 7<sup>th</sup> semester as Senior Capstone 1;
- (2) Three to six months after Senior Capstone 2 defense and before the Judicium.

When a student is accepted for an internship program at a company for more than three months in the summer semester, the extra activities can be articulated into equivalent courses (Senior Capstone I and Senior Capstone II) offered at SU. For the extended internship to be counted as Senior Capstone I and/or II, students must have completed additional 160 hours (for Senior Capstone I) or 320 hours (for Senior Capstones I & II). The grade translation into one of these courses in SU is subject to the final report and oral examination assessments. The content of the final report, the oral examination, syllabus, as well as the grading standard are discussed before the internship is started.

The 6-month of MBKM Certified Internship at a company after Semester 8, the articulation of credits will not go towards the degree plan. Additional 20 credit hours, can be attained when the student is admitted into MBKM Certified Internship program after completing the Senior Capstone II defense and before the Judicium.

## **10. Management of Curriculum**

Curriculum management is carried out by formulating the curriculum after the processes of evaluation and necessary revision of the previous curriculum have been done. In its supervision, a review of the RPS of each course subject is performed and its application is monitored. For example: the formulated CPL/SLO is reviewed for compliance with the relevant PLO by the curriculum team who understands the subject discussed in the meeting. The implementation of SLO is viewed from the assessment of SLO measurements i.e., PI (Performance Indicator), such as homework, quizzes, exams, presentations, final projects, etc. The implementation of the curriculum is reviewed by the measurement results a few times in a semester, which is usually discussed in the biweekly study program meetings. The Learning Management System by CANVAS platform is used for the monitoring of PLO achievement for every course. In the end of every semester, the results are presented and discussed among the permanent and non-permanent lecturers in Industrial Engineering Study Program.

## **CONCLUSION**

The 2024 IE Study Program Curriculum is a result of revision of many elements in the 2022 Curriculum. The changes are made after the inputs from many parties, and it is hoped that the new curriculum can better help to ensure the learning outcomes are achieved by our graduates. The new curriculum is also hoped to make the curriculum management easier as each course is mapped to less learning outcomes and the learning outcomes mapped to courses are more focused compared to the 2022 curriculum. We believe that the new curriculum is not free from errors and the review of curriculum is still needed after one cycle in the future.