# CURRICULUM 2023

## INTERNATIONAL UNDERGRADUATE PROGRAM

# INDUSTRIAL ENGINEERING

**Department of Mechanical and Industrial Engineering**
**Faculty of Engineerin**
**Universitas Negeri Malang**
**2023**

## Preface

All praise and gratitude be to Allah SWT for His blessings and guidance, enabling the 2023 Curriculum Development Team of the undergraduate Industrial Engineering Program to complete the formulation and development of the 2023 Curriculum. This curriculum serves as a guide for organizing education in the undergraduate Industrial Engineering Program, ensuring it is planned, directed, programmed, and on target.

The 2023 Curriculum is developed based on life-based learning, integrated with the concept of independent learning. This curriculum provides students with broader opportunities to develop competencies according to their interests and learn from life, through life, and for life. It also facilitates learning through both face-to-face and online methods, synchronously and asynchronously. Therefore, the 2023 Curriculum offers students the freedom to learn without the constraints of space and time.

On this occasion, the 2023 Curriculum Development Team of the undergraduate Industrial Engineering Program expresses sincere gratitude to all parties who have contributed, especially the lecturers in the undergraduate Industrial Engineering Program.

We hope that the 2023 Curriculum can serve as a guideline for all academic members of the undergraduate Industrial Engineering Program in conducting the learning process. By implementing this curriculum, it is expected that the quality of the undergraduate Industrial Engineering Program will improve, enabling it to compete at the national and international levels. This effort contributes to realizing Universitas Negeri Malang as an excellent and reference institution.

Of course, the 2023 Curriculum is not yet perfect. Periodic reviews will be conducted to adjust it to the developments in science and technology, ensuring it meets the needs of stakeholders.

Malang, July 2, 2023

The Development Team

# Content

## A. Identidy of Program

| | |
|---|---|
| Name | : Undergraduate Program of Industrial Engineering |
| Operational license | : 130/KPT/I/2017 (7 February 2017) |
| Accreditation state | : Good |
| Number of credits | : 146 credits |
| Institution | : Universitas Negeri Malang |
| Faculty | : Faculty of Engineering |
| Address | : Jalan Semarang 5 Malang |
| Telp. | : 0341-551312 |
| Website | : http://mesin.ft.um.ac.id/ |
| E-mail | : mesin@um.ac.id |

## B. Rationale for Curriculum Development

The era of the Industrial Revolution 4.0 has spurred rapid developments in the fields of the internet of things, artificial intelligence, big data, robotics, cloud computing, additive manufacturing & 3D printing, and e-learning. To compete effectively, university graduates must possess system and critical thinking skills, comprehensive oral and written communication skills, entrepreneurial abilities, and a commitment to lifelong learning.

Technological advancements driven by the Industrial Revolution 4.0 have also led to the emergence of Society 5.0, known as a super-smart society. Society 5.0 promotes the use of the internet of things, artificial intelligence, and robotics to enhance human comfort, characterized by the digitization of all aspects of society. Consequently, mastering digital technology and the ability to analyze big data generated from the digitization of various aspects of life are critical skills for university graduates.

The curriculum for the undergraduate Industrial Engineering Program is designed as an anticipatory measure for the wave of the Industrial Revolution 4.0 and Society 5.0, which demand individuals capable of working as professionals who can adapt to digital technology developments. This evolution has driven every industry to compete in extracting information from digital data. Therefore, the distinctive feature of the undergraduate Industrial Engineering Program curriculum that equips students to face these challenges is the field of big data analysis. Additionally, the curriculum allows students to develop their potential based on their interests.

The 2023 curriculum revision for the undergraduate Industrial Engineering Program aligns with the evaluation results of the current curriculum (2017, 2018, and 2020 Curricula), analysis of needs, and input from stakeholders and BKSTI (the Indonesian Association of Industrial Engineering Higher Education Providers). The current curriculum has too many courses in each semester from 1 to 6 (8-9 courses per semester), which places a heavy burden on students. Thus, the 2023 curriculum is designed to offer a maximum of 7 courses per semester. Moreover, the structure of course offerings needs to be adjusted because some courses are not presented in an optimal sequence. Meanwhile, input from stakeholders, such as the need to provide sufficient industry experience for students, must also be accommodated in this curriculum update.

This curriculum revision is also designed to follow the 2022 core curriculum for undergraduate Industrial Engineering programs issued by BKSTI. This core curriculum essentially recommends standard curricula considering Indonesia's higher education legal framework, the Industrial Engineering Body of Knowledge, industrial engineering learning outcome standards in line with the Indonesian National Work Competency Standards (SKKNI), higher education engineering competency standards, and the latest developments in industrial engineering knowledge.

## C. Academic Vision

The vision of the Undergraduate Industrial Engineering Program refers to the vision of UM and the Faculty of Engineering. The vision to be achieved by 2041, according to master development plan of UM, is as follows: To develop excellence in the field of Industrial Engineering and become a reference in science and technology, with an emphasis on the planning, control, and management of industrial systems based on big data analysis capabilities, producing graduates who are innovative and adaptable to change.

## D. Objectives

1. To produce graduates in the field of Industrial Engineering based on big data analysis who are excellent, intelligent, competitive, and possess academic and/or professional competencies, who are pious, have noble character, are independent, have national commitment, and can develop professionally.

2. To produce academic, scientific, and innovative works in the field of Industrial Engineering based on big data analysis and environmentally friendly smart technology.
3. To improve the quality and quantity of community service based on solving real-world problems, applying the results of studies and research to enhance excellence, productivity, and societal welfare through the mastery and application of technology nationally.

## E. Strategies

Referring to the strategic plans of UM, the Faculty of Engineering UM, the Department of Mechanical and Industrial Engineering, and the undergraduate Industrial Engineering Program, the four strategic targets to be achieved by the undergraduate Industrial Engineering Program are as follows:

1. Improved quality of education and learning
2. Improved quality of students and graduates
3. Improved quality of research and community service
4. Improved quality of management and institutional governance

To achieve these strategic targets, policies and strategies have been designed in line with the 2022-2027 Strategic Plan of the undergraduate Industrial Engineering Program. By 2027, it is expected that the four strategic targets will be achieved.

## *F. University Value*

UM's university value is to be a healthy and enlightening institution with excellent education based on life.

## G. Graduate Profile

The graduate profile is formulated based on the projected needs analysis derived from data on the growth of the manufacturing and service industries, as well as the analysis of global developments in Industrial Engineering knowledge. Additionally, the graduate profile refers to the profile of UM graduates, who are pious, have character, have national commitment, are independent, innovative-adaptive, capable of utilizing technology and communication skills, and able to collaborate globally.

**Program Educational Objective**

1. A Bachelor of Industrial Engineering who is able to design, improve, and implement integrated industrial systems (micro–meso–macro) to enhance efficiency, effectiveness, and productivity using a systems approach.
2. A Bachelor of Industrial Engineering who is able to collect, process, and interpret data, including big data, and formulate decision recommendations to support the planning, control, and management of industrial systems in a systemic and integrative manner.
3. A Bachelor of Industrial Engineering who is innovative and able to adapt to technological changes and evolving industry needs, capable of developing improvement/solution initiatives based on innovative thinking, and responsive to the dynamics of science and technology as well as ongoing change.

## H. Learning Outcomes (SCPL- Standar Capaian Pembelajaran Lulusan)

Learning outcomes of undergraduate industrial engineering program refer to the learning outcomes of UM and BKSTI. SCPL 1 refers to UM's learning outcomes, while SCPL 2-11 refer to BKSTI. The SCPL are formulated as follows:

1. Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.
2. Ability to apply knowledge of mathematics, basic and/or material sciences, information technology, and engineering to gain a comprehensive understanding of industrial engineering principles.
3. Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.
4. Ability to design and conduct laboratory and/or field experiments and analyze and interpret data to support industrial engineering decision-making processes.
5. Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.
6. Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.
7. Ability to communicate effectively both orally and in writing.
8. Ability to plan, complete, and evaluate tasks with consideration of given constraints.
9. Ability to work in teams.
10. Ability to be responsible to society, accountable, and practice professional ethics in solving industrial engineering problems.
11. Ability to engage in lifelong learning, including access to relevant knowledge on current issues.

The attitudes that every graduate of the undergraduate program at UM must possess are as follows:

1. Devoutness to God Almighty and the ability to show religious attitudes.
2. Uphold humanitarian values in performing duties based on religion, morals, and ethics.

3. Contribute to improving the quality of community, national life, and civilization progress based on Pancasila.
4. Act as citizens who are proud and love their homeland, have nationalism, and a sense of responsibility to the state and nation.
5. Appreciate cultural diversity, views, religions, and beliefs, as well as others' original opinions or findings.
6. Cooperate and have social sensitivity and concern for the community and the environment.
7. Obey the law and discipline in social and state life.
8. Internalize academic values, norms, and ethics.
9. Demonstrate responsibility for work in their field of expertise independently.
10. Internalize the spirit of independence, struggle, and entrepreneurship.
11. Become self-learners and lifelong learners.
12. Be responsive and adaptive to changes and developments in science and technology.

The general skills that UM undergraduate program graduates must possess include:

1. Ability to apply logical, critical, systematic, and innovative thinking in developing or implementing science and technology, considering and applying humanities values according to their expertise.
2. Ability to demonstrate independent, quality, and measurable performance.
3. Ability to assess the implications of developing or implementing science and technology, considering and applying humanities values according to their expertise based on scientific principles, procedures, and ethics to generate solutions, ideas, designs, or artistic critiques, compile scientific descriptions of the results in the form of theses or final project reports, and upload them on the university website.
4. Compile scientific descriptions of the studies mentioned above in the form of final project reports and upload them on the university website.
5. Ability to make appropriate decisions in solving problems in their field of expertise based on analysis of information and data.
6. Ability to maintain and develop a network with advisors, colleagues, peers, both within and outside their institution.
7. Ability to be responsible for achieving group work results and supervising and evaluating the completion of work assigned to those under their responsibility.
8. Ability to self-evaluate the workgroup under their responsibility and manage learning

independently.

9. Ability to document, store, secure, and retrieve data to ensure authenticity and prevent plagiarism.
10. Ability to utilize information technology in learning and working.

The knowledge that undergraduate Industrial Engineering program graduates must possess includes:

1. Mastery of theoretical concepts of engineering sciences, engineering principles, and engineering design required for the analysis and design of integrated systems.
2. Mastery of natural sciences concepts and the principles of mathematical engineering applications in the analysis and design of integrated systems.
3. Mastery of the principles and techniques of integrated system design with a systems approach.
4. Mastery of current principles and issues in general economics and social sciences.
5. Mastery of environmental conservation principles.
6. Mastery of occupational health and safety principles.
7. Mastery of communication techniques.
8. Mastery of knowledge of the latest and current technological developments.

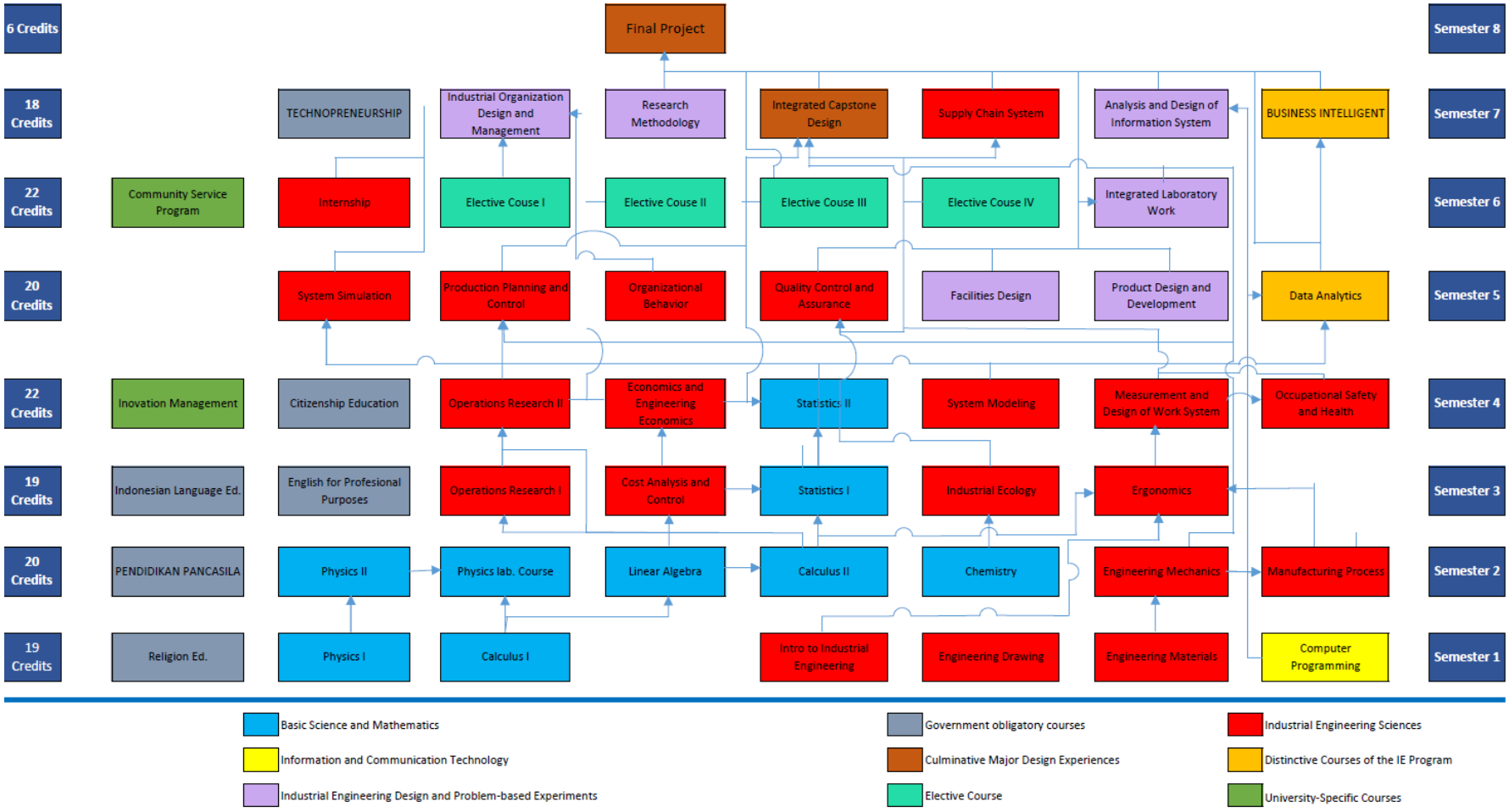
The specific skills that undergraduate Industrial Engineering program graduates must possess include:

1. Ability to apply mathematics, science, and engineering principles to solve complex engineering problems in integrated systems.
2. Ability to identify the sources of complex engineering problems in integrated systems through investigation, data analysis, interpretation (including big data), and information based on analytical, computational, or experimental approaches.
3. Ability to conduct research involving problem identification, formulation, and analysis in integrated engineering systems.
4. Ability to formulate alternative solutions to solve complex engineering problems in integrated systems considering economic, public health and safety, cultural, social, and environmental factors.
5. Ability to design, improve, implement, and control integrated systems considering technical standards, performance aspects, constraints, ease of implementation, sustainability, and considering economic, public health and safety, cultural, social, and environmental factors.
6. Ability to select resources and utilize information technology and computing-based design

and analysis tools appropriate for engineering activities in integrated systems.

7. Ability to effectively communicate ideas and recommendations in oral, written, and visual forms, both nationally and globally.
8. Ability to adapt to changes in knowledge or technology that occur in the process of implementation and research substance in design, operation, and improvement of integrated systems.

# I. Curriculum Mapping



## J. Structure of Curriculum

| No. | Course | | Credit | Semester | | | | | | | | Pre-requisite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Code | Course name | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| **A.** | **Character development courses (MDPK)** | | | | | | | | | | | |
| 1. | UNIV236001 | Islamic Education | 3 | 3* | | | | | | | | |
| 2. | UNIV236002 | Protestant Education | 3 | 3* | | | | | | | | |
| 3. | UNIV236003 | Catholic Education | 3 | 3* | | | | | | | | |
| 4. | UNIV236004 | Hindu Education | 3 | 3* | | | | | | | | |
| 5. | UNIV236005 | Buddhist Education | 3 | 3* | | | | | | | | |
| 6. | UNIV236006 | Konghucu Education | 3 | 3* | | | | | | | | |
| 7. | UNIV236014 | Faith Education | 3 | 3* | | | | | | | | |
| 8. | UNIV236007 | Pancasila Education | 2 | | 2 | | | | | | | |
| 9. | UNIV236008 | Citizenship Education | 2 | | | | 2 | | | | | |
| 10. | UNIV236009 | Indonesian Language Education | 2 | | | 2 | | | | | | |
| 11. | UNIV236010 | Innovation Management | 3 | | | | 3 | | | | | |
| **Total** | | | **12** | **3** | **2** | **2** | **5** | **0** | **0** | **0** | **0** | |

| B. | Skills and Expertise Courses (MKK) | | Credit | Semester | | | | | | | | Pre-requisite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| 1. | INTNTID236062 | English for Professional Purposes | 3 | | | 3 | | | | | | |
| 2. | INTNTID236062 | Occupational Health and Safety | 3 | | | | 3 | | | | | |
| 3 | INTNTID236001 | Physics I | 3 | 3 | | | | | | | | |
| 4 | INTNTID236002 | Calculus I | 3 | 3 | | | | | | | | |
| 5 | INTNTID236003 | Introduction to Industrial Engineering | 2 | 2 | | | | | | | | |
| 6 | INTNTID236004 | Engineering Drawing | 3 | 3 | | | | | | | | |
| 7 | INTNTID236005 | Engineering Materials | 2 | 2 | | | | | | | | |
| 8 | INTNTID236006 | Computer Programming | 3 | 3 | | | | | | | | |
| 9 | INTNTID236007 | Physics II | 3 | | 3 | | | | | | | Physics I |
| 10 | INTNTID236008 | Calculus II | 3 | | 3 | | | | | | | Calculus I |
| 11 | INTNTID236009 | Linear Algebra | 3 | | 3 | | | | | | | Calculus I |
| 12 | INTNTID236010 | Engineering Mechanics | 2 | | 2 | | | | | | | |
| 13 | INTNTID236011 | Statistics I | 3 | | 3 | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | INTNTID236012 | Manufacturing Process | 3 | | 3 | | | | | | | Engineering Materials |
| 15 | INTNTID236013 | Statistics II | 3 | | | 3 | | | | | | Statistics I |
| 16 | INTNTID236014 | Cost Analysis and Control | 3 | | | 3 | | | | | | Introduction to Industrial Engineering |
| 17 | INTNTID236015 | Operations Research I | 3 | | | 3 | | | | | | Calculus II, Linear Algebra |
| 18 | INTNTID236016 | Ergonomics | 3 | | | 3 | | | | | | Introduction to Industrial Engineering |
| 19 | INTNTID236017 | Industrial Ecology | 2 | | | 2 | | | | | | |
| 20 | INTNTID236018 | Measurement and Design of Work System | 3 | | | | 3 | | | | | Ergonomics |
| 21 | INTNTID236019 | System Modeling | 2 | | | | 2 | | | | | |
| 22 | INTNTID236020 | Economics and Engineering Economics | 3 | | | | 3 | | | | | |
| 23 | INTNTID236021 | Operations Research II | 3 | | | | 3 | | | | | Operations Research I |
| 24 | INTNTID236022 | Quality Control and Assurance | 3 | | | | | 3 | | | | |
| 25 | INTNTID236023 | Data Analytics | 3 | | | | | 3 | | | | Statistics II, Calculus II |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | INTNTID236024 | Production Planning and Control | 3 | | | | | 3 | | | | |
| 27 | INTNTID236025 | Organizational Behavior | 2 | | | | | 2 | | | | |
| 28 | INTNTID236065 | Physics laboratory Course | 2 | | 2 | | | | | | | |
| 29 | INTNTID236066 | Chemistry | 2 | | 2 | | | | | | | |
| 30 | INTNTID236033 | Supply Chain System | 3 | | | | | | | 3 | | INTNTID236017 |
| 31 | INTNTID236027 | Technopreneurship | 2 | | | | | | | 2 | | |
| 32 | UPKL236090 | Internship | 4 | | | | | | 4 | | | Pass minimum 80 credits |
| 33 | UKKN236090 | Community Service Program** | 4 | | | | | | 4 | | | Pass minimum 100 credits |
| 34 | INTNTID236111 | Final Project | 6 | | | | | | | | 6 | Research Methodology |
| **Total** | | | **98** | **16** | **21** | **17** | **14** | **11** | **8** | **5** | **6** | |

| C. | Self-Development Courses (MPPD) | | SKS | Semester | | | | | | | | Pre-requisite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| **C1.** | **System Engineering and Industrial Management Skills** | | | | | | | | | | | |
| 1. | INTNTID236030 | Facilities Design | 3 | | | | | 3 | | | | |
| 2. | INTNTID236031 | Product Design and Development | 3 | | | | | 3 | | | | Measurement and Design of Work System |
| 3. | INTNTID236032 | System Simulation | 3 | | | | | 3 | | | | Statistics II |
| 4 | INTNTID236028 | Integrated Laboratory Work | 2 | | | | | | 2 | | | INTNTID236012, INTNTID236014, INTNTID236016, INTNTID236018, INTNTID236024 |
| 5 | INTNTID236029 | Integrated Capstone Design | | | | | | | | 2 | | INTNTID236012, INTTID236016, INTNTID236017, INTNTID236018, INTNTID236022, INTNTID236028 |
| 4. | INTNTID236026 | Research Methodology | 2 | | | | | | | 2 | | Production Planning and Control |
| 5. | INTNTID236034 | Analysis and Design of Information System | 3 | | | | | | | 3 | | |
| 6. | INTNTID236035 | Business Intelligent | 3 | | | | | | | 3 | | Data Analytics |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7. | INTNTID236036 | Industrial Organization Design and Management | 3 | | | | | | | 3 | | Industrial Ecology, Organizational Behavior |
| 8. | INTNTID236037 | Multicriteria Decision Making | 3 | | | | | | 3 | | | Operations Research II |
| 9. | INTNTID236038 | Stochastic Process | 3 | | | | | | 3 | | | Operations Research II |
| 10. | INTNTID236039 | Heuristics and Metaheuristics Optimization | 3 | | | | | | 3 | | | Operations Research II |
| 11 | INTNTID236040 | Text Mining | 3 | | | | | | 3 | | | Data Analytics |
| 12. | INTNTID236041 | Experimental Design | 3 | | | | | | 3 | | | Statistics I |
| 13. | INTNTID236042 | Advanced Data Analytics | 3 | | | | | | 3 | | | Data Analytics |
| 14. | INTNTID236043 | System Dynamics | 3 | | | | | | 3 | | | Operations Research II |
| 15. | INTNTID236044 | Productivity Analysis | 3 | | | | | | 3 | | | Supply Chain System |
| 16. | INTNTID236045 | Decision Analysis | 3 | | | | | | 3 | | | Operations Research II |
| 17. | INTNTID236046 | Manufacturing System | 3 | | | | | | 3 | | | |
| 18. | INTNTID236047 | Maintenance and Reliability Engineering | 3 | | | | | | 3 | | | Statistics II |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19. | INTNTID236048 | Production Scheduling | 3 | | | | | | 3 | | | |
| 20. | INTNTID236049 | Combinatorial Optimization | 3 | | | | | | 3 | | | |
| 21. | INTNTID236050 | Six Sigma | 3 | | | | | | 3 | | | Statistics II, Data Analytics |
| 22. | INTNTID236051 | Knowledge Management | 3 | | | | | | 3 | | | |
| 23. | INTNTID236052 | Technology Management | 3 | | | | | | 3 | | | |
| 24. | INTNTID236053 | Performance Management | 3 | | | | | | 3 | | | |
| 25. | INTNTID236054 | Enterprise Resource Planning | 3 | | | | | | 3 | | | |
| 26. | INTNTID236055 | Service Management | 3 | | | | | | 3 | | | |
| 27. | INTNTID236056 | Strategic Management | 3 | | | | | | 3 | | | |
| 28. | INTNTID236057 | Managerial Accounting | 3 | | | | | | 3 | | | |
| 29. | INTNTID236058 | Customer Relationship Management | 3 | | | | | | 3 | | | |
| 30. | INTNTID236059 | Marketing Management | 3 | | | | | | 3 | | | |
| 31. | INTNTID236060 | Industrial Automation | 3 | | | | | | 3 | | | |
| 32 | NTID236067 | Business Design and Analysis | 3 | | | | | | 3 | | | |
| 33. | INTNTID236061 | Project Management | 3 | | | | | | 3 | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| **Total** | | **36** | **0** | **0** | **0** | **0** | **9** | **15** | **12** | **0** | |
| **Total credits** | | **146** | **19** | **19** | **19** | **19** | **20** | **23** | **19** | **8** | |

* Choose 1 according to your religion

** by LPPM

## K. Courses per Semester

| Semester I | | | |
|---|---|---|---|
| # | Code | Courses | Credits |
| 1 | INTUNIV23600X | Religion Education | 3 |
| 2 | INTNTID236001 | Physics I | 3 |
| 3 | INTNTID236002 | Calculus I | 3 |
| 4 | INTNTID236003 | Introduction to Industrial Engineering | 2 |
| 5 | INTNTID236004 | Engineering Drawing | 3 |
| 6 | INTNTID236005 | Engineering Materials | 2 |
| 7 | INTNTID236006 | Computer Programming | 3 |
| **Jumlah SKS** | | | **19** |

| Semester II | | | |
|---|---|---|---|
| # | Code | Courses | Credits |
| 1 | INTUNIV236007 | Pancasila Education | 2 |
| 2 | INTNTID236007 | Physics II | 3 |
| 3 | INTNTID236008 | Calculus II | 3 |
| 4 | INTNTID236009 | Linear Algebra | 3 |
| 5 | INTNTID236010 | Engineering Mechanics | 2 |
| 6 | INTNTID236012 | Manufacturing Process | 3 |
| 7 | INTNTID236065 | Physics Laboratory course | 2 |
| 8 | INTNTID236066 | Chemistry | 2 |
| **Jumlah SKS** | | | **20** |

| Semester III | | | |
|---|---|---|---|
| # | Code | Courses | Credits |
| 1 | INTUNIV236009 | Indonesian Language Education | 2 |
| 2 | INTNTID236062 | English for Professional Purposes | 3 |
| 3 | INTNTID236014 | Cost Analysis and Control | 3 |
| 4 | INTNTID236015 | Operations Research I | 3 |
| 5 | INTNTID236016 | Ergonomics | 3 |
| 6 | INTNTID236025 | Organizational Behavior | 2 |
| 7 | INTNTID236011 | Statistics I | 3 |
| **Jumlah SKS** | | | **19** |

| Semester IV | | | |
|---|---|---|---|
| # | Code | Courses | Credits |
| 1 | INTUNIV236008 | Citizenship Education | 2 |
| 2 | INTUNIV236010 | Innovation Management | 3 |
| 3 | INTNTID236063 | Occupational Safety and Health | 3 |
| 4 | INTNTID236018 | Measurement and Design of Work System | 3 |
| 5 | INTNTID236019 | System Modeling | 2 |
| 6 | INTNTID236020 | Economics and Engineering Economics | 3 |
| 7 | INTNTID236021 | Operations Research II | 3 |
| 8 | INTNTID236013 | Statistics II | 3 |
| **Jumlah SKS** | | | **22** |

| Semester V | | | |
|---|---|---|---|
| # | Code | Courses | Credits |
| 1 | INTNTID236022 | Quality Control and Assurance | 3 |
| 2 | INTNTID236023 | Data Analytics | 3 |
| 3 | INTNTID236024 | Production Planning and Control | 3 |
| 4 | INTNTID236017 | Industrial Ecology | 2 |
| 5 | INTNTID236030 | Facilities Design | 3 |
| 6 | INTNTID236031 | Product Design and Development | 3 |
| 7 | INTNTID236032 | System Simulation | 3 |
| **Jumlah SKS** | | | **20** |

| Semester VI | | | |
|---|---|---|---|
| # | Code | Courses | Credits |
| 1 | INTUPKL236090 | Internship | 4 |
| 2 | INTUKKN236090 | Community Service Program | 4 |
| 3 | INTNTID236XXX | Elective Couse I | 3 |
| 4 | INTNTID236XXX | Elective Couse II | 3 |
| 5 | INTNTID236XXX | Elective Couse III | 3 |
| 6 | INTNTID236XXX | Elective Couse IV | 3 |
| 7 | INTNTID236028 | Integrated Laboratory Work | 2 |
| **Jumlah SKS** | | | **22** |

| Semester VII | | | |
|---|---|---|---|
| # | Code | Courses | Credits |
| 1 | INTNTID236026 | Research Methodology | 2 |
| 2 | INTNTID236028 | Integrated Laboratory Work | 2 |
| 3 | INTNTID236033 | Supply Chain System | 3 |
| 4 | INTNTID236034 | Analysis and Design of Information System | 3 |
| 5 | INTNTID236035 | Business Intelligent | 3 |
| 6 | INTNTID236036 | Industrial Organization Design and Management | 3 |
| 7 | INTNTID236029 | Integrated Capstone Design | 2 |
| **Jumlah SKS** | | | **18** |

| Semester VIII | | | |
|---|---|---|---|
| # | Code | Course | Credits |
| 1 | INTNTID236100 | Final Project | 6 |
| | | | |
| **Jumlah SKS** | | | **6** |
| **Total SKS Keseluruhan** | | | **146** |

| Elective Courses | | | |
|---|---|---|---|
| # | Code | Courses | Credits |
| 1 | INTNTID236037 | Multicriteria Decision Making | 3 |
| 2 | INTNTID236038 | Stochastics Process | 3 |
| 3 | INTNTID236039 | Heuristics and Metaheuristics Optimization | 3 |
| 4 | INTNTID236040 | Text Mining | 3 |
| 5 | INTNTID236041 | Experimental Design | 3 |
| 6 | INTNTID236042 | Advanced Data Mining | 3 |
| 7 | INTNTID236050 | Six Sigma | 3 |
| 8 | INTNTID236043 | System Dynamic | 3 |
| 9 | INTNTID236044 | Productivity Analysis | 3 |
| 10 | INTNTID236045 | Decision Analysis | 3 |
| 11 | INTNTID236051 | Knowledge Management | 3 |
| 12 | INTNTID236052 | Technology Management | 3 |
| 13 | INTNTID236053 | Performance Management | 3 |
| 14 | INTNTID236054 | Enterprise Resource Planning | 3 |
| 15 | INTNTID236051 | Service Management | 3 |
| 16 | INTNTID236052 | Strategic Management | 3 |

| | | | |
|---|---|---|---|
| 17 | INTNTID236057 | Managerial Accounting | 3 |
| 18 | INTNTID236058 | Customer Relationship Management | 3 |
| 19 | INTNTID236059 | Marketing Management | 3 |
| 20 | INTNTID236060 | Industrial Automation | 3 |
| 21 | INTNTID236046 | Manufacturing System | 3 |
| 22 | INTNTID236047 | Maintenance and Reliability Engineering | 3 |
| 23 | INTNTID236048 | Production Scheduling | 3 |
| 24 | INTNTID236049 | Combinatorial Optimization | 3 |
| 25 | INTNTID236061 | Project Management | 3 |
| 26 | INTNTID236067 | Business Design and Analysis | 3 |

## L. Description of Courses

**Course Name** **:** Islam Education

**Kode** **: UNIV236001**

**Credit** **:** 3/3

**Pre-requisite** **: -**

**Standar CPL 1**

Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.

Course Learning Outcomes (CPMK)

1. Analyze the concepts and theories of the relationship between God and humans in a responsible, logical, critical, and systematic manner and apply the results of this analysis in societal life.
2. Analyze the sources and dimensions of Islamic law by contributing critically and logically to the improvement of life quality and applying them in societal life.
3. Evaluate the application of morality and science as considerations in making appropriate decisions to address contemporary issues in their environment.

Sub-Course Learning Outcomes (Sub-CPMK)

1. Analyze the relationship between God and humans.
2. Identify the sources and dimensions of Dinul Islam.
3. Analyze morality, science, and socio-cultural aspects.

4. Analyze contemporary issues from an Islamic perspective.
5. Exhibit Islamic behavior in interactions with God and humans.
6. Exhibit behavior according to Islamic law in daily life.
7. Exhibit noble character as academics and members of society.
8. Exhibit an Islamic attitude in responding to contemporary issues.
9. Resolve issues related to disciplines connected to faith.
10. Resolve issues related to disciplines connected to Islamic law.
11. Resolve issues related to disciplines connected to morality.

Course Description

This course is designed to strengthen students' faith through religious, philosophical thinking, rational attitudes, and broad perspectives to understand and believe in the truth of various aspects of Islamic teachings, integrating them into their discipline, and applying them in their daily personality and behavior. The course covers topics such as the doctrine of faith, humans in Islamic conception, pillars of character building, Islamic law and differences in schools of thought, marriage, efforts to achieve a blessed family, Islamic morals and their role in community development, the dynamics of Islamic culture and civilization, corruption and efforts to eradicate it from an Islamic perspective, the economic system and work ethic in Islam, politics, and patriotism from an Islamic perspective, modern Islamic movements and organizations in Indonesia, jihad, religious radicalism and moderate Muslims, as well as women and feminism from an Islamic perspective.

**Reference**


1. *Bahan Ajar Mata Kuliah Umum Pendidikan Agama Islam*. 2016. Jakarta: Direktorat JenderalPembelajaran dan Kemahasiswaan Kementerian Riset, Teknologi dan Pendidikan Tinggi Nasih, A Munjin. dkk. 2016. *Menyemai Islam Ramah di Perguruan Tinggi*. Malang: Dream Litera
2. Nata, Abudin. 2002. *Akhlaq Tasawuf*. Jakarta : Rajawali PressShihab, Quraish.1996. *Wawasan Al-Qur'an*. Bandung: Mizan
3. Tim Dosen PAI UM, 2018. *Pendidikan Islam Transformatif: Menuju Pengembangan PribadiBerkarakter*. Malang: Dream Litera.


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**Course name** **:** Protestant Education
**Code** **: UNIV236002**
**Credits** **:** 3/3
**Pre-requisite** **: -**

**Standar CPL 1**

Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.

Course Learning Outcomes (CPMK)

1. Analyze the concepts, objectives, and basic principles of Christian faith correctly as stated in the Bible.
2. Analyze various life phenomena from the perspective of Christian faith.
3. Creatively develop attitudes and behaviors that nurture faith and belief in God.
4. Apply social life ethics according to Christian teachings in national, state, and cultural life.

Sub-Course Learning Outcomes (Sub-CPMK)

1. Analyze the nature of God in revelation.
2. Analyze the Trinity of God.
3. Analyze the existence of the church.
4. Analyze the existence of science and technology from the perspective of Christian faith.
5. Analyze the existence of humans and development from the perspective of Christian faith.
6. Analyze ethical issues in social life from the perspective of Christian faith.

Course Description

This course teaches students about the concepts, objectives, and basic principles of Christian faith according to the Bible. It also guides students to creatively develop attitudes and behaviors that nurture faith and belief in God and to apply social life ethics according to Christian teachings in national, state, and cultural life.

Reference

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**Course name** **:** Catholic Education
**Code** **:** UNIV236003
**Credits** **:** 3/3
**Pre-requisite** **: -**

**Standar CPL 1**

Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.

Course Learning Outcomes (CPMK)

1. Analyze the existence of God's mercy, as well as the origins and purpose of human life as the image of God who believes in the Holy Trinity.
2. Analyze the existence of Jesus as the divine revelation carrying out human salvation.
3. Demonstrate attitudes and behaviors as a person of faith with a clean conscience.
4. Offer oneself for the common good based on Pancasila.

Sub-Course Learning Outcomes (Sub-CPMK)

1. Analyze the origin and purpose of human life as the image of God.
2. Analyze the meaning of love and the existence of being loved by God.
3. Analyze the meaning of the call to faith in a Catholic context.
4. Analyze the concept of the Holy Trinity.
5. Analyze the role of Jesus as Revelation for human salvation passed down through generations.
6. Analyze the five missions of the Church and the seven sacraments as means of salvation.
7. Analyze the parallel between personality development and faith development.
8. Demonstrate attitudes as a person of faith according to the social teachings of the Church.
9. Demonstrate a clean conscience according to the five missions of the Church.

Course Description

This course examines the origin and purpose of human life, the meaning of God's love, the Holy Trinity, the role of Jesus as Revelation for human salvation, the five missions of the Church and the sacraments, as well as the parallel between personality development and faith development. The course also explores how to have attitudes as a person of faith according to the social teachings of the Church and a clean conscience according to the five missions of the Church. Additionally, this course studies how to offer oneself for the common good based on Pancasila.

Reference


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**Course name** **:** Hindu Education

**Code** **:** UNIV236004

**Credits** **:** 3/3

**Pre-requisite** **: -**

**Standar CPL 1**

Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.

Course Learning Outcomes (CPMK)

1. Understand the purpose and function of Hindu Religious Education in character and personality formation.
2. Analyze the essence of Hinduism from the perspective of the development of Hindu religion, Hindu legal sources, Hindu leadership, and Hindu ethical teachings.
3. Demonstrate attitudes and behaviors that reflect the understanding of Hindu teachings.
4. Communicate Hindu teachings to the public to address social issues using popular approaches or scientific formulations.
5. Apply the values in Hindu teachings to build professionalism and integrity and to maintain Indonesia's diversity.

Sub-Course Learning Outcomes (Sub-CPMK)

1. Explain the purpose and function of Hindu Religious Education in shaping the character and personality

of students.

2. Analyze the positive values of the historical development of Hinduism in Indonesia and the world.

3. Analyze the hierarchy of the Vedas as the source of Hindu law (Sruti, Smerti, Sila, Acara, Atmanastuti).

4. Explain the concept of Brahma Widya (Hindu Theology) in building Sraddha and Bhakti.

5. Demonstrate attitudes and behaviors that reflect leadership principles according to Hindu teachings in building a strong personal foundation.

6. Demonstrate attitudes and behaviors that reflect ethical principles in social interactions, academic interactions, and work environment interactions.

7. Demonstrate attitudes and behaviors that reflect the principles of harmonious community life according to Hindu teachings.

8. Develop an understanding of Hindu teachings through religious practices.

9. Present alternative solutions to social issues by applying principles from Hindu teachings.

10. Apply the values of Hindu teachings in building professionalism in innovative work.

11. Apply the values of Hindu teachings in maintaining Indonesia's diversity.

Course Description

This course examines the purpose and function of Hindu Religious Education in building a humanistic personality basis for students, the essence of Hinduism from the perspectives of historical development, theology, Hindu legal sources, leadership, and Hindu ethics. It also covers the understanding of Hindu teachings through arts and religious practices, and fostering awareness and harmony in developing professionalism and maintaining diversity.

**References**

*Bahan Ajar Mata Kuliah Umum Pendidikan Agama Hindu*. 2016. Jakarta: Direktorat Jenderal Pembelajaran dan Kemahasiswaan Kementerian Riset, Teknologi dan Pendidikan Tinggi

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**Course name** **:** Budhist Education
**Code** **:** UNIV236005
**Credits** **:** 3/3
**Pre-requisite** **: -**

**Standar CPL 1**

Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.

Course Learning Outcomes (CPMK)

1. Analyze the purpose and function of Buddhist Religious Education in shaping character and possessing noble virtues.
2. Analyze the content of the Tripitaka as the source of Buddhist teachings.
3. Demonstrate attitudes and behaviors that reflect the positive values of the historical development of Buddhism in the Nusantara region and the world.
4. Demonstrate attitudes and behaviors that respect other religions based on the teachings of loving-kindness according to moral ethical principles (Catur Paramitha).
5. Apply leadership principles taught by the Buddha (Dasa Raja Dhamma).
6. Develop an understanding of religious teachings through religious practices (Athasila).

Sub-Course Learning Outcomes (Sub-CPMK)

1. Understand the purpose and function of Buddhist Religious Education and the content of the Tripitaka.
2. Demonstrate attitudes and behaviors that reflect the positive values of the historical development of Buddhism and respect for other religions based on moral ethical principles (Catur Paramitha).
3. Apply the leadership principles taught by the Buddha and develop an understanding of

religious teachings through religious practices (Athasila).

Course Description

This course examines the purpose and function of Buddhist Religious Education in building a foundation of noble character and virtue, exploring the core teachings through the Tripitaka, the primary scripture of Buddhism. It emphasizes the historical development of Buddhism in the Nusantara region and globally, highlighting positive values and their contemporary relevance. Students will demonstrate attitudes and behaviors that reflect respect for other religions, grounded in the teachings of loving-kindness and the ethical principles of Catur Paramitha. The course covers the leadership principles taught by the Buddha, known as Dasa Raja Dhamma, and their application in various contexts. Additionally, it includes practical aspects of religious practice through Athasila, allowing students to deepen their understanding and experience of Buddhist teachings, integrating them into daily life to contribute to a harmonious and respectful society.

**References**

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*Materi Kuliah Sejarah Perkembangan Agama Buddha.* 2003. Jakarta: Dewi Kayana Abadi.

Diputhesa, Oka. 2010. *Sutta Pittaka Dhiga Nikaya.* Jakarta: Danau Batur

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**Course name** **:** Pendidikan Kepercayaan *(Spiritual Education)*
**Code** **:** UNIV236014
**Credits** **:** 3/3
**Pre-requisite** **: -**

**Standar CPL 1**

Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.

Course Learning Outcomes (CPMK)

1. Analyze life in accordance with the belief in Almighty God.
2. Demonstrate attitudes and spiritual behaviors consistent with the belief in Almighty God.
3. Solve discipline-related problems based on the teachings of the belief in Almighty God.

Sub-Learning Outcomes (sub CPMK)

1. Analyze the sources and dimensions of the belief in Almighty God.
2. Analyze the relationship between humans and Almighty God.
3. Analyze behavior (ethics), science, socio-culture, and legal norms from the perspective of the belief in Almighty God.
4. Demonstrate spiritual attitudes and behaviors in interacting with God according to the belief in Almighty God.
5. Exhibit noble character as academics and community members in accordance with the conception of the belief in Almighty God and applicable laws.
6. Demonstrate good attitudes and behaviors according to the teachings of the belief in Almighty God in responding to current global issues.
7. Solve discipline-related problems related to beliefs, differences in beliefs, and the meaning of tolerance within the scope of beliefs and religions.
8. Solve discipline-related problems related to legal norms and their roles in community and national life.
9. Solve discipline-related problems related to behavior.

Course Description

This course teaches students about the concept, sources, and dimensions of the belief in

Almighty God, the relationship between humans and Almighty God, and various life phenomena from the perspective of the belief in Almighty God. It also instructs students on how to demonstrate spiritual attitudes and behaviors in interacting with God and in responding to current global issues according to the belief in Almighty God, as well as how to exhibit noble character as academics and community members in line with the conception of the belief in Almighty God and applicable laws.

**References**

Tim Dosen Pendidikan Kepercayaan UM, 2019. Pendidikan Kepercayaan : Menciptakan Manusia yang selalu memperindah dan menyelamatkan hidup dan kehidupan yang serba baik dan indah bagi yang ada di bumi ini.

**Course name** : Pancasila Education
**Code** : UNIV236007
**Credits** : 2/2

**Standar CPL 1**

Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.

Course Learning Outcomes (CPMK)

1. Analyze the importance of Pancasila education.
2. Analyze Pancasila in the flow of the nation's history.
3. Analyze Pancasila as the foundation of the state.
4. Analyze Pancasila as the state ideology.
5. Analyze Pancasila as a philosophical system.
6. Evaluate Pancasila as an ethical system.
7. Evaluate Pancasila as the foundational value for the development of knowledge.
8. Demonstrate attitudes and behaviors that reflect Pancasila values.
9. Implement Pancasila values in daily life.

Sub-Learning Outcomes (sub CPMK)

1. Understand the theoretical and practical concepts of Pancasila.
2. Engage in critical thinking to analyze the dynamics and challenges of applying Pancasila values.
3. Study the importance of Pancasila education.
4. Analyze Pancasila in the historical context of the Indonesian nation.
5. Examine the state, its objectives, and the urgency of a foundational state philosophy.
6. Analyze Pancasila as the state ideology.
7. Analyze Pancasila as a philosophical system.
8. Evaluate Pancasila as an ethical system.
9. Evaluate Pancasila as the foundational value for the development of knowledge.

Course Description

This course on Pancasila Education provides a comprehensive exploration of Indonesia's foundational philosophy, Pancasila. It examines both the theoretical underpinnings and

practical applications of Pancasila, emphasizing its historical significance, role as the state ideology, and its ethical and philosophical implications. Students will critically analyze Pancasila's relevance in contemporary society, its impact on national development, and the importance of Pancasila education. The course aims to cultivate a deep understanding of Pancasila's values and principles, encouraging students to embody these values in their daily lives and professional endeavors to foster a just and harmonious society in Indonesia.

**References**


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**Course name** : Citizenship Education
**Code** : UNIV236008
**Credits** : 2/2
**Pre-requisite** : -

**Standar CPL 1**

Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.

Course Learning Outcomes (CPMK)

1. Examine the fundamentals of civic education.
2. Analyze the scholarly aspects of civic education.
3. Evaluate the dynamics of civic education.

Sub Course Learning Outcomes (sub CPMK)

1. Explain the concept of citizenship and citizenry.
2. Identify the competencies required for citizens to be proud and patriotic towards their homeland.
3. Analyze the connection between efforts to foster young citizens into good citizens and the challenges of modern development from the perspective of civic education.
4. Explain the concept of national identity.
5. Identify forms of Indonesian national identity.
6. Demonstrate respect and commitment as citizens towards Indonesia's national identity.
7. Explain the concept of national integrity.
8. Identify challenges to Indonesia's national integrity.
9. Design efforts to strengthen Indonesia's national integrity in accordance with contemporary needs.
10. Explain the concept and forms of Indonesia's constitution from a historical perspective.
11. Identify the forms of implementing Indonesia's constitution based on legislative regulations.
12. Explain the concept of rights and obligations.
13. Explain the concept and implementation of Pancasila democracy.
14. Analyze case studies of fulfilling rights and fulfilling citizens' obligations in the context of

Pancasila democracy.

15. Explain the concept of just law.

16. Analyze case studies of law enforcement and violations in the dynamics of Indonesian national life.

17. Explain the concept of archipelagic outlook in the perspective of the Unitary State of the Republic of Indonesia (NKRI).

18. Provide examples of implementing Indonesia's archipelagic outlook in the practices of citizens' lives according to their professions.

19. Explain the concept of national resilience in the perspective of the Unitary State of the Republic of Indonesia (NKRI).

20. Analyze the existence of the 8 components that constitute Indonesia's national resilience.

21. Provide examples of community involvement in efforts to strengthen Indonesia's national resilience.

Course Description

The Civic Education course focuses on providing comprehensive understanding, enhancing learning motivation, and developing skills for students to become proud and patriotic citizens. In detail, the course presents the concepts and urgency of civic education in higher education; national identity as the foundation for national character formation; national integrity as a parameter of national unity; the application of the 1945 Constitution of the Republic of Indonesia (UUD NRI); rights and obligations of citizens in democratic life; just law; archipelagic outlook; and national resilience.

**References**


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**Course name** **:** Indonesian Language for Academic Purposes
**Code** **:** UNIV236009
**Credits** **:** 2/2
**Pre-requisite** **: -**

**Standar CPL 1**

Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.

Course Learning Outcomes (CPMK)

1. Analyze the issues of language use in academic writing.
2. Use Indonesian language effectively and correctly for daily communication in academic forums.
3. Utilize written Indonesian language for academic purposes in accordance with scholarly principles.

Sub Course Learning Outcomes (sub CPMK)

1. Critically, creatively, and argumentatively use Indonesian language to plan academic writing.
2. Compile references in academic writing across various genres.
3. Edit academic work.

Course Description

This course provides linguistic insights into the role and function of the Indonesian language, including its spelling history. It strengthens academic writing skills by focusing on proper spelling according to the General Guidelines for Indonesian Spelling, selecting appropriate words (diction) based on precise norms, composing effective sentences, paragraphs that meet completeness, unity, and coherence criteria, and structuring discourse critically and argumentatively to enhance academic writing skills grounded in scientific principles, procedures, and ethics.

**References**

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*Kamus Besar Bahasa Indonesia* (https://kbbi.kemdikbud.go.id/)

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**Course Name** **:** Innovation Management
**Code** **:** UNIV236010
**Credits** **:** 3/3
**Pre-requisite** **:-**

**Standar CPL 1**

Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.

Course Learning Outcomes (CPMK)

1. Develop innovative ways of thinking and perspectives to tackle various challenges of social and technological changes in the era of the Fourth Industrial Revolution.
2. Manage innovative ideas and plans through the design thinking process.

Sub Course Learning Outcomes (sub CPMK)

1. Identify challenges of social and technological changes across different parts of the world in the context of the Fourth Industrial Revolution.
2. Identify innovation demands based on disciplinary perspectives.
3. Explain the principles and models of innovation.
4. Describe the nature and performance procedures of innovation through the design thinking model.
5. Identify needs and problems requiring innovative solutions within disciplinary domains (empathize/explore).
6. Collect data to delve into problems and environmental needs that can be developed into innovative ideas (define).
7. Analyze and synthesize data to determine priority problems to be developed into innovative plans (synthesize).
8. Develop multiple innovative plan ideas (ideate).
9. Analyze the strengths and weaknesses of developed innovative plan ideas (analyze and

select).

10. Determine and develop outstanding innovative ideas (prototype).
11. Present and publish innovative ideas and works (learn feedback).
12. Refine, publish tested innovative ideas, and prepare reports (revise, share and repost).

Course Description

This course facilitates the development of innovation management skills aligned with disciplinary characteristics and innovation principles. Students practice developing innovation through the design thinking process, including topic selection and notice, problem identification and information gathering, idea development, idea analysis, prototype development, presentation and feedback gathering, as well as refinement, publication, and reporting. The course covers (1) innovation demands based on disciplinary perspectives, (2) principles and models of innovation, (3) the nature and performance procedures of innovation through the design thinking model, (4) group innovation topic determination, (5) identification of needs and problems for developing innovative ideas (framing a question/explore), (6) data collection for innovative idea development (define), (7) analysis and synthesis of problem data for innovative plan ideas (synthesize), (8) development of multiple innovative plan ideas (ideate), (9) analysis of strengths and weaknesses of developed innovative plan ideas (analyze and select), (10) development of outstanding innovative ideas, and (11) presentation of innovative ideas and works (learn feedback).

**References**


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*Design Thinking* (https://www.youtube.com/watch?v=yaccMIZyiQo)

*Design Thinking* (https://www.youtube.com/watch?v=_r0VX-aU_T8)

*Catatan Najwa: Ide Brillian Bos Sidomuncul* (https://www.youtube.com/watch?v=XkL7DAV9KqU&t=6s)

*Roti John, Roti John Kekinian* (https://www.youtube.com/watch?v=7dZhB0oBI1w)

*Catatan Najwa; Bos Gojek, dan Gibran* (https://www.youtube.com/watch?v=iTsVSjRUSyU)

*Seberapa Kreatif Dirimu* (https://www.youtube.com/watch?v=JnmeVDUVnt8&t=68s) (https://www.youtube.com/watch?v=opIwXmwp830)

*Motivasi Buat Sarjana Susah Kerja* (https://www.youtube.com/watch?v=Q3AbqsJyFLI&t=50s)

*Mengembangkan Kreativitas* (https://www.youtube.com/watch?v=p_OejdoGk_g)

**INTNTID236062 English for Prefessional Purposes, 3 credits**

Pre-requisite:

Koordinator: Vertic Eridani

SCPL 7:

Ability to communicate effectively both orally and in writing.

Course Learning Outcomes (CPMK):

1. Ability to listen to and comprehend lecture materials and discourse delivered through lecture methods in English. [Listening]
2. Ability to speak and express opinions, arguments, questions, answers, and refutations appropriately in context. [Speaking]
3. Proficiency in actively and critically reading to understand content aspects, text features, and author attitudes (tone and purpose). [Reading]
4. Skill in writing through the development of sentences, paragraphs, and essays based on types of writing (narrative, descriptive, argumentative); development of ideas while considering unity and coherence aspects. [Writing]

Sub Course Learning Outcomes (Sub CPMK):

- Intensive and extensive reading related to science and technology issues (introduction, drawing conclusions, understanding paragraphs, text patterns, skimming and scanning, summarizing, critical reading).
- Ability to conduct academic presentations and speak on science and technology-related topics (expressing opinions, academic presentations, answering questions).
- Ability to understand conversations in various genres (everyday conversations, listening to academic talks and lectures).
- Ability to write in various genres (writing standard sentences, composing paragraphs, writing academic essays: narrative, descriptive, argumentative).

Course Description

This course focuses on developing comprehensive English language skills essential for academic purposes, specifically tailored to science and technology contexts. Students will enhance their ability to listen to and comprehend lectures and discussions, speak confidently and effectively in academic settings, critically analyze and interpret diverse texts related to

science and technology, and refine their writing skills across various genres including narrative, descriptive, and argumentative essays. Through intensive and extensive reading practices, students will learn to summarize, engage in critical reading, and grasp authorial intentions. Additionally, the course emphasizes active participation in academic presentations, both in expressing viewpoints and addressing queries, ensuring proficiency in both spoken and written academic English pertinent to science and technology topics.

References


1. Bailey, S. (2011). Academic writing: A handbook for international students. Milton Park, Abingdon, Oxon: Routledge
2. Comfort, Jeremy. Oxford Business English Skills : Effective Presentations. Oxford UNIVUMersity Press, 2011.
3. Becker, L. & Joan, V.E. 2010. Presentation Skills for Students. Palgrave: Macmillan.
4. Bonamy, D. 2013. Technical English. New York: Pearson Education.
5. Wallwork, A. 2014. A Guide to Professional English. New York: Springer-Verlag.


**INTNTID236063 Occupational Health and Safety, 3 credits**

Pre-requisite:

Coordinator: Vertic Eridani

SCPL 8 dan 9:

- Ability to plan, complete, and evaluate tasks with consideration of given constraints.
- Ability to work in teams

Learning Outcomes of the Course (CPMK):

- Presenting the fundamentals and principles of Occupational Health and Safety (K3).
- Analyzing the core occupational health and safety legislation in Indonesia through field case studies.
- Discussing several key occupational health and safety regulations aligned with international standards (OSHA).
- Exploring the occupational health and safety management systems within companies.
- Integrating the basics of occupational health and safety with ergonomics.
- Examining the implementation of occupational health and safety across various industrial

sectors.

Sub Learning Outcomes (Sub CPMK):

- Understanding the nature, objectives, and benefits of occupational health and safety (K3).
- Understanding Occupational Diseases (PAK) and Work-Related Diseases (PAHK).
- Understanding the factors causing workplace accidents and their management.
- Understanding Personal Protective Equipment (PPE).
- Conducting routine monitoring and efforts to reduce work-related accidents.
- Understanding job security and workers' health protection.
- Identifying physical hazards in the workplace environment.
- Identifying chemical hazards in various types of work.
- Integrating occupational health and safety with ergonomics.
- Implementing occupational health and safety practices across various industrial sectors.

Course Description

This course focuses on the fundamentals and principles of Occupational Health and Safety (K3), emphasizing its application in various industrial settings. Students will analyze core legislation related to K3 in Indonesia through practical case studies, while also examining international standards such as OSHA. The course covers occupational health and safety management systems within companies and integrates K3 principles with ergonomics. Students will gain insights into identifying and mitigating workplace hazards, including physical and chemical risks, and learn about the importance of Personal Protective Equipment (PPE). Additionally, the course addresses occupational diseases, work-related health issues, and strategies for accident prevention and routine monitoring. By the end of the course, students will be equipped to apply K3 practices effectively across different sectors, enhancing their understanding of workplace safety and health protection.

References

1. Conoco Philips Alaska Inc. Brooks Range Petroleum, Exxonmobile. 2014. Alaska Safety Handbook. Alaska: AT Publishing and Printing.
2. Departemen Kesehatan Republik Indonesia. 2006. Pedoman Kesehatan dan Keselamatan Kerja Instalasi Farmasi Rumah Sakit (K3 IFRS). Jakarta.
3. International Association of Drilling Contractors. 2004. Health, Safety and Environmental Reference Guide. Houston. Texas. USA.

4. Organisasi Perburuhan Internasional. 2013. Kesehatan dan Keselamatan Kerja di Tempat kerja Sarana untuk Produktivitas. Jakarta: ILO.
5. Organisasi Perburuhan Internasional. 2005. Pedoman praktis Keselamatan dan Kesehatan Kerja di bidang konstruksi. Jakarta: ILO.

**INTNTIDU236001 Physics I, 3 sks**

Pre-requisite:

Coordinator:

Atif Fikri

SCPL 2:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Learning Outcomes of the Course (CPMK):

- Understanding the formulations of basic laws of physics concerning mechanics and motion,
- Understanding the formulations of basic laws of physics concerning work and energy,
- Understanding the formulations of basic laws of physics concerning fluid mechanics,
- Describing the thermal behavior of a material.

Sub Learning Outcomes of the Course (sub CPMK):

- Ability to understand quantities and vectors,
- Ability to understand particle kinematics: velocity, acceleration, linear motion, projectile motion, circular motion,
- Ability to understand particle dynamics: Newton's laws, frictional forces,
- Ability to understand work and energy: concept of work, kinetic energy, potential energy, conservation of mechanical energy, momentum and collisions,
- Ability to understand rotational motion: angular velocity and acceleration, torque and moment of inertia, rolling motion,
- Ability to understand vibrations: simple harmonic motion, combination of harmonic oscillations,
- Ability to understand fluid mechanics: hydrostatics, hydrodynamics,

- Ability to understand thermophysics: temperature and heat; thermal characteristics of matter.

Course Description:

This course focuses on understanding fundamental laws of physics in mechanics, motion, work, energy, fluid mechanics, and thermal behavior analysis. Students will learn to understand these principles to understand quantities, vectors, kinematics (including linear, projectile, circular motion), dynamics (Newton's laws, friction), energy concepts (work, kinetic and potential energy, conservation laws), rotational motion, vibrations, fluid mechanics (hydrostatics, hydrodynamics), and thermophysics (temperature, heat, thermal characteristics). Emphasis is placed on practical applications and problem-solving within various contexts of physics, preparing students with essential skills in analytical thinking and physical principles.

References


1. Sears, F.W. & Zemansky, M. 2016. UNIVUMersity Physics with Modern Physics 14th Edition. Pearson.
2. Giancoli, D. C., (Terj, Yuhilza H). 2001. Fisika, Jilid 1. Jakarta: Erlangga.
3. Halliday & Resnic. Fundamental of Physics. 1987. New York: John Wiley and Sons.
4. Tipler, P. A. (Terj. L. Prasetio dan R.W.Adi). 1998. Fisika : untuk Sains dan Teknik, Jilid 1. Jakarta: Erlangga.
5. Young, H. D., Sears, F.W. & Zemansky, M. 2014. UNIVUMersity Physics: with Modern Physics Vol. 2. New York: Pearson.


**INTNTID236002 Calculus 1, 3 credits**

Pre-requisite: -.

Coordinator: Aisyah Larasati

SCPL 2:

Ability to apply knowledge of mathematics, basic and/or material sciences, information technology, and engineering to gain a comprehensive understanding of industrial engineering principles.

Course Learning Outcomes (CPMK):

1. Understand the real number system.
2. Solve inequalities, determine domains, and ranges.
3. Understand and compute function limits and determine continuity.

4. Compute derivatives of functions.
6. Plot graphs with asymptotes.
7. Use derivatives to determine extreme points, increasing/decreasing functions, and concavity.
8. Compute definite and indefinite integrals using substitution and their applications.

Sub Learning Outcomes (Sub CPMK):
- Understand the basic concepts of the real number system: understanding real number systems (real coordinates, order properties).
- Understand equations and inequalities, absolute values, coordinate planes, lines, distances between two points, circles, and parabolas.
- Understand functions: algebraic and transcendental, domains, ranges, function operations, function graphs, inverse functions.
- Understand limits and function continuity.
- Understand derivatives: tangent lines, rate of change, derivative function definitions, derivative techniques, chain rule, and implicit function derivatives.
- Understand derivative applications: intervals of increase/decrease, function concavity, extrema, function graphs (polynomial, rational fraction), optimization problem applications, L'Hopital's theorem.
- Understand indefinite integrals: antiderivatives, indefinite integrals, integrals with substitution.
- Understand definite integrals.

Course Description:
This course covers essential topics in calculus focusing on real numbers, inequalities, limits, continuity, differentiation, optimization using derivatives, asymptotes in graphs, extrema points, concavity, and definite and indefinite integrals with substitution applications. Students will gain proficiency in understanding the concepts of real number systems, equations, inequalities, absolute values, coordinate planes, lines, distances, circles, and parabolas. They will also explore algebraic and transcendental functions, their domains, ranges, operations, graphs, and inverse functions. Emphasis is placed on practical applications of calculus in analyzing functions, determining limits, derivatives, integrals, and their applications in optimization and problem-solving scenarios.

References

1. Anton, H. 2012. Calculus, Edisi 10. New York: John Wiley & Sons.
2. Purcell, J.E., & Rigdon, S.E. 2006. Calculus, Edisi 9. New Jersey: Prentice-Hall.
3. Stewart, J. 2012. Calculus, Edisi 7. Canada: Brooks/cole-Cengage Learning

**INTNTID236003 Introduction to Industrial Engineering, 2 credits**

Pre-requisite: -.

Coordinator: Abdul Muid

SCPL 3 and 10:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.
- Ability to be responsible to society, accountable, and practice professional ethics in solving industrial engineering problems.

Course Learning Outcomes (CPMK):

- Understand and explain the fundamental framework of Industrial Engineering science.
- Understand and explain the concept of systems and its context.
- Understand, possess, and explain system thinking (systems thinking approach).
- Apply basic analytics in understanding simple business systems and processes.
- Understand the curriculum structure of Industrial Engineering and the interrelationships between courses.
- Apply teamwork skills to complete simple tasks collaboratively.
- Understand basic learning skills including researching, reading, summarizing, and presenting information and ideas orally and in writing.

Sub Learning Outcomes (Sub CPMK):

- Understand the historical background, definition, and scope of the industrial engineering discipline.
- Understand Production Techniques: a brief overview of various production processes.
- Understand the concept of Productivity.

- Understand the Principles of Engineering Economics and Resource Allocation.
- Understand the Principles of Work Design and Measurement.
- Understand the concept of economic analysis for decision making in production processes.
- Understand the concepts of quality control and product reliability.
- Understand the concepts of production planning and control.

Course Description:

This course provides a comprehensive introduction to the field of Industrial Engineering, focusing on foundational concepts and practical applications. Students will gain a deep understanding of the scientific framework of Industrial Engineering, including systems theory and system thinking methodologies. They will apply analytical skills to analyze and comprehend simple business systems and processes. Additionally, the course covers the structure of the Industrial Engineering curriculum and its interconnectedness among various disciplines. Emphasis is placed on developing teamwork abilities for collaborative task completion and enhancing fundamental learning skills such as information retrieval, reading comprehension, summarization, and effective oral and written presentation of ideas. Topics also include historical perspectives, definitions, and the scope of Industrial Engineering, production techniques, productivity, engineering economics, resource allocation, work design, measurement principles, economic analysis in production decision-making, quality control, product reliability, and production planning and control concepts.

References

1. Badiru, A.B. 2017. Handbook of Industrial & System Engineering. CRC Press.
2. Shtub, A. & Cohen, Y. 2017. Introduction to Industrial Engineering. CRC Press.
3. Turner, W.C., Mize, J.H., Kenneth, E.C., & Nazemet, J. W. 1993. Introduction to Industrial and System Engineering. Prentice Hall, Inc.
4. Zandin, K. B. 2001. Maynard's Industrial Engineering Handbook. McGraw-Hill Education.

**INTNTID236004 Engineering Drawing, 3 credits**

Prasyarat: -

Coordinator:

Aminnudin

SCPL 3 and 6:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.
- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Course Learning Outcomes (CPMK):

- Understand and apply the concepts and functions of technical drawings.
- Master the principles of graphic presentation through proficiency in standards, notations, and norms of technical drawing, including construction, orthographic projection, isometric, and perspective.

Sub Course Learning Outcomes (Sub CPMK):

- Possess knowledge and skills in the fundamentals of machine drawing.
- Ability to apply techniques and principles using manual technical drawing tools.
- Analyze ISO standards related to drawing layout and sheet paper.
- Draw basic geometric constructions in technical drawings.
- Create pictorial projections, orthographic views, and perspectives of objects or subjects.
- Draw sections and perspectives.
- Analyze symbols, work symbols, and tolerances in drawings.
- Draw parts, assemblies, and spans.
- Draw machine components.

Course Description:

This course equips students with a comprehensive understanding and practical application of technical drawing principles. Students will grasp the fundamental concepts and functions of technical drawings, mastering graphic presentation techniques adhering to standardized norms

and notations. They will delve into machine drawing basics, learning to utilize manual drawing tools effectively and analyze ISO standards for drawing layout and paper format. Practical skills include creating geometric constructions, pictorial projections, orthographic views, and perspectives of objects. Additionally, students will interpret symbols, work symbols, and tolerances in drawings, and develop proficiency in drawing parts, assemblies, spans, and machine components, preparing them for practical applications in engineering and technical fields.

References


1. Frank, A. 2017. Elementary Mechanical Drawing. Read Book Ltd.
2. French, Thomas E., and Vierck, Charles J. 1978. The fundamentals of engineering drawing and graphic technology. Twelfth Edition. New York: McGraw-Hill Book Company.
3. Griffiths, Brian. 2003. Engineering Drawing for Manufacture. Kogan Page Science.
4. La Hey, J. dan De Bruijn, LA. 1986. Ilmu Menggambar Bangunan Mesin. Jakarta: Pradnya Paramita.
5. Sato, T dan Sugiarto, N. 1981. Menggambar Mesin Menurut Stanar ISO. Jakarta: Pradnya Paramita.
6. Terench. M. & Shumaker tt. Proses Pipe Drafting USA. The Goodnest Wilcox


**INTNTID236005 Engineering Materials, 2 credits**

Pre-requisite: -.

Coordinator: Heru Suryanto

SCPL 2:

Ability to apply knowledge of mathematics, basic and/or material sciences, information technology, and engineering to gain a comprehensive understanding of industrial engineering principles.

Course Learning Outcomes (CPMK):

- Understand the fundamentals of materials science in determining processes and material selection for the production of parts/objects related to everyday needs.
- Apply material selection in the planning and development of a product.

Sub Learning Outcomes (Sub CPMK):

- Master the concept of materials science.
- Understand the mechanical properties of materials (metals, polymers, composites).
- Explain the heat treatment of materials (metals, polymers, composites).
- Understand the electrical properties of materials (metals, polymers, composites).
- Understand material alloys.
- Understand the optical properties of materials.
- Explain phase diagrams.

Course Description:

This course equips students with foundational knowledge and practical skills in materials science essential for selecting materials and processes in everyday product development. Students will comprehend the principles of materials science, including mechanical, thermal, electrical, and optical properties of metals, polymers, and composites. They will learn to apply this knowledge in choosing suitable materials through hands-on activities involving heat treatment, alloying, and understanding phase diagrams. The course emphasizes the importance of material selection in meeting specific design and functional requirements for various applications, ensuring students gain proficiency in both theoretical understanding and practical application within the field of engineering materials.

References


1. Callister, W. D. & Rethwisch, D. G. 2013. Materials Science And Engineering: An Introduction, 9th Edition. Wiley.
2. Kalpakjian, S. & Schmid, S. R. 2001. Manufacturing Engineering Technology, 4thEd. Prentice-Hall.
3. Smith, W. F. 1996. Principles of Materials Science and Engineering. New York: McGraw-Hill.


**INTNTID236006 Computer Programming, 3 credits**

Pre-requisite: -.

Coordinator: Vertic Eridani

SCPL 6:

Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Course Learning Outcomes (CPMK):

- Students are able to explain types of algorithms for solving computational problems.
- Students are able to explain the use of syntax in programming languages (e.g., Python).
- Students are able to demonstrate the use of algorithms using programming languages (e.g., Python).
- Students are able to apply the use of algorithms using programming languages (e.g., Python).

Sub-CPMK:

- Able to understand programming concepts.
- Able to create flowcharts.
- Able to create programs for arithmetic operations.
- Able to understand and perform conditional and logical operations.
- Able to understand exception handling.
- Able to understand OOP (Object-Oriented Programming): classes, objects, attributes, list-based collections, searching, and sorting.
- Able to perform data analysis.
- Able to visualize data.

Course Description

This course provides a comprehensive introduction to programming and algorithmic problem-solving using Python. Students will learn to identify and implement various types of algorithms, understand and apply syntax correctly, and create flowcharts for program design. The course covers essential programming concepts including arithmetic operations, conditional and logical operations, exception handling, and Object-Oriented Programming (OOP) principles such as classes, objects, attributes, and list-based collections. Additionally, students will gain skills in data analysis and visualization, preparing them to tackle real-world computational challenges effectively. By the end of the course, students will be proficient in using algorithms and programming techniques to solve complex problems.

References


- Cormen, T. H., Leiserson, C. E., Rivest, R. L., Stein, C. (2022). Introduction to Algorithm, 4th ed., The MIT Press.

- Hetland, M. (2010). Python Algorithms. Apress.
- Matthes, E. (2019). Python Crash Course: A Hands-On, Project-Based Introduction to Programming. No-Starch Press.
- Provost, F., Fawcett, T. (2013). Data Science for Business, O'Reilly Media, Inc.
- Schutt, R., O'Neill, C. (2014). Doing Data Science, O'Reilly Media, Inc


**INTNTID236007 Physics II, 3 credits**

Pre-requisite: Fisika I

Koordinator: Atif Fikri

SCPL 2:

Ability to apply knowledge of mathematics, basic and/or material sciences, information technology, and engineering to gain a comprehensive understanding of industrial engineering principles.

Course Description

This course equips students with foundational knowledge in electricity, magnetism, vibrations, and waves, enabling them to apply these concepts to solve related problems. Students will gain an understanding of electrical properties such as electric potential, capacitors, dielectrics, electrodynamics, and alternating current. They will also explore magnetic properties, magnetic fields, and induced electromotive force (EMF). Additionally, the course covers wave theory and modern physics, providing a comprehensive understanding of these fundamental topics.

Learning Outcomes

- Understand basic concepts of electricity and magnetism to solve related problems.
- Understand theories of vibrations and waves to solve related problems.

Sub-Learning Outcomes

- Understand the electrical properties of materials: electric potential, capacitors, dielectrics, electrodynamics, and alternating current.
- Understand magnetic properties, magnetic fields, and induced electromotive force

(EMF).

- Understand wave theory.
- Understand modern physics.

References


1. Sears, F.W. & Zemansky, M. 2016. UNIVUMersity Physics with Modern Physics 14th Edition. Pearson.
2. Giancoli, D. C. 2001. Fisika Dasar, Edisi Kelima. Jakarta: Erlangga.
3. Halliday, D., & Resnick, R. 2004. Fundamentals of Physics, 7th Edition. John Wiley and Sons.
4. Serway, R. A.. 1996. Physics for Scientists and Engineers with Modern Physics, Fourth Edition. New York: Saunders College Publishing.
5. Serway, R. A., Jewett, J. W. 2004. Physics for Scientists And Engineers with Physics NOW and InfoTrac, Sixth Edition. New York: Thomson Brooks/Cole


**INTNTID236008 Calculus II, 3 credits**

Pre-requisite: Calculus 1

Coordinator: Aisyah Larasati

SCPL 2:

Ability to apply knowledge of mathematics, basic and/or material sciences, information technology, and engineering to gain a comprehensive understanding of industrial engineering principles.

Course Description

This course provides students with a comprehensive understanding of transcendental functions, integral techniques, infinite series, and the foundational concepts of differential equations. Students will learn to solve first and second-order ordinary differential equations and apply Laplace transformations to various problems. The course aims to equip students with the skills necessary to solve complex mathematical problems using advanced techniques and concepts.

Learning Outcomes

- Understand transcendental functions.
- Solve problems using integral techniques.
- Understand and calculate infinite series.
- Understand the basic concepts of differential equations.
- Solve first-order ordinary differential equations.
- Solve second-order ordinary differential equations.
- Understand and apply Laplace transformations.

Sub-Learning Outcomes

- Understand transcendental functions.
- Understand integral techniques.
- Understand infinite series.
- Understand the basic concepts of differential equations.
- Understand first-order ordinary differential equations.
- Understand second-order ordinary differential equations.
- Understand series solutions.
- Understand Laplace transformations.

References

1. Anton, H. 2012. Calculus, Edisi 10. New York: John Wiley & Sons.
2. Purcell, J.E., & Rigdon, S.E. 2006. Calculus, Edisi 9. New Jersey: Prentice-Hall.
3. Stewart, J. 2012. Calculus, Edisi 7. Canada: Brooks/cole-Cengage Learning.

**INTNTID236009 Linear Algebra, 3 credits**

Prae-requisite: Calkulus 1

Coordinator: Aisyah Larasati

SCPL 2:

Ability to apply knowledge of mathematics, basic and/or material sciences, information technology, and engineering to gain a comprehensive understanding of industrial engineering principles.

Course Description

This course provides a comprehensive introduction to linear algebra, covering fundamental concepts such as linear equations, matrix theory, vector spaces, and linear transformations. Students will learn to determine eigenvalues and eigenvectors and apply linear algebra techniques to solve various problems. The course emphasizes practical applications and theoretical understanding, preparing students to utilize linear algebra in diverse fields.

Learning Outcomes

- Understand basic concepts of linear algebra.
- Understand linear equations and their applications.
- Understand matrix theory and its applications.
- Understand vector spaces and subspaces.
- Understand linear transformations and their applications.
- Determine eigenvalues and eigenvectors.
- Use linear algebra to solve problems.

Sub-Learning Outcomes

- Understand basic concepts of linear algebra.
- Understand systems of linear equations.
- Understand matrix theory and applications.
- Understand the principles of determinants.
- Understand vectors in planes and spaces.
- Understand Euclidean vector spaces.
- Understand general vector spaces.
- Understand inner product spaces.
- Understand orthogonal matrix diagonalization.

- Understand linear transformations.
- Understand eigenvalues and eigenvectors.
- Understand applications of linear algebra.

References

1. Anton, H., & Rorres, C. 2013. *Elementary linear algebra: applications version*. John Wiley & Sons.
2. Lipschutz, S. & Lipson, M. 2006. Schaum's Easy Outlines: Aljabar Linear, Edisi Ketiga. Penerbit Erlangga.
3. Strang, G. 2016. Introduction to Linear Algebra, Edisi 5. Wellsley Cambridge Press

**INTNTID236010 Engineering Mechanics, 2 sks 2 js**

Pre-requisitet:

Coordinator:

Redyarsa

SCPL 2:

Ability to apply knowledge of mathematics, basic and/or material sciences, information technology, and engineering to gain a comprehensive understanding of industrial engineering principles.

Course Description

This course provides a thorough understanding of the determination of reaction forces and member forces in trusses and frames. Students will learn to create shear force and moment diagrams, calculate stresses under various types of loads, and transform 2D stress-strain. The course covers essential concepts such as vectors, Newton's Laws, equilibrium equations, and the forces acting on structural and mechanical elements. Additionally, students will understand the effects and benefits of friction in mechanical systems, preparing them to analyze and solve problems in structural mechanics effectively.

Learning Outcomes

- Understand the determination of reaction forces and member forces in trusses and frames.
- Create shear force and moment diagrams for trusses and frames.
- Determine stresses from various types of loads on trusses and frames.

- Transform 2D stress-strain.

Sub-Learning Outcomes

- Understand vector concepts.
- Understand Newton's First, Second, and Third Laws.
- Understand equilibrium equations.
- Understand the forces acting on structural or mechanical elements.
- Understand the effects and benefits of friction in mechanical systems.

References


1. Beer, Ferdinand P; Johnson Jr, E Russel; 1998. Vector Mechanics for Engineers: Statics. Mc Graw Hill.
2. Geere, J. M. & Goodno B. J. 2013. Mechanics of Materials, SI Edition, 8th Edition. Cengage Learning.
3. Hibbeler, R. C. 1995. Engineering Mechanicas: Statistics, 7th.ed. Prentice Hall.
4. Hibbeler, R. C. 1995. Mechanics of Materials, 7th.ed. Prentice Hall.
5. Meriem, J. L., Kreige, L. G. 2002. Engineering Mechanics Volume 1: Statics. New York: John Willey & Sons.
6. Riley, W. F., Struges, L. D. and Morris, D. H.. 1995. Statistics and Mechanics : An Integrated Approach, 1st.ed. Jhon Wiley and Sons


**INTNTIDU236011 Statistics I, 3 credits**

Pre-requisite: -

Coordinator: Abdul Muid

SCPL 2 dan 4:

- Ability to apply knowledge of mathematics, basic and/or material sciences, information technology, and engineering to gain a comprehensive understanding of industrial engineering principles.
- Ability to design and conduct laboratory and/or field experiments and analyze and interpret data to support industrial engineering decision-making processes.

Course Description

This course provides a comprehensive introduction to both descriptive and inferential statistics, focusing on their applications in industry. Students will learn to analyze single and grouped data using descriptive statistics, including various data types and collection methods, as well as numerical and graphical data description. The course covers inferential statistics concepts such as probability distributions, sampling methods, point estimation, and confidence intervals. Students will apply these statistical concepts to solve industrial problems and will gain hands-on experience operating statistical software such as SPSS and Minitab.

Learning Outcomes

- Understand the concepts of descriptive statistics (single and grouped data).
- Understand the concepts of inferential statistics (probability distributions, sampling, point estimation, confidence intervals).
- Analyze data using descriptive statistics.
- Analyze data using inferential statistics.
- Apply statistical concepts to solve industrial problems.
- Operate statistical processing software (SPSS and Minitab).

Sub-Learning Outcomes

- Understand an introduction to industrial statistics.
- Understand types of data.
- Understand probability distributions.
- Understand descriptive statistics (data types, data collection methods, numerical and graphical data description).
- Understand inferential statistics (probability, discrete probability distributions, continuous probability distributions, sampling methods, sampling distributions, parameter estimation, confidence intervals).

References

1. Devore, J.L. 2008. Probability and Statistics for Engineering and the Sciences. Thomson Learning.
2. Walpole, R.E., Myers, R.H. & Ye, K. 2007. Probabilitiy and Statistics for Engineers and Scientists, Edisi 8. Pearson Prentice Hall.

**INTNTID236012 Manufacturing Process, 3 credits**

Prasyarat: Engineering materials, engineering drawing

Coordinator: Aminnudin

SCPL 3 and 6:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.
- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Course Description

This course offers a foundational understanding of manufacturing processes, covering both traditional and modern product formation techniques. Students will analyze processes and techniques in the context of simple product design. Key topics include an introduction to manufacturing processes, the basics of metal casting, forming and deformation principles, sheet metalworking, powder metallurgy, plastic materials, machining fundamentals, time calculation, and process selection. Additionally, the course covers design considerations, modern machining methods, assembly processes, and advanced manufacturing technologies, equipping students with the skills to evaluate and optimize manufacturing techniques.

Learning Outcomes

- Understand the basics of manufacturing processes.
- Understand traditional and modern product formation.
- Analyze processes and techniques for simple product design.

Sub-Learning Outcomes

- Understand an introduction to manufacturing processes.
- Understand the basics of metal casting.
- Understand the fundamentals of forming and deformation.
- Understand sheet metalworking.
- Understand powder metallurgy.
- Understand plastic materials.

- Understand machining fundamentals.
- Perform time calculation and process selection.
- Consider design and machining equipment.
- Perform modern/non-traditional machining (NTM).
- Perform assembly processes.
- Understand advanced manufacturing technology.

References

1. Groover, M.P. 2002. Fundamentals of Modern Manufacturing. Prentice Hall
2. Gershwin, S.B. 1994. Manufacturing Systems Engineering. Prentice Hall.
3. Kalpakjian, S. dan Schmid, S. R., 2009. Manufacturing Engineering and Technology, Edisi
7. Pearson.

**INTNTID236013 Statistics II, 3 credits**

Pre-requisite: Statistics I

Coordinator: Rudi Nurdiansyah

SCPL 2 and 4:

- Ability to apply knowledge of mathematics, basic and/or material sciences, information technology, and engineering to gain a comprehensive understanding of industrial engineering principles.
- Ability to design and conduct laboratory and/or field experiments and analyze and interpret data to support industrial engineering decision-making processes.

Course Description

This course provides a thorough understanding of inferential statistics, non-parametric statistics, and their applications in hypothesis testing. Students will learn to analyze data using variance analysis, regression, and correlation techniques, and select appropriate goodness of fit tests. The course also covers the application of non-parametric statistical methods and problem-solving in industrial contexts using statistical techniques. Students will gain hands-on experience with statistical software such as SPSS and Minitab, enabling them to effectively analyze and interpret data.

Learning Outcomes

- Understand inferential statistics concepts (probability distributions, sampling, point estimation, confidence intervals).
- Understand non-parametric statistics concepts.
- Formulate and test statistical hypotheses.
- Analyze data using variance analysis, regression, and correlation techniques.
- Select appropriate goodness of fit tests.
- Analyze data using non-parametric statistical techniques.
- Solve industrial problems using appropriate statistical methods.
- Operate statistical processing software (SPSS and Minitab).

Sub-Learning Outcomes

- Perform hypothesis testing.
- Conduct variance analysis.
- Perform correlation analysis.
- Conduct single-variable regression analysis.
- Conduct multivariable regression analysis.
- Understand goodness of fit tests.
- Understand contingency tables (cross-tabulation analysis).
- Understand non-parametric statistics and related cases.

References

1. Devore, J.L. 2008. Probability and Statistics for Engineering and the Sciences. Thomson Learning.
2. Montgomery, D.C., & Runger, G.C. 2013. Applied Statistics and Probability for Engineers. Wiley.
3. Walpole, R.E., Myers, R.H. & Ye, K. 2007. Probabilitiy and Statistics for Engineers and Scientists, Edisi 8. Pearson Prentice Hall.

**INTNTID236014 Cost Analysis and Control, 3 credits**

Pre-requisite: Introduction to Industrial Engineering

Coordinator: Aulia Azzardina

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Course Description

This course covers the fundamentals of financial and cost management, including elements of financial accounting, income statements, balance sheets, and cash flow statements. Students will gain an understanding of ratio analysis, cost-volume-profit relationships, cost drivers, break-even analysis, and measurement methods. Additionally, the course explores budgeting and cost determination, covering cost classification, cost estimation methods, cost allocation, cost analysis, target costing, standard costing, flexible budgets, capital budgeting, and various costing systems such as process costing, job order costing, activity-based costing, and lean accounting.

Course Learning Outcomes (CPMK):

- Understand the fundamentals of financial and cost management, elements of financial accounting, income statements, balance sheets, and cash flow statements.
- Understand ratio analysis, cost-volume-profit relationships, cost drivers, break-even analysis, and measurement methods.
- Understand budgeting and cost determination: cost classification, cost estimation methods, cost allocation, cost analysis, target costing, standard costing, flexible budgets, capital budgeting. Types of costing systems: process costing, job order costing, activity-based costing, lean accounting.

Sub Learning Outcomes (Sub CPMK):

- Able to understand the basics of financial and cost management.
- Able to understand financial accounting elements.
- Able to prepare income statements, balance sheets, and cash flow statements.
- Able to perform ratio analysis, cost-volume-profit analysis, cost drivers, break-even analysis,

and measurement methods.
- Able to perform budgeting and cost determination: cost classification, cost estimation methods, cost allocation, cost analysis.
- Able to understand target costing, standard costing, flexible budgets, capital budgeting.
- Able to understand types of costing systems: process costing, job order costing, activity-based costing, lean accounting.

References


1. Hilton, R. W. (1999). *Managerial accounting* (Vol. 568). Boston, MA: Irwin/McGraw-Hill.
2. Tayyari, F. (2021). *Cost Analysis for Engineers and Scientists*. CRC Press.
3. Greer, W. R., & Nussbaum, D. A. (1990). *Cost analysis and estimating: tools and techniques*. New York: Springer-Verlag.


**INTNTID236015 Operations Research I, 3 credits**

Pre-requisite: Calculus 1, 2, linear algebra

Coordinator: Rudi Nurdiansyah

SCPL 5 & 6:

- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.
- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Course Learning Outcomes (CPMK):
- Identify decision variables, objective functions, and constraints based on problem descriptions.
- Model linear problems including transportation, assignment, transshipment, and network models.
- Solve linear optimization problems using the simplex method manually.
- Analyze sensitivity of linear problem solutions.
- Operate optimization software (LINDO and MATLAB) to solve linear equation models.
- Interpret optimization software output and implications for decision-making.

Sub Learning Outcomes (Sub CPMK):

- Able to formulate problems.
- Able to understand principles of constructing mathematical models.
- Able to formulate linear programs.
- Understand procedures and calculations of the simplex algorithm.
- Able to analyze sensitivity and duality analysis.
- Able to solve transportation, assignment, and transshipment problems.
- Able to solve network model problems.
- Able to apply software such as LINDO, LINGO, Solver, or MATLAB.

Course Description

This course provides a comprehensive exploration of linear optimization techniques essential for decision-making in various domains. Students will learn to identify decision variables, formulate objective functions, and establish constraints based on problem descriptions. They will model linear problems including transportation, assignment, transshipment, and network models, mastering manual solutions using the simplex method. Emphasis is placed on sensitivity analysis of solutions and the practical application of optimization software like LINDO and MATLAB to solve linear equation models. Through interpreting software outputs, students will understand the implications for effective decision-making processes, preparing them to tackle real-world optimization challenges in diverse fields.

References

1. Bazaraa, M. S., Jarvis, J. J., & Sherali, H. D. 2011. Linear Programming and Network Flows. John Wiley & Sons.
2. Taha, H.A. 2017. Operation Research: An Introduction, Edisi 10. Pearson.
3. Winston, W.L. 2004. Operations Research: Applications and Algorithms, Edisi 4. Indiana UNIVUMersity.

**INTNTID236016 Ergonomics, 3 credits**

Pre-requisite: Introduction to Industrial Engineeering

Coordinator: Vertic Eridani

SCPL 5 dan 10:

- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.

- Ability to be responsible to society, accountable, and practice professional ethics in solving industrial engineering problems.

Course Learning Outcomes (CPMK):

• Students will be able to explain the concept of Ergonomics.

• Students will understand the concept of physiology and its relationship with workload.

• Students will understand the concepts of anthropometrics, biomechanics, manual material handling, and their benefits for work system design.

• Students will understand cognitive ergonomics.

• Students will understand macro ergonomics.

Sub Learning Outcomes (Sub CPMK):

• Understand the introduction to ergonomics.

• Understand anthropometrics.

• Understand human physiology.

• Understand the physical work environment.

• Able to prevent musculoskeletal disorders.

• Able to design manual material handling.

• Understand cognitive ergonomics.

• Understand macro ergonomics.

Course description

This course delves into the multifaceted field of Ergonomics, equipping students with comprehensive knowledge essential for optimizing human-system interaction. Students will explore fundamental concepts such as the principles of Ergonomics, the physiological impacts of workload, and the applications of anthropometrics, biomechanics, and manual material handling in workplace design. Additionally, they will delve into cognitive Ergonomics and macro Ergonomics, gaining insights into enhancing both individual and system-wide ergonomic considerations. The course emphasizes practical skills in preventing musculoskeletal disorders and designing ergonomic solutions tailored to diverse work environments, preparing students to contribute effectively to enhancing workplace health and productivity.

References

- Bridger, R. (2017). Introduction to Human Factors and Ergonomics. United Kingdom: CRC Press.
- Freivalds, A., Niebel, B. (2013). Niebel's Methods, Standards, & Work Design. Mcgraw-Hill Higher Education.
- Groover, M. P. (2013). Work Systems: The Methods, Measurement and Management of Work. United Kingdom: Pearson.
- Lehto, M. R., Landry, S.J. (2013). Introduction to Human Factors and Ergonomics for Engineers, 2nd ed., CRC Press.
- Wickens, C.D., Lee, J., Gordon-Becker, S. Liu, Y. (2014). An Introduction to Human Factors Engineering, 2nd ed., Pearson.
- Wickens, C. D., Hollands, J. G., Banbury, S., Helton, W. S. (2021). Engineering Psychology and Human Performance. United Kingdom: Routledge.
- Handbook of Standards and Guidelines in Human Factors and Ergonomics, Second Edition. (2021). United States: CRC Press.
- Berlin, C., Adams, C. (2017). Production Ergonomics: Designing Work Systems to Support Optimal Human Performance. United Kingdom: Ubiquity Press.


**INTNTID236017 Industrial Ecology, 2 credits**

Pre-requisite: -

Coordinator: Abdul Muid

SCPL 3 dan 6:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.
- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Course Learning Outcomes (CPMK):

- Explore the influence of the environment on living organisms (ecology).
- Investigate the relationship between humans and their environment.
- Analyze environmental science as a framework for interdisciplinary approaches to

addressing human environmental issues, particularly concerning living organisms in general.

Sub Learning Outcomes (Sub CPMK):

- Able to perform Ecology as the basis of environmental knowledge.
- Able to grasp the concepts and engineering of sustainability.
- Able to understand the fundamental principles of environmental science.
- Able to analyze agricultural systems, forests, lakes, and grasslands.
- Able to analyze human impact and the degree of ecosystem decline.
- Able to analyze human-environment interactions and infectious diseases.
- Capable of developing urban planning, regional planning, and national planning.
- Understand environmental pollution and methods for controlling, mitigating, and controlling pollution from waste and pollutants.

Course description

This course explores the intricate relationship between humans and their environment, emphasizing ecological impacts on living organisms and the interdisciplinary nature of environmental science. Students will delve into topics ranging from the foundational principles of ecology to the sustainable engineering practices essential for addressing contemporary environmental challenges. They will analyze agricultural, forest, lake, and grassland ecosystems, while also examining human-induced impacts and the resulting decline in ecosystem health. Additionally, the course covers the complex interactions between human activities and environmental health, including the spread of infectious diseases. Practical applications include the development of urban and regional planning strategies aimed at sustainable development and effective pollution control measures to mitigate environmental degradation caused by waste and pollutants.

References

1. Arief, L. M. 2016. Pengolahan Limbah Industri: Dasar-dasar Pengetahuan dan Aplikasi di Tempat Kerja. Penerbit Andi.
2. Chiras, D. D. 2012. Environmental Science, 9th Edition. Jones & Bartlett Learning,
3. Siahaan, N. H. T. 2004. Hukum Lingkungan dan Ekologi Pembangunan. Gelora Aksara Pratama.
4. Tchobanoglous, G., Burton, F. L., Stensel, H. D. 2013. Wastewater Engineering:

Treatment and Resource Recovery. McGraw-Hill Ed.
5. Vesilind, P. A., Peirce, J. J., Weiner, R. F. 2013. Environmental Engineering 2nd Edition. Butterworths.

**INTNTID236018 Measurement and Design of Work System, 3 credits**

Pre-requisite: Ergonomics

Coordinator: Vertic Eridani

SCPL 3 and 4:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.
- Ability to design and conduct laboratory and/or field experiments and analyze and interpret data to support industrial engineering decision-making processes.

Course Learning Outcomes (CPMK):

• Students are able to implement various work measurements, both directly and indirectly.

• Students can analyze work measurement results to provide recommendations for productivity improvement.

• Students are capable of evaluating work systems according to ergonomic principles.

• Students can provide recommendations for implementing work system designs.

Sub Learning Outcomes (Sub CPMK):

• Able to perform work system analysis.

• Able to engage in work system design processes.

• Capable of developing performance metrics.

• Proficient in creating work diagrams.

• Able to conduct time and motion studies.

• Competent in operational analysis.

• Capable of implementing design implementations.

Course description

This course equips students with comprehensive skills in work analysis and system design, focusing on enhancing productivity and ergonomic principles. Students will learn to implement various methods of work measurement, analyze outcomes to recommend productivity enhancements, and evaluate work systems through ergonomic lenses. Practical applications include designing and implementing efficient work systems, developing performance metrics, creating work diagrams, and conducting detailed time and motion studies. By mastering these skills, students will be prepared to contribute effectively to improving workplace efficiency and optimizing ergonomic conditions, ensuring sustainable and productive work environments.

References


- Bridger, R. (2017). Introduction to Human Factors and Ergonomics. United Kingdom: CRC Press.
- Freivalds, A., Niebel, B. (2013). Niebel's Methods, Standards, & Work Design. Mcgraw-Hill Higher Education.
- Groover, M. P. (2013). Work Systems: The Methods, Measurement and Management of Work. United Kingdom: Pearson.
- Lehto, M. R., Landry, S.J. (2013). Introduction to Human Factors and Ergonomics for Engineers, 2nd ed., CRC Press.
- Wickens, C.D., Lee, J., Gordon-Becker, S. Liu, Y. (2014). An Introduction to Human Factors Engineering, 2nd ed., Pearson.
- Konz, S. (2018). Work Design: Occupational Ergonomics. United Kingdom: CRC Press.
- Johnson, S., Konz, S. A. (2000). Work Design: Industrial Ergonomics. United States: Holcomb Hathaway


**INTNTIDUM6019 System Modeling, 2 credits**

Pre-requisite : -

Coordinator: Abdul Muid

SCPL 5 dan 8:

- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering
- Ability to plan, complete, and evaluate tasks with consideration of given constraints

Course Learning Outcomes (CPMK):

- Understand the basic concepts of system modeling and problem identification.
- Develop accurate system models and system diagrams.
- Master the procedures of hard system methodology and soft system methodology.
- Define problems based on real-world and theoretical issues relevant to the field of industrial engineering.
- Implement system modeling in various real and theoretical case studies.
- Analyze and validate developed or reviewed models.

Sub Learning Outcomes (Sub CPMK):

- Able to perform system modeling for problem-solving (real and theoretical within the scope of Industrial Engineering).
- Capable of creating deterministic models.
- Capable of creating stochastic models.
- Able to solve case studies using deterministic and stochastic models.
- Proficient in using both hard system methodology and soft system methodology concepts.

Course description

This course offers comprehensive training in system modeling and problem-solving methodologies tailored for industrial engineering. Students will grasp foundational concepts of system modeling and develop precise system diagrams using both hard and soft system methodologies. They will learn to define and address real-world and theoretical problems specific to industrial engineering through deterministic and stochastic models. Practical applications include analyzing and validating these models across various case studies to enhance understanding and applicability in industrial settings.

References

1. Checkland, P., & Scholes, J. 1999. Soft Systems Methodology: A 30-Year Retrospective. Chichester: John Wiley.
2. Daellenbach, H. G. and D.C. McNickle. 2005. Management Science: Decision Making through System Thinking. United Kingdom: Pallgrave Macmillan.
3. Law, A. M., Kelton, W. D., & Kelton, W. D. (2007). Simulation modeling and analysis (Vol. 3). New York: McGraw-Hill.

**INTNTID236020 Economics and Engineering Economics, 3 credits**

Pre-requisite: -

Coordinator: Rudi

SCPL 3 dan 6:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering
- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice

Course Learning Outcomes (CPMK):

- Understand the principles of demand and supply using problem-based learning methods in case studies within the industrial sector.
- Comprehend price elasticity principles and shifts in supply-demand curves through analysis of various types of goods in the Industry 4.0 era.
- Analyze production functions and production costs.
- Apply market structure practices in the Industry 4.0 era.
- Analyze types of national income, the impact, and effectiveness of monetary and fiscal policies, particularly in developing countries.
- Explore the basic concepts and principles of engineering economics within a company.
- Practice principles of equivalence and compound interest and their application in various analytical tools.
- Analyze the fundamental principles and use of financial feasibility measurements.
- Calculate technical life, economic life, and depreciation within a company.
- Explore principles of tax calculation.

Sub Learning Outcomes (Sub CPMK):

- Able to understand the principles of economic activities, their driving factors, and production factors within them.
- Able to grasp the principles of price mechanisms in economic issues.
- Able to understand consumer behavior principles, market demand characteristics, and analyze demand elasticity.

- Able to understand the marginal utility approach and indifferent curve.
- Able to understand producer behavior principles and analyze supply elasticity.
- Able to understand revenue principles, profits, and losses.
- Able to understand market structure concepts.
- Able to comprehend macroeconomic principles including types of national income, distinguishing them, studying the impact and effectiveness of monetary and fiscal policies.
- Able to understand basic principles of engineering economics.
- Able to understand principles of constructing cash flow diagrams.
- Able to understand principles of equivalence and compound interest.
- Able to understand principles and analyze Present Worth Analysis.
- Able to understand principles and analyze cases using Annual Cash Flow Analysis.
- Able to understand principles and analyze cases using Rate of Return Analysis.
- Able to understand principles and analyze cases using Future Worth Analysis.
- Able to understand principles of using Benefit Cost Ratio, Payback Period.
- Able to understand principles of calculating depreciation, technical life, and economic life.
- Able to understand principles of tax calculation.

Course description

This course provides a comprehensive exploration of economic principles and their application in industrial contexts, particularly in the era of Industry 4.0. Students will delve into fundamental concepts such as demand and supply dynamics, price elasticity, production functions, and market structures. They will analyze various types of goods and their economic impacts, while also evaluating the effectiveness of monetary and fiscal policies in developing economies. Practical skills include financial feasibility analysis, cash flow management, and depreciation calculations crucial for informed decision-making in industrial settings. Additionally, students will learn about taxation principles and their implications. Through case studies and problem-based learning approaches, students will develop the ability to apply economic theories to real-world scenarios, preparing them for roles where economic analysis and strategic financial planning are essential.

References

1. Blank. L. T. and Tarquin. A. J. 1983. Engieering Economy, 2nd Edition. New York: McGraw Hill.
2. DeGarmo. E.P., Sullivan, W.G., and Canada. J.R. 1984. Engineering Economy, 7th edition. New York: Macmillan.

3. Donald G. Newnan,. 1990. Engineering Economic Analysis, 3th edition. California. Engineering Press Inc.
4. Kleinfeld, I. 1982. Engineering and Managerial Economics. New York: Holt, Rinehart and Winston.
5. Samuelson, P.A. & Nordhaus,W.D. 1996. Economics. fourteenth edition. MgGraw-Hill International editions.
6. Krugman, Paul & Wells, Robin. 2013. Economics. 3rd Ed. Worth Publishers.
7. Aziz, Noor. 2003. Mikro Ekonomi Aplikasi dan Manajemen. Malang: Bayumedia Publishing.
8. Sukirno, Sadono. 2002. Pengantar Teori Mikro Ekonomi. Ed.2. Jakarta: Raja Grafindo Persada.
9. Sukirno. Sadono. 2003. Makro Ekonomi ed.3. Jakarta: Raja Grafindo Persada

**INTNTID236021 Operations Research II, 3 credits**

Pre-requisite: Operations Research I

Coordinator: Rudi

SCPL 5 dean 6:

- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.
- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Course Learning Outcomes (CPMK):

- Understanding concepts of integer, nonlinear, and dynamic programming, as well as game theory, Markov chains, and queueing theory.
- Mastering procedures for solving integer and dynamic programming problems. Modeling appropriate problems using deterministic and stochastic models.
- Modeling game theory and Markov chain problems.
- Solving integer and dynamic programming problems manually. Operating optimization software (LINDO, LINGO, and Matlab) to solve deterministic and stochastic model problems.

Sub Course Learning Outcomes (Sub CPMK):

- Understanding deterministic models and their applications.
- Understanding stochastic models and their applications.
- Understanding integer programming.
- Understanding nonlinear programming.
- Understanding game theory.
- Understanding dynamic programming.
- Understanding Markov chains.
- Understanding queueing theory.

Course description

This course offers a comprehensive study of advanced mathematical modeling techniques essential in industrial and operational contexts. Students will grasp foundational concepts such as integer, nonlinear, and dynamic programming, alongside game theory, Markov chains, and queueing theory. They will develop proficiency in formulating and solving problems using both deterministic and stochastic models, applying these skills to real-world scenarios. Practical applications include manual problem-solving techniques for integer and dynamic programming, as well as utilizing optimization software like LINDO, LINGO, and Matlab to tackle complex optimization problems. By mastering these methodologies, students will be equipped to analyze and optimize decision-making processes across various industrial sectors, preparing them for roles that demand advanced mathematical and analytical skills.

References

1. Taha, H.A. 2017. Operation Research: An Introduction, Edisi 10. Pearson.
2. Winston, W.L. 2004. Operations Research: Applications and Algorithms, Edisi 4. Indiana UNIVUMersity.

**INTNTID236022 Quality Control and Assurance, 3 credits**

Pre-requisite: -

Coordinator: Abdul Muid

SCPL 5 and 6:

- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.

- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Learning Outcomes of the Course (CPMK):
- Understanding the concept of quality and its role as a management strategy.
- Understanding techniques for controlling and assuring the quality of products and services.
- Implementing techniques essential for controlling the quality of products and services, crucial in designing a quality assurance system.

Sub Learning Outcomes (Sub CPMK):
- Able to understand the basic concepts of quality planning and control (management and assurance).
- Able to grasp fundamental statistical concepts.
- Understanding the dimensions of product quality.
- Understanding the principles of quality control.
- Able to create control charts.
- Capable of designing activities for inspection and acceptance sampling.
- Understanding service quality.
- Capable of quality improvement through design.
- Understanding Taguchi methods.

Course description

This course equips students with fundamental knowledge and practical skills in quality management essential for contemporary organizational strategies. Students will comprehend the role of quality as a strategic asset and explore various techniques for ensuring product and service excellence. Emphasizing both theoretical foundations and practical applications, the course covers quality planning, statistical fundamentals, and control methods crucial for implementing effective quality assurance systems. Students will learn to design control charts, conduct inspection and acceptance sampling, and improve quality through systematic design approaches. Additionally, the course delves into service quality considerations and introduces advanced methodologies like Taguchi methods, preparing students to tackle real-world quality challenges across industries.

References

1. Grant, E.L. and R.S. Leavenworth. 2000. Statistical Quality Control. New York: McGraw-

Hill Book, Co.
2. Mitra, A. 2016. Fundamentals of Quality Control and Improvement. Wiley.
3. Montgomery, Douglas C. 2005. .Introduction to Statistical Quality Control. New York: John Wiley & Sons Corp.
4. Sao, R. B. 2016. Perfect Quality Assurance and Quality Control. CreateSpace Independent

**INTNTID236023 Data Analytics, 3 credits**

Pre-requisite: Calculus II, statistics II

Coordinator: Aisyah Larasati

SCPL 4 and 6:

- Ability to design and conduct laboratory and/or field experiments and analyze and interpret data to support industrial engineering decision-making processes.
- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Learning Outcomes (CPMK)

- Understanding the basic concepts of data analytics and its strategic role in industrial engineering.
- Understanding various types of data and data acquisition processes.
- Formulating problems in the context of big data and non-conventional data.
- Ability to clean, prepare, and visualize data.
- Modeling problems in the context of big data and non-conventional data.
- Mastering procedures of various data analytics techniques.
- Solving problems using supervised and unsupervised models.
- Presenting data analytics results for decision-making.

Sub CPMK:

- Understanding the basic concepts of data analytics.
- Understanding the strategic role of data analytics in the context of industrial engineering.
- Understanding the key processes in data analytics.
- Understanding types of data and data acquisition processes.
- Ability to clean and prepare data.
- Ability to create data visualizations.

- Ability to model and analyze data.
- Understanding Supervised and Unsupervised models.
- Ability to evaluate models and make decisions.
- Understanding ethics in data analytics.
- Ability to present data analytics results.

Course description

The course on Data Analytics in Industrial Engineering equips students with fundamental concepts and strategic applications in the field. Students will comprehend the basics of data analytics, its pivotal role in industrial contexts, and various data types and acquisition processes. They will learn to formulate and model problems using big data and unconventional data, while mastering techniques to clean, prepare, visualize, and analyze data effectively. Through supervised and unsupervised models, students will solve real-world problems and present their findings for informed decision-making. The course also emphasizes ethical considerations in data analytics, ensuring students are adept at handling data responsibly and ethically in professional settings.

References

1. Han, J., Kamber, M. & Pei, J. 2011. Data Mining: Concepts and Techniques, Edisi 3. Morgan Kaufmann.
2. Santosa, B. & Umam, A. 2017. Data Mining dan Big data Analytics. PT. Media Penebar Ilmu
3. Witten, Ian H., Frank, Eibe, Hall, Mark A., & Pal, Christopher J. 2016. Data Mining, Fourth Edition: Practical Machine Learning Tools and Techniques (Morgan Kaufmann Series in Data Management Systems).

**INTNTID236024 Production Planning and Control, 3 credits**

Pre-requisite:

Coordinator: Aisyah Larasati

SCPL 5 & 6:

- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.

- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Course Learning Outcomes (CPMK):
- Understand the concepts of production planning and control.
- Comprehend the fundamental concepts of production systems.
- Perform forecasting using various techniques.
- Develop master production schedules.
- Plan material requirements.
- Conduct inventory planning.
- Evaluate assembly line balancing.
- Plan production activity control.
- Apply concepts of production planning and control to problem-solving.

Sub-Course Learning Outcomes (Sub CPMK):
- Ability to understand the concepts of production planning and control.
- Ability to comprehend forecasting techniques.
- Ability to develop master production schedules.
- Understanding of independent and dependent demand inventory.
- Ability to create aggregate planning.
- Ability to formulate capacity planning.
- Ability to plan material requirements.
- Ability to plan capacity requirements.
- Ability to schedule production.
- Ability to balance assembly lines.
- Ability to implement just-in-time production system concepts.

Course description:
This course equips students with essential knowledge and skills in production planning and control (PPC) within industrial engineering contexts. Students will grasp the foundational concepts of production systems and learn to forecast using diverse methodologies. They will develop proficiency in creating master production schedules, planning material and capacity requirements, and managing inventory effectively. The course emphasizes the evaluation of assembly line balance and the implementation of production activity control techniques. Through

practical applications, students will apply PPC concepts to solve real-world challenges, preparing them to optimize production processes and enhance operational efficiency in industrial settings.

References

1. Arnold, J. T., 2011. Introduction to Materials Management, 5th. India: Pearson Education
2. Mukhopadhyay, S. K. 2015. Production Planning and Control, 3rd Edition. PHI Learning.
3. Zhang, J., 2017. Multi-Agent-Based Production Planning and Control. Wiley.

**INTNTID236025 Organizational Behavior, 2 credits**

Pre-requisite: -

Coordinator: Vertic Eridani

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering

Learning Outcomes of the Course (CPMK):

- Students are able to explain the concepts of industrial psychology.
- Students can understand the principles used to enhance the influence and leadership of individuals within organizations of various sizes.
- Students are capable of using appropriate tools to implement effective changes.
- Students are able to develop sensitivity and appreciation for how the experiences, nature, and values of individuals can be optimally utilized to contribute to the organization.

Sub Learning Outcomes (Sub CPMK):

- Able to understand human behavior in organizations (industrial psychology).
- Able to understand the relationships among individuals within groups.
- Able to understand organizational support in achieving performance (individual, group, and organizational performance).

Course Description:

This course equips students with a comprehensive understanding of industrial psychology

principles and their application in organizational settings. Students will delve into the concepts of enhancing individual influence and leadership across different organizational scales. They will learn to effectively apply tools for implementing organizational changes and cultivate sensitivity towards harnessing individual experiences, traits, and values to maximize organizational contributions. Additionally, the course explores human behavior within organizations, emphasizing interpersonal dynamics and the crucial role of organizational support in achieving optimal individual, group, and overall organizational performance.

References


- Aamodt, M. G. (2016). Industrial/Organizational Psychology: An Applied Approach, 8th ed., Cengage Learning.
- Colquitt, J. A., Lepine, J.A., Wesson, M. J. (2019). Organizational Behavior: Improving Performance and Commitment in The Workplace, 6th ed., McGrawHill Education.
- Robbins, S.P., Judge, T.A. (2018). Organizational Behavior, 18th ed., Pearson


**INTNTID236026 Research Methodology, 3 credits**

Prasyarat: -

Coordinator: Rudi Nurdiansyah

SCPL 7 dan 8:

- Ability to communicate effectively both orally and in writing.
- Ability to plan, complete, and evaluate tasks with consideration of given constraints.

Learning Outcomes of the Course (CPMK):

- Analyze real-world problems potentially faced by IT graduates in the workplace and society, along with their problem-solving methodologies.
- Generate multiple problem-solving alternatives, methods, or techniques, including data requirements, constraints, assumptions needed, and consequences of each proposed solution.
- Analyze problems using critical, creative, and innovative thinking in their resolution.
- Proficiently gather and synthesize information, perform editing and referencing, communicate scientifically both orally and in writing, and write scientific reports and journals based on problem-solving outcomes.

Sub Learning Outcomes (Sub CPMK):

- Identify existing problems in the workplace and society accurately.
- Understand appropriate problem-solving methodologies that are effective, efficient, and involve creativity and innovation.
- Apply suitable problem-solving methods/techniques based on the framework of Industrial Engineering science.
- Understand constraints and assumptions relevant to the problem conditions.
- Understand data collection methods and necessary information for problem-solving.
- Understand the study of scientific attitudes and ethics.
- Skillfully gather and synthesize information, perform editing and referencing, communicate scientifically both orally and in writing, and write scientific reports and journals based on problem-solving outcomes.

Course Description:

This course equips students with the skills necessary for IT professionals to tackle real-world challenges in both professional and societal contexts. Students will learn to analyze complex problems using critical, creative, and innovative thinking. They will develop the ability to identify multiple solution alternatives, assess data needs, constraints, and assumptions, and evaluate the implications of each proposed solution. Emphasizing effective communication and scientific writing, students will synthesize information, edit and reference accurately, and produce scientific reports and journals. Through this course, students will master methodologies that integrate Industrial Engineering frameworks, ensuring they are well-prepared to address and resolve diverse challenges in their future careers.

References

1. Modeling & Problem Techniques for Engineers
2. Saukah, A. 2017. Pedoman Penulisan Karya Ilmiah UM (PPKI). Malang: UM Press.
3. Santoso, S., 2001. Riset Pemasaran. Konsep Aplikasi dengan SPSS. Jakarta: Elex Media Komputindo.
4. Singarimbun, M. 1989. Metode Penelitian Survei. Jakarta: LP3ES.

**INTNTID236027 Technopreneurship 2 credits**

Pre-requisite: -

Coordinator: Vertic Eridani

SCPL 8: Ability to plan, complete, and evaluate tasks with consideration of given constraints.

Course Learning Outcomes (CPMK):

- Students will be able to explain the fundamental concepts, theories, and practices used in the field of technopreneurship and its role in the global economy and society.
- Students will be able to describe the process of creating new ventures, including the activities, challenges, and opportunities involved.
- Students will be able to evaluate new venture opportunities to determine their strengths, weaknesses, and overall business potential.
- Students will be able to implement creative ideas into tangible products.

Sub Learning Outcomes (Sub CPMK):

- Understanding the processes and entrepreneurial mindset.
- Conducting innovation and generating ideas.
- Applying design thinking principles.
- Understanding competitive advantage and markets.
- Creating a Business Model Canvas.
- Developing Value Proposition Design.
- Performing financial analysis.
- Executing and developing a business plan.

Course Description:

This course equips students with comprehensive knowledge and skills in technopreneurship, emphasizing its pivotal role in the global economy and society. Students will explore the foundational concepts, theories, and practical applications essential for understanding and participating in entrepreneurial ventures. They will learn the intricacies of creating new ventures, navigating through challenges and seizing opportunities. Through a hands-on approach, students will evaluate business potentials, develop creative ideas into tangible products, and articulate these through robust business models and value propositions. Practical exercises in design thinking, financial analysis, and business planning will prepare students to execute

entrepreneurial strategies effectively in real-world contexts.

References


- Osterwalder, A., & Pigneur, Y. (2010). Business model generation. John Wiley & Sons.
- Osterwalder, A., Pigneur, Y., Papadakos, P., Bernarda, G., Papadakos, T., & Smith, A. (2014). Value proposition design. John Wiley & Sons.
- Ireland, R. D., Barringer, B. R. (2019). Entrepreneurship: Successfully Launching New Ventures. United Kingdom: Pearson.
- Link, P., Lewrick, M., Leifer, L. (2018). The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems. United States: Wiley.


**INTNTID236028 Integrated Laboratory Work, 2 credits**

Pre-requisite: Manufacturing Process, Cost Analysis dan control, Ergonomics, Measurement and Design of work system, and Production planning and control

Coordinator: Rudi Nurdiansyah

SCPL 3, 4, 6 dan 9:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.
- Ability to design and conduct laboratory and/or field experiments and analyze and interpret data to support industrial engineering decision-making processes.
- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.
- Ability to work in teams.

Course Learning Outcomes (CPMK):

- Understand the concept of work, work systems, and their role in enhancing efficiency and productivity.
- Be proficient in using anthropometric measuring tools to measure human body parts in sitting and standing working positions.

- Be able to execute work observation procedures for work measurement purposes (time and physiological).
- Perform biomechanical calculations for tasks within a workstation.
- Measure the physiological performance of task execution.
- Estimate the mental aspects of a job.
- Understand the basic concepts of work system design and ergonomics.
- Understand standard time measurement.
- Design workstations and work environments according to the principles of work system design and ergonomics.
- Use ergonomic principles to evaluate the design of a product.
- Use biomechanical principles to design products and work systems.
- Create assembly line designs and evaluate their performance.

Sub CPMK:

- Design workpieces.
- Design the necessary manufacturing processes.
- Plan workstations and operators.
- Plan standard work time.
- Evaluate workstation performance.
- Evaluate operator performance at workstations.

Course Description:

This course equips students with a comprehensive understanding of work systems, ergonomic principles, and their pivotal role in enhancing efficiency and productivity. Students will learn to utilize anthropometric tools for measuring human body dimensions in various work postures, conduct observational procedures to measure work metrics like time and physiological factors, and apply biomechanical calculations to optimize workstation design. They will also evaluate physiological and mental performance in job execution, grasp the fundamentals of work system and ergonomic design, and apply these principles to design ergonomic workstations and environments. Additionally, students will learn to evaluate product designs using ergonomic principles and apply biomechanics to enhance both product and work system designs. Subsequently, they will gain practical skills in designing work objects, manufacturing processes, planning workstations and operator setups, establishing standard work times, and evaluating

performance at workstations.

References

1. Groover, M. P. Work Systems: The Methods, Measurement & Management of Work. Pearson Pub. 2007.
2. Groover, MP. Fundamental of Modern Manufacturing: Materials, Processes and Systems. John Wiley & Sons. 2006.

**INTNTID236029 Integrated Capstone Design, 2 credits**

Pre-requisite: Manufacturing Process, Cost Analysis dan control, Ergonomics, Measurement and Design of work system, and Production planning and control

Coordinator: Rudi Nurdiansyah

SCPL 3, 5, 8, 9 dan 10:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.
- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.
- Ability to plan, complete, and evaluate tasks with consideration of given constraints.
- Ability to work in teams.
- Ability to be responsible to society, accountable, and practice professional ethics in solving industrial engineering problems

Learning Outcomes of the Course (CPMK):

- Able to apply engineering practices based on knowledge and skills acquired from previous coursework activities.
- Understand and adhere to engineering standards and multiple design constraints in solving complex problems in industry.
- Able to integrate various IEBoK (Industrial Engineering Body of Knowledge) with a systems approach starting from BoK System Design Engineering and ending at BoK Engineering Economic Analysis.

Sub Learning Outcomes (Sub CPMK):

- Able to apply Work Design & Measurement.
- Able to apply Operations Research & Analysis.
- Able to apply Engineering Economic Analysis.
- Able to apply Facilities Engineering & Energy Management.
- Able to apply Quality & Reliability Engineering.
- Able to apply Ergonomics & Human Factors.
- Able to apply Operations Engineering & Management.
- Able to apply Supply Chain Management.
- Able to apply Engineering Management.
- Able to apply Safety.
- Able to apply Information Engineering.
- Able to apply Design & Manufacturing Engineering.
- Able to apply Product Design & Development.
- Able to apply System Design & Engineering.

Course Description:

This course equips students with the practical skills and comprehensive knowledge necessary for engineering practices in various industrial settings. Students will learn to navigate complex challenges by integrating industrial engineering principles with a systematic approach, starting from system design engineering to engineering economic analysis. They will apply their understanding of engineering standards and multiple design constraints to solve intricate problems effectively. The course covers a wide spectrum of IEBoK domains, including Work Design & Measurement, Operations Research & Analysis, Engineering Economic Analysis, Facilities Engineering & Energy Management, Quality & Reliability Engineering, Ergonomics & Human Factors, Operations Engineering & Management, Supply Chain Management, Engineering Management, Safety, Information Engineering, Design & Manufacturing Engineering, Product Design & Development, and System Design & Engineering, ensuring they are well-prepared for diverse roles in the field of industrial engineering.

References

1. Groover, M. P. Work Systems: The Methods, Measurement & Management of Work. Pearson Pub. 2007.

2. Groover, MP. Fundamental of Modern Manufacturing: Materials, Processes and Systems. John Wiley & Sons. 2006.

**INTUPKL236090 Internship, 4 credits**

Pre-requisite: pass minimum 80 credits

Coordinator: Rudi

SCPL 5, 7 dan 11:

- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.
- Ability to communicate effectively both orally and in writing
- Ability to engage in lifelong learning, including access to relevant knowledge on current issues.

Course Learning Outcomes (CPMK):

- Gain direct work experience and knowledge of industry problems and their solutions, enabling students to provide valuable insights to the industry.
- Present an analytical report based on practical work experience in a systematic manner.

Sub CPMK:

- Able to write an industrial practice proposal.
- Capable of analyzing industry types aligned with interests and skills.
- Able to analyze job execution in industry.
- Capable of job analysis in industry.
- Capable of creating daily reports from practical experience.
- Capable of preparing the final internship report.
- Capable of public communication in academic and formal settings through presenting the results of industrial practice analyses.

Course Description:

This course equips students with practical industry experience and direct knowledge to tackle real-world industrial challenges effectively. Students will gain insights into problem-solving methodologies essential for contributing meaningfully to industrial settings. They will learn to

systematically analyze their practical work experiences and present them in structured analytical reports. Additionally, through specialized modules, students will develop skills in writing industrial practice proposals, analyzing various industry types, evaluating job execution, conducting job analyses, preparing daily reports, crafting comprehensive final internship reports, and communicating findings effectively through formal presentations in academic and professional settings. This course prepares students to integrate theoretical knowledge with practical application, enhancing their readiness for the demands of the industrial sector.

References


1. Petunjuk Teknis Pedoman Pelaksanaan Praktik Industri, Jurusan Teknik Mesin UNIVUMersitas Negeri Malang.
2. Penulis, T. 2017. Pedoman Penulisan Karya Ilmiah UM (PPKI). Malang: UM Press.


**Course name** **:** Community Service Program
**Kode** **:** INTUKKN236090
**Credits** **:** 4
**Pre-requisite** **:** pass minimum 100 credits

**SCPL 1**

Possess knowledge and ability to demonstrate behavior as citizens who are religious, love their country, nation, and Indonesian culture based on the spirit of Pancasila, and have independence in working innovatively, adaptively, and critically according to global dynamics.

Course Learning Outcomes (CPMK):

1. Implementing stages of community service utilizing learned knowledge and research-based products of science and technology.
2. Demonstrating attitudes reflecting social competence within the community to enhance institutional functions and community life quality.
3. Establishing partnerships and developing collaborative networks with local governments, state-owned enterprises, regional-owned enterprises, business sectors, and industries synergistically between universities and society.

Sub Course Learning Outcomes (CPMK):

1. Analyzing societal issues.
2. Formulating alternative solutions based on learned knowledge and utilizing research-based products of science and technology.
3. Performing practical community service actions in both monodisciplinary and multidisciplinary approaches.

Course Description:

Community Service Learning (Kuliah Kerja Nyata or KKN) is a course that provides meaningful experiences for students to apply their knowledge and research outcomes through community engagement activities, aiming to assist in resolving societal issues.

References:

Pedoman pendidikan UM 2023

**INTNTID236111 Final Project, 6 credits**

Pre-requisite: Research Methodology

Coordinator: Rudi

Konstruk Standar-CPL 5, 7 dan 11:

- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.
- Ability to communicate effectively both orally and in writing.
- Ability to engage in lifelong learning, including access to relevant knowledge on current issues.

Course Learning Outcomes (CPMK):

- Able to think critically and analytically.
- Applying industrial engineering theories to real-world cases in industry.
- Developing the ability to conduct independent research.
- Effective communication both orally and in writing.
- Capable of developing interpersonal skills.

Sub Course Learning Outcomes (CPMK):

- Capable of solving industry problems by applying theories, testing hypotheses based on survey or interview data.
- Able to develop a methodology useful for solving these problems.
- Capable of writing a proposal for the Final Project.
- Capable of writing the final report for the Final Project.

Course Description:

This course equips students with essential skills in industrial engineering through a blend of theoretical learning and practical application. Students develop critical and analytical thinking abilities, applying them to real-world industrial scenarios. Emphasis is placed on conducting independent research and mastering effective communication, both oral and written, alongside the cultivation of interpersonal skills. Through hands-on projects and case studies, students learn to tackle industry challenges by employing theoretical frameworks, testing hypotheses with data from surveys or interviews, and devising practical methodologies for problem-solving. The course also guides students in crafting comprehensive proposals and final reports for their projects, preparing them to make meaningful contributions in industrial settings.

References

1. Forsyth, P. 2016. How to Write Reports and Proposals, Edisi 4. Kogan Page Limited.
2. Ibnu, S., Mukhadis, A., & Dasna, I. W. 2003. Dasar-dasar Metodologi Penelitian. Malang: Universitas Negeri Malang.
3. Penulis, T. 2017. Pedoman Penulisan Karya Ilmiah UNIVUMersitas Negeri Malang. UM Press

**INTNTID236030 Facilities Design, 3 credits**

Pre-requisite:

Coordinator: Rudi

Konstruk Standar-CPL 3 dan 6:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or

utilizing local and national resource potentials with a global perspective in industrial engineering.

- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Course Learning Outcomes (CPMK):

- Explain the fundamental concepts of efficient and effective facility planning.
- Solve location determination problems for facilities using qualitative and quantitative approaches.
- Describe the basic data required for facility planning and design.
- Specify and determine supporting facilities in facility planning, including warehouses.
- Describe and determine material handling equipment in layout design.
- Design and model layouts or evaluate layouts using qualitative and quantitative approaches.
- Create comprehensive layout model designs with 2-dimensional or 3-dimensional visualizations.

Sub Course Learning Outcomes (Sub CPMK):

- Analyze products and processes.
- Analyze material flow and space requirements.
- Calculate facility requirements.
- Apply traditional approaches to facility layout.
- Understand basic mathematical models and algorithms for layout problems.
- Understand group technology layout and non-traditional layouts.
- Design material handling systems.
- Understand storage and warehousing.
- Determine factory location.

Course Description:

This course equips students with the essential knowledge and skills in efficient and effective facility planning. Students will learn to solve location determination challenges using both qualitative and quantitative methods, and understand the fundamental data necessary for planning and designing facilities, including warehouses. They will explore the selection and implementation of material handling equipment in layout designs and gain proficiency in creating and evaluating comprehensive layout models through both qualitative and quantitative approaches. Additionally, the course covers advanced topics such as product and process analysis, material flow analysis, space requirement calculations, traditional and innovative

facility layout approaches, mathematical modeling, group technology layouts, material handling system design, and warehouse management. Students will also learn the intricacies of determining optimal factory locations.

References


1. Francis, R. L., 2004. Facility Layout and Location: An Analytical Approach. Prentice Hall.
2. Heragu, S. 2016. Facilities Design, 4th Edition.CRC Press
3. Tompkins, J. A., James, J. A. Bozer Y. A., & Tanchoco, J. M. A. 2010 . Facilities Planning. 4th Edition.
4. Wignjosoebroto, S. 1996. Tata Letak Pabrik dan Pemindahan Bahan. PT. Gunawidya.


**INTNTID236031 Product Design and Development, 3 credits**

Pre-requisite: Measurement and Design of work system

Coordinator: Redyarsa

SCPL 3 and 5:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.
- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.

Course Learning Outcomes (CPMK):

- Understand the scope of industrial product design and development processes.
- Differentiate between core components and support components inherent in a product.
- Synthesize new opportunities for innovative product development.
- Apply various methods to interpret the voice of the customer (VOC) into finished products.
- Develop products from phase 0 to phase 5.
- Determine trade-offs between cost and quality in product specifications.

Sub Learning Outcomes (Sub CPMK):

- Understand product concepts.
- Understand ideation of product functions (based on market needs perception or technological innovation).
- Analyze techno-economic and marketing aspects.
- Understand product design (engineering & industrial design).
- Understand prototype development, testing, and evaluation.
- Understand production activities and product sales (distribution).
- Understand current issues in the product development process.

Course Description:

This course equips students with comprehensive skills in industrial product design and development processes. Students will learn to distinguish between core and support components essential to product structure and functionality. They will synthesize innovative opportunities and translate customer needs into tangible products using various methodologies. From initial concept (phase 0) to full development (phase 5), students will navigate the entire product lifecycle, making critical decisions on cost-quality trade-offs in product specifications. Subsequently, they will delve into product ideation based on market demands and technological innovations, analyze techno-economic and marketing factors, engage in detailed product engineering and industrial design, prototype development, testing, and evaluation, and gain insights into production and distribution challenges. This course also explores contemporary issues influencing the dynamic landscape of product development.

References

1. Pahl, G., & Beitz, W. 2013. Engineering Design: A Systematic Approach. Springer Science & Business Media.
2. Pessoa, M. V. P. & Trabasso, L. G. 2016. The Lean Product Design and Development Journey: A Practical View. Springer.
3. Silva, A. 2010. Handbook of Research on Trends in Product Design and Development: technological and Organizational Perspective. Business Science Reference.
4. Ulrich, K.T, & Eppinger, S.D. 2015. Product Design & Development, Edisi 6. McGraw-Hill.

**INTNTID236032 System Simulation, 3 credits**

Pre-requisite: Statistics II

Coordinator: Aisyah Larasati

SCPL 5 and 6:

- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.
- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Learning Outcomes of the Course (CPMK):

- Understand the basic concepts of simulation and problem formulation using simulation approaches.
- Comprehend the concepts of events, event lists, activities, and resources.
- Develop valid simulation models.
- Conduct experiments using simulation models.
- Determine appropriate statistical recorders and system randomness sources.
- Model system structures accurately.
- Analyze the validity of simulation models.
- Model using Monte Carlo simulation.
- Model using discrete event simulation.
- Analyze simulation model outputs.
- Develop and select scenarios for system improvement using simulation.

Sub Learning Outcomes (Sub CPMK):

- Able to understand Introduction to simulation (basic concepts, definitions, and steps in system modeling).
- Able to understand Problem formulation and system characterization.
- Able to understand Events, event lists, activities, and resources.
- Able to understand Activity cycle diagrams.
- Able to understand Selection of appropriate input distributions.
- Able to understand Random number generation and randomness sources.
- Able to understand Discrete event simulation.
- Able to understand Monte Carlo simulation.

- Able to understand Verification and validation of simulation models.
- Able to understand analysis of simulation model outputs.
- Able to understand Development and selection of scenarios for system improvement using simulation.

Course Description:

This course equips students with the fundamental principles and practical skills in simulation, essential for analyzing and optimizing complex systems in various industries. Students will learn to formulate and validate simulation models, utilizing techniques like Monte Carlo and discrete event simulations to evaluate system behaviors and outcomes. Emphasis is placed on understanding the intricacies of system structures, event handling, resource allocation, and statistical analysis within simulated environments. Additionally, students will develop proficiency in selecting appropriate input distributions, conducting experiments, and interpreting simulation results to enhance decision-making and system performance. Through hands-on exercises and project work, students will apply these skills to model real-world scenarios and propose effective system improvements.

References

1. Kelton, W. D., Sadowski, R. P., & Zupick, N. B. 2014. Simulation with Arena, Edisi 6. McGraw-Hill Education.
2. Law, A. M. 2014. Simulation Modeling and Analysis, 5th edition. McGraw-Hill Education.
3. Banks, J. et.al. 2009. Discrete Event System Simulation. Prentice-Hall, Inc.

**INTNTID236033 Supply Chain System, 3 credits**

Pre-requisite: Production planning and control

Coordinator: Abdul Muid

SCPL 3 and 5:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

- Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.

Course Learning Outcomes (CPMK):
- Analyzing the basic principles of supply chain management
- Examining principles of supply chain network design
- Analyzing transportation and distribution management
- Analyzing lean supply chain principles
- Evaluating supply chain performance measurement

Sub Course Learning Outcomes (Sub CPMK):
- Understanding the fundamentals of Supply Chain Management
- Understanding supply chain strategies
- Understanding new product design
- Understanding supply chain network design
- Understanding demand management and production planning
- Understanding inventory management in supply chains
- Understanding procurement management
- Understanding transportation and distribution management
- Understanding lean supply chains
- Understanding supply chain performance measurement
- Understanding international supply chains

**Course Description:**

This course equips students with essential knowledge and skills in Supply Chain Management (SCM), focusing on principles, strategies, and practical applications within global business contexts. Students will explore fundamental SCM principles, including supply chain network design, transportation and distribution management, lean methodologies, and performance measurement. Through practical analysis and case studies, students will learn to optimize supply chain operations, manage inventory effectively, and implement strategic procurement practices. The course emphasizes the integration of SCM strategies with organizational goals, preparing students to tackle real-world challenges in logistics and operations management.

References

1. Ayer, J. B. 2001. Handbook Of Supply Chain Management. St Lucie Press/APICS.
2. Ballou, R. H. 2004. Business Logistics/Supply Chain Management; Planning, Organizing
3. Chopra, S., Meindl, P. 2004. Supply chain management: Strategy, planning and operation. Prentice Hall.
4. Pujawan, N. 2017. Supply Chain Management. Yogyakarta: Penerbit Andi.

**INTNTID236034 Analysis and Design of Information System, 3 credits**

Pre-requisite:

Coordinator:

Vertic Eridani

SCPL 3 and 6:

- Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering
- Ability to apply modern engineering methods, skills, and tools necessary for industrial engineering practice.

Course Learning Outcomes (CPMK):

- Able to apply planning stages in designing information systems.
- Capable of defining system requirements during the analysis and design stages of information system development.
- Competent in establishing system specifications during the design phase of information system development.
- Proficient in determining operations, support, and maintenance during the implementation phase of information system design.

Sub Learning Outcomes (Sub CPMK):

- Capable of analyzing systems.
- Understands System Development Approaches.
- Capable of analyzing System Requirements.

- Understands System Requirements Modeling.
- Able to evaluate system alternatives based on needs, environment, and implementation.
- Understands System and Database Design.
- Understands User Interface Design, System Controls, and Security.
- Able to implement Systems.

Course description:

This course equips students with the essential skills for designing and implementing information systems. Students will learn to apply systematic planning processes throughout the stages of system development, from initial analysis to final implementation. They will gain proficiency in defining system requirements, specifying system functionalities, and ensuring operational effectiveness. Additionally, the course covers advanced topics such as system analysis, various system development approaches, and the critical aspects of system design including database integration, user interface design, controls, and security measures. By the end of the course, students will be capable of evaluating system alternatives and effectively implementing comprehensive information systems to meet organizational needs.

References

1. Al Fatta, H. 2007. Analisis & Perancangan Sistem Informasi. Yogyakarta: Andi.
2. Kadir, A. 2003. Pengenalan Sistem Informasi. Yogyakarta: Andi.
3. McLeod, R. & Schell, G.P. 2007. Management information systems. USA: Pearson/Prentice Hall.
4. Satzinger, J. W., Jackson, R. B., & Burd, S. D. (2011). Systems analysis and design in a changing world. Cengage learning.
5. Valacich, J., George, J., & Hoffer, J. 2014. Essentials of systems analysis and design. Prentice Hall Press.
6. Dennis, A., Roth, R. M., & Wixom, B. H. (2012). System Analysis and Design, Fifth Edition. John Wiley & Sons

**INTNTID236035 Business Intelligent, 3 credits**

Pre-requisite: Data Analytics

Coordinator: Aisyah Larasati

SCPL 4:

Ability to design and conduct laboratory and/or field experiments and analyze and interpret data to support industrial engineering decision-making processes.

Learning Outcomes of the Course (CPMK):

- Understanding the concept of decision-making using computer assistance.
- Applying business intelligence methodologies to solve managerial problems and exploit business opportunities.
- Utilizing computer-based systems to exploit business opportunities.
- Understanding the dynamics of competition and business opportunities using computer-based systems.
- Operating software in business intelligence (Planners Lab, IBM SPSS Modeler).

Sub Learning Outcomes (Sub CPMK):

- Able to understand the framework for managerial decision-making.
- Able to comprehend business intelligence methodologies in managerial decision-making.
- Able to use computer-based systems to exploit business opportunities.
- Able to understand the dynamics of competition and business opportunities using computer-based systems.

Course Description:

This course equips students with the essential skills in utilizing computer-assisted decision-making and business intelligence methodologies to tackle managerial challenges and seize business opportunities. Students will delve into the dynamics of competition and learn to leverage computer-based systems for strategic decision-making and business exploitation. Practical sessions using software like Planners Lab and IBM SPSS Modeler will enhance their ability to analyze data and make informed managerial decisions. Through comprehensive exploration of decision frameworks and hands-on application of business intelligence tools, students will develop critical competencies essential for navigating modern business environments.

References

1. Reznor, E.P. 2017. Big Data: A Beginner's Guide To Using Data Science For Business (Transforming Information, Deep Learning, Boost Profits, Business Intelligence). EPR Publisher.
2. Sharda, R., Delen, D., & Turban, E. 2017. Business Intelligence and Analytics: Systems for Decision Support. Pearson.
3. Sherman, Rick. 2014. Business Intelligence Guidebook: From Data Integration to Analytics. Morgan Kauffman.

**INTNTIDUM6036 Industrial Organization Design and Management, 3 credits**

Pre-requisite: Industrial Ecology, Organizational behavior

Coordinator: Abdul Muid

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Course Learning Outcomes (CPMK):

- Explain the relationship between strategy, organizational design, and HR management
- Able to create recruitment, placement, and talent management plans
- Capable of designing training and development programs
- Able to evaluate compensation calculations
- Capable of analyzing employee relations

Sub Course Learning Outcomes (Sub CPMK):

- Understand organizational strategy and organizational design
- Understand the management of human resources from recruitment to development
- Understand types of organizational structures and their advantages/disadvantages
- Understand job analysis
- Understand tools for evaluating employee performance
- Understand compensation system design

Course Description:

This course equips students with comprehensive knowledge and skills in strategic human resource management. Students will explore the intricate relationship between organizational strategy, design, and HR management practices. They will learn to develop strategic plans for recruitment, placement, and talent management, as well as design effective training and development initiatives. The course covers the evaluation of compensation strategies and the analysis of employee relations within organizational contexts. Additionally, students will gain insights into various organizational structures and the tools used for job analysis and performance evaluation. This course prepares students to effectively manage human capital in diverse organizational settings, ensuring alignment with strategic goals and enhancing organizational effectiveness.

References

1. Armstrong, Michael. 2009. Armstrong's Handbook of Human Resource Management Practice. 11th Edition. Kogan Page.
2. Brian E. Becker, Mark A. Huselid. Dave Ulrich. 2009. The HR Scorecard Mengaitkan Manusia, Strategi dan Kinerja. Translation copyright Erlangga.
3. Dessler, Gary. 2013. Human Resource Management. 13th ed. Pearson Prentice Hall.
4. Jones, Gareth R. 2013. Organizational Theory design, and Change, 7th ed. Prentice Hall.

**INTNTID236037 Multicriteria Decicion Making, 3 credits**

Pre-requisite: Operation Research II

Coordinator: Rudi

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Learning Outcomes (CPMK):

- Able to understand how to respond to various decision-making problems under different conditions that may be encountered.
- Capable of applying probability theories adjusted to conditions and problems, ensuring decisions are relevant to the situations faced.

Sub Learning Outcomes (Sub CPMK):

- Able to comprehend the concept of decision-making, its functions and objectives, the elements involved, and factors influencing decision-making.
- Capable of understanding risky conditions and applying decision-making resolution techniques under risky conditions.
- Capable of understanding uncertain conditions and applying decision-making resolution techniques under uncertain conditions.

Course Description:

This course equips students with the essential skills to effectively address decision-making challenges across various scenarios. Students will gain a thorough understanding of decision-making concepts, its functions, objectives, and influencing factors. They will learn to apply probability theories and decision-making techniques tailored to both risky and uncertain conditions, ensuring that their decisions remain relevant and effective. By the end of the course, students will be proficient in analyzing and resolving decision-making problems through practical applications of theory, preparing them to navigate complex decision landscapes in professional settings.

References

1. Saaty, T.L. 1990. Multicriteria Decision Making: The Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation. RWS Publication.
2. Triono, R.A. 2011. Pengambilan Keputusan Manajerial; Teori dan Praktik untuk Manajer dan Akademisi. Jakarta: Salemba Empat.
3. Voronin, A. 2017. Multi-Criteria Decision Making for the Management of Complex Systems (Advances in Logistics, Operations, and Management Science). IGI Global.
4. Tzeng, G., & Huang, J. 2012. Multiple Attribute Decision Making: Methods and Applications. Boca Raton, FL: CRC Press.

**INTNTID236038 Stochastics Process, 3 credits**

Pre-requisite: Operations Research II

Coordinator: Aisyah Larasati

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Learning Outcomes for the Course (CPMK):

- Understand the concepts of stochastic processes, Poisson processes, Gaussian processes, and Markov chains.
- Differentiate various probability models.
- Solve Markov and Chebyshev inequalities.
- Implement stochastic processes to solve industry-related problems.

Sub Learning Outcomes (Sub CPMK):

- Understand probability concepts.
- Understand probability models.

- Understand Bernoulli processes and stochastic processes.
- Understand Markov and Chebyshev inequalities.
- Understand the Central Limit Theorem.
- Understand Poisson processes.
- Understand Gaussian random vectors and processes.
- Understand finite state and countable state Markov chains.
- Understand renewal processes.
- Understand random walk and large deviations.

Course Description:

This course introduces students to advanced concepts in stochastic processes essential for decision-making in various industrial contexts. Students will delve into stochastic processes such as Poisson, Gaussian, and Markov chains, understanding their theoretical underpinnings and practical applications in industry. The course focuses on developing skills to differentiate and apply probability models, solve complex inequalities like Markov and Chebyshev's, and implement stochastic models to address real-world industrial challenges. By mastering these concepts, students will be equipped with the analytical tools necessary to make informed decisions in uncertain environments and contribute effectively to industrial settings.

References

1. Durrett, R. 2016. Essentials of Stochastic Processes. Springer.
2. Gallager, G.R. 2014. Stochastic Processes: Theory for Applications. Cambridge UNIVUMersity Press
3. Melsa, L.J. & Sage, A.P. 2013. An Introduction to Probability and Stochastic Processes. Dover Publications.

**INTNTID236039 Heuristics dan Metaheuristics Optimization, 3 credits**

Pre-requisite: Operation Research II

Coordinator: Rudi

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Learning Outcomes of the Course (CPMK):

- Formulating mathematical models for various types of optimization problems.
- Solving optimization problems using heuristic techniques.
- Solving optimization problems using metaheuristic techniques.
- Comparing optimization results obtained from different methods.
- Operating software to solve optimization problems.

Sub Learning Outcomes (Sub CPMK):

- Understanding optimization concepts, optimization techniques, the importance of metaheuristics, examples of optimization problems, single and multi-modal functions.
- Understanding the Traveling Salesman Problem (TSP) and scheduling as prototypes of combinatorial problems, mathematical formulation of TSP and scheduling cases.
- Understanding single and multivariable functions, simulated annealing concept, finding solutions using simulated annealing for continuous problems.
- Understanding Simulated Annealing concept for discrete cases, implementing Simulated Annealing for discrete TSP cases using software.
- Understanding Particle Swarm Optimization, implementation for simple problems, implementation with software for multivariable cases.
- Understanding Genetic Algorithm, Cross Entropy, implementation of genetic algorithm and cross entropy, implementing these techniques for combinatorial optimization cases and conducting result comparisons.

Course Description:

This course equips students with the essential skills in mathematical optimization techniques necessary for tackling real-world problems. Students will learn to formulate mathematical models for various optimization scenarios and apply heuristic and metaheuristic approaches to find solutions efficiently. Emphasis is placed on comparing and evaluating optimization outcomes using different methods. Practical application is emphasized through hands-on use of software tools to implement and analyze optimization strategies. Subtopics include understanding fundamental optimization concepts, such as heuristic and metaheuristic techniques, and applying them to examples like the Traveling Salesman Problem (TSP) and scheduling. Additionally, students explore advanced techniques like simulated annealing, particle swarm optimization, and genetic algorithms, gaining proficiency in using these methods through practical exercises and software implementations to solve both continuous and discrete optimization problems.

References


1. Santosa, B & Willy, P. 2011. Metode Metaheuristic. Guna Widya.
2. Santosa, B. 2007. Matlab Untuk Statistika Dan Teknik Optimasi. Graha Ilmu,
3. Lee, K.Y & Sharkawi, M.A. 2008. Modern Heuristic Optimization Techniques, Theory and Applications to Power Systems. Wiley Interscience.
4. Edelkamp, S., & Schrödl, S. (2012). Heuristic search: Theory and applications.Amsterdam: Elsevier.
5. Talbi, E. (2009). Metaheuristics: From design to implementation. Hoboken: Wiley.

**INTNTID236046 Manufacturing System, 3 credits**

Prasyarat:

Koordinator: Rudi

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Course Learning Outcomes (CPMK):

- Able to solve real-world problems in both manufacturing and service industries.
- Understands manufacturing system components, manufacturing operations, and steps for improvement.
- Capable of analyzing manufacturing systems.

Sub Learning Outcomes (Sub CPMK):

- Understands production systems.
- Understands material handling systems.
- Understands inventory control.
- Understands inspection in manufacturing systems.
- Understands packaging and non-physical activities that support manufacturing operations.

Course Description:

This course equips students with the essential skills to tackle real-world challenges in both manufacturing and service industries. Students will delve into the intricacies of manufacturing systems, mastering components, operational processes, and methodologies for continuous improvement. Through detailed analysis, they will gain proficiency in optimizing production systems, material handling, inventory control, inspection processes, and supportive non-physical activities crucial for efficient manufacturing operations. By the end of the course, students will be well-prepared to apply their knowledge in solving complex industrial problems and enhancing operational efficiencies across diverse sectors.

References

1. Groover, M. P. (2001). *Automation, production systems and computer-aided manufacturing*. Prentice Hall PTR.

**INTNTID236047 Maintenance and Reliability Engineering, 3 credits**

Pre-requisite: Statistics II

Coordinator: Aisyah Larasati

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Course Learning Outcomes (CPMK):

- Understanding the concept of reliability of components and equipment.
- Evaluating the reliability of systems through testing and prediction.
- Mastering various maintenance procedures and understanding their strengths, weaknesses, and appropriateness.
- Calculating maintenance requirements within a company and their interrelation with other business functions within the company.

Sub Learning Outcomes (Sub CPMK):

- Understanding the basic concepts of maintenance and reliability engineering.
- Understanding maintenance policies as decision-making processes.
- Understanding the distribution of time-to-failure frequencies.
- Understanding corrective and preventive maintenance policies.
- Understanding individual and group replacement policies.
- Understanding the optimal determination of standby equipment quantities.
- Understanding replacement decision-making.
- Understanding Total Productive Maintenance (TPM).

**Course Description:**

This course equips students with the essential skills to manage reliability and maintenance

within manufacturing and service industries. Students will grasp fundamental concepts such as component and equipment reliability, and evaluate system reliability through both testing and predictive methods. They will gain proficiency in various maintenance procedures, understanding their respective advantages, disadvantages, and appropriate applications. Additionally, the course emphasizes calculating maintenance needs within organizational contexts, integrating these with broader business functions. Subsequent topics cover foundational principles in maintenance and reliability engineering, decision-making processes for maintenance policies, analysis of time-to-failure distributions, and strategies for corrective and preventive maintenance. Students will also explore optimal equipment standby quantities, replacement decision frameworks, and the implementation of Total Productive Maintenance (TPM) practices.

References


1. Elsayed, A. E. 2012. Reliability Engineering, Edisi 2. Wiley.
2. O'connor, P. D. T., & Kleyner, A. 2012. Practical Reliability Engineering. Wiley.
3. Birolini, A. 2017. Reliability Engineering: Theory and Practice, Edisi 8. Springer.
4. Mishra, R. C. 2006. Reliability and Maintenance Engineering. New Age International.
5. Nakagawa, T. 2006. Maintenance Theory of Reliability. Springer.


**INTNTID236048 Production Scheduling, 3 credits**

Pre-requisite: -

Coordinator: Rudi Nurdiansyah

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Course Learning Outcomes (CPMK):

- Understand the concept of production scheduling.
- Understand the types of production systems.
- Understand the criteria and constraints in production scheduling.

- Able to create production schedules based on existing criteria and constraints.
- Able to optimize production scheduling based on existing criteria and constraints.

Sub Course Learning Outcomes (Sub CPMK):
- Able to understand flowshop, job shop, and open shop production systems.
- Able to understand criteria in production scheduling.
- Able to understand constraints in production scheduling.
- Able to apply algorithms for production scheduling.

Course Description:
This course equips students with the essential knowledge and skills in production scheduling, focusing on understanding various production systems, criteria, and constraints involved. Students will learn to develop production schedules tailored to specific criteria and constraints, and optimize these schedules using appropriate algorithms. Through hands-on applications and theoretical foundations, students will explore flowshop, job shop, and open shop production systems, gaining proficiency in effectively managing and optimizing production processes to meet industry demands efficiently.

References

1. Pinedo, M. L. (2012). *Scheduling* (Vol. 29). New York: Springer.
2. Pinedo, M. L. (2016). Scheduling theory, Algorithms, and Systems. New York: Springer.


**INTNTID236049 Combinatorial Optimization, 3 credits**
Pre-requiste: Operations Research II
Coordinator: Rudi Nurdiansyah

SCPL 3:
Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Course Learning Outcomes (CPMK):

- Understand the concepts of integer and combinatorial programming.
- Understand modeling techniques in combinatorial optimization.
- Understand solution techniques to solve combinatorial optimization problems.

Sub Learning Outcomes (Sub CPMK):

- Able to understand Integer programming.
- Able to understand transformation using binary variables.
- Able to understand the Traveling Salesman Problem.
- Able to understand the Knapsack Problem.
- Able to understand Capacitated/Uncapacitated Lot Sizing.
- Able to understand Scheduling problems.
- Able to apply solution techniques: branch and bound, heuristic, metaheuristics.

**Course Description:**

This course equips students with the essential skills in combinatorial optimization and integer programming. Students will grasp the foundational concepts of integer and combinatorial programming, delve into effective modeling techniques for optimization problems, and explore various solution strategies such as branch and bound, heuristics, and metaheuristics. Through practical applications and case studies, students will learn to tackle real-world challenges like the Traveling Salesman Problem, Knapsack Problem, and Scheduling Problems. By the end of the course, students will be proficient in formulating and optimizing solutions to complex combinatorial problems using advanced mathematical and computational methods.

References


1. Chen, D. S., Batson, R. G., & Dang, Y. (2011). *Applied integer programming: modeling and solution*. John Wiley & Sons..
2. Korte, B., & Vygen, J. (2005). Combinatorial optimization. Theory and algorithms. Springer.
3. Wolsey, L. A., & Nemhauser, G. L. (1999). *Integer and combinatorial optimization* (Vol. 55). John Wiley & Sons.

**INTNTID236060 Industrial Automation, 3 credits**

**Pre-requisite:**

**Coordinator: Rudi**

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Course Learning Outcomes (CPMK):

- Able to identify technical and non-technical requirements.
- Analyze and design improvements for a simple automation system in an industry.

Sub Learning Outcomes (Sub CPMK):

- Understand the logic of components for automation.
- Understand industrial control systems.
- Understand computers, NC, and CNC.
- Understand Industrial Robots.
- Understand automation design.
- Understand Computer Integrated Manufacturing (CIM).

Course Description:

This course equips students with the skills needed to identify both technical and non-technical requirements in industrial settings and to analyze and design improvements for simple automation systems. Students will delve into the logic of automation components, industrial control systems, computer applications including NC and CNC, and the integration of industrial robots. They will also explore the principles of automation design and Computer Integrated Manufacturing (CIM), preparing them to contribute effectively to enhancing operational efficiency in various industrial environments.

References

1. Groover, M. P. 2001. Automation, Production Systems, and Computer – Integrated Manufacturing, 2nd edition, New Jersey: Prentice Hall,.

2. Mehta, B. R. & Reddy, Y. J. 2015. Industrial Process Automation System: Design and Implementation. Elsevier.
3. Soloman, S. 1994. Sensors and Control Systems in Manufacturing. New York: McGraw-Hill.
4. Toncich, D. J. 1993. Data Communications and Networking for Manufacturing Industries. Brighton: Chrystobel Engineering.
5. Toncich, D. J. 1994. Computer Architecture and Interfacing to Mechatronic Systems. Brighton: Chrystobel Engineering.

**INTNTID236040 Text Mining, 3 credits**

Pre-requisite : Data Analytics

Coordinator: Aisyah Larasati

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Learning Outcomes (CPMK):

- Understanding techniques in managing collections of text and web documents
- Operating techniques in information retrieval
- Applying data mining concepts to collections of text documents
- Formulating managerial implications from information retrieval results

Sub CPMK:

- Able to understand the fundamentals of text mining and web mining
- Able to understand basic supervised learning methods
- Able to understand basic unsupervised learning methods
- Able to understand document vector formation
- Able to understand information retrieval and data indexing
- Able to understand strategies in information retrieval
- Able to understand link analysis

- Able to understand web crawling methods

Course Description:

This course equips students with the essential skills in managing and analyzing text and web document collections. Students will learn advanced techniques in information retrieval and data mining, focusing on both supervised and unsupervised learning methods. The curriculum covers fundamental concepts such as document vectorization, strategies in information retrieval, and link analysis. Practical applications include web crawling methods and deriving managerial insights from information retrieval outcomes. By the end of the course, students will be proficient in applying these techniques to real-world scenarios, enhancing their capabilities in handling and extracting value from large datasets in digital environments.

References


1. Liu, B. (2011). Web data mining: exploring hyperlinks, contents, and usage data. 2nd edition. Springer Science & Business Media.
2. Büttcher, S., Clarke, C. L., & Cormack, G. V. (2016). Information retrieval: Implementing and evaluating search engines. Mit Press.
3. Han, J., Kamber, M. & Pei, J. 2011. Data Mining: Concepts and Techniques, Edisi 3. Morgan Kaufmann.
4. Witten, Ian H., Frank, Eibe, Hall, Mark A., & Pal, Christopher J. 2016. Data Mining: Practical Machine Learning Tools and Techniques, Edisi 4. Morgan Kaufmann.
5. Büttcher, S., Clarke, C. L., & Cormack, G. V. (2016). Information retrieval: Implementing and evaluating search engines. Mit Press.


**INTNTID236041 Eksperimental Design, 3 credits**

Pre-requisite: Statistics

Coordinator: Suprayitno

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Learning Outcomes of the Course (CPMK):

- Understanding the characteristics of each experimental design.
- Designing experiments suitable for the characteristics of the problem.
- Conducting appropriate analysis for each experimental design.
- Applying suitable experimental designs to solve research problems in the field of Industrial Engineering.

Sub Learning Outcomes (Sub CPMK):

- Able to understand various types of experimental designs.
- Able to understand experimental designs with and without blocks.
- Able to understand Full Factorial Experimental Designs.
- Able to analyze one-way variance, both without blocks, with blocks, and other types of experiments, to solve problems in design, improvement, installation, and operation of integral systems.
- Able to analyze two-way variance, both with full factorial and other design forms, to solve problems in design, improvement, installation, and operation of integral systems.
- Able to apply experimental designs to solve problems in design, improvement, installation, and operation of systems.

Course Description:

This course equips students with the fundamental skills needed to design and analyze experiments in Industrial Engineering. Students will grasp the essential characteristics of various experimental designs and learn to tailor experiments to suit specific problem scenarios. They will gain proficiency in conducting thorough analyses using these designs to address research challenges within the field. Subsequently, students will apply their knowledge by employing experimental designs effectively in solving problems related to system design, improvement, installation, and operation across industrial settings. Topics covered include types of experimental designs, factorial designs, variance analysis methods, and their practical applications in industrial systems.

References

1. Montgomery, D.C. 2012. Design and Analysis of Experiment. Singapore: John Wiley & Son Inc.

2. Hardwick, C. 2013. Practical Design of Experiment. CreateSpace Independent Publishing Platform.

**INTNTIDUM6045 Advanced Data Analytics, 3 credits**

Pre-requisite: Data Analytics

Coordinator: Aisyah Larasati

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Learning Outcomes for the Course (CPMK):

- Formulating problems
- Understanding basic concepts of modeling
- Mastering the procedures of decision tree, support vector machine, and artificial neural network.
- Analyzing big data using decision tree, support vector machine, and artificial neural network techniques.
- Solving problems using text mining approaches
- Operating data mining software (IBM SPSS Modeler, Rapid Miner, and Matlab)

Sub Learning Outcomes (Sub CPMK):

- Understanding Big Data concepts
- Understanding decision tree and support vector machine techniques
- Understanding artificial neural network techniques
- Applying decision tree, support vector machine, and artificial neural network techniques to solve real-world problems
- Understanding text mining
- Operating data mining software (IBM SPSS Modeler, Rapid Miner, and Matlab)

Course Description:

This course equips students with the essential skills in data-driven decision-making and advanced analytics techniques. Students will learn to formulate complex problems, grasp fundamental modeling concepts, and proficiently utilize decision tree, support vector machine, and artificial neural network methodologies. They will gain proficiency in analyzing extensive datasets using these techniques, along with employing text mining strategies for problem-solving. Practical application is emphasized through hands-on experience with industry-standard data mining software such as IBM SPSS Modeler, Rapid Miner, and Matlab. Additionally, the course covers foundational knowledge in Big Data concepts and prepares students to apply these techniques across various domains to address real-world challenges effectively.

References


1. Han, J., Kamber, M. & Pei, J. 2011. Data Mining: Concepts and Techniques, Edisi 3. Morgan Kaufmann.
2. Reznor, Elliot P. 2017. Big Data: A Beginner's Guide To Using Data Science For Business (Transforming Information, Deep Learning, Boost Profits, Business Intelligence). EPR Publisher.
3. Sharda, Ramesh, Delen, Dursun, dan Turban, Efraim. 2017. Business Intelligence and Analytics: Systems for Decision Support. Pearson
4. Sherman, Rick. 2014. Business Intelligence Guidebook: From Data Integration to Analytics. Morgan Kauffman.
5. Witten, Ian H., Frank, Eibe, Hall, Mark A., & Pal, Christopher J. 2016. Data Mining: Practical Machine Learning Tools and Techniques, Edisi 4. Morgan Kaufmann.


**INTNTID236050 Six Sigma, 3 credits**

Pre-requisite: Statistics, Quality Control and Assurance

Coordinator: Vertic Eridani

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Learning outcomes (CPMK)

- Understanding the concepts of Six Sigma
- Formulating quality problems per
- Operating software to find sigma values
- Applying Six Sigma concepts to solve company problems.

Sub CPMK:

- Identify all quality functional needs, Quality improvement methods: from QC to SS; History and introduction
- Able to understand the basic concepts of Quality Development Systems
- Able to understand the characteristics of products or services
- Able to understand Product and service development; services in the context of SIX SIGMA: components and characteristics to be improved, with DMAIC or DMADV methodology
- Able to understand the concept of sigma and process capability, basic six sigma methods; a. problem solving tools (process mapping, flow chart, check sheet, pareto analysis, RCA), b. 7 tools (affinity, tree, process decision, matrix, interrelationship, prioritization, network, other), c. knowledge discovery (run chart, descriptive stat. histogram, explanatory).
- Able to understand Six Sigma leadership, various belt levels within the six sigma organization.
- Able to understand Managing six sigma projects; quality initiatives, short and long term quality, performance measurement, benefit-cost analysis
- Able to understand Principle measurement and data; measurement and data collection, scale, data reliability and validity, R&R studies.

Able to understand Six Sigma: Six Sigma in marketing, Six sigma in project – production, Six Sigma in financing, Six Sigma performance control (designing control mechanism, performance metrics, SCOR model, benchmarking; six sigma- quality improvement in action).

Course Description:

This course equips students with a comprehensive understanding of Six Sigma principles and their application in resolving quality issues within organizations. Students will learn to conceptualize and articulate quality problems, utilize software tools to assess sigma values, and implement Six Sigma methodologies like DMAIC and DMADV to enhance organizational processes. The curriculum covers foundational aspects such as quality improvement methods

from Quality Control (QC) to Six Sigma (SS), and explores the intricacies of product and service development under the Six Sigma framework. Additionally, students will delve into problem-solving tools, leadership roles within Six Sigma, project management techniques, and performance measurement strategies essential for driving quality enhancements across various domains including marketing, production, financing, and overall operational excellence.

References


1. Gasperz, V. & Fontana, A. 2007. Lean Six Sigma for Manufacturing and Service Industries. Jakarta: PT. Gramedia Pustaka Utama.
2. Gasperz, V. 2008. The Executive Guide to Implementing Lean Six Sigma. Jakarta: PT. Gramedia Pustaka Utama.
3. Martin, J.P. 2014. Lean Six Sigma for Supply Chain Management: The 10-Step Solution Process, Edisi 2. Mc Graw Hill.
4. Pyzdek, T. & Keller, P. 2014. The Six Sigma Handbook. Mc Graw Hill.


**INTNTID236043 System Dinamic, 3 credit**

Prasyarat: Operations Research II

Coordinator: Abdul Muid

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Course Learning Outcomes (CPMK):

- Building equations to solve a model
- Modeling systems using dynamic approaches
- Creating system simulations using dynamic approaches
- Modeling nonlinearities and resource constraints
- Modeling delays, smoothing, and averaging

Sub CPMK:

- Understanding system behavior and causal loop diagrams
- Understanding stock and flow diagrams
- Understanding equations to solve a model
- Understanding system dynamics modeling
- Understanding basic feedback structures
- Understanding delays, smoothing, and averaging

Course Description:

This course equips students with the skills to model and simulate complex systems using dynamic approaches. Students will learn to formulate equations, model nonlinearities, and incorporate resource constraints in dynamic system simulations. The course covers essential techniques such as modeling delays, smoothing, and averaging to capture real-world system behaviors effectively. Subsequently, students will delve into understanding causal loop diagrams, stock and flow diagrams, and mastering basic feedback structures to analyze and optimize system dynamics. Through practical applications and hands-on exercises, students will develop proficiency in using these tools to solve real-world problems in various domains.

References


1. Daellenbach, H., McNickle, D., & Dye, S. 2013. Management Science: Decision-Making through Systems Thinking. Palgrave Publisher.
2. Gobson, J.E., Scherer, William T., Gibson, William F., & Smith, Michael C. 2016. How to Do Systems Analysis: Primer and Casebook (Wiley Series in Systems Engineering and Management). Wiley.
3. Sniedovich, M. 2010. Dynamic Programming: Foundations and Principles. CRC Press.


**INTNTID236044 Productivity Analysis, 3 credits**

Pre-requisite: Industrial Organization Design and Management

Coordinator: Aisyah Larasati

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and

safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Learning Outcomes (CPMK):
- Understanding the basic concepts of productivity.
- Understanding productivity measurement procedures using various approaches.
- Conducting productivity measurements using various approaches.
- Identifying and selecting alternative problem-solving methods to enhance productivity.

Sub-CPMK:

- Able to understand the basic concepts of productivity analysis.
- Able to comprehend the Productivity Cycle (Measurement, Evaluation, Planning, Improvement).
- Able to understand productivity measurement models (three common classifications, measurement models at national, industry, service, government levels).
- Capable of understanding technology-based productivity improvements (automation, CAD, CAM, robotics, applications at the company level).
- Capable of understanding worker-based productivity improvements (individual and group financial incentives, workforce promotion, job enrichment, etc.).
- Capable of understanding product-based productivity improvements (Value Analysis & Engineering).
- Capable of understanding job-based productivity improvements (job simplification techniques, work measurement, job evaluation, etc.).
- Capable of understanding Green Productivity (background, driving factors, methodology implementation, benefits, applications).
- Capable of understanding Data Envelopment Analysis (usefulness, advantages and limitations, models, managerial value).

Course Description:

This course introduces students to the fundamental concepts of productivity and equips them with diverse measurement techniques. Students will learn to apply these methods to measure productivity across various sectors and scenarios. Emphasis is placed on identifying and implementing effective problem-solving strategies to enhance productivity. Additionally, the course covers advanced topics such as technology-driven enhancements, workforce incentives,

product analysis, job simplification techniques, and Green Productivity initiatives. Students will also explore Data Envelopment Analysis as a tool for assessing managerial effectiveness and operational efficiency. Through theoretical insights and practical applications, students gain comprehensive skills in analyzing, evaluating, and improving productivity in organizational settings.

References


1. Liker, J. K. and Ross, K. 2016. The Toyota Way to Service Excellence: Lean Transformation in Service Organizations. Mc Graw Hill.
2. Stephen A. Ruffa. 2008. Going Lean How The Best Companies Apply Lean Manufacturing. New York: AMACOM.
3. Shigeyasu Sakamoto. 2010. Beyond World Class Productivity Industrial Engineering Practice and Theory. London: Springer-Verlag London Limited.
4. Sumanth, D.J. 1985. Productivity Engineering and Management. New York: McGraw-Hill.


**INTNTID236045 Decision Analysis, 3 credits**

Pre-requisite: Operations Research II

Coordinator: Rudi Nurdiansyah

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Course Learning Outcomes (CPMK):

- Describe the decision-making process in detail
- Differentiate between types of problems
- Analyze decision-making situations
- Have a comprehensive understanding of uncertainty modeling
- Possess the ability in preference modeling
- Apply decision-making stages and real-world scenarios to solve problems in the design, improvement, installation, and operation of integral systems.

Sub Learning Outcomes (Sub CPMK):

- Analyze decision-making situations
- Understand formalized decision analysis
- Understand decision criteria
- Understand the concepts of certainty, risk, and conflict
- Understand decision-making techniques

Course Description:

This course equips students with comprehensive skills in decision-making and uncertainty modeling essential for addressing complex challenges in the design, improvement, installation, and operation of integral systems. Students will delve into the detailed process of decision-making, learning to differentiate various problem types and analyze decision scenarios. They will gain proficiency in modeling uncertainty and preferences, applying these techniques to real-world situations. The curriculum covers formalized decision analysis, criteria evaluation, and explores concepts such as certainty, risk, and conflict to foster robust decision-making strategies. Through this course, students will develop practical expertise in employing decision-making tools and techniques to enhance system functionality and efficiency.

References

1. Abbas, A.E., & Howard, R.A. 2016. Foundations of Decision Analysis. Pearson.
2. Mangkusubroto, K. & Krisnadi, C.L. 1983. Analisis Keputusan. Bandung: Ganeca Exact.
3. Ragdale, C. 2017. Spreadsheet Modeling & Decision Analysis: A Practical Introduction to Business Analytics. South-Western College Publication.
4. Clemen, R. T. (1996). Making hard decisions: An introduction to decision analysis. Pacific Grove, Ca.: Brooks/Cole

**INTNTID236051 Knowledge management, 3 credits**

Pre-requisite:

Coordinator:

Abdul Muid

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering

Course Description:

This course equips students with the skills to analyze and implement knowledge management concepts essential for achieving financial goals, enhancing quality, improving processes, and fostering innovation. Students will explore various models and technologies of knowledge management applicable in business contexts, learning to deploy knowledge management systems effectively within organizations or industries. They will develop a comprehensive knowledge management plan aimed at creating, capturing, presenting, and disseminating knowledge throughout an organization or industry. Through focused study on Knowledge Management (KM), students will grasp its interdisciplinary nature in achieving organizational goals, its role as an enabler of organizational learning processes, and its integration into business strategies through information technology and human resource management.

Learning Outcomes of the Course (CPMK):

- Analyzing knowledge management concepts to achieve financial goals, enhance quality and processes, and foster innovation.
- Implementing various models and technologies of knowledge management in the business world.
- Utilizing knowledge management systems within an organization/industry.
- Creating a knowledge management plan for the purposes of knowledge creation, capture, presentation, and dissemination within an organization (industry).

Sub Learning Outcomes (Sub CPMK):

- Understanding Knowledge Management (KM).
- Understanding the involvement of multidisciplinary knowledge in achieving organizational (company) goals.
- Understanding KM's focus on organizational goals.
- Understanding KM as an enabler for organizational learning processes.

- Implementing KM in information technology and human resource management within the business strategy of a company.

References


1. Awad, E.M. & Ghaziri, H.. 2004. Knowledge Management. Pearson Education.
2. Dalkir, Kimiz. Knowledge Management in Theory and Practice. MIT Press, 2012.
3. Probst, G., Raub, S., and Romhardt, K. 2002. Knowledge Management: Building Blocks for Success. John Wiley & Sons.
4. Krishna, N. P. 2016. Knowledge Management with Systems Modelling Case Studies. Springer.
5. Spender, J. C., Handzic, M., et.al., 2015. Advances in Knowledge Management Celebrating Twenty Years of Research and Practic. Springer.


**INTNTID236052 Technology management , 3 credits**

Pre-requisite:

Coordinator:

Abdul Muid

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Learning Outcomes of the Course (CPMK):

- Having a comprehensive understanding of industrial dynamics in technological innovation.
- Able to formulate technology innovation strategies.
- Capable of implementing technology innovation strategies.
- Conducting assessments for the efficient and effective development of technology innovation through audits.
- Analyzing strategic technology planning and management aligned with business strategies.

Sub Learning Outcomes (Sub CPMK):

- Understanding the basic concepts of technology.
- Understanding the role of technology in creating value.
- Understanding critical factors in Technology Management.
- Understanding Technology Life Cycles.
- Understanding Science and Technology Push vs Market Pull.
- Understanding Technology Diffusion.
- Understanding the process of innovation and technology-based product development.
- Understanding Technology Audit Models.

Course Description:

This course explores the dynamics of industrial innovation through technology, equipping students with a comprehensive understanding of how technological advancements drive organizational goals such as financial success, quality improvement, and process enhancement, as well as fostering innovation. Students will learn to formulate and implement effective technology innovation strategies, conduct efficient technology audits for development, and strategically manage technology aligned with business strategies. Additionally, the course covers foundational concepts of technology, the role of technology in value creation, critical factors in technology management, technology life cycles, innovation processes, and technology audit models.

References

1. Alamsyah, F. A. and Loeis, A. M. 2010. Indonesia Business Cases: From Innovation to Financial Exellence. Binus Publising.
2. Blokdyk, G. 2017. Innovation Management Technology for Product Development: A Project-Based Tutorial. CreateSpace Independent Publishing Platform.
3. Schilling, Melissa A. Strategic Management of Technological Innovation. McGraw-Hill, 2013.
4. White, M. A. and Bruton, G.D. 2011. The Management of Technology and Innovation: Strategic Approach 2nd Ed. Cengage Learning.

**INTNTID236053 Performance Manajement, 3 credits**

Pre-requisite:

Coordinator:

Abdul Muid

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering.

Course Learning Outcomes (CPMK):

- Analyzing the characteristics and fundamental attitudes of a technopreneur.
- Mastering the Personal Entrepreneurial Competencies (PECs) in the field of technopreneurship to be pursued.
- Drafting an entrepreneurial proposal.
- Presenting a business profile to be pursued.

Sub Learning Outcomes (Sub CPMK):

- Understanding the principles and scope of performance.
- Understanding performance planning.
- Understanding performance assessment and evaluation.
- Understanding individual and team performance.
- Understanding performance development within organizations.
- Understanding case analysis of performance management within organizations.

Course Description:

This course focuses on the essential skills and competencies required in technopreneurship, emphasizing the analysis of technopreneurial characteristics and attitudes. Students will master the Personal Entrepreneurial Competencies (PECs) relevant to their chosen fields within technopreneurship, enabling them to formulate and present comprehensive entrepreneurial proposals. The course also covers principles and practices in performance management, including planning, assessment, and evaluation of individual and team performance, alongside strategies for enhancing performance within organizational contexts. Through case studies and

practical applications, students will develop a deep understanding of managing and optimizing performance to drive entrepreneurial success in dynamic business environments.

References


1. Pulakos, E.D. 2009. Performance Management. A New Approach for Driving Business Results. Willy Black Wels.
2. Wibisono, D. 2011. Manajemen Kinerja Korporasi & Organisasi: Panduan Penyusunan Indikator. Jakarta: Erlangga.
3. Armstrong, M. 2009. Handbook of Performance Managemen. London: Kogan Page.
4. Armstrong, M. 2006. Performance Management: Key Strategies and Practical Guidelines. London: Kogan Page.
5. Dharma, S. 2009. Manajemen Kinerja, Filsafah Teori dan Penerapannya. Yogyakarta: Pustaka Pelajar.
6. Wibowo. 2007. Manajemen Kinerja. Jakarta: PT. Rajagrafindo Persada.


**INTNTID236054 Enterprise Resource Planning, 3 credits**

Pre-requisite:

Coordinator:

Abdul Muid

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering

Learning Outcomes of the Course (CPMK):

- Students will be able to understand and explain the basic principles of business functions.
- Students will be able to illustrate how fragmented information systems fail to support business decisions.
- Students will be able to illustrate and explain how integrated information systems can help companies provide accurate, consistent, and up-to-date data for business managers.
- Students will understand how the use of ERP can optimize business processes.

- Students will understand analytics and business intelligence applications in an integrated enterprise system environment.

Sub Learning Outcomes (Sub CPMK):
- Ability to understand the concept of Enterprise.
- Ability to understand ERP and related technologies.
- Ability to understand the ERP implementation life cycle.
- Ability to understand ERP module structures.
- Ability to understand ERP from a business function perspective.
- Ability to solve ERP case studies.

Course Description:
This course equips students with fundamental insights into business function principles and the pivotal role of integrated information systems. Students learn how fragmented information systems can hinder effective business decision-making and contrast this with the benefits of integrated systems providing accurate and current data crucial for managerial decisions. The course explores the optimization potential of Enterprise Resource Planning (ERP) systems in streamlining business processes. Additionally, students delve into the applications of analytics and business intelligence within an integrated enterprise environment. Through case studies and practical examples, students develop a comprehensive understanding of ERP implementation lifecycle, module structures, and their strategic alignment with organizational functions.

References

1. Leon, A. (2014). Enterprise Resource Planning. New Delhi: McGraw-Hill Education (India) Pte Ltd.
2. Bradford, M. (2015). Modern ERP: Select, Implement, and Use Today's Advanced Business Systems, 3rd Edition. Raleigh, NC: North Carolina State UNIVUM.
3. Monk, E. and Wagner, B. (2013). Concepts in Enterprise Resource Planning, 4th Ed. Boston: Course Technology / Cengage Learning.

**INTNTID236055 Service Manajement, 3 credits**

Pre-requisite:

Coordinator:

Vertic Eridani

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering

Learning Outcomes for the Course (CPMK):

- Understand the role of services, the nature of services, and service strategies.
- Ability to design service companies.
- Ability to manage service operations.
- Develop steps for service quality.
- Analyze the development of service quality models.

Sub Learning Outcomes (Sub CPMK):

- Understand Service Design.
- Understand Development of Quality in Service.
- Understand Customer Value Management.
- Understand Defining Design Attributes.
- Understand Setting Design Performance Standards.
- Understand Generating and Evaluating Design Concepts.
- Understand Implementing the Design.
- Understand Measuring Performance.
- Understand Assessing Customer Satisfaction.
- Understand Service Quality Model.
- Understand Six Sigma in Service.

Course Description:

This course explores the fundamentals of service management, emphasizing the role, nature, and strategic approaches to services. Students will learn to design and manage service-oriented

companies, focusing on operational effectiveness and quality enhancement. The curriculum covers the development of service quality models and strategies to ensure customer satisfaction and value creation. Topics include service design principles, implementing quality improvement initiatives, managing customer expectations through effective design attributes and performance standards, and applying methodologies like Six Sigma to enhance service delivery. Through case studies and practical applications, students will gain insights into optimizing service operations and achieving excellence in service quality management.

References

1. James, F. 2011. Service Management. New York: Mc Graw Hill.
2. Lovelock, C., Wirtz, J. & Mussry, J. 2011. Pemasaran Jasa. Pearson Education Inc.

**INTNTIDUM6056 Strategic Manajement, 3 credit**

Pre-requisite: -.

Coordinator: Abdul Muid

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering

Learning Outcomes (CPMK):

- Analyzing the characteristics and basic attitudes of a technopreneur.
- Developing a descriptive model of strategic management.
- Drafting an entrepreneurship proposal.
- Presenting the business profile that will be pursued.

Sub CPMK:

- Able to understand the establishment of vision, mission, objectives, and philosophy of a company.
- Able to comprehend descriptive models of strategic management.
- Capable of developing conceptual abilities and methods through case studies.
- Understanding the internal and external environment of a company.

- Able to understand the formulation of strategic analysis and alternative strategies.

**Course Description:**

This course equips students with a comprehensive understanding of technopreneurship principles and strategic management. Students will analyze the fundamental characteristics and attitudes required for technopreneurship, develop descriptive models for strategic management, and craft entrepreneurship proposals. Emphasis is placed on presenting viable business profiles. Additionally, the course covers essential aspects such as establishing company vision, mission, objectives, and philosophy, understanding internal and external company environments, and formulating strategic analyses and alternative strategies. Through case studies and practical applications, students will enhance their abilities in conceptual development and strategic decision-making, preparing them for entrepreneurial endeavors in dynamic business environments.

References


1. datHitt, Michael A., et al. Strategic Management: Competitiveness and Globalization: Concepts and Cases. Thomson Learning, 2007.
2. Osterwalder, A., Pigneur, Y., & Clark, T. (2010). Business model generation: A handbook for visionaries, game changers, and challengers. Hoboken, NJ: Wiley.
3. Hit, M.A. 2006. Strategic Management. e-book. www.pdfdrive.net.
4. Saloner, G., Shepard, A., Podolny, J. 2001. Strategic Management. John Wiley & Sons, Inc.


**INTNTID236057 Managerial Accounting, 3 credits**

Pre-requisite:

Coordinator: Aulia

Azzardina

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering

Course Learning Outcomes (CPMK):

- Explore concepts, techniques, and management accounting information.
- Analyze the functions of planning, control, decision-making, and evaluation, and effectively manage cost information strategically to create organizational competitive advantages.

Sub CPMK:

- Understand the concepts of management accounting.
- Understand activity-based behavior and activity-based management concepts.
- Comprehend activity-based costing.
- Grasp the concepts of quality costs and productivity.
- Understand decision-making strategies related to costs.

**Course Description:**

This course equips students with a comprehensive understanding of management accounting principles essential for organizational success. Students will delve into the concepts, techniques, and strategic management of cost information crucial for achieving competitive advantages in today's business landscape. Through detailed exploration, they will analyze the pivotal roles of planning, control, decision-making, and evaluation within organizations. Additionally, the course emphasizes practical applications such as activity-based behavior, management, and costing, enhancing students' ability to strategize effectively in cost-related decision-making scenarios. By the end of the course, students will be adept at integrating these insights to drive strategic financial management and performance improvement.

References

1. Hansen, D.R and Maryanne, M. 2007. Management Accounting, 8th edition. South Western Thomson Learning (HM).
2. Drury, C. 2006. Cost and Management Accounting 6th (An Introduction). London: Thomson Learning.

**INTNTID236058 Customer Relationship Management, 3 credits**

Pre-requisite:

Coordinator: Verticeridani

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering

Course Learning Outcomes (CPMK):

- Explore concepts, tools, methods, and implications of customer relations, both with existing customers and potential customers, as a competitive advantage.
- Examine concepts of Customer Lifetime Value and Customer Life Cycle Management.
- Master the presentation and analysis of CRM data to gain insights into customers for better decision-making.
- Compare and select tools and software for CRM implementation and determine implementation stages.
- Develop customer relationship strategies within an industry context.

Sub Learning Outcomes (Sub CPMK):

- Understand the concept of Customer Relationship Management (CRM).
- Analyze historical customer data.
- Understand integrating data from various communication channels.
- Analyze customer information to offer superior service.
- Understand strategies for achieving customer satisfaction goals.

Course Description:

This course explores the fundamental concepts and strategic implications of customer relationship management (CRM) as a cornerstone of competitive advantage. Students will delve into tools, methods, and techniques for managing relationships with both current and prospective customers, emphasizing Customer Lifetime Value and Customer Life Cycle Management. They will develop proficiency in data presentation and analysis within CRM frameworks to enhance decision-making capabilities. Additionally, the course covers the selection and implementation of CRM tools and software, alongside strategies for optimizing customer satisfaction and loyalty across diverse industry contexts. Through comprehensive study of CRM, students will gain essential skills in leveraging customer insights to drive organizational success and competitiveness.

References

1. Anderson, K., & Kerr, C. (2002). Customer relationship management. New York:McGraw-Hill.
2. Buttle, F. & Maklan, S. 2015. Customer Relationship Management: Concepts andTechnologies, 2nd edition. Routledge.
3. Kumar, V. & Reinartz, W. 2012. Customer Relationship Management: Concept, Strategy,and Tools. Springer.
4. Muther, A. 2002. Customer Relationship Management: Electronic Customer Care in theNew Economy. Springer.
5. Payne, A. 2005. HANDBOOK OF CRM: Achieving Excellence in Customer Management.Taylor and Francis.

**INTNTID236059 Marketing Manajement, 3 credits**

Pre-
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Coordin
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Eridani

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or utilizing local and national resource potentials with a global perspective in industrial engineering

Learning Outcomes of the Course (CPMK):

- Explore the fundamental concepts of marketing theory and the scope of marketing.
- Analyze methods for managing marketing information.
- Evaluate marketing mix strategies including segmentation, target market, differentiation, and positioning.
- Examine brand positioning strategies.
- Analyze the design and development of new products through an understanding of product life cycle strategies.

Sub Learning Outcomes (Sub CPMK):

- Understand the basic concepts of marketing theory.
- Comprehend emerging trends in marketing scope.
- Understand partnerships for building customer relationships.
- Manage marketing information effectively.
- Understand consumer markets and consumer buying behavior.
- Understand business markets and business buying behavior.
- Understand marketing strategies including segmentation, target market, differentiation, and positioning.
- Understand the marketing mix principles (7Ps).

- Understand the basics of market research.
- Understand branding concepts and strategies for goods and services.
- Understand new product development and product life cycle strategies.
- Understand cost-based pricing: capturing and understanding customer value.
- Understand promotional strategies.

Course Description:

This course provides a comprehensive exploration of fundamental marketing concepts and strategies essential for competitive advantage. Students will delve into theories and practical applications, including the management of marketing information and the intricacies of the marketing mix: segmentation, targeting, differentiation, and positioning. Emphasis is placed on brand strategy development and the analysis of product lifecycle strategies to foster innovation. Additionally, the course covers emerging marketing trends, consumer and business market behaviors, and effective use of market research for informed decision-making. Students will also learn about the principles of branding, the implementation of partnerships for customer relationship building, and strategic pricing approaches aimed at capturing and delivering customer value.

References

1. Kotler, P. 2006. Prinsip-Prinsip Pemasaran - edisi 12. Jakarta: Erlangga.
2. Kotler, P. 2005. Manajemen Pemasaran. Jakarta: Erlangga.

**INTNTID236061 Project Manajement, 3 credits**

Pre-requisite: -

Coordinator: Abdul Muid

SCPL 3:

Ability to design integrated systems by meeting required standards and various realistic multi-aspect constraints (e.g., technical, legal, economic, environmental, social, political, health and safety, sustainability), involving various stakeholders, and identifying and/or

utilizing local and national resource potentials with a global perspective in industrial engineering

Course Learning Outcomes (CPMK):

- Understand the main processes in project management and the importance of integrating organizational strategy with project management.
- Understand the subsystems within project management systems that determine project success.
- Understand the concepts and detailed techniques of work breakdown structure as the basis for project planning and control.
- Understand project planning and design project control instruments.
- Understand project assessment.
- Understand available project funding sources and select the best sources for engineering projects.
- Understand the concepts, techniques, and decision-making tools available for project management.
- Understand project risk factors and select models for analyzing, evaluating, and managing project risks.
- Identify potential conflicts and issues that may arise in projects.
- Identify critical human behavioral aspects that determine project management success.
- Use computer-based information systems to manage projects effectively and efficiently.

Sub CPMK:

- Understand project management processes.
- Understand work breakdown techniques.
- Understand project control instruments.
- Understand decision making.
- Understand risk factors.
- Understand CPM (Critical Path Method).
- Understand PERT (Program Evaluation and Review Technique).
- Evaluate budgets.
- Apply algorithmic techniques to solve project management-related issues.

**Course Description:**

This course explores the fundamental principles and practices of project management essential for effective organizational strategy integration and project success. Students will delve into key project management processes, including the intricacies of work breakdown structure for planning and control, as well as the design and implementation of project control instruments. Emphasis is placed on decision-making tools, risk assessment, and management strategies crucial for mitigating project risks and resolving potential conflicts. Additionally, the course addresses human behavioral factors pivotal to project management success. Practical applications include utilizing computer-based information systems for efficient project management. By mastering these concepts and techniques, students will develop comprehensive skills to manage projects across various sectors effectively.

References

1. Clifford Gray and Erik Larson, Project Management: The Managerial Process 5th, Clifford Gray and Erik Larson, McGraw-Hill, 2010

**INTNTID236067 Business Analysis and Design, 3 credits**

**Prerequisite:** –

**Coordinator:** Abdul Muid

**Standard CPL-5:**

Ability to identify, formulate, analyze, and solve complex problems in the field of industrial engineering.

**Course Learning Outcomes (CLOs):**

- Design the establishment and development of a business comprehensively.
- Identify opportunities, strategy design, product design, production process design, production system design and its operation, supply chain design, layout design, business location selection, as well as organizational and human resource design.

**Sub-CLOs:**

- Conduct a complete and integrated feasibility analysis in establishing and developing manufacturing-based businesses.
- Perform SWOT analysis of a business start-up or development idea.
- Analyze and develop appropriate strategies for business establishment or development.

- Conduct market analysis and prepare a marketing plan.
- Develop competitive and innovative product designs.
- Analyze and prepare a production process plan.
- Select machinery and plan layouts and labor requirements on the production floor.
- Analyze and design production/manufacturing systems.
- Analyze and develop a supply chain plan, including supplier selection, distribution network planning, and selection of distribution/transportation means.
- Analyze and select business locations.
- Analyze and plan layouts within the business site.
- Prepare financial requirements based on market and technical aspects.

**Course Description:**

This course provides students with comprehensive knowledge and practical skills in analyzing and designing business enterprises, particularly in the context of manufacturing-based ventures. The learning outcomes include conducting a complete and integrated feasibility analysis for establishing and developing businesses.

**References:**


1. Behrens & Hawraner, 1992. *Manual for the Preparation of Industrial Feasibility Studies*. UNIDO-United Nation Publication.
2. Anityasari, M. & Wessiani, N. A. 2011. *Analisa Kelayakan Usaha: Dilengkapi Kajian Manajemen Resik*. Gunawidya.
3. Overton, R. 2007. *Feasibility Studies Made Simple*. Martin Books Ltd.
4. Osterwalder, A., Pigneur, Y., & Clark, T. (2010). *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. Hoboken, NJ: John Wiley & Sons.


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**INTNTID236065 Physics Laboratory, 2 credits**

**Prerequisite:** Physics I

**Coordinator:** Chintia Dwi Wangsa

**Standard CPL-2:**

Ability to apply knowledge of mathematics, natural sciences and/or materials, information technology, and engineering to obtain a comprehensive understanding of industrial engineering principles.

**Course Learning Outcomes (CLOs):**

- Understand fundamental laws of physics in experiments on mechanics, energy, fluid, and

thermal systems.

- Conduct accurate physical measurements and use measuring instruments properly.
- Analyze experimental data quantitatively and relate it to basic physical theories.
- Demonstrate scientific attitudes including accuracy, honesty, discipline, and teamwork in conducting laboratory experiments.

**Sub-CLOs:**

- Measure scalar and vector quantities using basic measuring instruments.
- Analyze linear motion, projectile motion, and circular motion through experiments.
- Verify Newton's laws and the effect of friction forces in particle dynamics experiments.
- Conduct experiments on work, energy, momentum, and collisions to prove the law of conservation.
- Analyze rotational motion, moment of inertia, and simple harmonic motion through experiments.
- Perform fluid experiments (hydrostatics and hydrodynamics) to prove Archimedes' and Bernoulli's laws.
- Conduct calorimetry experiments to determine specific heat and thermal properties of materials.
- Prepare laboratory reports with data analysis, graphs, and conclusions in accordance with scientific standards.

**Course Description:**

This course provides students with hands-on experience in applying the fundamental laws of physics through laboratory experiments. Students will develop skills in measurement, data analysis, and scientific reporting, as well as practice scientific attitudes such as accuracy, honesty, and teamwork.

**References:**


- Sears, F.W. & Zemansky, M. 2016. *Physics with Modern Physics* (14th Edition). Pearson.
- Giancoli, D. C., (Trans. Yuhilza H). 2001. *Fisika, Jilid 1*. Jakarta: Erlangga.
- Halliday & Resnick. 1987. *Fundamentals of Physics*. New York: John Wiley and Sons.
- Tipler, P. A. (Trans. L. Prasetio & R.W. Adi). 1998. *Fisika untuk Sains dan Teknik, Jilid 3*. Jakarta: Erlangga.
- Young, H. D., Sears, F.W. & Zemansky, M. 2014. *University Physics: with Modern Physics Vol. 2*. New York: Pearson.


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**NTID236066 Chemistry, 2 credits**

**Prerequisite:** –

**Coordinator:** Rifqi Fauzi

**Standard CPL-2:**

Ability to apply knowledge of mathematics, natural sciences and/or materials, information technology, and engineering to obtain a comprehensive understanding of industrial engineering principles.

**Course Learning Outcomes (CLOs):**

- Demonstrate understanding of basic concepts in chemistry.
- Understand principles and methods required to analyze chemical phenomena.
- Formulate and solve chemical problems.

**Sub-CLOs:**

- Understand the concepts of stoichiometry and the fundamental laws of chemistry, the periodic system, atomic structure, and bonding.
- Analyze energy and material aspects in relation to atomic bonding.
- Relate acids and bases to material properties.
- Analyze corrosion and its environmental causes.
- Analyze chemical bonding in fuels.
- Utilize water for steam boilers and steam turbines.
- Understand metallic and polymeric atomic bonding.

**Course Description:**

This course introduces students to the fundamental principles of chemistry, covering both theoretical concepts and practical applications. The course emphasizes the structure of matter, chemical bonding, stoichiometry, states of matter, chemical reactions, thermodynamics, kinetics, and equilibrium. Students will also explore the properties of solutions, acids and bases, electrochemistry, and an introduction to organic and inorganic compounds.

**References:**


- Saito, Taro. 2014. *Buku Teks Kimia Anorganik*. Online translation by Ismunandar. Iwanami Shoten Publishing Company, Tokyo.
- Takeuchi, Yashito. 2012. *Buku Teks Pengantar Kimia*. Online translation by Asadisongko. Iwanami Shoten, Publishers, Tokyo.
- Whitten, Davis, Peck, and Stanley. 2004. *General Chemistry* (7th edition). Thomson: Brooks Cole.