## COURSE STRUCTURE MASTER PROGRAM INDUSTRIAL ENGINEERING

<table>
<thead>
<tr>
<th>Course</th>
<th>SKS</th>
<th>Specialization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>[IE Innovation and Ergonomics] [SPL Production Systems and Logistics] [MI Industrial Management] [RDK Data and Quality Engineering] [RS System Engineering]</td>
</tr>
<tr>
<td><strong>1st Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Thinking</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Research Methodology</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Operation Management</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Industrial System Engineering</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>2nd Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advance Operation Research</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Advance Statistics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Specialization Compulsory 1</td>
<td>3</td>
<td>Safety Engineering and Management Manufacturing System Industrial Economics Data Mining Decision and Risk in System Engineering</td>
</tr>
<tr>
<td>Specialization Compulsory 2</td>
<td>3</td>
<td>Industrial Technology Management Inventory System Industrial Resource Management Data Engineering System Based Analysis</td>
</tr>
<tr>
<td><strong>3rd Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specialization Compulsory 3</td>
<td>3</td>
<td>Product and Service Innovation Logistics System Industrial Project Development Reliability and Quality System Engineering Management</td>
</tr>
<tr>
<td>Specialization Compulsory 4</td>
<td>3</td>
<td>Macro Ergonomics Logistics System Transportation System Industrial Strategic Management Multivariate Data Analysis Performance Analysis and Modeling</td>
</tr>
<tr>
<td>Specialization Electives 2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>4th Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thesis</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Publication</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Course Syllabus

SYSTEM THINKING (3 SKS)

Learning Objective(s): Course participants are able to implement soft OR concept which is SSM (Soft System Methodology) as a thinking pattern to understand a systemic problem.


Text Book(s):

RESEARCH METHODOLOGY (3 SKS)

Learning Objective(s): Course participants are able to understand the basic steps necessary for a scientific research and publications and prepare themselves for the upcoming Thesis as part of the pre-requisites on receiving the master degree

Pre-requisite(s): Please Read Thesis SOP

Text Book(s):

OPERATIONS MANAGEMENT (3 SKS)

Learning Objective(s): Course participants are able to analyze, design, and operate productive systems in order to create competitive products and services.


Prerequisite(s): -

Textbooks:
2. Operations Management; Nigel Slack, Stuart Chambers, Robert Johnston; Prentice Hall; 2010

INDUSTRIAL SYSTEM ENGINEERING (3 SKS)

Learning Objective(s): Course participants are able to analyze implementation of NPD Process in an organization and know the approaches, tools and techniques used in each steps of the process according to the needs and characteristics of the organization in order to achieve competitive advantage.

Syllabus: Introduction to NPD Process, Models of NPD Process, Detail Design of of Stage-Gate Model dan Concurrent Engineering, Value Engineering, Spiral NPD Model, Case Studies Implementation NPD.

Textbook(s):

INDUSTRIAL TECHNOLOGY MANAGEMENT (3 SKS)

Learning Objective(s): Course participants are able to understand the steps of technology management in an organization.


Textbook(s):

ADVANCED OPERATIONS RESEARCH (3 SKS)
Learning Objective(s): Course participants are able to understand and implement mathematical model to optimize problem-solving within industrial management and technical issues, which later can be modeled quantitatively, deterministically and stochastically.
Pre-requisite(s): -
Text Book(s):
  1. Hamdy A. Taha, Operations Research, 7th

MACRO ERGONOMICS (3 SKS)
Learning Objective(s): Course participants are able to understand comprehensively about work system design that consists of interacting variables such as hardware and software within internal and external physical environment, organization structure and process in order to make it better. Ability to understand how to implement ergonomic science.
Syllabus: Introduction to macroergonomics, method and tools that are used in work system design and analysis, introduction to organization integration in productivity, safety, health and quality of work life context
Text Book(s):

ADVANCED STATISTICS (3 SKS)
Learning Objective(s): Course participants are able to organize the collection, process, and analysis of data using statistics and engineering principles to support decision making process, within DOE - Design of Experiment.
Pre-requisite(s): -
Text Book(s):
  2. Design and Analysis of Experiments, Angela Dean and Daniel Voss, Springer-Verlag, 2000
  3. Experimental Design with Applications in Management, Engineering, and the Sciences, Paul D. Barger and Robert E. Maurer, Thomson Learning, 2002

SAFETY ENGINEERING AND MANAGEMENT (3 SKS)
Learning Objective(s): Course participants are expected to understand about the importance of work safety in various work fields. Students are also able to do observation, evaluation, and analysis of work safety program to enhance the benefit, in order to achieve effective and efficient work safety program and human-centered focus. Students also are able to understand about management and engineering design concept which is related to occupational safety in an industrial organization through suppression in control of hazardous materials, safety consideration in production facility and maintenance, and operation of effective safety program.
Syllabus: General introduction about work safety in various fields, performance and human error, work safety management program, human reliability assessment, risk management (for human/ worker), work safety management engineering in various work fields. Basic Safety, OSHA Standards, hazard identification and elimination, accident causes and prevention, hazard communication, safe work practice and description, function, and scope of safety engineering and management that are relevant with industry, especially that are related to safe production facility design and operation.
Prerequisite(s): -
Textbook(s):
MACRO ERGONOMICS (3 CREDITS)
Learning Objective(s): Course participants are able to understand comprehensively about work system design that consists of interacting variables such as hardware and software within internal and external physical environment, organization structure and process in order to make it better. Ability to understand how to implement ergonomic science.

Syllabus: Introduction to macroergonomics, method and tools that are used in work system design and analysis, introduction to organization integration in productivity, safety, health and quality of work life context

Pre-requisite(s): -

Text Book(s):

KNOWLEDGE MANAGEMENT (3 SKS)
Learning Objective(s): Course participants are able to comprehend the concept of knowledge starting from creation, use, transfer, retention and disposal of knowledge to broaden the understanding about the importance of KM for achieving organizations objective.


Pre-requisite(s): -

Textbook(s):

COGNITIVE ERGONOMICS (2 SKS)
Learning Objective(s): Course participants are able to understand about basic principles of ergonomics and human factors in cognitive perspective. Students are expected to implement knowledge of cognitive ergonomics in workplace, and also be expected to measure, evaluate, and analyze performance and behavior of various fields and the relation to technology development and engineering. Students are also are expected to design Hierarchical Task Analysis (HTA) as a part of task design based on cognitive.

Syllabus: General introduction to ergonomics and human factors, cognitive aspect in humanmachine/ machine-environment interaction, cognitive aspect in industry, cognitive aspect in transportation, information technology and cognitive performance, behavior aspect and human cognitive performance in designing Hierarchical Task Analysis (HTA).

Text book(s):

TECHNOPRENEURSHIP (2SKS)
Learning Objective(s): Course participants are able to understand concept, method and application of technopreneurship.

Syllabus: Basic Principles of Entrepreneurship, Technology for Entrepreneur, Entrepreneurship and Innovation
Text book(s):
1. Trott, P. Managing Technology Entrepreneurship and Innovation, Routledge, Uk, 2014

HUMAN PERFORMANCE ENGINEERING (2SKS)
Learning Objective(s): Course participants are able to understand basic concept and implement the knowledge of human performance engineering. Participants should be able to calculate, evaluate and analyse performance and behaviour in real cases which also includes the advancement in technology and engineering.
Text book(s):
2. Jurnal dan artikel terkait HPE.

MANUFACTURING SYSTEM (3 SKS)
Learning Objective(s): Course participants are able to understand manufacturing system concept that converts raw material into valuable products and its implementation, including product design activities, process and facilities, and technology used to create competitive products.
Prerequisite(s): -
Textbooks:
1. Operations Management-An Asian Perspective; William J. Stevenson, and Sum Chee Chuong ; McGraw-Hill; 2010

TOTAL QUALITY MANAGEMENT (2 SKS)
Learning Objective(s): Course participants are able to use concepts and application of TQM as the basis for analysis and evaluation of quality improvement system.
Text Book(s):
2. Quality Management; Goetsch & Davis, 2000, Prentice Hall

SUPPLY CHAIN MANAGEMENT (2SKS)
Learning Objective(s): Course participants are able to understand about concept and application of SCM to analyze and evaluate the role of operators in a whole supply chain
Prerequisite:-
Text Book(s):

DATA MINING (3SKS)
Learning Objective(s): Course participants are able to organize the extraction, process, and data analysis in a right way to make decisions.
Syllabus: Concept and Process of Data Mining, Algorithm in Data Mining, Data Mining Application in Organization.
Pre-requisite(s): -
Text Book(s):
MULTIVARIATE ANALYSIS (3SKS)

Learning Objective(s): Course participants are able to organize the extraction, process & analysis of multivariate data in a right way to make decisions.


Pre-requisite(s): -

Text Book(s):

DECISION UNCERTAINTIES AND RISK (2SKS)

Learning objective(s): Course participants are able to analyze risks and uncertainties based on statistical tools accurately to make decision

Syllabus: Concept and Decision Making Process, Uncertainty Theory, Risks Analysis Prerequisites: Statistics and Probability, Industrial Statistics

Pre-requisite(s): -

Text books:

CUSTOMER RELATIONSHIP MANAGEMENT (2SKS)

Learning Objective(s): Course participants are able to understand the role and function of customer relationship management in improving organization’s/company’s competitiveness.

Syllabus: Concept and Procedure of CRM Implementation in Organization, CRM Process Management, Managing Networks for CRM performance CRM Success Measurement, Best Practices of CRM Implementation, Managing supplier partner relationships, IT for CRM

Pre-requisite(s): -

Textbooks:

ADVANCED OPTIMIZATION (2SKS)

Learning Objective(s): Course participants are able to design and implement various heuristic and meta-heuristic optimization algorithms to solve problems in industrial engineering field.


Pre-requisite(s): -

Text Book(s):

SYSTEM ENGINEERING MANAGEMENT (3SKS)

Learning Objective(s): Course participants understand the basics of system engineering management in the industry so they would be able to manage a process of design, installation, management and termination of a system

Text Book(s):

SYSTEM PERFORMANCE ANALYSIS AND MODELLING (3SKS)
Learning Objective(s): Course participants are able to specify, predict and evaluate the performance of the system designed by different system modeling
Text Book(s):

TECHNOLOGY POLICY MODELING USING SYSTEM DYNAMICS (2SKS)
Learning Objective(s): Course participants understand the concepts, methods and tools for systems dynamics modelling to specify, predict and evaluate the impact of a policy so a better policy decision could be formulated.
Syllabus: Introduction to Policy and Technology Policy, Technology aspects of policy, Introduction to system dynamics, basic models of policy analysis using system dynamics, policy modelling case studies.
Text Book(s):
1. Model Pengenalan Pemodelan Sistem Dinamis SEMS

CONCEPTUAL SYSTEM DESIGN (2SKS)
Learning Objective(s): Course participants understand the concepts, methods and tools to develop a complete system based on the needs of multiple stakeholders, which could be transformed into a system with complete specifications.
Text Book(s):

GAME THEORY (2SKS)
Learning Objective(s): Course participants are able to know how to make decisions in a condition that involves multi-actor. Course participants are able to calculate the effects of strategic decisions or policy taken in an environment and take into account the response of that decision.
Syllabus: Types of strategic games, Nash equilibrium, Continuous and Discontinuous Games, Evaluation and Learning in the game, Games with a non-perfect information, Nash bargaining action, repeated games, mechanism design, social choice and voting theory
Text Book(s):

RESOURCE AND LOGISTIC SUPPORT FOR SYSTEM ENGINEERING (2SKS)
Learning Objective(s): Course participants understand the tools and methods of planning and managing of resources and logistical support in systems engineering process.
Text Book(s):
THESIS (8 SKS)
Learning Objective(s): Course participants are able to systematically present his/her problems and idea during scientific forum with concise and correct.
Pre-requisite(s): Please Read Thesis SOP
Text Book(s):