Sylabus – Compulsory Courses

COURSE	UG1849xx	: RELIGION STUDIES (For example: ISLAM)
	Credit	: 2 credits
	Semester	: 1

COURSE DESCRIPTION

In this course, students will learn about Islam and its teachings that include theology, syari'ah, Islamic morals and insight in order to have a comprehensive ability to synergize the development and utilization of science and technology in order to bring benefit to mankind. Lectures will be conducted in the classroom in the form of materials, tasks, and discussions, as well as outside the classroom in the form of case studies and outdoor lectures, so that students are able to think and act based on Islamic values and upholding justice and truth. In the end, students have the character of an honest, trustworthy, communicative, intelligent and social sensitivity in performing a harmonious relationship to manifest piety and social rituals.

COURSE'S LEARNING OUTCOME

- Students are able to explain Islam and its teachings properly
- Students are able to understand human nature and responsibilities as a human being
- Students are able to make the creed of Islam as the foundation of thinking and attitude
- Students are able to implement a noble character in life
- Students have a sense of justice and ready to enforce the law and human rights in society
- Students have tolerant and able to realize harmony.
- Students are able to understand the concept of science and technology in Islam and are able to integrate faith, science and charity as well as having an attitude of responsibility as scientists
- Students are able to distinguish between Islamic teachings and cultures
- Students are able to be democratic, and understand political discourse in the Islamic perspective
- Students have a civil character and ready to become a part of modern society, and can be implemented in reality

MAIN REFERENCES

- Ahmad, HA. Malik, TauhidMembina Pribadi Muslim dan Masyarakat, Jakarta: al- Hidayah, 1980.
- Al-Ghazali, Ihya' Ulumuddin, terjemahan Ismail Ya'qub, Jakarta: CV. Faizan, 1988.
- Depag RI, Materi Instruksional Pendidikan Agama Islam di Perguruan Tinggi Umum, Jakarta, 2004.
- Iberani, Jamal Syarif dan MM. Hidayat, Mengenal Islam, Jakarta: El-Kahfi, 2003
- Imarah, Muhammad, Islam dan Pluralitas: Perbedaan dan Kemajemukan dalam Bingkai
- Persatuan, Jakarta: Gema Insani,1999.
- Muhibbin, Zainul dkk, Pendidikan Agama Islam Membangun Karakter Madani, Surabaya: ITS Press, 2012
- Muslim Nurdin, KH., dkk, Moral dan Kognisi Islam, Bandung: Alfabeta, 1995.
- Mutahhari, Murtadha, Perspektif Al-Qur'an tentangManusiadan Agama, Bandung: Mizan, 1984.
- Razaq, Nasaruddin, Dinnul Islam, Bandung: Al-Ma'arif, 1998
- Shihab, Muhammad Quraish, Membumikan al-Qur'an,Bandung: Mizan, 1996
- Wahyuddin dkk, Pendidikan Agama Islam untukPerguruanTinggi, Jakarta:Grasindo, 2009

COURSE	UG184912	: BAHASA INDONESIA
	Credit	: 2 credits
	Semester	: 1

COURSE DESCRIPTION

This course is one of the general/national compulsory courses. Students will explore course material including (a) proper academic ethics and differences in the types and systematics of KTI, (b) the formulation of the Indonesian language used in KTI with due observance of the principles of grammar, PUEBI, and KBBI principles, (c) references related to KTI, (d) the accuracy of the Indonesian language formulation in writing KTI, (e) the correct and correct use of Indonesian formulations in the preparation of KTI, (f) skilled in conveying the results of ideas/ideas verbally.

COURSE'S LEARNING OUTCOME

- Students can understand academic ethics and the differences in the types andsystematics of scientific writing (KTI) appropriately.
- Students can understand the Indonesian formulation used in KTI according togrammar, PUEBI, and KBBI principles.
- Students can understand the references related to KTI.
- Students can understand the Indonesian language formulation in writing KTI.
- Students can use Indonesian formulations properly and correctly in preparation.
- Students can convey their ideas/ideas verbally.

MAIN REFERENCES

- Dirjen Pembelajaran dan Kemahasiswaan Kemenristekdikti, Bahasa Indonesia untukPerguruan Tinggi, Jakarta, Dirjen Belmawa, 2016.
- Kamus Besar Bahasa Indonesia (daring atau luring), Kemdikbud RI.
- Hasan Alwi dkk. Tata Bahasa Baku Bahasa Indonesia. Edisi Ketiga., Balai Pustaka.
- Pedoman Umum Ejaan Bahasa Indonesia (PUEBI).

COURSE	SF184101	: Physics 1
	Credit	: 4 credits
	Semester	: 1

COURSE DESCRIPTION

Physics 1 is designed to provide fundamental tools for students in understanding various natural characteristics as well as introducing numerous laws of physics. This course will describe the basic physics theory of motion, vibration and wave, and fluid in a basic mathematical form, followed by exercises and their applications. By attending this course, students are expected to be able to apply various physics approach to solve various physics-related real-life problems.

COURSE'S LEARNING OUTCOME

- Students can use various basic laws of physics about mechanical, fluid, and heat
- Ability to solve various physics-related problems
- Keep up with contemporary development in science and technology
- Able to apply basic laws of physics in other aspects

MAIN REFERENCES

1. Halliday & Resnic; 'Fundamental of Physics'. John Wiley and Sons, New York, 1987
2. Tim Dosen, "Diktat Fisika I", "Soal-soal Fisika I", Fisika FMIPA-ITS

COURSE		
	UG184913	: Civics
	Credit	: 2 credits
	Semester	: 1

COURSE DESCRIPTION

In this course, students acquire knowledge and learning experiences to increase understanding and awareness about: a sense of nationalism and patriotism, civilized democratic, become citizens who are competitive, disciplined and actively participated in building a peaceful life based on system of values of Pancasila. After this course, students are expected to be able to realize themselves into good citizens who capable of supporting the nation, democratic citizens, namely citizens who are intelligent, civilized and responsible for the survival of Indonesia in practice the ability of science, technology and art holds.

COURSE'S LEARNING OUTCOME

- Students are able to utilize science and technology according to the principles of sustainable development to support the achievement of the welfare and prosperity of Indonesian people
- Students have comprehensive knowledge to synergize the utility of science and technology with national elements including Pancasila, the 1945 Constitution, Legal System and Governance, Human Rights, Democracy, Geopolitics and Geo-strategy
- Students are able to take the right decision to prioritize national interests, upholding human rights and fair international relationship
- Students uphold the attitudes and values: respect the unity in diversity, able to work in a team, has the nature of trust, social sensitivity and high passion for the community and for Indonesia

MAIN REFERENCES

- Winarno, Paradigma Baru Pendidikan Kewarganegaraan, Penerbit Bumi Aksara
- Soedarso, Filsafat Pancasila Identitas Indonesia, Penerbit Pustaka Radja
- Hasan Alwi, Bahasa Baku Bahasa Indonesia, Penerbit Balai Pustaka
- Ir. Sukarno, editor H Amin Arjoso, SH, Tjamkan Pancasila Dasar Falsafah Negara, Penerbit Panitia Nasional Peringatan Lahirnya Pancasila 1 Juni 1945 – 1 Juni 1964 Jakarta
- Prof.Dr. Moh. Mahfud M.D., Dasar dan Struktur Ketatanegaraan Indonesia, Penerbit PT Rineka Cipta.
- Magnis-Suseno, Etika Politik: Prinsip-prinsip Moral Dasar Kenegaraan Modern, Penerbit Gramedia Pustaka Utama
- Inu Kencana Syafiie & Andi Azikin, Perbandingan Pemerintahan, Penerbit PT Refika Aditama
- Gunawan Sumodiningrat, Mewujudkan Kesejahteraan Bangsa, Penerbit PT Elex Media Komputindo

COURSE		
	SK184101	: Chemistry 1
	Credit	: 3 credits
	Semester	: 1

COURSE DESCRIPTION

This course focuses on the basic principles of chemistry as prerequisite knowledge of more advanced sciences related to chemistry. The material presented includes atomic theory, chemical bonding, stoichiometry, substance forms and phase changes, acid-base theory, ionic equilibrium in solution, chemical thermodynamics, chemical kinetics and electrochemistry. Data are valuable resources, and the amount of information available is exploding.

COURSE'S LEARNING OUTCOME

- Students can use the basic principles of chemistry as a basis for studying sciencerelated to chemistry.
- Students can perform basic chemical calculations.

MAIN REFERENCES

- Tim Dosen Departemen Kimia, (2019). "Kimia 1", edisi kedua, Media Bersaudara, Surabaya.

COURSE		
	KM184101	: Mathematics 1
	Credit	: 3 credits
	Semester	: 1

COURSE DESCRIPTION

In this course, the student will learn concepts, characteristics, and solving technique of function, differentiation, and integration. This course covers the concept of mathematical thinking in solving various problems on engineering, modelling, and other problems that related to the application of differentiation and integration.
Course materials are including the system of real numbers, function and limit, derivation and its applications, Integral with elementary functions Learning methods: lecture, discussion, computation & problem interpretation exercises

COURSE'S LEARNING OUTCOME

- Able to solve an inequality, determine the domain and range.
- Able to understand and calculate function of limit and determine function continuity.
- Able to derive mathematical functions and applies on an optimization functions
- Able to make a graph that contatins asymptotes, utilizing derivation test to determine extreme point, increasing / decreasing function, and concavity-convexity
- Able to calculate uncertain caluculus with substitution problem

MAIN REFERENCES

1. Tim Dosen Jurusan Matematika ITS, Buku Ajar Kalkulus I , Edisi ke-4 JurusanMatematika ITS, 2012
2. Anton, H. dkk, Calculus, 10-th edition, John Wiley & Sons, New York, 2012

COURSE		
	TI184101	: Introduction To Industrial and System Engineering
	Credit	: 2 credits
	Semester	: 1

COURSE DESCRIPTION

An overview of the profile, profession, employment opportunities and competencies that would be possessed by a graduate of Industrial Engineering is initial foundation that need to be understood by industrial engineering students. Introduction to Industrial and Systems Engineering gives that overview both hard skill and soft skill, an initial understanding of a system and their interactions, understanding of business systems and business processes occurring within the company in general and the way it is managed, the interaction between the company, as well as an overview of the curriculum and courses that exist in the Industrial Engineering Department. After attending this course, students are expected to understand and be able to explain the basic framework of science in Industrial Engineering, to understand the concept of the system and their interactions, as well as understanding the structure and linkage of Industrial Engineering courses. This course will introduce a variety of teaching methods based on Student-Centered-Learning (SCL) that student actively involved in learning process.

COURSE'S LEARNING OUTCOME

- Students understand and are able to explain the basic framework of science inIndustrial Engineering
- Students understand and are able to explain the definition of system and its content
- Students understand, own and are able to explain the systems thinking
- Students have the basic analytical ability in understanding systems and simplebusiness processes
- Students understand the curriculum structure and interrelationships between thecourses
- Students have team working ability to do simple assignments
- Students have basic learning skills include searching, reading, extracting, andpresenting information and ideas orally and in writing

MAIN REFERENCES

1. Wignjosoebroto, S. (2003) Pengantar Teknik dan Manajemen Industri, Guna Widya,Surabaya.
2. Turner, W. (1993) Introduction to Industrial and System Engineering, Prentice Hall,New York.
3. Hicks, P. E. (1994) Industrial Engineering and Management: A New Perspective,McGraw-Hill, Tokyo.
4. Daellenbach, H. G. & McNickle, D. C. (2005) Management Science: Decision Makingthrough Systems Thinking, Palgrave Macmillan, New York

COURSE		
	UG184914	: English
	Credit	: 2 credits
	Semester	: 2

COURSE DESCRIPTION

In this course, students will learn about the basic concepts of language skills including listening skills, speaking, reading and writing. In addition, students apply the basic concepts of the language skills to express ideas and thoughts in oral and in written in the academic life as well as empirical insights especially related to science and technology.

COURSE'S LEARNING OUTCOME

- Students are able to understand material course delivered by lecture in english
- Students are able to speak and to provide opinion, argumentation, question, answer, and interruption which is appropriate to the context
- Students are able to read actively and critically while understanding reading contents (content aspects, text features, as well as author attitudes: tone and purpose)
- Students are able to write by developing sentences, paragraphs, and essay based on writing types (narrative, descriptive, and argumentative); as well as ideas development regarding unity and coherency aspects.
- Students are able to work in a team while discussing problem
- Students are able to present ideas and work results well in english

MAIN REFERENCES

1. Becker Lucinda & Joan Van Emden, "Presentation Skills for Students, Palgrave, Macmillan, 2010
2. Bonamy David, "Technical English," Pearson Education, New York, 2011
3. Fellag Linda Robinson, "College Reading," Houghton Mifflin Company, 2006
4. Fuchs Marjorie & Bonner Margaret, " Focus on Grammar; An Integrated Skills Approach," Pearson Education, Inc, 2006
5. Hague Ann, " First Steps in Academic Writing," Addison Wesley Publishing Company,1996
6. Hogue Ann, Oshima Alice, "Introduction to Academic Writing", Longman,1997
7. Hockly Nicky & Dudeney Gavin, "How to Teach English with Technology, Pearson Education Limited, 2007
8. Johnston Susan S, Zukowski Jean/Faust, "Steps to Academic Reading," Heinle, Canada, 2002.
9. Mikulecky, Beatrice S, "Advanced Reading Power", Pearson Education, New York, 2007.
10. Preiss Sherry, "NorthStar: Listening and Speaking," Pearson Education, New York 2009.
11. Root Christine & Blanchard Karen, " Ready to Read Now, Pearson Education, New York, 2005

COURSE		
	SF184202	: PHYSICS 2
	Credit	: 2 credits
	Semester	: 2

COURSE DESCRIPTION

This course is designed to provide an understanding of natural circumstances and the law of physics on electricity and magnetism to enrolled students. This course is supposed to give an understanding of various principles and basic physics concepts that related to electricity and magnetism, to solve basic physics problem through theoretical and experimental studies. The explanation would be provided in a simple mathematical form, followed by exercises and their applications. This course contains lab practice so that students can measure physical magnitude correctly, able to analyze lab practice data, and able to describe the lab practice results in scientific writings. After attending this course, students are expected to be able to

analyze electricity and magnetism phenomena by utilizing various laws of physics, as well as analyzing an electrical circuit.

COURSE'S LEARNING OUTCOME

- Students can explain and utilizing laws of physics that correspond to electricity andmagnetism
- Ability to solve problems
- Keep up with contemporary development in science and technology
- Able to apply basic laws of physics that correspond to electricity and magnetism inother aspects

MAIN REFERENCES

1. Halliday & Resnic; 'Fundamental of Physics'. John Wiley and Sons, New York, 1987
2. Tim Dosen, "Diktat Fisika I", "Soal-soal Fisika I", Fisika FMIPA-ITS
3. "Petunjuk Praktikum Fisika Dasar ", Fisika, MIPA-ITS

COURSE	KM184201	: Mathematics 2
	Credit	: 2 credits
	Semester	: 2

COURSE DESCRIPTION

In this course, students will learn about the theory and solving technique towards integral and row, the concept of mathematical thinking so that he/she is ready to learn further, especially materials that related to integration, convergence and its application.
Materials that are covered in this course: various simple integration technique, application of integral, row and its application.
Learning method: lecture, discussion, and independent and group exercises.

COURSE'S LEARNING OUTCOME

- Students can understand the concept of integration and solve a problem with asuitable method
- Students can apply integration technique on problems related to geometry
- Students can understand concepts of function on polar coordinate and parametricequality
- Students can understand concepts of convergence from infinite row
- Students can understand and utilize row (MacLaurin dan Taylor, Binomial) from a function

MAIN REFERENCES

1. Tim Dosen Jurusan Matematika ITS, Buku Ajar Kalkulus 2 , Edisi ke-5 JurusanMatematika ITS, 2014
2. Anton, H, et. al, Calculus, 10-th edition, John Wiley & Sons, New York, 2012

COURSE	TI184202	: ENGINEERING DRAWING
	Credit	: 2 credits
	Semester	: 2

COURSE DESCRIPTION

The production process and product design are one of the main activities in the manufacturing and service industries. Technical drawings are visual means to provide information about ideas and product specifications, which are further described as detailed and technical information for the production process. In this course, students are guided to recognize and understand the use of drawing tools, the basic rules used to create technical drawings and be able to read images and think (perception) of the shape of the image for the benefit of the production process and product design. In addition, it also provides an understanding of CAD (Computer Aided Design) applications as the application of the latest technology – including its integration in CAD/CAM/CAE in realizing complete drawings.

COURSE'S LEARNING OUTCOME

- Students understand the role of engineering drawing in product design and production.
- Students are able to collect and comprehend existing drawing of product.
- Students are able to explore, generate/express idea of product design and convert it into a preliminary skecth.
- Students are able to illustrate concept of the product (design) following International standard for engineering drawing.
- Students are able to produce product design in a visual and comprehensive manner with CAD Software.

MAIN REFERENCES

Gupta, BVR and M Raja Roy. Engineering Drawing. New Delhi: I.K. International Publishing House Pvt Ltd. 2008

COURSE		
	UG184911	: PANCASILA
	Credit	: 2 credits
	Semester	: 2

COURSE DESCRIPTION

The course is one of the general/national compulsory courses. In this course, students will gain knowledge and learning experiences to increase understanding and awareness of a sense of nationality and love for the country through insight into Pancasila so that they become citizens who have competitiveness, are highly disciplined and actively participate in building a peaceful life based on the Pancasila value system. Upon the completion of thiscourse, students are expected to manifest themselves into good citizens who can support their nation and state. Students become civilized and responsible citizens for the survival of the Indonesian state in exercising their skills in science, technology and the arts.

COURSE'S LEARNING OUTCOME

- Students can understand the importance of history to strengthen national identityand Indonesian national identity.
- Students can analyze national factual problems based on the Pancasila perspective.
- Students can analyze the concept of developing science and technology based on thevalues of Pancasila.
- Students can practice social sensitivity, environmental awareness and love for thecountry.

MAIN REFERENCES

Kemenristekdikti. 2016. Pendidikan Pancasila Untuk Perguruan Tinggi. Jakarta: Dirjen Belmawa Kementerian Dikti

COURSE		
	TI184204	: ENGINEERING MATERIALS
	Credit	: 3 credits
	Semester	: 2

COURSE DESCRIPTION

Knowledge of materials is needed to be able to analyze the production system and application of a material in the industrial world. Technical material knowledge discusses the material classification, material mechanical properties, testing the mechanical properties of materials, iron-iron carbide phase diagrams, the process of making iron and steel, non-ferrous metals, corrosion and corrosion prevention. It is expected that at the end of the lecture students will be able to understand the material classification and application of several types of material, know the testing mechanism and calculate the results of the test of the mechanical properties of the material which includes tensile properties, hardness properties, properties, impacts, fatigue properties and creep properties, understand the concept of iron phase diagrams - carbide iron, understand the mechanism of making iron and steel with several types of melting reactors, understand the classification and properties of non ferrous metals, understand the corrosion behaviour of the material and understand the mechanism of corrosion prevention on the material.

COURSE'S LEARNING OUTCOME

- Explaining the materials classifications
- Analyzing the mechanical properties of materials
- Explaining the concept of the iron carbide phase diagram
- Explaining the process of making iron and steel
- Explaining the classification of non-ferrous metals nad their applications
- Explaining the basic concepts of corrosion in materials
- Explaining corrosion prevention

MAIN REFERENCES
• William D. Calister, Jr, "An Introduction Material Science and Engineering", 7 th edition, John Willey & Sons, Inc, USA • Wahid Suherman, "Pengetahuan Bahan Teknik", Institut Teknologi Sepuluh Nopember Teknik Material dan Metalurgi, Surabaya, Indonesia

COURSE		
	TI184203	: ENGINEERING STATISTICS 1
	Credit	: 3 credits
	Semester	: 2

COURSE DESCRIPTION
Engineering Statistics I aims to give knowledge and skill to students about statistical methods which are beneficial and useful in objective decision making based on the data. Lecture materials include types of data, data processing to provide information, descriptive statistics (numeric and graphic), probability theory, probability distribution (discrete and continuous), sampling distribution, sampling methods, and parameter estimation.

COURSE'S LEARNING OUTCOME
• Ability to understand data, descriptive statistics, includes scope, basic assumption and the limitations to use it. • Ability to apply descriptive statistics methods and probability distribution for solving industrial problems. • Ability to demonstrate the use of statistical softwares, especially for descriptive statistics and probability distribution. • Ability to analyse data and software's output on solving problems based on real study cases.

MAIN REFERENCES
David F. Groebner, Patrick W. Shannon, Phillip C.Fry dan Kent D. Smith, "business Statistics : A Decission Making Approach", Prentice Hall, 8th Edition,2010.

COURSE		
	TI184305	: INTRODUCTION TO ECONOMICS
	Credit	: 2 credits
	Semester	: 3

COURSE DESCRIPTION
Introduction to Economics is a knowledge course on the basics of economics which aims to provide an understanding of resource allocation / income distribution by the operation of the price system (microeconomics), the operation of the aggregate price system on the economic potential of the nation / region and the policies of the stakeholders that affect the conditions macro economic environment (macroeconomics), and sustainable growth and the effect of balance of payments on exchange rates (global economy). This knowledge is very important as initial knowledge in understanding and analyzing problems and framing in undergoing a profession from the perspective of industrial and systems engineering.

COURSE'S LEARNING OUTCOME
• Able to understand economic issues and concepts relevant to the study of industrial engineering and systems. • Able to understand and be able to perform calculations related to the system for forming prices for goods and services that work to determine resource allocation / income distribution in various levels of complexity of problems (work stations, companies, and industries). • Able to understand and be able to perform calculations related to the system for forming prices for goods and services that work to determine resource allocation / income distribution in various levels of complexity of problems (work stations, companies, and industries). • Able to understand fiscal and monetary policy and measure the magnitude of the impact it has on the industrial system in various levels of complexity. • Able to understand the global economy about how to grow a company / industry in a sustainable manner, strengthen currency exchange rates through balance of payments management, and use economic resources in a circular manner. • Able to work together in a group project to complete assignments that are relevant to the main topic of the lecture and present the results in writing and orally in a class panel.

MAIN REFERENCES
Lipsey, R, Crystal, A, 2011, Economics, 12 th, Oxford University Press Inc., New York.

COURSE		
	TI184306	: ENGINEERING STATISTICS 2
	Credit	: 3 credits
	Semester	: 3

COURSE DESCRIPTION

Engineering Statistics II is a continuation of Engineering Statistics I. Engineering Statistics II mainly emphasizes on comprehending inferential statistics including hypothesis test both one and two population parameters, analysis of variance, single and multi-variables correlation analysis, linear regression, goodness of fit test, contingency table and non-parametric statistics. In this course students learn how to apply statistical tools for solving problems in relevant cases. By mastering these topics, students are expected to have sufficient knowledge and strong analytical skill especially in inferential process (how to estimate population parameter based on sample data) in the shake of completing their further courses, giving solutions in the job training or pursuing their higher degree.

COURSE'S LEARNING OUTCOME

- Ability to understand inferential statistics, includes scope, basic assumption and the limitations to use it.
- Ability to apply inferential statistics methods or tools for solving problems.
- Ability to demonstrate the use of statistical softwares, especially for inferential statistics.
- Ability to analyse data and software's output on solving problems based on real study cases.

MAIN REFERENCES

David F. Groebner, Patrick W. Shannon, Phillip C.Fry dan Kent D. Smith, "Bussiness Statistics : A Decission Making Approach", Prentice Hall, 8th Edition,2017.

COURSE		
	TI184307	: COST ANALYSIS AND ESTIMATION
	Credit	: 3 credits
	Semester	: 3

COURSE DESCRIPTION

Students are expected to have a thorough understanding on accumulated cost during various types of manufacture and service industry and able to perform an estimation and calculation of production cost, record it according a generally accepted accounting system and review it based on report produced.

COURSE'S LEARNING OUTCOME

- To understand the relationship of industrial activities cycle and accounting process.
- To provide knowledge and skills in recording, classifying, reporting and analysis of financial report.
- To understand cost management systems in varios type of industry.
- To identify and calculate various product cost type.
- To understand job order osting, process-costing and activity based costing.
- To understand full costing dan direct costing methods.
- To understand product costestimation.
- To understand profit planning and control system.

MAIN REFERENCES

Warren et al., Accounting 21th , Thomson Learning, 2010.

COURSE		
	TI184308	: MANUFACTURING PROCESS
	Credit	: 3 credits
	Semester	: 3

COURSE DESCRIPTION

Manufacturing is a process to make a product from raw materials through series of activities involving technologies. This course provides understanding and analyzis capability of various manufacturing processes that is widely applied in discrete industry. It encompasses processing and assembly operations for metals and non metals. Processing operations includes solidification, particulate, deformation processes, material removal (traditional and modern methods) and additive manufacturing. Assembly operations includes permanen joining and mechanical fastening processes.

COURSE'S LEARNING OUTCOME

- Ability to understand scope of manufacturing and production systems.
- Ability to understand solidification operations processes for metals (casting).
- Ability to understand material removal operations processes for metals (metal cutting).
- Ability to understand deformation and particulate operations processes for metals (metal forming and powder metallurgy).
- Ability to understand additive manufacturing processes (3D Printing).
- Ability to understand operations processes for non metals (plastics, composites).
- Ability to understand permanent assembly (welding) and mechnical fastening processes.
- Ability to understand modern manufacturing processes and its current technology.

MAIN REFERENCES

Groover, M.P. (2002). Fundamentals of Modern Manufacturing, Prentice Hall

COURSE	TI184309	: ERGONOMICS
	Credit	: 3 credits
	Semester	: 3

COURSE DESCRIPTION

Industrial ergonomics aims to design the working interactions for higher industrial productivity by considering effectiveness, efficiency, safety, and comfortness. This course isdesigned to provide knowledge and ability for student in order to improve the processes orwork equipment fit to Ergonomics principles. The object of discussion will related to improvement of human interaction quality by considering humans, machines, labor, environment, systems and organizations. Industrial ergonomics notice various human abilities, advantages and disadvantages in improving the work interaction.

COURSE'S LEARNING OUTCOME

- able to explain the basic concept and data of Ergonomics study
- able to analyze human body posture and working mechanism
- able to analyze the human interaction in work system
- able to analyze human abilities and limitations in avoiding the error
- able to analyze the environmental factors in work system

MAIN REFERENCES

Tayyari, Fariborz and Smith, James L. (1997). Occupational Ergonomics: Principles and Applications. Chapman & Hall, London.

COURSE	TI184310	: OPERATIONS RESEARCH 1
	Credit	: 3 credits
	Semester	: 3

COURSE DESCRIPTION

Every business and industry naturally seeks the best design and operation under scarce resource allocations. Thus, the decision making process is critical to find the best solution. This course deals on the scientific approach to decision making which involves the use of mathematical models. This course discusses the theoretical background and formulation of the mathematical models and the solution method, such as graphical method, simplex method as well as sensitivity analysis. The applications of the model in solving business andindustry problems are also presented and discussed, such as transportation and network models.

COURSE'S LEARNING OUTCOME

- Ability to understand characteristics: assumptions in methodology of LP and ability to understand the identification of problems that can be modeled with LP and or can be solved with the available heuristic algorithms
- Ability to formulate problems using the LP model and then to be able use the geometric method (graph) to get a solution to the LP model with two variables
- Ability to use the simplex method with linear algebra (matrix) to obtain solutions to the LP model
- Ability to use the simplex method with tables to obtain a solution of the LP model and the students able to use artificial variable techniques and two-phase and big-M methods to obtain LP model solutions
- Ability to use Solver-MS Excel and LINDO software to get LP model solutions and to explain all numbers on the output of the Solver-MS Excel and LINDO software and perform a sensitivity analysis of the resulting output
- Ability to understand duality concept and able to find LP solution with complementary slackness and dual simplex algorithm
- Ability to understand the sensitivity analysis of the effect of changing parameters, adding new variables, or adding new constraints to decision variables and objective functions using linear algebra
- Ability to use heuristic algorithms to solve problems: transportation, trashipment, and assignments and it is proceed to use heuristic algorithms to solve problems: shortest route, minimum spanning tree, maximum flow, and minimum cost flow.

MAIN REFERENCES

- Bazaraa, Mokhtar S., Jarvis, John J., and Sherali, Hanif D. (2010). Linear Programming and Network Flows, 4th Edition, John Wiley & Sons.
- Winston, Wayne. L. (2003). Operations Research: Applications and Algorithms, 4th Edition, Cengage Learning.
- Taha, Hamdy. A. (2017). Operations Research: An Introduction, 10th Edition, Pearson Education Limited.
- Lieberman, G. J., and Hillier, F. S. (2015). Introduction to Operations Research, 10th Edition, McGraw-Hill Education.

COURSE		
	TI184411	: COMPUTER ALGORITHMS AND PROGRAMMING
	Credit	: 3 credits
	Semester	: 4

COURSE DESCRIPTION

This course contains an introduction to problem solving techniques using a structured programming approach. At the beginning of the learning section, students learn problem solving techniques by representing algorithms in the form of flow charts and pseudocodes. In the second part students learn a programming language that implements simple algorithms with direct structured, branched, and repetitive techniques.

COURSE'S LEARNING OUTCOME

- Students know the understanding of the algorithm and its description with a flowchart.
- Students know the purpose and elements of a programming language.
- Students understand the properties of variables.
- Students can implement repetition.
- Students are able to make a simple algorithm with repetition.
- Students recognize floating point, char, string and one-dimensional array data types.
- Students are able to make simple algorithms by looping with the use of arrays.
- Students are able to decompose by function.
- Students are able to use multi-dimensional arrays.

MAIN REFERENCES

Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithm", The MIT Press, Cambridge, Massachusetts London, England

COURSE		
	TI184412	: INDUSTRIAL AUTOMATION
	Credit	: 3 credits
	Semester	: 4

COURSE DESCRIPTION

A global competitive encourages industries to shorten the manufacturing lead time with high quality of the product. Automation becomes the solution that utilize advanced-technology and modern tools for the companies. The ability to design the automated system begin from understanding the basic principles of automation, its mechanism also the components need for an integrated system. The practical implication to design and maximizing the use of control system are highly demanded by then. By completing this course, student will be able to propose innovative prototype of an automated system as a part of the integrated solution.

COURSE'S LEARNING OUTCOME

- The ability to understand basic principles, analyze technological advancements, and evaluate the implementation of automation concepts in industries based on the framework of the Fourth Industrial Revolution.
- The ability to understand the constituent components of industrial automation as well as the general and mathematical concepts of logic gates, fuzzy logic, as well as signals and digital circuits.
- The ability to understand the implementation of automation within the scope of more complex industrial systems and utilizing higher levels of technology (advanced technology).
- The ability to materialize the design of industrial automation into a prototype of a simple automation level based on karakuri, image processing software, and production process support.

MAIN REFERENCES

Groover, MP 2001, Automation, Production Systems, and Computer – Integrated Manufacturing, 2nd edition, Prentice Hall, New Jersey

COURSE		
	TI184413	: METHOD STUDY AND WORK MEASUREMENT
	Credit	: 3 credits
	Semester	: 4

COURSE DESCRIPTION

"There is always a better working method" of each operation process. This principle is the basis of continuous improvement in the production floor. Increasing the processeffectiveness and efficiency become the focus of improvement, which will ultimately increase productivity. The improving process begins by defining overall production system and waste identification. The waste may occurs are overproduction, inventory, transportation, motion, defect, time and process.

Method study, including motion and work study was conducted in order to get better working method and minimize waste. Motion study will study motion study arrangement to get effective and efficient working method based on human strengths and weaknesses. While time study was conducted through work measurement. Various work measurement was studied, both direct and indirect in order to be properly applied to various problems. Further analysis of work measurement result was conducted to provide recommendation
for productivity improvement.

COURSE'S LEARNING OUTCOME

- Have knowledge of various work measurement, both direct and indirect.
- Able to analyze work measurement result to provide recommendation for productivityimprovement.

MAIN REFERENCES

Barnes, M.R., Motion and Time Study : Design and Measurement of Work, 7th edition, New York : John Wiley and Sons, 1980.

COURSE		
	TI184414	: MANUFACTURING SYSTEM
	Credit	: 4 credits
	Semester	: 4

COURSE DESCRIPTION

Manufacturing system as an important part of the modern industry should be designed and controlled properly to achieve the strategic objectives e.g. fulfill the customer needs with high- quality products with shorter delivery time. Considering these criteria will ensure the company to sustain and compete optimally. Component of manufacturing system i.e. production facility, storage and material handling, inspection, etc are interconnected to produce a tangible product. This course covers the operation characteristics of the manufacturing system includes production rate, cycle time, and manufacturing lead time (MLT). Moreover, many approaches to improve the manufacturing system efficiency i.e. automation, Flexible Manufacturing System, Just In Time, Lean Manufacturing, and Industry 4.0 also will be discussed.

COURSE'S LEARNING OUTCOME

- Students are understand the basic principles for designing the manufacturing system and identifying the need for analyzing the manufacturing system.
- Students are able to select relevant resources and analyze the engineering aspect of the manufacturing system components.
- Students are able to conduct the engineering analysis of the simple concept in manufacturing system.
- Students are understand the basic principles and technology of development and integration in the manufacturing system.

MAIN REFERENCES

Groover, M.P 2001, Automation, Production Systems, and Computer Integrated Manufacturing, Prentice Hall

COURSE		
	TI184415	: ENGINEERING ECONOMICS
	Credit	: 3 credits
	Semester	: 4

COURSE DESCRIPTION

Engineering economics aims to study and analyze the economic impact of the engineering solutions or decision makings. The economic analysis includes the calculation and comparison between benefit and cost that incurred in the implementation of engineering solutions. The solution is economic valuable when the benefit is higher than its cost. The commercial and non-commercial institution will select the solution that has the best economic value. Engineering economics course will equip the student with the ability to conduct economic analysis through delivering concepts and methods in analyzing the economic value of the engineering decision.

COURSE'S LEARNING OUTCOME

- Students able to understand and explain the concepts of value, cost, and time value ofmoney
- Students able to model the cash flow of engineering decisions
- Students able to understand the interest concept and use interest table and formulato calculate the economic equivalence of engineering decisions
- Students able to understand and explain the impact of inflation in the economicequivalence calculation
- Students able to understand and use the methods for calculating and comparing theeconomic value of engineering decisions
- Students able to conduct sensitivity and risk analysis for analyzing the impact ofuncertainty to the feasibility of engineering decision
- Students able to understand the concept of depreciation and its impact to financialcash flow and calculate the depreciation cost by using the appropriate method
- Students able to understand the impact of tax rate to the financial cash flow ofengineering decisions
- Students able to understand the concept of replacement analysis for engineeringassets
- Students able to use software application or excel functions to calculate economicvalue of engineering decisions

MAIN REFERENCES

Engineering Economic Analysis by Donald G. Newnan, Ted G. Eschenbach and Jerome P. Lavelle (Feb 26, 2004)

COURSE		
	TI184416	: OPERATIONS RESEARCH 2
	Credit	: 3 credits
	Semester	: 4

COURSE DESCRIPTION

Operations Research 2 course is the second series of Operations Research which gives the lecture in introduction to optimization modelling in decision making. Unlike the first series which focuses on the basic deterministic models and methods, this course focuses on mathematical modeling, such as advanced deterministic models and methods in Operations Research as well as stochastic models and applies them on the industrial and business problems. Through mathematical modeling, it seeks to design, improve and operate complex systems in the best possible way (optimal solution). The mathematical tools used for the solution of such models are either deterministic or stochastic, depending on the nature of the system modeled. Topics discussed are Integer Programming, Game Theory, Dynamic Programming, Markov Chain, and Queuing Theory, including the use of optimization software, such as Solver and LINDO/LINGO.

COURSE'S LEARNING OUTCOME
• Ability to understand the characteristics of deterministic and stochastic model from different types of decision-making environments and the appropriate decision making approaches, as well as methods overview, such as Integer Programming, Goal Programming, Dynamic Programming, Game Theory, Markov Chain, and Queuing Theory (knowledge and understanding) • Ability to formulate, build and solve problems by using appropriate deterministic models, such as Integer Programming, Goal Programming, and Dynamic Programming (Cognitive skills - thinking and analysis) • Ability to formulate, build and solve problems by using some appropriate deterministic and stochastic models, such as Game Theory, Markov Chain, and Queuing Theory (Cognitive skills - thinking and analysis) • Ability to use optimization software, such as Solver-MS Excel and LINDO/LINGO to solve deterministic and stochastic models and to explain and interpret the output of optimization software (Practical and Subject Specific Skills) • Ability to apply models, present and work in a team to build and develop mathematical model for industrial and business cases (communication skills).
MAIN REFERENCES
• Winston, Wayne. L. (2003). Operations Research: Applications and Algorithms, 4th Edition, Cengage Learning. • Lieberman, G. J., and Hillier, F. S. (2015). Introduction to Operations Research, 10th Edition, McGraw-Hill Education. • Bazaraa, Mokhtar S., Jarvis, John J., and Sherali, Hanif D. (2010). Linear Programming and Network Flows, 4th Edition, John Wiley & Sons. • Taha, Hamdy. A. (2017). Operations Research: An Introduction, 10th Edition, Pearson Education Limited

COURSE		
	TI184417	: QUALITY CONTROL TECHNIQUES
	Credit	: 3 credits
	Semester	: 5
COURSE DESCRIPTION		
Quality is one of the importance competitive advantage. Quality could means conform to specification and comply to regulation. The quality cover planning, control monitoring, and assurance. In Quality control (QC), the quality characteristics of the manufacturing output products are inspected, measured, and compared to predetermined standard. This QC ensures that the products fulfill the requirements both from customer and manufacturer. The states of product in terms of conform to standard, as well as the process capability indices can be measured. This course provides knowledge and expect the student to understand and able to implement many techniques to control the quality, which is very important to design the quality assurance (QA) system both for product or proses.		
COURSE'S LEARNING OUTCOME		
• Students are able to explain the quality concepts in field. • Students are able to analyze the capability of process by implementing the variety of quality control techniques both online or offline includes the SPC. • Students are able to plan the experiment for quality improvements. • Students are able to apply the acceptance sampling techniques for quality decision making. • Students are able to design the quality assurance program.		
MAIN REFERENCES		
Montgomery, Douglas C. (2005). Introduction to Statistical Quality Control. New York: John Wiley & Sons Corp.		

COURSE		
	TI184418	: PRODUCTION PLANNING AND INVENTORY CONTROL
	Credit	: 4 credits
	Semester	: 5

COURSE DESCRIPTION

Production planning and inventory control is a central function in any manufacturing company. It deals with optimizing the use of production resources in order to satisfy customers' demand. The objective of this course is to introduce to students various concepts, techniques, methods, and practical issues related to production planning and control.

COURSE'S LEARNING OUTCOME

- Explain the roles of production planning and inventory control among other functions in a manufacturing company.
- Explain the framework of production planning and inventory control from demand forecasting to production activity control.
- Apply basic forecasting methods and measure their accuracy.
- Use suitable methods / techniques to develop a set of production plans, including aggregate production planning, master production scheduling, and material requirement planning. Students are also required to understand capacity planning methods in different levels of decision.
- Use various techniques to control and manage inventory.
- Use techniques to control production activities.
- Explain practical issues related to PPIC and its relations with the supply chain.

MAIN REFERENCES

Fogarty, D. W., Blackstone, J. H., and Hoffmann, T. R. (1991). Production and Inventory Management 2nd Ed., South Western Publishing.

COURSE		
	TI184419	: BASIC ENGINEERING MECHANICS
	Credit	: 3 credits
	Semester	: 5

COURSE DESCRIPTION

This course is intended the students to develop the ability, in the engineering student, tounderstand, formulate, and solve a given problem in a logical manner and to apply it to solve a few basic problems in engineering mechanics.

COURSE'S LEARNING OUTCOME

- Students are able to understand and use physics basic laws (Newton Law I, II and III)
- Students are able to calculate and analysis basic vector forces and several staticequilibrium of particles and rigid bodies
- Students are able to calculate the dynamic equilibrium of particles and rigid bodies

MAIN REFERENCES

- Mekanika Teknik: Statika Jilid 1. RC Hibbeler. 1997.
- Mekanika Teknik: Statika Jilid 2. RC Hibbeler. 1997.
- Schaum's Outline of Theory and Problems Of Engineering Mechanics - Statics AndDynamics. Fifth Edition. E.W. Nelson, C.L. Best, W.G. McLean. McGraw-Hill. 1998.

COURSE		
	TI184420	: PRODUCTS DESIGN AND DEVELOPMENT
	Credit	: 3 credits
	Semester	: 5

COURSE DESCRIPTION

The design and development of product is a core business process for most companies. A specialized, knowledgeable and high skilled human resource is required in managing the design and development of products (P3) in order to produce a high quality product. The purpose of this course, therefore, is to provide basic theoretical and practical understanding of customer drive product design and development process which enable student to design product which not only technically reliable, high quality, but also marketable. Product concepts, design processes, methods/techniques and current issues on product design and development are discussed, along with economic implications of design. Students will gain an understanding of product design and development processes
as well as useful tools/techniques..

COURSE'S LEARNING OUTCOME

- Student able to explain the scope of industrial product design and development
- Student able to explain the differences between product core component and support component
- Student able to define, to synthesize, to evaluate new business opportunities of innovative product development.
- Student able to use methods for identifying the voice of customers (VOC) and translating VOC to the final product.
- Student able to conduct product design and development process from Phase-0 to Phase-5.
- Student able to analyze and explain the trade-off between cost and quality on product specification.

MAIN REFERENCES

- Ulrich, K.T, Eppinger, S.D., Product Design & Development, 2nd Edition, McGraw-Hill, 2000

COURSE	TI184421	: ORGANIZATIONAL AND HUMAN RESOURCEMANAGEMENT (OHRM)
	Credit	: 3 credits
	Semester	: 5

COURSE DESCRIPTION

Human Resource Management needs to be tailored to the organization's strategic choice of design. While the design of the organization must be aligned with the strategy of the company or organization. Organizational and Human Resoureces Management (OHRM) course more emphasis on organizational strategy, organizational design and management of human resource management from recruitment to development of human resources. Through OHRM course students are expected to have an understanding and be able to manage human resources efficiently and effectively.

COURSE'S LEARNING OUTCOME

- Students are able to explain the relationship between strategy , organizational design and human resource management
- Students are able to create a draft vision and mission statement
- Students are able to draw conclusions about the characteristics of a good vision andmission
- Students are able to choose an appropriate generic strategy (product leadership , excellent operational , customer intimacy)
- Students are able to explain the definition of authority (vertical and horizontal differentiation) and control (span of control)
- Students are able to mention the types of organizational structure and the advantages / shortcomings masing2
- Students are able to design in accordance with the organization 's business strategy of an organization
- Students are able to design human resource management strategies derived from the organization's strategy
- Students are able to explain the 8 main pillar in HRM
- Students are able to do a simple job analysis
- Students are able to explain a variety of employee performance appraisal tools
- Students can design a compensation system according to organizational design and business strategy

MAIN REFERENCES

1. Dessler, Gary. Human Resource Management, 13th ed. Pearson Prentice Hall: 2013
2. Jones, Gareth R. Organizational Theory, design, and Change, 7th ed. Prentice Hall: 2013

COURSE	TI184522	: INDUSTRIAL SYSTEM SIMULATION
	Credit	: 3 credits
	Semester	: 5

COURSE DESCRIPTION

Simulation is a technique for imitating processes / operations using computer devices from a complex system that is difficult (cannot) be modeled mathematically. The simulation model is designed to be used to study the system by conducting experiments to get the value of a single decision variable or combination that can meet the objectives set. This course will discuss how to design the correct simulation model, so that it is hoped that after completing this course students are able to develop a valid simulation model and perform experiments using a simulation model. Learning activities consist of lectures that discuss simulation concepts and simulation modeling techniques as well as real system case study assignments that are presented at the end of the course.

COURSE'S LEARNING OUTCOME

- Ability to understand the concepts and basics of discrete event simulation (DES)
- Ability to understand the concept of random number generators and are able to explain their use in the DES model
- Ability to explain the difference between DES and the exact optimization method and other simulation methods (Monte Carlo Simulation, System Dynamics, and Agent Based Simulation)
- Ability to use commercial DES simulation software to build DES models, carry out experiments and interpret experimental output.
- Ability to determine the type of data needed to model DES and analyze input data.

COURSE'S LEARNING OUTCOME
• Ability to use statistical methods in analyzing DES output and to develop various alternative improvement scenarios and compare them to get the best scenario • Ability to present DES experimental results by working together in a team.
MAIN REFERENCES
1. Kelton, W., Sadowski, R., and Swets, N., Simulation with Arena, , 5th edition, McGraw-HillEducation, 2009 2. Harrell, Ghosh, Bowden, Simulation Using Promodel, McGrawHill, 2004

COURSE		
	TI184623	: MAINTENANCE AND RELIABILITY TECHNIQUES
	Credit	: 3 credits
	Semester	: 6

COURSE DESCRIPTION
This course has two goals. First, this course aims to provide understanding about reliability of an equipment, machinery, or production facility in a company, manufactured product produced by a manufacturer, system or application that developed by a company, organization, or government institution. Students will learn about failure definition, reliability, how to measure it, how to test it, and how to manage it in different circumstances including in a complex system. Second, this course aims to learn the roles of maintenance in supporting the sustainable operation within a company, whether manufacturer, service industry, or other institution. Starting from knowing equipments/facilities that need to be maintained, students will learn various maintenance strategies, their strength, and their limitation. Relationship between maintenance and other business processes will be detailed so that students can design or develop an effective and efficient maintenance management in a company.
COURSE'S LEARNING OUTCOME
• Understand the concept of failure, reliability, and various lifetime distribution of an equipment / product / application / system in a company, how to measure it, and how to analyze it manually or using software. • Understand various maintenance strategies, each strength and limitation, comparison,and appropriate implementation of each. • Identify the need of maintenance in a company and analyze the relationship and the interaction of maintenance and other business processes in a company. • Design a proper maintenance management system.
MAIN REFERENCES
Lewis, E. E. 1987. Introduction to Reliability Engineering, John Wiley & Sons, USA.

COURSE	TI184624	: FACILITY PLANNING
	Credit	: 3 credits
	Semester	: 6

COURSE DESCRIPTION

Facility Planning in one of the important and complex stages in enterprise strategic planning. This course will discuss several stages in facility planning i.e.: facility location analysis, material flow design, warehouse facility planning, facility layout design and framework, material handling, and planning for supporting facilities. Facility arrangement
in layout and its optimization will be discussed as the main objectives of this course.

COURSE'S LEARNING OUTCOME

- Able to explain the basic concept and data in facility planning
- Able to apply the location analysis method using qualitative and quantitativeapproaches
- Able to design the material flow and handling in plant facilities
- Able to design and evaluate the facility layout using qualitative and quantitativeapproaches.
- Able to specify the supporting facilities in facilities planning
- Able to model the layout in 2d and 3d presentation

MAIN REFERENCES

Wignjosoebroto,S. (1996). Tata Letak Pabrik dan Pemindahan Bahan. PT. Gunawidya

COURSE	TI184625	: SYSTEM MODELING
	Credit	: 3 credits
	Semester	: 6

COURSE DESCRIPTION

This course is trying to give knowledge and ability to utilize the concept of System Thinking and System Approach to deal with many practical situations in scope of Industrial Engineering and Management cases. Within studying this course, you will learn how to identify and formulate a problem, identify and set a correct objective and system relevant, utilize a correct System Diagram, and solve the problem by using a proven Management Sciences Methodology.

COURSE'S LEARNING OUTCOME

- Provide an understanding of the basic concepts of system modeling, identification of problems, and the development of system relevant and system diagrams
- Provide an understanding the techniques of the hard systems and soft systems methodology methodology
- Ability to define problems (real and theoretical) that are relevant to the areas of industrial engineering and describe the implementation the concept of System Thinking, System Approach, and System Modeling to variety of real world and theoritical case studies.
- Provide the ability to develop models, analyze and validate the model from a system relevant

MAIN REFERENCES

- Daellenbach, H. G. and D.C. McNickle. (2005), Management Science: Decision Makingthrough System Thinking, Pallgrave Macmillan, United Kingdom.
- Murthy, D.N.P., Page, M.W., and Rodin,E.Y., Mathematical Modelling, Pergamon Press,1990.
- Clement, Robert T. (1997). Making Hard Decisions: An Introduction to Decision Analysis, 2nd Edition., Duxbury Press.

COURSE		
	TI184626	: LOGISTICS SYSTEM
	Credit	: 3 credits
	Semester	: 6

COURSE DESCRIPTION

This subject is a mandatory course discussing logistics functions for individual companies or supply chains. The purpose of this course is to give knowledge and skills for students to understand the concepts and models in logistics management and their application in real cases. Students should also be able to use related logistics application softwares.
Combining the ability to understand cases of logistics, to translate them into models and to select and determine the solution methods, students are expected to have comprehensive
knowledge on logistics management.

COURSE'S LEARNING OUTCOME

- Students are able to explain scope, main functions and main functions of Logistics Management, including the role of ICT logistics
- Students are able to understand the logistics management models including Network Distribution, Transportation, and Warehousing Models. Students are able to implement the models using related softwares
- Students are able to perform an analysis of the application of logistics management to deal with the real situation

MAIN REFERENCES

Ballou, Ronald. H. (2004) Business Logistics Management, Prentice Hall International, Inc., USA

COURSE		
	TI184727	: INDUSTRIAL ECOLOGY
	Credit	: 2 credits
	Semester	: 7

COURSE DESCRIPTION

There are four objectives of this course. First, students will learn about eco-system and the environment, and how technology and human activities affect the environment. Second, students will learn about sustainable development concepts and principles. By understanding the interactions between human activities, technology, and environment, students will be able to identify and analyze environmental problems at local, national, or global scope from the light of sustainable development. Next, students will be encouraged to come up with critical analysis and innovations that solve the identified environmental problems. Third, students will learn about process industries that produce various products in their daily life, such as cement, fertilizer, cooking oil, medicines, etc. It is expected that students will have broad insights and understand the critical ecological factors in process industry. Fourth, students will learn about environment management systems such as ISO, AMDAL, etc. This semester, this course will be linked to the Guest Lecture Series (GLS) on Sustainable Development Goals (SDGs) implemented by ITS Global Engagement (ITS GE) which invite speakers from overseas. It is expected that students can learn about industrial ecology and environmental problems from various perspectives and in various fields.

COURSE'S LEARNING OUTCOME

- Students are able to understand the concepts of ecosystem, the impact of industries, technology, and human activities toward environment, as well as environment management systems, such as ISO, AMDAL, etc.
- Students are able to understand environmental problems at local, national, and global scope.
- Students are able to explain the concept of sustainable development and its principles.
- Students are able to understand process industries that produce a wide range of products and their environmental impacts.
- Student are able to carry out a critical analysis or develop simple innovations to solve environmental problems.

MAIN REFERENCES

Miller.G.T. (2004).Living in the Environment Principles, Connections and Solution.13th, Thomson Learning.

COURSE		
	TI184728	: SUPPLY CHAIN MANAGEMENT
	Credit	: 3 credits
	Semester	: 7

COURSE DESCRIPTION

Supply Chain Management is concerned with an integrated approach to managing the flow of materials (raw materials and products), information, and money that occurs internally in the company as well as within the interconnected group of companies known as the supplychain. In this course, students learn various concepts, methods, and tools to increase the competitiveness of companies in tight competition.

COURSE'S LEARNING OUTCOME

- Explain the role of supply chain management in increasing company competitiveness
- Explain various strategy in managing supply chains
- Explain important supply chain considerations in product design
- Describe the nature of network design in the supply chain and use different models indesigning a supply chain network
- Explain the impact of demand pattern on supply chains
- Explain the strategic role of procurement in supply chains
- Explain how to manage inventory in supply chains by using an integrated perspective
- Explain the importance of managing information in supply chains
- Explain supply chain performance measurements for several product categories

MAIN REFERENCES

Chopra, S., and Meindl, P. (2015). Supply chain management: Strategy, planning, and operations, 6th Edition. Pearson Education.

COURSE		
	TI184729	: INDUSTRIAL PLANNING
	Credit	: 3 credits
	Semester	: 7

COURSE DESCRIPTION

This course is an integrated course of many previous courses which is aimed for giving the understanding and skills for students in the establishment and development plans of comprehensive business. Students are required to be able to prepare a business feasibility analysis for the establishment and development plans of business. This course is a serial
course and will be continued by Business Design Analysis courses in semester 7.

COURSE'S LEARNING OUTCOME

- Students are able to compose a complete / comprehensive and integrated feasibility analysis for the establishment and development plans of manufacturing-based businesses, which in detail:
- Students are able to design the establishment or development plans of integrated business, include: opportunities identification, strategic design, product design, manufacturing process design, design and operation of production systems, supply chain design, layout design, business location selection and design of organization and human resources
- Students are able to compose the business plan in a good, rational, and professional feasibility study
- Students are able to communicate / present their work outcomes well
- Students are able to cooperate with other team members in performing design and analysis of business

MAIN REFERENCES

Maria Anityasari & Naning Aranti Wessiani, "Analisa Kelayakan Usaha: Dilengkapi Kajian Manajemen Resiko", Gunawidya, 2011

COURSE		
	UG184916	: CONCEPT OF TECHNOLOGY (Basic Knowledge danApplication)
	Credit	: 3 credits
	Semester	: 7

COURSE DESCRIPTION

This course will expose students to science, technology and innovation and their applications in society and the environment. As citizens, students will be able to have skills and creativity in comprehensively utilizing technology. During the course, students can develop systematic and constructive thinking based on information transformation thinking models. The process includes problem observation, problems exploration, and solution formulation. Finally, students can optimally design a Real Work Lecture (KKN) proposal based on field facts.

COURSE'S LEARNING OUTCOME

- Students understand the outline of the lecture from the beginning to the implementation of KKN.
- Students can transform information into something simpler to comprehend.
- Students can make a Logframe Matrix.
- Students have insight and can implement the principles of sustainable development according to their area of expertise in solving problems in the community and the surrounding environment.
- Students can understand the basics of using technology by optimizing information and communication technology in solving problems in society and its environment.
- Students can use open source-based information technology to create agency websites.
- Students can use applied information technology to solve practical problems in society.
- Students can develop a cooperative attitude and have social sensitivity and concern for society and the environment.
- Students can be part of the solution to problems that exist in community groups.
- Students can use technology appropriately and have creativity in solving problems that exist in society and the environment.

MAIN REFERENCES

- Buku Transformasi Informasi, Dr.techn. Pujo Aji, ST.MT., ITS Pres., 2016
- Arahan Pelaksanaan Tujuan Pembangunan, Alamat Kontak: Website :
- sdgs.bappenas.go.id
- Alfred Watkins and Michel Ehst, "Science, Technology and Innovation: Capacity
- Building for Sustainable Growth and Poverty Reduction", The International Bank for
- Reconstruction and Development, Washington DC, 2008.
- Frieder Meyer Krahmer, "Innovation and Sustainable Development-Lesson for Innovation Policies, " A Springer-Verlag Company, Heidelberg, 1998.

COURSE		
	TI184830	: PROJECT MANAGEMENT
	Credit	: 2 credits
	Semester	: 8

COURSE DESCRIPTION

Currently, project management is getting more important. Planning, execute and controlling a project is relatively difficult due to its complexity of various aspects such as time, cost, resources, goal achievement measurement, and many more. This lecture will provide students with understanding on planning, scheduling, organizing and project control on product development projects, constructions, system information, new businessand other important events. The focus will be on project's management processes and important tools use to manage a project.
The understanding on project management concepts and techniques will provide students with a competitive advantage to compete in engineering fields of work and/or other fields.

COURSE'S LEARNING OUTCOME

- To understand the main processes in project management and the importance ofintegration between the organizational strategy with project management .
- To understand the sub-systems in a project management system that determines thesuccess of the project management.
- To understand the concepts and techniques detailed work breakdown structures as abasis for planning and controlling project.
- To understand the project planning and designing project control instruments.
- To understand the valuation of project.
- To understand the sources of funding available for the project and choose the best sources for engineering project.
- To understand the concepts, techniques and decision-making tools available for managing projects.
- To understand the risk factors faced by the project and choose the model of analysis,evaluation and management of project risks.
- To recognize potential conflicts and problems that can occur on the project.
- To identify critical aspects of human behavior that determine the success of theproject management .
- To Use computer-based information system for managing projects effectively andefficiently .

MAIN REFERENCES

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

COURSE		
	TI184831	: DESIGN OF BUSINESS INFORMATION SYSTEMS
	Credit	: 3 credits
	Semester	: 8

COURSE DESCRIPTION

A company or organization will face the challenges of the complexity of the issue and the larger volumes of data, especially when the company has grown and are in a competitive situation. Therefore, in order to survive and be competitive, we need an information system that can support decision making efficiently and effectively. This lecture will provide insight to students related to the design of information systems within the scope ofthe company or business. Emphasis is on the basic concepts of material information systems both manual and computer-based, enterprise system basic concepts related functions and levels of management, process / design stage of information systems, business information systems applications design. Understanding of the concept and design of the information system will provide supplies for students to be able to design information systems and applications within the scope of the business

COURSE'S LEARNING OUTCOME

- Students understand the relationship of subjects within the scope industrial engineering
- Students understand the basic concepts of information systems both manual andcomputer-based
- Students understand the relationship of information systems with the functions andlevels of management within the scope of the company
- Students understand the system as an alternative solution approach in designingbusiness information systems
- Students understand the framework or model of problem solving (problem solver)
- Students understand the stages in the design of business information systems
- Students are able to model the real case in the framework of information systems designin the form of a data flow diagram
- Students are able to identify the needs of entities and attributes in accordance with thepurpose why information systems need to be designed
- Students are able to design information systems in the form of relationships betweenentities (entity relationship diagram)
- Students are able to design an application system based on the design of the relationship between entities
- Students were able to convince the presentation of the design of information systemsthrough

MAIN REFERENCES

McLeod Jr. Management Information System,., Prentice Hall, 2004.

COURSE		
	TI184832	: INTERNSHIP/PRACTICAL WORK
	Credit	: 2 credits
	Semester	: 8

COURSE DESCRIPTION

Internship is designed to introduce students in applying industrial engineering concept and to prepare students for working in the area that the industrial engineer used to works in a company. Also, internship is aimed for the students to understand and apply how to use industrial engineering method in solving the industrial problems comprehensively.

COURSE'S LEARNING OUTCOME

- Students are able to communicate both speaking and writing well.
- Students understand industrial engineering functions.
- Students have experiences to solve industrial problems with industrial engineering functions.

COURSE		
	UG184915	: TECHNOPRENEURSHIP
	Credit	: 3 credits
	Semester	: 8

COURSE DESCRIPTION

This course provides an understanding and skills for students to be able to identify and evaluate technology-based business opportunities in accordance with the areas of expertise of students, and to develop business opportunities. This course combines theory and practice of introduction of direct (hands-on experience) is integrated in developing ideas and business opportunities. In the end, students are expected to pour into the business opportunities of effective business plans.

COURSE'S LEARNING OUTCOME

- Students are able to apply their expertise, innovation and creativity to produce a business draft /market oriented products by using science and technology to generate an entrepreneurial opportunity
- Students are able to adapt to the situation and survive in conditions of uncertainty
- Students are able to take risks with precise calculation
- Students are responsible for own work and can be held accountable for the achievement of the result of teamwork by promoting business ethics
- Students are able to speak Indonesian well and fluent in spoken language and written for entrepreneurship as well as daily life.

MAIN REFERENCES

- Barringer, B. R., & Ireland, R. D. (2010). Entrepreneurship: Successfully launching newventures. Upper Saddle River, N.J: Prentice Hall.
- International Labor Organization, Generate Your Business Idea
- International Labor Organization, Memulai Bisnis
- Osterwalder, A., Pigneur, Y., & Clark, T. (2010). Business model generation: A handbook
- for visionaries, game changers, and challengers. Hoboken, NJ: Wiley.
- William, B. K., Sawyer, S. C., Berston, S., (2013). Business: A Practical Introduction. Upper Saddle River, N.J: Prentice Hall

COURSE		
	TI184833	: FINAL PROJECT
	Credit	: 6 credits
	Semester	: 8

COURSE DESCRIPTION

Students are designed to develop their ability to continue study in graduate level or to work. This final project gives students to have experiences in solving industrial problems. Topics in this final project can be a case study in a company by applying theory, hypothesis testing based on survey data or interview, or a methodology development which can be used in solving industrial problems.

COURSE'S LEARNING OUTCOME

- Students are able to think critical and analysis.
- Students are able to apply industrial engineering theory in solving industrial problems.
- Students can develop their ability in solving problems individually.
- Students are able to communicate both speaking and writing well, also to develop interpersonal skills.

Sylabus – Elective Courses

COURSE		
	TI184901	: APPLIED ERGONOMICS
	Credit	: 3 credits
	Semester	: 7

COURSE DESCRIPTION

The interaction between humans with other entities in a working system will be discussed in this course to enhance the quality of work and to design the work system to be better. Some case studies about five main interactions of humans in Ergonomics i.e .: human-machine, human-computer, human-system, human-environment, and human-organization will be analyzed by the student in interactive group exploration. This course will discuss the evaluation and improvement of the working system by considering the advantages and limitations of humans following the principle of Ergonomics. As the final evaluation, a student must be designed and proposed an improvement to solve a small real problem in their group project.

COURSE'S LEARNING OUTCOME

- Participants are able to apply the concept and principle of Ergonomics in several human-interactions.
- Participants are able to explain the problem or phenomenon related with Ergonomics in the specific field of real applications.
- Participants are able to analyze the reliability and limitations of human beings to manage the errors.
- Participants are able to evaluate the weakness of a certain work system which does not meet the Ergonomics standard.
- Participants are able to propose the improvement of the work system based on the Ergonomics approaches to make the system more effective, efficient, safe, and comfortable.
- Participants are able to communicate effectively, work together in working environment and have professional attitude

MAIN REFERENCES

- Bridger, R. . (2018). Introduction to Human Factors and Ergonomics (fourth edi). New York: CRC Taylor & Francis Group.
- Hedge, A. (Ed.). (2017). Eergonomic Workplace Design for Health, Wellness, and Productivity. CRC Press.
- Kroemer, K. H. E. (2008). Fitting the Human. Fitting the Human.
- MacLeod, D. (2006). The Ergonomics Kit for General Industry. In The Ergonomics Kit for General Industry (2nd ed.). CRC Taylor & Francis Group.
- McKeown, C. (2019). Office Ergonomics and Human Factors. CRC Press.
- Niu, S., & Kogi, K. (Eds.). (2010). Ergonomics Checkpoints (2nd ed.). International

COURSE		
	TI184902	: ERGO SAFETY
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION

Occupational Safety and Health (OSH) is an important topic in both manufacturing and service industries. The effort to create a safe, comfortable and healthy workplace needs to be prioritized and is currently mandatory for the Government. Not only from the security side of company property, but more than that, the main thing is from the human side.

The Ergo Safety course provides an understanding of the importance of safety and ergonomics aspects, and how to identify existing hazards. Furthermore, students are expected to be able to assess and take precautions against potential hazards in order to minimize the chance of accidents and minimize losses due to accidents. This course also describes the safety relationship in industry 4.0.

COURSE'S LEARNING OUTCOME

- Students are able to understand the concept and principal of Ergo Safety.
- Students are able to apply hazard identification technique analysis.
- Students are able to apply safety risk assessment techniques and propose improvements.
- Students are able to understand Safety Management Systems and Safety Data Management
- Students are able to understand quantitative and qualitative safety tools analysis.
- Students are able to apply the knowledge of Ergo Safety to evaluate work systems and solve problems through effective teamwork and have professional attitude.

MAIN REFERENCES

- Geotsch, L.D., 1999, Occupational Safety and Health for Technologists, Engineers, and Managers, Prentice Hall.
- Artikel dari jurnal ilmiah dengan topik Ergonomics dan Human Factors.

COURSE	TI184903	: MACRO ERGONOMICS
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION

Macro-ergonomics is a field of science that deals with the analysis, design and evaluation of a work system. The work system is a system that involves humans in their interactions with organizations, jobs, technology / machines / work tools, and work environment. The purpose of macroergonomics is to harmonize work systems at both the macro and micro-ergonomic levels to increase productivity, job satisfaction, health and safety, and employee commitment. This goal is achieved by analyzing the entire system, arranging each element of the work system to "fit" one another, and considering various aspects of work before making a change.

COURSE'S LEARNING OUTCOME

- Students are able to understand the role of Macro Ergonomics in improving the performance / improvement of the work system and explain the basic concepts of Macro Ergonomics.
- Students are able to understand the importance of human interaction with organizations, systems, and technology and the factors that influence socio-technological interactions.
- Students are able to analyze the importance of participation in managing interactions more effectively and efficiently
- Students are able to apply Macro Ergonomics concepts in the real world
- Students are able to understand and apply Macro Ergonomics methods / approaches in evaluating and improving macro work systems.

MAIN REFERENCES

- Hendrick & Kleiner, Macroergonomics (200) Theory, Methods, and Aplications, Lawrenze Earlbaum Association.
- Hendrick, H. W. (1991). Ergonomics in organizational design and management. Ergonomics, 34(6), 743-756.
- Kluge, A. (2014). The Acquisition of Knowledge and Skills for Taskwork and Teamwork to Control Complex Technical Systems - A Cognitive and Macroergonomics Perspective.
- Vargaz, et al. (2018) Macroergonomics for Manufacturing Systems.
- Hollnagel (2014) Safety–I and Safety–II The Past and Future of Safety Management
- Karltun et al. (2017) HTO e A complementary ergonomics approach
- Salvendy, G. (2012). Handbook of Human Factors and Ergonomics, 4th edition, John Willey and Sons.
- Pulat, Mustafa. (1992). Fundamentals of Industrial Ergonomics. New Jersey : Prentice Hall.Kroemer, K.H.E. (2009). Fitting the Human : Introduction to Ergonomics, 6th edition. CRC Press.
- Artikel dari jurnal ilmiah dengan topik Ergonomics dan Human Factors

COURSE	TI184904	: METHODS AND WORK SYSTEM DESIGN
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION

Method and work system design is a course that studies the principles and techniques for getting the best design of a work system. By using the knowledge obtained in this course, students can apply the techniques of methods analysis for designing the integrated work system. The design of the work system by taking into account the technology aspect, psychology and work physiology can optimize overall human/ worker well being.

COURSE'S LEARNING OUTCOME

- Students understand various methods in designing work systems and are able to analyze and evaluate the existing work system.
- Students can identify factors that influence work design.
- Students can classify methods of analysis and work system design.
- Students can evaluate work systems which focus toward human capabilities and limitations.
- Students can design a strategy of productivity improvement through method and work station improvement.
- Students can design more effective and efficient work systems.

MAIN REFERENCES

- Barnes, Ralph M., Motion and Time Study : Design and Measurement of Work, 7th edition, New York : John Wiley and Sons

COURSE	TI184905	: PHYSIOLOGY AND WORK BIOMECHANICS
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION

Product and work system design that pays attention to human characteristics (human abilities and weaknesses) are essential because the unsuitable method will eventually cause various problems, especially in human performance and health. This course will discuss issues related to the physical requirements, program design, the measurement of physical demands, and factors related to fatigue and injury in the workplace from a physiological and biomechanical perspective. It will also discuss issues related to safety and completion of job-specific tasks in the workplace. Through this course, students are expected to be able to know and apply techniques of analysis and evaluation of physiology and biomechanics by understanding the human body structure and mechanism.

COURSE'S LEARNING OUTCOME

- Students are able to understand the basics of occupational physiology and biomechanics, including the musculoskeletal systems.
- Students are able to understand the concept of blood circulation and respiratory system which are related to occupational physiology.
- Students are able to evaluate a worker's physical work capacity, the energy consumption, and the physical workload.
- Students are able to understand the concept of fatigue and sleepiness, and how to manage them in the workplace.
- Students are able to understand the principles of biomechanics and anthropometry parameters which are employed in biomechanical analysis.
- Students are able to evaluate the work postures/movements by employing appropriate biomechanical models.
- Students are able to understand the relationship of mechanical work, energy and power.
- Students are able to evaluate the work movements/postures employing RULA/REBA, NIOSH RWL, and ManneQuin Software.

MAIN REFERENCES
• Rodahl, K., The Physiology of Work, Taylor and Francis, 2005. • Astrand, P., Rodahl, K., Dahl, H.A., Stromme, S.B., Textbook of Work Physiology : Physiological Bases of Exercise. Fourth Edition, 2003 • Chaffin, D.B, Anderson, G.B.J, Martin, B.J.,Occupational Biomechanics, John Willey & Son, 4th ed., 2006 • Winter, David A. Biomechanics and motor control of human movement. John Wiley & Sons, 2009. • Hall, Susan J. Basic Biomechanics. 6th ed. McGraw Hill. 2012 • Cheng-Kung Cheng, Savio L-Y. Woo, Frontiers in Orthopaedic Biomechanics,Springer Singapore, 2020.

COURSE	TI184908	: HUMAN RELIABILITY
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION
Human reliability is to find credible ways of helping designers, management, operators, and authorities to be able to help increase the safety and profitability of technological systems. Human reliability coupled with probabilistic risk/safety assessment introduces people to a thought process to perceive risks in operation and help define ways in which the risk can be reduced. During the course, participants will acquire the theory and practical application of human reliability. Several methods will be studied in order to predict, anticipate, and investigate the possibility of human error in the various areas of work.

COURSE'S LEARNING OUTCOME
• Students are able to explain the basic concept and the influenced factors of human reliability • Students are able to measure, calculate, and predict the reliability of human in working process • Students are able to analyze the reliability and limitations of human beings to manage errors. • Students are able to evaluate an observed object of study by considering the human reliability aspects. • Students are able to communicate effectively, work together in working environment and have professional attitude

MAIN REFERENCES
• Spurgin, A. (2010). Human Reliability Assessment, Theory and Practice. CNC Press, New York • Dhillon, B.S. (2009). Human Reliability, Error,and Human Factors in Engineering Maintenance, CRC Press, New York • Duffey, R.B., and Saull, J.W. (2008). Managing Risk: The Human Element, John Wiley & Sons, Ltd, United Kingdom • Wickens,C.D., Gordon,S,E., Liu, Y., (2003). An introduction to Human Factors Engineering. Pearson, 2nd edition, Pearson Ltd.

COURSE	TI184909	: COGNITIVE ERGONOMICS
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION
The effectiveness of human interaction in a work system is influenced by cognitive aspects in processing input from a display or information. Cognitive aspects need to be considered in designing work systems so that mistakes or mistakes in carrying out a work procedure can be avoided. Cognitive ergonomics is a course designed to provide an understanding of human interactions with the work system that surrounds them based on a cognitive overview. The main discussion in cognitive ergonomics lies in the design of the interface between humans and the work system that considers the advantages and limitations of human cognitive aspects which include the input process (perceptual stage), procentral processes (cognitive stage, for example: problem solving), and motor processes (action). stage).

COURSE'S LEARNING OUTCOME

- Students are able to explain the general concept of cognitive ergonomics
- Students are able to explain the limitation and strength of human cognitive aspect
- Students are able to analyse human interaction with system based on cognitive aspect
- Students are able to implement the concept and evaluation method of cognitive
- ergonomics to improve work system design.
- Students are able to apply the develop propose work system design that consider
- the limitation and strength of human cognitive aspect

MAIN REFERENCES

- Wickens,C.D., Gordon,S,E., Liu, Y., (2003). An introduction to Human Factors Engineering.Pearson, 2nd edition, Pearson Ltd
- Sanders, M.S. and McCormick, E.J. (1992). Human Factors in Engineering and Design. McGraw-Hill Inc.
- Salvendy, G. (2012). Handbook of Human Factors and Ergonomics, 4th edition, John Willey andSons
- Stanton, N. et al. (2005) Handbook of Human Factors and Ergonomics Methods. CRC Press, US.
- Andrews, K. (2009) Human Computer Interaction Lecture Notes. Graz University of Technology.
- Anshel, J. (2005) Visual Ergonomics Handbook. CRC Press.
- Moray, N. (1979) Mental Workload : Its Theory and MEasurement.
- Harris D. (2007) Engineering Psychology and Cognitive Ergonomics. 7th InternationalConference, EPCE 2007. Springer, Germany.
- Hollnagel, E. (2003) Handbook of Cognitive Task Design. Lawrence Erlbaum Associates, New Jersey.
- Long J. And Whitefield A. (1989) Cognitive Ergonomics and HumanPortfolio MK - 5 Computer Interaction.Cambridge University Press, New York.

COURSE	TI184921	: PRODUCTIVITY ANALYSIS
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

The Productivity Analysis course teaches the productivity management process in the production system, especially in a manufacturing company environment. This subject also explains the productivity cycle, several productivity models and examples of productivity applications in several companies. The productivity cycle which consists of measuring productivity, evaluating productivity, planning productivity, improving productivity and maintaining productivity. After taking this course, students are expected to understand and be able to analyze the production system and suggest some improvements to increase the productivity ratio. This course will introduce various Student-Centered-Learning (SCL) based learning methods where students are actively involved in the learning process.

COURSE'S LEARNING OUTCOME

- Students understand theconcepts and basics of productivity management.
- Students understand and know the requirements of the productivity cycle: measuring, evaluating, planning, increasing and maintaining productivity.
- Students understand and master productivity management in manufacturing and service companies.
- Students are able to use various techniques to increase productivity.

MAIN REFERENCES

- . Sumanth, D.J., 1985, Productivity Engineering and Management, McGraw Hill Book, Singapore.

COURSE	TI184922	: COMPUTER INTEGRATED MANUFACTURING
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

Computer Integrated Manufacturing is a manufacturing system that has integration between its physical devices, data processing and business function through a particular computer framework. The real time monitoring and review is urgently required in current advanced industries. This will ensure the achievement of great availability, quality and productivity. This course will addresses some issues to review production information starting from caption and alteration until sortation and delivery. Further, it implements a particular method to synchronize manufacturing system components or sub process such as inspection system, manufacturing process, packaging, storage and material handling

COURSE'S LEARNING OUTCOME

- Students understand the concept of Computer Integrated Manufacturing.
- Students are able to define the integration components of planning, production process, inspection, and packaging.
- Students are able to define integration strategy in the framework of upgrade or full implementation.
- Students are able to conduct an integration evaluation.
- Students are able to design a computer integrated manufacturing system in particular industry.

MAIN REFERENCES

- Ang, C.L. 1898. Planning and Implementing Computer Integrated Manufacturing, Computers in Industry 12, 131-140
- Groover, Mikell. P. 2001. Automation, Production system, and Computer-Integrated Manufacturing, 2nd edition, Prentice Hall, New Jesery
- Hannam, Roger 1996. Computer Integrated Manufacturing: from concepts to realisation, Addison-Wesley, Harlow-England
- Waldner, Jean-Baptiste 1992. Principles of Computer-Integrated Manufacturing, John Wiley & Sons, ISBN 047193450X
- Kumar, K.D,et.al. 2005. Computers in Manufacturing: towards successful implementation of integrated automation system, Technovation 25,477-488
- Lindsrom, V & Winroth, M. 2010. Aligning manufacturing Strategy and Levels of Automation: A case study, Journal of Engineering and Technology Management 27, 148-159
- Singh, Nanua 1996. Computer Integrated Design & Manufacturing, John Wiley & Sons Inc.
- Scheer, August-Wilhelm Computer Integrated Manufacturing: Towards the Factory of the Future, 2nd ed., Springer-Verlaq, 1991
- Singh, V 1997. The Cim Debacle: Methodologies to Facilitate Software Interoperability. Springer. ISBN 9813083212.
- Korem, Yoram 1983. Computer Control of Manufacturing Systems, McGraw Hill Inc. pp 287, ISBN 0-07-035341-7.

COURSE		
	TI184923	: CONCURRENT ENGINEERING
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

The length of time required to traditionally design new products is an issue that the Concurrent Engineering (CE) approach can improve it. New product development through the CE method such as designing products and production process can be run parallel, consider the entire product lofe cycle from concept to product completion, is used and worked on by teams from different departments or divisions including suppliers and customers. This elective course equips students with knowledge about collaborative development of new products using the CE approach, including the elements needed to implement CE in a company. In addition, students also understand the tools that are important in CE such as, Design for X (DfX) and Design for Manufacture and Assembly (DfMA), also can use DfMA software ti design new products.

COURSE'S LEARNING OUTCOME

- Students are able to understand the basic concept of concurrent engineering.
- Students are able to understand the elements in concurrent engineering.
- Students are able to understand the concept of design for x.

- Students are able to understand DFM concept and DFM applications.
- Students are able to use the DFMA software.
- Students are able to understand variations of design for X (example: design for logistic, etc.)
- Students are able to develop alternative design development based on DFMA concept.
- Students are able to understand the basic concept of Lean Product Development..

MAIN REFERENCES

- T. A. Salomone, What Every Engineer Should Know about Concurrent Engineering: Marcel Dekker, 1998.
- G. Boothroyd, P. Dewhurst, and W. Knight, Product Design for Manufacture and Assembly. Basel, Switzerland: Marcel Dekker AG, 2002
- Modul DFMA, Laboratorium Sistem Manufaktur, 2014
- G. Q. Huang (1996) Design for X, Concurrent Engineering Imperatives, First Edition, Chapman & Hall, London, UK
- Product design and development, by K.T. Ulrich and S.D. Eppinger, Tata McGraw Hill
- The Toyota Product Development System: Integrating People, Process And Technology. 1st Edition by James M. Morgan, Jeffrey K. Liker.

COURSE		
	TI184925	: SIX SIGMA
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

Six Sigma helps solve problems in various systems that have a view to continuous process improvement. Topics covered include: the concept of continuous process improvement, sigma measurement, organization-leadership belt, DMAIC methodology, DMADV, six sigma programs used to solve problems encountered both in the production and service system environments.

COURSE'S LEARNING OUTCOME

- Students are able to understand the six sigma concept and methodology and quality improvement.
- Students are able to understand the main issues that can explain the target of quality improvement based on real problems, consumer voices and market voices.
- Students are able to understand and can choose potential / critical factors that influence the quality characteristics.
- Students are able to understanding improvement targets in the form of statistics (data collection, descriptive and hypothetical and process capabilities) and converting in the form of DPMO and sigma values.
- Students are able to work together with a team to complete tasks and present ideas and group work results.
- Students are able to analyze the results of the selected alternative improvement solutions

MAIN REFERENCES

- James W. Matin. 2006. Lean Six Sigma for Supply Chain Management. Mc Graw Hill.
- Thomas pyzdek. 2009. The Six Sigma Handbook, Third Edition. USA : Mc Graw Hill.
- Vincent Gasperz. 2007. Lean Six Sigma for Manufacturing and Service Industries.

COURSE		
	TI184926	: SUSTAINABLE MANUFACTURING
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

This is an elective course for undergraduate students at the Department of Industrial Engineering ITS. This course is designed to provide students with an understanding of macro sustainability issues, concepts and scope of Sustainable Manufacturing (SM), strategies in SM, management approaches in SM, and tools commonly used in SM. Additionally, a case study on Zero Waste Stores will be explored thoroughly. In the current situation, there is no doubt that integrating sustainability into business process will enhance business's total performance and competitiveness. Skills developed and knowledge acquired from this course will prepare students to be environmentally conscious engineers who are sensitive to environmentally related problems and capable to solve those problems and enhance total performance of industries.

COURSE'S LEARNING OUTCOME

- Students understand the reasons, the history, the concept, the principles, the international movements, the progress of regulations/laws related to sustainable development and sustainable manufacturing at international, regional, national, and local levels.
- Students are able to recognize and identify problems related to sustainability at macro and micro levels.
- Students are able to implement sustainability principles in business processes.
- Students develop sensitivity and care to environmental related problems surround them.
- Students are able to communicate their ideas and thoughts verbally and in writing.

MAIN REFERENCES

- Anityasari, M. (2009) An Integrated Assessment Model for Reuse Strategy: Technical, Social, Environmental, and Economic Aspects, VDM Verlag
- Curran, M.A. (1996) Environmental Life-Cycle Assessment, McGraw-Hill
- Lewis, H., Gertsakis, J., Grant, T., Morelli, N., Sweatman, A. (2001) Design+ Environment, Greenleaf Publishing
- Dornfeld, D.A. (2013) Green Manufacturing, Springer
- Kementerian Perindustrian Republik Indonesia (2014), Industri Hijau (Green Industry)
- Selected international journals & articles (materials will be provided).

COURSE		
	TI184927	: INDUSTRIAL ENVIRONMENTAL MANAGEMENT
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

Industrial environmental management is an elective course specially designed for Industrial Engineering students. This subject studies the principles of management related to the strategic issues of environmental aspects in the organizations, corporations and industries. Industrial environmental management subject also explain about environmental management systems, the principle of integration of environmental aspects for production planning, production process, consumption and end of product management, that get the integration of operational systems and organizations that have environmentally friendly and better eco efficiency. This subject equips students to understand and be able to identify and implement the principles of auditing and environmental performance measurement for industries and organizations.

COURSE'S LEARNING OUTCOME

- Students are able to understand the important of environmental aspects and be able to explain the importance of "sustainability" concept int the corporate context and industrial strategies, also be able to recognize aspects of environmental impacts in the use of natural resources.
- Students are able to understand and explain the relationship between environmental management needs in business development strategies and production processes.

- Students are able to explain the importance of environmental aspects in the design, planning, operation, and control of an environmentally friendly production system.
- Students are able to explain and apply several auditing concepts and environmental impact analysis and understand how to measure environmental performance.
- Students are able to identify environmental impacts and assess the significance of a business process activity impact.
- Students are able to simulate an organization or industry towards an better "eco-efficiency" of organization or industry.
- Students are able to implement the basic principles and technique of environmental management: environmental quality control, starting from the planning, monitoring, controlling, analysis and evaluation stages.

MAIN REFERENCES

- Dixon, J.A And M. Hufschmidt. Economic Valuation Techniques For The Environment: A Case Workbook. The Joint Hopkins University Press, 1991.
- Annonyme. Iso Dan Ban, Implementaing Iso 14000. Environmental Management Systems According To Iso 14001.
- Ulhoi J.P. Corporate Resources And Environmental Management: What, Why, And What ?. Tims Xxxii Conference, Alaska, 1995.
- Allenby, B., Graedel Te. (2010). Industrial Ecology, Prentice Hall. New York
- Soemarwoto, O. Analisis Dampak Lingkungan.Gadjah Mada University Press; Jogjakarta. 1990.
- North, K. Environmental Business Management. Management Development Series, 2005.
- Annoy. Business Strategy And The Environment. Vol.No.1, March 2006, Joint Wiley & Sons.
- Tietennberg T. Environmental And Natural Resource Economics. Scot, Foresman And Company, Boston,1988.
- Hotenfenbeck,W. The Green Management Revolution: Lessons In Environmental Excellence. Prentice Hall.1992.
- DE SIMONE L AND F.POPOFF. ECO EFFICIENCY.THE BUSINESS LINK TO SUSTAINABLE DEVELOPMENT. THE MIT PRES 1997

COURSE		
	TI184930	: QUALITY ENGINEERING LEARNING DESIGN
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

The ability to continuously improve quality is one of the company's needs that must be met. This Quality Engineering course is aimed at guiding and training students in understanding the concept of quality improvement, managing quality improvement activities, and practicing quality improvement techniques. Team work is an essential foundation in implementing quality improvement programs. Identify factors that affect quality and make quality improvement alternatives. Alternative quality improvement is done by striving for the selected product parameters or process parameters to produce robust product or process quality. Students will also learn techniques to determine tolerance of the parameters of the product or process

COURSE'S LEARNING OUTCOME

- Students are able to understand the concept of Quality Improvement
- Students understand the factors that influence the success of quality improvement programs.
- Students are able to understand, implement, and manage quality improvement programs.
- Students are able to understand and use quality improvement techniques

MAIN REFERENCES

- Peace G., Stuart, Taguchi Methods a Hands-on Approach, Addison-Wesley Publishing Company, Inc., Canada, 1995
- Amitava M, Fundamentals of Quality Control and Improvement, Macmilan Publishing Company, New York, 1998.

- AIAG, Measurement System Analysis Reference Manual, Crysler Corporation, 1995.

COURSE	TI184933	: LEAN CONCEPT & ITS APPLICATIONS
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

Industrial and System engineers should be responsible for continuously improving operational performance, develop systems that are fast, flexible, focus to their customers. This course will introduce undergraduate and graduate students to Lean thinking principles and its implementations. This course provides students with an introduction to Lean concept, Lean production and Lean services starting from describing the background behind its development and how evaluations and assessments of enterprise systems are performed and then initiate an improvement project. Some of Lean tools and techniques will be described and in some cases demonstrated in simulation exercises. The issues relating to employee involvement, improvement teams, training and culture, also examples of applications in manufacturing and business processes will be presented.

COURSE'S LEARNING OUTCOME

- Ability to understand the Lean thinking concept.
- Ability to apply Lean Concept.
- Ability to analyze a manufacturing system using Lean Manufacturing tools.
- Ability to criticize the applications of Lean thinking in production system and service sectors.
- Ability to construct an improvement plan using Lean Concept

MAIN REFERENCES

- Lean Thinking, James Womack and Daniel Jones, Free Press, Revised Edition, 2003.
- Lean Production Simplified, Pascal Dennis, Productivity Press, 2007.
- The Toyota Way Field-book, Jeffrey Liker and David Meier, McGraw-Hill, 2006.
- Going Lean: How the Best Companies Apply Lean Manufacturing Principles to Shatter Uncertainty, Drive Innovation, and Maximize Profi t, Stephen A. Ruffa, Amacom, 2008.

COURSE	TI184941	: MULTI CRITERIA DECISION MAKING
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

Multi Criteria Decision Making (MCDM) Course is an elective course for undergraduate students at the Department of Industrial Engineering ITS. This course is concerned with structuring and solving decision and planning problem involving multiple criteria and multi objective environment. The aim this course to provide students with an understanding of decision making process and to explain the conflicting criteria and objective faced in real system decision. This course will prepare the student to be able to implement the technique of MCDM to analysis the decision problem faced in industries, corporate, organization unit or any kind of decision level where are considered as problem os multi-objective or else multi-attribute.

COURSE'S LEARNING OUTCOME

- Students understand the decision environment and situation in which traditional concept of "optimal" is non existent in nature due to complex or real problem of decision making.
- Students are able to recognize and identify problems related paradigm of conflicting criteria or objective taking into account, satisfied solution and compromise as well as bounded rationality.
- Students are able to implement/apply several and out ranking technique for measurement preference of the related decision making in conflicting criteria and considering the multiple objective.
- Students are understanding and able to utilize various of MCDM/MODM algorithm and techniques to solve simple to appropriate complexity decision problems.
- Students are able to develop mathematical model for solving problem multicriteria/multiobjective environment and to analyse the trade off of the compromise solution.
- Students are able to communicate their ideas and thoughts verbally and in writing.

MAIN REFERENCES

- Bana E Costa, C.A (1996). Readings In Multiple Criteria Decision Aid, Springer Verlag, Berlin.
- Goicoechea, A., D.R. Hansen And L. Duckstein. Multiobjective Decision Analysis With Engineering And Business Applications. Joint Wiley And Sons, 1982.
- Maystre L.Y., J.Pictet Dan J. Simos. Methode Multicritere Electre, Presses Polytechniques Et Universitqires Romandes, Lausanne, 1995
- Tabucanon, M.T.Multipile Criteria Decision Making In Industry, Elsevier, 1992
- SAATY,T.L, FUNDAMENTAL OF DECISION MAKING IN PRIORITY THEORY. RWS PUBLICATIONS, 1994.

COURSE		
	TI184943	: DATA MINING
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION

Data Mining Course consists of concepts, processes, and the use of data mining. Through this course, students are instructed and being given insights to be able to extract beneficial information or knowledge from a big scale data set through data mining tools. Data mining tools such as clustering, classification, regression, and association will be introduced until the ways to implement it by using software. Data preprocessing will be introduced before data mining tools can be imposed toward a data set.

COURSE'S LEARNING OUTCOME

- Students understand the concept, process, why, what is data mining, data, data quality, types of variables.
- Students understand the concept of learning, supervised, unsupervised learning.
- Students are able to explain data mining tasks: classification, regression, computing, association, social networks, text mining, descriptive, predictive, prescriptive.
- Students understand the concept and implement data mining algorithms: clustering, KNN, SVM, LDA
- Students are able to do data preprocessing: cleaning, scaling, normalization
- Students are able to use the R software or Matlab
- Students are able to apply data mining tools to perform data mining tasks
- Students are able to evaluate the otput of data mining experiments
- Students are able to present and analyse of data mining output

MAIN REFERENCES

- Data Mining terapan dengan matlab (budi santosa, 2007)
- J. Han, M. Kamber, and J. Pei, Data Mining: Concepts and Techniques. Morgan Kaufmann, 3rd ed. , 2011
- 3.P.-N. Tan, M. Steinbach and V. Kumar, Introduction to Data Mining, Wiley, 2005.

COURSE		
	TI184944	: METAHEURISTICS OPTIMIZATION
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION

Metaheuristics are typically high-level problem-independent strategies which guide an underlying more problem specific heuristic to increase their performance in finding the optimal solution. They are general purpose tools but have to be tailored to a specific problem. Since many real-world problems can be solved with metaheuristics, it is not possible to cover too many of them in one semester. As a compromise, a few problems will be chosen (such as function optimization, single machine scheduling, and traveling salesman problem) to show the use of these metaheuristics in the class

COURSE'S LEARNING OUTCOME

- Understand and explain class of optimization, optimization techniques, basic concept of metaheurisrics, advantages of metaheuristics
- Understand and apply metaheuristics for simple and complex cases using software
- Hybridize two or more metaheuristics and or heuristics techniques

MAIN REFERENCES

- Metaheuristik: konsep dan implementasi Budi santosa, Paul Willy, 2011
- Modern Heuristic Optimization Techniques, Theory and Applications to Power Systems, Wiley Interscience, Kwang Y Lee and Mohamed A Sharkawi,

COURSE		
	TI184946	: SYSTEM DYNAMICS METHODOLOGY
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION

System Dynamics Methodology is an approach based on the "Systems Thinking" paradigm in seeing a problem comprehensively and related to other problems as a complex systemic relationship. The problems referred to in this lecture are not limited to engineering problems, but also involve broader issues, including: social, economic and environmental issues. By looking at the problems comprehensively, students are expected to be able to design and build the relationship between problems with one another in the form of a cause and effect diagram. This cause-and-effect diagram is the first step in modeling in order to fully represent the reality of the problem. Furthermore, students follow up by developing a causal diagram into a computer simulation model in the form of a flow chart with the help of STELLA or VENTANA software and simulate the model. Based on the simulation results, students must be able to validate and verify the model that has been developed as a benchmark for the validity of the model. On the basis of a model that has proven its validity, students are trained to be able to use and compile treatment scenarios as well as to analyze the behavior of the model representing the real world. Learning activities consist of lectures that discuss systems thinking paradigms, system modeling using STELLA or VENTANA software. The next step is to perform simulation and analysis of behavioral scenarios on the model that has been developed. In this lecture, students are required to complete individual and group assignments related to the development of a dynamic system model.

COURSE'S LEARNING OUTCOME

- Be able to understand about: what, why and how the concept and paradigm of systems thinking in seeing a problem comprehensively and providing examples of a problem that is related to other problems and does not stand alone, as a systemic linkage.
- Be able to develop a series of positive and negative causal linkages logically and completely, and identifying the existence of closed positive and negative feedback loops in a cause-and-effect diagram.

- Be able to categorize the relationship between problems as a material or informational relationship as well as to categorize problems or entity variables in the causal diagram as stocks, rates, converters and constants.
- Be able to utilize a System Dynamics software, namely STELLA or VENTANA to build flowcharts, carry out experiments through simulation, verify and validate the results of model built and able to interpret the output of simulation experiments.
- Be able to make policy scenarios on the model by changing the model parameter values or the model structure as well as predicting the future behavior of the model towards the scenario changes, and then selecting the best scenario alternative.
- Be able to communicate and work in team to build and develop a System Dynamics model from a real case which is in line with their interests in the fields of sustainable development goals (SDGs)

MAIN REFERENCES

- Sterman, J. D., Business Dynamics : System Thinking and Modeling for Complex World; McGraw-Hill Higher Education, 2000.
- Borschev, A. The Big Book of Simulation Modeling, Anylogic North America, 2013.
- Bala, B. K., Arshad, F. M., Noh, K. H., System Dynamics : Modelling and Sumulation, Springer, 2017..

COURSE		
	TI184949	: GAME THEORY
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION

Game theory discusses mathematical-based techniques for multi-player decision making problems. Topics covered include scope and type of games, its formalization, techniques to find the solution, and some interesting issues in game theory application in industrial cases. This course is intended to equip bachelor students with close-to-reality decision making through systematic and analytical approaches.

COURSE'S LEARNING OUTCOME

- Be able To understand the concepts, basics and types of multi player decision making (game) and its application in industry.
- Be able to construct the model and to solve non cooperative games especially the two-player zero-sum games.
- Be able to construct the model and to solve the two-player zero-sum games.
- Be able to operate game theory software application for both non-cooperative and cooperative games.
- Be able to recognize the updated game theory implementation in industrial cases as lifelong study.

MAIN REFERENCES

- Dutta, P.K., Strategies and games: Theory and practice, MIT Press, 1999.

COURSE		
	TI184951	: DECISION ANALYSIS
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION

This course provides another perspective on engineering-industrial problem solving. If students have previously studied optimization mathematical problems, Decision Analysis is more focused on the process of structuring the problem, thinking creatively to produce alternative decisions, then proceed with the search for the best alternative using solution techniques that have been learned in previous courses. . Accommodating the uncertainty factors and decision maker preferences also become an integral part that

is also studied in this course.

COURSE'S LEARNING OUTCOME

- Understand the basic concepts and paradigms of decision problems.
- Be able to perform analysis and selection of the best alternatives according to the criteria and models used
- Understand how to do decision structuring by modeling problem decisions that are commonly used
- Be able to accommodate uncertainty in decision modeling
- Be able to consider decision maker preferences in analyzing decision making

MAIN REFERENCES

- Clement, Robert T. (1996). Making Hard Decisions: An Introduction to Decision Analysis, 2nd Edition., Duxbury Press.

COURSE		
	TI184952	: APPLIED DISCRETE EVENT SIMULATION
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION

Business and industrial problems now becomes complex. The complexity of the problem can be seen from the uncertain conditions which whom they face. For example, they cannot even predict their future product demands or the availability of their resources, such as raw materials, manpowers, or machines. The interdependencies between sub-system also make the problem more complex. The decreasing demand with steady production will make the inventory level increase, as one of the interdependency. Thus, discrete event simulation is appropriate tools to be used to solve these kinds of problems.
This course is advanced discrete event simulation course. As the continuation of the first series, industrial system simulation, this course is intended to teach students who needs to enrich their basic skills in Discrete Event Simulation by developing, implementing, and applying advanced simulation methods. This course will focus on the use of advanced moduls of simulation software and apply them on operational business decisions. For example, we will use simulation to determine optimal inventory policies, either under backorder or lost sale conditions. Some recent problems either taken from the final projects/thesis or jurnal/conference papers also are under studied to enhance the skills of the students.

COURSE'S LEARNING OUTCOME

- Be able to define, formulate, construct and resolve various complex systems facing by industrial and business by using simulation models
- Be able to identify the inputs of and Interpret outputs from a simulation model
- Be able to use and apply the advanced modules of simulation software
- Be able to disseminate results, defend the choices of model structure and data inputs by means of an interactive oral presentation and examination
- Be able to describe the limitations of simulation analyses

MAIN REFERENCES

- Benjamin Melamed and Tayfur Altiok, "Simulation Modeling and Analysis with ARENA", Elsevier Inc, 2007.
- Alan Pritsker and Jean J. O'Reilly, "Simulation with Visual SLAM and AweSim", Wiley, 1999
- W. David Kelton, Randall P. Sadowski, "Simulation with Arena", McGraw-Hill Education, 2014.

COURSE		
	TI184962	: ENTERPRISE RESOURCE PLANNING
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

Enterprise resource planning (ERP) is operations and supply chain management software used bu companies to coordinate information in business areas. The objective of this course is to introduce the ERP concepts, ERP modules and ERP practical case.

COURSE'S LEARNING OUTCOME

- Students are able to explain the definition, history, function, benefits, modules, and practical case of ERP
- Students are able to explain business process re-engineering in ERP, method of BPR in ERP and how BPR applied in ERP
- Students are able to explain planning, design and implemention of ERP
- Students are able to understand and apply sales and marketing module in ERP Software (SAP, Oracle and Odoo)
- Students are able to understand and apply production/supply chain management module in ERP software
- Students are able to understand and apply accounting and financial module in ERP
- Students are able to understand and apply human resources module in ERP

MAIN REFERENCES

- Monk, E and Wagner, B (2009) Concepts in Enterprise Resource Planning, 3st editions, Course Technology

COURSE		
	TI184963	: PROCUREMENT AND MATERIAL MANAGEMENT
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

Procurement and Materials Management equips students with a master's degree program the ability to develop models of basic supplies and apply it, as well as provide the capability for analyzing models of more complex supply system for problem solving and research. Topics covered include: the scope of the inventory system, the basic models of inventory systems, procurement systems , and suppliers selection.

COURSE'S LEARNING OUTCOME

- Students understand the concepts and basics of procurement and material management and related activities.
- Students understand and able to analyze the development and applications of inventory system models in real life systems.
- Students are able to analyze and design systems related to inventory management problems and related areas.
- Students are able to understand the basic of procurement / purchasing strategy, sourcing strategy and sourcing strategy process.
- Students are able to present the development of inventory system models and applications, supply management and related subject from selected journals as a group of students.

MAIN REFERENCES

- Tersine, Richard J.,(1994), Principle of Inventory and Materials Management, Forth Edition, Prentice Hall Inc.,.

COURSE		
	TI184964	: AIR TRANSPORTATION MANAGEMENT
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

This course gives a comprehensive understanding to Industrial Engineering Undergraduate Students about the decision making process in air transportation management. This course focuses in the development of planning optimization models along with the best exact also heuristic solutions for flight scheduling, flight routes and operational flight execution that covers revenue management, crew scheduling and fleet assignment.

COURSE'S LEARNING OUTCOME

- Students are able to understand and explain about the scope of Air Transportation Management including Airline Business and its competition.
- Students are able to understand and develop airline management system basic models : Airline Planning and Operations in different decision levels
- Students are able to understand and develop man power planning related to air transportation : cabin crew and pilots, and maintenance and ground handling officers
- Students are able to analyze the roles of Revenue Management in Airlines including pricing and seat inventory strategy
- Students are able to analyze the problems occurred in Airport Operations and Planning
- Students are able to apply air transportation models for practical cases with specific algorithm and conduct an analysis of the application
- students can develop the ability to form a simple heuristic algorithm in solving problems

MAIN REFERENCES

- Bazargan, Massoud (2010). Airline Operation and Scheduling, 1st Edition., Ashgate Publishing Limited
- Norman J Ashford, Pierre Coutu , John R. Beasley (2013). Airport Operations (Third Edition), McGrawHill.

COURSE		
	TI184965	: DISTRIBUTION MANAGEMENT
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

Distribution Management is an elective course for Industrial Engineering undergraduate students. This course gives an overview of mathematical models in transportation and distribution system planning, and the correlation between advanced theories and simple computer applications. Students attending this course are expected to have basic skills in programming and operational research. This course is designed to provide student with modeling problem and forming both exact and heuristic algorithms to solve transportation and distribution problems. This course will introduce a variety of teaching methods based on Student-Centered-Learning (SCL) that students actively involved in learning process. The students are required to learn Visual Basic Applications for Microsoft Excel (VBA Excel) independently after taking a session of Introduction to VBA Excel during this course. In the end of this lecture, the students will be assigned with a VBA Excel based final project related to transportation and distribution systems.

COURSE'S LEARNING OUTCOME

- Students are able to recognize and identify problems related to distribution network and transportation
- Students are able to understand mathematical modeling techniques for solving distribution network and transportation planning problems
- Students are able to apply distribution network models for real cases with specific algorithm and conduct an analysis of the application

- Students are able to apply transportation models for real cases with specific algorithm and conduct an analysis of the application
- Students can develop the ability to form a simple heuristic algorithm in solving problems
- Students have basic skills in programming using Visual Basic for Application for Microsoft Excel

MAIN REFERENCES

- Daskin, Mark S. (2013). Network and Discrete Location: Models, Algorithms, and Applications. New York: John Wiley and Sons, Ltd. 2nd Edition
- Paolo Toth and Daniele Vigo (Eds). (2014) The Vehicle Routing Problem. Monographs on Discrete Mathematics and Applications. S.I.A.M., Philadelpia. 2nd Edition

COURSE	TI184966	: RETAIL SUPPLY CHAIN MANAGEMENT
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

This course aims to provide students with knowledge about retail supply chain management, which includes understanding the strategic planning in retail, retail types, product classification, market selection, and coordination between supplier-warehouse - store. This course also assists the students to understand how to manage supply chain management for retail businesses through several small projects related to real cases. Several issues addressed are consumer behavior, pricing strategies, store layout, space allocation and retailing for special products. These projects also help the students to have an experience in designing a supply chain in a real mini case. In the end of this course, the students are expected to have a comprehensive knowledge and basic design skills on the retail supply chain.

COURSE'S LEARNING OUTCOME

- Explain process in developing strategic plan in retail
- Understand the product category and relate it with the type of retailer
- Use analytical tools in designing retail supply chain.
- Explain the different policies in pricing.
- Understand how shopping behavior and product layout affects retail performance
- Understand the impotance of coordination between supplier-warehouse-retail store
- Describe several alternatives of technology that can be used to manage data related to retail

MAIN REFERENCES

- Barry Berman, Joel R. Evans - Retail Management A Strategic Approach (13th Edition), Pearson (2018)

COURSE	TI184971	: BUSINESS PROCESS RE-ENGINEERING
	Credit	: 3 credits
	Semester	: 6/7/8 (elective)

COURSE DESCRIPTION

Business process re-engineering is a process approach to improve business performance that combines methodologies and information technology. The objective of this course is to introduce the concepts, models, techniques, methods and practical case in business process re-engineering.

COURSE'S LEARNING OUTCOME

- Ability to explain BPR concepts and the relationship business strategy and business processes
- Ability to apply the generic business process models
- Ability to explain the business process in ERP system
- Ability to apply the methods/techniques for business process mapping

- Ability to analysis process for simple and complex problems
- Ability to apply process mining techniques to re-inviting business processes
- Ability to understand and apply process improvement using process mining software

MAIN REFERENCES

- Anupindi, R., Chopra, S., Deshmukh, S. D., Van Mieghem, J. A., & Zemel, E. (2006). Managing business process flows: Pearson Higher Ed.
- Weske, M (2007), Business process management: concepts, languages and architecture, Springer
- Vanany (2016) Business process re-engineering, Sinar Gamedia

COURSE	TI184972	: SERVICE MANAGEMENT
	Credit	: 3 credits
	Semester	: 7

COURSE DESCRIPTION

As a continuously increasing global economy, providing services is believed as a new strategy that could give more competitive advantages for the industry to survive in today's market. In line with this fact, it becomes more relevant for Industrial Engineers to understand all aspects related to service management. Through this course, students will obtain a comprehensive understanding of how to manage a service company, including a theoretical understanding of how to design services, how to execute the service design and how to evaluate the service implementation and give improvement recommendations. Students will work in a team as well to analyse and evaluate a real service industry or case study to sharpen their practical understanding.

COURSE'S LEARNING OUTCOME

- Students can describe the role of services in global economics.
- Students can explain the basic concept of service, including its characteristics.
- Students can design a service base on four steps.
- Students can implement the result of the design base on four steps.
- Students can identify recommendations to improve the performance of a service company.
- Students can present the discovery learning of service design and management in a specific context in the real world.

MAIN REFERENCES

- Ramaswamy, R. 1996. Design and management of service processes: keeping customers for life: Addison-Wesley.
- Fitzsimmons, J.A. and Fitzsimmons, M.J. 2014. Service management: operations, strategy, and information technology: Irwin/McGraw-Hill. Eighth edition.

COURSE	TI184973	: PERFORMANCE MANAGEMENT
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION

Performance Management aims to provide the students with the knowledge of the strategic roles of performance management in corporate. The objects of study cover the basic concept of integrated performance management, the traditional and modern models of performance management such as Balanced Scorecard, Performance Prism, Excellence Model, and employee performance measurement.

COURSE'S LEARNING OUTCOME

- Students are able to understand the basic concept of integrated performance management
- Students are able to understand and use the model of performance management
- Students are able to understand the concept of employee performance management
- Students are able to design integrated framework of corporate performance management

MAIN REFERENCES

- Hakes, Chris, 2007. The EFQM Excellence Model to Assess Organizational Performance - A Management Guide (Best Practice), 1st Edition, Van Haren Publishing.
- Kaplan, Robert S. and David P. Norton, 1996. The Balanced Scorecard: Translating Strategy into Action, 1st Edition, Harvard Business Review Press.
- Kaplan, Robert S. and David P. Norton, 2000. The Strategy-Focused Organization, 1st Edition, Harvard Business Review Press.
- Kaplan, Robert S. and David P. Norton, 2004. Strategy Maps: Converting Intangible Assets into Tangible Outcomes, 1st Edition, Harvard Business Review Press.
- Kaplan, Robert S. and David P. Norton, 2006. Alignment: Using the Balanced Scorecard to Create Corporate Synergies, 1st Edition, Harvard Business Review Press.
- Kaplan, Robert S. and David P. Norton, 2008. The Execution Premium: Linking Strategy to Operations for Competitive Advantage, 1st Edition, Harvard Business Review Press.
- Neely, Andi, 2002. Business Performance Measurement, 1st Edition, Cambridge University Press.
- Neely, Andi, Chris Adams, and Mike Kennerley, 2002. The Performance Prism: The Scorecard for Measuring and Managing Business Success, 1st Edition, Financial Times Prentice Hall.
- Verweire, Kurt and Lutgart Van Den Berghe, 2004. Integrated Performance Management: A Guide to Strategy Implementation, 1st Edition, Sage Publications.

COURSE		
	TI184974	: KNOWLEDGE MANAGEMENT
	Credit	: 3 credits
	Semester	: 8

COURSE DESCRIPTION

In this course, students will be directed to understand the conception and methodology of knowledge management which includes the creation of knowledge, knowledge architecture, codification of knowledge, and analytical tools needed for knowledge management and the development of knowledge portals and audits, acquisitions, transfer and sharing of knowledge in order to achieve the company's competitive advantage.

COURSE'S LEARNING OUTCOME

- Students understand the conception of knowledge and knowledge management.
- Students understand the techniques and tools, as well as the framework that can be used to carry out management of knowledge.
- Students understand and are able to use KM Tools and Knowledge Portals in the process of managing corporate knowledge.
- Students understand and are able to implement the knowledge management and learning of corporate organizations to produce innovation.

MAIN REFERENCES

- K. Dalkir, Knowledge management in theory and practice. Amsterdam; Boston: Elsevier/Butterworth Heinemann, 2005.
- Elias M. Awad, Hassan M. Ghaziri, Knowledge Management, Pearson Education Inc., Prentice Hall, 2004.

COURSE		
	TI184976	: FINANCIAL MANAGEMENT
	Credit	: 3 credits
	Semester	: 8

COURSE DESCRIPTION

In the middle of increasingly industrial competition, an Industrial Engineer is expected to play a role in the creation of company / industry value. To achieve this goal, an important competency that must be possessed is the ability to conduct analysis from a stronger financial perspective, enabling them to make decisions that better reflect the needs of the industry. This course will provide concepts and decisions in financial management, especially those related to corporate finance. The discussion in this lecture is divided into 4 main parts. Part one will introduce the basic concepts of financial management, the second part will explain the valuation of financial assets, the third part discusses in detail the investment decisions on long-term assets and the last part discusses the capital structure and dividend policy of company. Students will complete several assignments and exercises to strengthen their understanding of the topics discussed during lectures.

COURSE'S LEARNING OUTCOME

- Students are able to understand finance and the scope and problems faced in financial management.
- Students understand how to value financial assets.
- Students understand investing in long-term assets and make an assessment of investments in those long-term assets.
- Students understand the theories related to funding structures and can determine the optimal funding structure and dividend policy.
- Students understand how to manage working capital efficiently and effectively.
- Students can identify, analyze, evaluate and manage financial risks.

MAIN REFERENCES

- Titman, Keown et al, "Financial Management: Principles and Applications 12/E", Pearson, 2014.
- Berk, DeMarco et al, "Fundamentals of Corporate Finance", Prentice Hall, 2012.
- Crundwell F.K., "Finance for Engineers: Evaluation and Funding of Capital Projects", Springer-Verlag, London, 2008.

COURSE		
	TI184979	: CORPORATE RISK MANAGEMENT
	Credit	: 3 credits
	Semester	: 3

COURSE DESCRIPTION

Risk Management is the election course that aims to provide the students with the knowledge of the important risk management incorporate. The objects of study cover risk standards, framework, and processes that include risk identification, assessment, and prioritizing. Students will also learn to use several risk management quantitative tools such as Strategic Objective at Risk (SOAR), Failure Mode Effect and Analysis (FMEA), Fault Tree Analysis (FTA), Value at Risk (VAR), and Monte Carlo Simulation.

COURSE'S LEARNING OUTCOME

- Students can understand the risk concept and the important aspects of corporate risk management.
- Students can understand and use quantitative methods to identify and assess risks.
- Students can understand and design risk profile, mitigation strategies and risk management audit.
- Students can develop their critical, analytical thinking, and communication skill by conducting case study analysis.

MAIN REFERENCES
• Dempster, M.A.H. 2002. Risk Management: Value at Risk and Beyond. 1st Edition. Cambridge University Press. • McDermott, Robin E, Raymond J. Mikulak, and Michael E. Beauregard. 2009. The Basics of FMEA. 2nd Edition. Taylor & Francis Group. • Merna, Tony and Faisal Al-Thani, 2008. Corporate Risk Management. 2nd Edition. John Wiley & Sons. • Monahan, Gregory, 2008. Enterprise Risk Management: A Methodology for Achieving Strategic Objective. 1st Edition. John Wiley & Sons. • Olson, David L. and Desheng Wu. 2020. Enterprise Risk Management Models. 3rd Edition. Springer

COURSE		
	TI184980	: INDUSTRIAL CLUSTER
	Credit	: 3 credits
	Semester	: 5

COURSE DESCRIPTION
The Industrial Cluster Course is a subject that focuses on providing knowledge about an effective industrial development strategy used to improve industrial performance and to have a positive impact on the regional economy, both locally, regionally and nationally. This course is designed to introduce the concept of industrial clusters, their rationale and approaches used in their development. Students will also learn about several methods to analyze the effectiveness of an industrial cluster. At the end of the lecture, students will have the ability to design an applicable industrial cluster development model and have the ability to become industrial cluster facilitators in minimal areas for micro, small and medium scale enterprises.

COURSE'S LEARNING OUTCOME
• Students can create a production chain map and identify specific industrial cluster stakeholders. • Students can identify stakeholder needs in an industrial cluster. • Students can elaborate information and data to analyze the completeness of components and functional effectiveness of an industrial cluster. • Students can design a predetermined industrial cluster development model concerning the sustainability of competitiveness. • Students can use relevant software to analyze the dynamics of an industrial cluster. • Students can become a facilitator in the development of industrial clusters at least on a small and medium industrial scale.

MAIN REFERENCES
• Porter M.E. 1998. Clusters and the New Economic of Competetion. Harvard Business Review • Porter, M. 1980. Competitive Strategy : Techniques for Analyzing Industries and Competitors : With a New Introduction : The Free Press

COURSE		
	TI184986	: AGENT-BASED MODELLING
	Credit	: 3 credits
	Semester	: Elective

COURSE DESCRIPTION
This course provides a new approach in system modeling, particularly in the context of Industrial Engineering. The agent-based system modeling (ABSM) approach applies a bottom-up approach in general, which means it focuses on interactions between agents to understand an emergent behavior in a system. The approach also has an ability to generate information for anticipating the possible effects of business decisions on a market and industries. At the completion, students are expected to understand why agent-based modeling is needed, what the foundation of ABSM is, why ABSM is useful and used, and how the approach works. Students are also required to be able to develop agent-based models for several case studies in the Industrial Engineering context. As for the platform, this course uses NetLogo because it is easy to acquire (i.e. freeware) and has been proven supports complexity education. This course will

introduce a variety of teaching methods based on Student-Centered-Learning (SCL) that give students opportunity to actively get involved in the learning process.

COURSE'S LEARNING OUTCOME

- Students understand the concept of agent-based system modeling
- Students understand the agent's characteristics, attributes, and behavior
- Students understand and demonstrate the agent-based modeling approach for system modeling
- Student understand and are able to apply the conceptual modeling approach for agent-based system modeling
- Students are able to be proficient in NetLogo
- Students are capable to test the validity and verify the model
- Students are able to design and implement experiments and analyze the results

MAIN REFERENCES

- Railsback, S. F., and Grimm, V., 2012, Agent-based and individual-based modeling: A practical introduction. Princeton: Princeton University Press.
- Wilensky, U., 2014, NetLogo 5.1.0 User Manual. http://ccl.northwestern.edu/netlogo/. Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL.
- North, M. J. and Macal, C. M., 2007, Managing Business Complexity: Discovering Strategic Solutions with Agent-based Modeling and Simulation, Oxford University Press.
- Robinson, S., 2014, Simulation: The practice of model development and use, Palgrave Macmillan.
- Robertson, D.A., and Caldart, A.A., 2009, The dynamics of strategy: Mastering strategic landscapes of the firm, Oxford University Press.

COURSE		
	TI184986	: STRATEGIC MANAGEMENT
	Credit	: 3 credits
	Semester	: 7

COURSE DESCRIPTION

The strategic management course aims to provide students with knowledge about:

- existing competition in the market for goods or services,
- competitive attributes that can be used,
- the components of the strategy
- competitive attributes that can be used,
- analysis and the steps taken to formulate a strategy,
- generic strategies that can be used
- the latest strategies that can be used,
- strategy implementation,
- monitoring and evaluation of strategies.

During lectures, students also get assignments which include:

- designing a vision, mission, and strategic objectives,
- formulate order qualifiers and order winner criteria,
- SWOT analysis
- formulate a strategy based on the results of a SWOT analysis,
- strategy implementation, monitoring and evaluation of strategy implementation

COURSE'S LEARNING OUTCOME

- Students understand the important components of Strategic Management and their role in the company's overall business process
- Students are able to design Strategic Management System for corporate based on important components in Strategic Management
- Students have strategic communication skills on the Strategic Management designs that are prepared

MAIN REFERENCES

- David, Fred R. and Forest R. David. 2015. Strategic Management: Concepts and Cases. 15th Edition. USA: Pearson Education
- Thompson, Arthur A., A.J. Strickland, and John Thompson. 1999. Strategic Management: Concepts and Cases. 11th Edition. McGraw-Hill Companies